Dewatering Assessment

Cashmere Mill Site Remedial Excavation (Phase 2)
Cashmere, Washington

for
Washington State Department of Ecology

July 31, 2013

GeoEngineers
Earth Science + Technology

Dewatering Assessment

Cashmere Mill Site Remedial Excavation (Phase 2)
Cashmere, Washington

for
Washington State Department of Ecology

July 31, 2013

GeoEngineers

523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Dewatering Assessment

Cashmere Mill Site Remedial Excavation (Phase 2) Cashmere, Washington

File No. 18593-001-01

July 31, 2013

Prepared for:

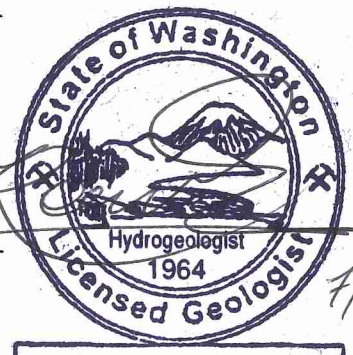
Washington Department of Ecology
Toxics Cleanup Program – Central Region Office
15 West Yakima Avenue, Suite 200
Yakima, Washington 98902-3452

Attention: Mary Monahan, Project Manager

Prepared by:

GeoEngineers, Inc.
523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Jodie L. Lamb, LEG, PMP
Project Manager



7/31/12

Michael A.P. Kenrick, PE, LHG
Principal Hydrogeologist

JDL:MAPK:tlm:tjh

GeoEngineers

Table of Contents

LIST OF FIGURES

APPENDICES

INTRODUCTION AND BACKGROUND

This report summarizes our hydrogeologic assessment services for dewatering activities conducted at the Cashmere Mill Site, Phase 2 Area (Site) located in Cashmere, Washington. Our assessment is associated with the excavation and removal (being completed by others) of wood waste and soil containing petroleum hydrocarbons at concentrations exceeding Model Toxics Control Act (MTCA) Method A Cleanup Levels. The Site is located on the western side of the town of Cashmere (Figure 1) and currently is owned by the Port of Chelan (Port). The Port is conducting a cleanup as a condition of the pending sale of the property. Cleanup at the site is being funded by the Washington State Department of Ecology (Ecology). To facilitate excavation and removal of the wood waste from the Site, Ecology has contracted with GeoEngineers, Inc. (GeoEngineers) to conduct a dewatering assessment and design for the project. The project Site is shown relative to surrounding physical features on the Vicinity Map, Figure 1.

The Site operated as a lumber mill from the 1940s through the 1970s, and has been used for commercial and industrial purposes since that time. During mill operations at the site, low-elevation areas were filled with wood waste material and imported fill. The subject Site was identified as the former log storage area for the mill site (MFA, 2013).

Remedial activities for the Mill Site project, which includes the areas north and south of Mill Road, are being conducted in two phases (Phase I and Phase 2). The Phase I construction included removal of wood waste and petroleum-contaminated soil from the areas located north of Mill Road and was completed on June 30, 2013. During Phase I construction, concerns were raised about the management of groundwater and the generation of excess volumes of potentially contaminated water within excavations that could not be properly dewatered. These concerns prompted Ecology to request a dewatering assessment that could more clearly define the challenge of maintaining dry excavations, and provide a basis for dewatering system design and implementation that could be incorporated into plans and specifications for the remedial excavations on Phase 2. This hydrogeologic assessment will address dewatering for excavation of wood waste and PCS from the Phase 2 area, generally bounded on the north by Mill Road and on the west, south and east by Brender Creek.

PREVIOUS INVESTIGATIONS

Between 2007 and 2013, the Port engaged RH2 Engineers, Inc. and Maul, Foster, Alongi, Inc. to conduct several characterization investigations across the overall former mill site. In the Phase 2 Area, these investigations identified variable depths of wood waste. In general, the wood waste appears to have the greatest thickness in the southeastern portion of the Site (RH2, 2012a), extending to depths on the order of 12 feet, and thins to the north. Because of the relatively shallow local groundwater table, much of the wood waste is located below the groundwater table. A comprehensive summary of overall Site history and previous investigations can be found in “Site Characterization Report, Former Cashmere Mill Site, Cashmere, Washington” prepared by MFA (2013).

These investigations also identified petroleum hydrocarbon-contaminated soil and an underground storage tank (UST) in the northeastern portion of the site; this area is planned to undergo remedial excavation concurrent with the excavation and removal of wood waste.

GeoEngineers conducted a geotechnical evaluation of the site in 2010, a summary of the evaluation can be found our Preliminary Geotechnical Engineering Services Report (GeoEngineers 2010). Our evaluation included the excavation of numerous test pits and drilling of two exploratory borings, both of which were completed as monitoring wells (B-1 and B-2). B-1 remains accessible in the northeastern part of the site and was used as part of this assessment; monitoring well B-2 could not be located. We understand the well was likely buried or damaged when the southern portion of the site was regraded as part of the pilot wood waste interim removal action conducted in 2011.

RH2 Engineering, Inc. installed a dewatering test well (DW-01) in the southern portion of the site in September 2012 to assess the feasibility of construction dewatering at the site. The test well was pumped for approximately three hours at increasing, but irregular, rates up to 92 gallons per minute (gpm), and achieved a maximum drawdown of 6.2 feet. Observation or monitoring wells were not used for this evaluation; therefore, the cone of depression could not be measured. Findings of this assessment are presented in a technical memorandum prepared by RH2 (2012b).

PROJECT DESCRIPTION

The Port and Ecology have entered into an interagency agreement (C1300049) to facilitate cleanup at the site in preparation for sale and redevelopment. The property is comprised of several parcels and is planned for purchase by Crunch Pak, Inc. The purchase and sale agreement between the Port and Crunch Pak, Inc. requires that the wood waste be removed and replaced with compacted fill material, and that the surface of the site be graded in preparation for redevelopment. Phase 2 construction, including dewatering implementation and remedial actions, is scheduled to begin in about September 2013 and is expected to last about 15 weeks.

OBJECTIVES

The primary objectives of this study were to:

1. Complete a full-scale pumping test on a test well at the Cashmere Mill site and observe water level responses in seven observation wells and nearby Wenatchee River and Brender Creek.
2. Use the test results to evaluate aquifer characteristics.
3. Assess the feasibility of dewatering the project excavations.
4. Provide conceptual recommendations for a dewatering system.
5. Develop recommended revisions to the Dewatering Specification.
6. Provide a minimum system design shown on a plan sheet for dewatering the area of wood waste requiring deep excavation.

SCOPE OF SERVICES

Our specific scope of services included:

- Drill and construct one 10-inch diameter temporary test well and seven 2-inch diameter observation wells using air-rotary drilling methods.
- Collect soil samples from drill cuttings continuously during drilling for field-screening using visual observations, water sheen, and headspace vapor measurements with a photoionization detector (PID) to assess possible presence of petroleum-related contaminants.
- Develop wells using surging and bailing/pumping as follows:
    - Develop test well using air-lift techniques and/or mechanical bailing and surging within sections of the screen until sand production in minimal and discharge is clear of notable solids.
    - Develop observation wells using surging by hand and/or bailing or pumping.
- Collect three groundwater samples from the newly constructed test well and two observation wells and submit for chemical analysis. Collect two samples during the constant rate discharge test.
- Perform a step-rate test with up to four pumping rates. Monitor recovery following completion of the test.
- Perform a 24-hour constant-rate pumping test at a target pumping rate of between 200 and 300 gallons per minute.
- Monitor water quality during the pumping test.
- Collect two water samples during the constant-rate test and submit for laboratory analysis of gasoline and diesel range hydrocarbons, VOCs and SVOCs.
- Depending on the results of chemical analysis, discharge water from the pumping test to Brender Creek, approximately 400 feet to the south.
- Analyze data from the pumping test to estimate aquifer transmissivity and hydraulic conductivity, anticipate probable water level drawdown versus distance for a typical pumping well, estimate likely well yield, and allow for well losses to provide expected well-specific capacity.
- Develop a conceptual approach to dewatering the site for remedial excavation, including suggested and alternative methods (for example, wells, wellpoints, etc.) and layouts expected to achieve the required drawdown.
- Prepare a draft report summarizing the results of our dewatering assessment and provide conceptual recommendations regarding design and operation of construction dewatering.
- Prepare a final report that incorporates review comments.

HYDROGEOLOGIC SETTING AND SUBSURFACE CONDITIONS

General

The Cashmere Mill site is located in the Wenatchee River Valley in the town of Cashmere, Washington, approximately 8 miles upstream of the river's confluence with the Columbia River. The Site is located on the southern side of the river valley within the historic floodplain. A former meander is located along the south and east portion of the Site (currently occupied by Brender Creek), which we understand was cut-off from the river and abandoned in the early 1900s for the purpose of Site development.

Site Geology

During this investigation, four geologic units were encountered, listed from youngest to oldest as the Fill Unit, Upper Alluvium, Intermediate Unit, and Lower Alluvium Unit. Each of these geologic units is described in the sections below.

Fill Unit

The Fill unit is comprised of wood waste material, consisting of a mixture of lumber, raw wood, and sawdust mixed with soil, and other fill material such as concrete and asphalt were reportedly imported from off-site sources to the site over several decades. The groundwater table is located within the fill unit.

Upper Alluvium Unit

The Upper Alluvium unit was encountered beneath the Fill unit and generally consisted of brown coarse sand and sub-rounded gravel with varying amounts of fine sand and silt. The Upper Alluvium is interpreted as channel deposits interbedded with overbank deposits from former occupation of this area by the Wenatchee River.

Intermediate Unit

An apparent low-permeability unit was encountered below the Upper Alluvium consisting of brownish-gray fine to coarse sand with occasional gravel. Compared with the over- and underlying units, the Intermediate Unit exhibited:

- Increased competence (the boring walls of this unit stayed open during drilling);
- Increased silt and fine sand and lower gravel content; and
- Produced less groundwater during drilling.

The deposit was encountered within all borings completed for this assessment; however, the lateral continuity across the site is unknown.

Lower Alluvium Unit

The lower alluvium generally consisted of coarse greenish-gray fine to coarse sand with varying amounts of sub-angular gravel. Groundwater produced during drilling in this unit was observed to have a bluish tint and the volume generated was significantly greater than for the above units. The

drilling for this assessment did not penetrate the full thickness of the Lower Alluvium, or encounter bedrock.

Test and Monitoring Wells

One temporary Test Well (TW-1) and seven Observation Wells (OW-1 through OW-7) were drilled to depths ranging from 20 to 40 feet. A summary of the construction details of the wells is presented in Table 1 below. Logs of the borings showing details of the well construction are included in Appendix A.

TABLE 1. SUMMARY OF BORINGS, TEST WELL AND OBSERVATION WELLS

Well Name	TW-1	OW-1	OW-2	OW-3	OW-4	OW-5	OW-6	OW-7
Well Depth (feet)	22	20.38	22.08	24.38	25.32	21.64	20.02	40.34
Well Diameter (inches)	9	2	2	2	2	2	2	2
Top of Casing Elevation (feet NAVD 88)	798.27	794.91	794.45	795.51	795.8	794.57	793.22	792.03
Screened Interval Depth (feet btoc[1])	14.37 to 24.37	10.2 to 19.73	11.87 to 21.4	14.2 to 23.73	15.2 to 24.73	11.45 to 20.98	9.85 to 19.38	30.22 to 39.75
Screened Interval Elevation Top/Bottom (feet NAVD 88)	785.7/ 775.9	784.71/ 775.18	782.58/ 773.05	781.31/ 771.78	780.6/ 771.07	783.12/ 773.59	783.37/ 773.84	761.81/ 752.28
Pre-Test Water Depth (feet btoc1)	8.15	4.17	3.66	4.62	4.79	3.92	2.71	2.29
Pre-Test Water Elevation (feet NAVD 88)	790.12	790.74	790.79	790.89	791.0	790.65	790.51	789.74
Distance From Pumping Well (feet)	0	25.91	57.41	144.90	204.50	26.75	53.92	143.50
Drawdown After 24-Hours of Pumping (feet)	4.89	2.29	1.84	1.17	0.90	2.08	1.64	0.85

Notes:
1 btoc = below top of casing

The test and observation wells were drilled in the southern portion of the Phase 2 project area in a "V" formation, at the approximate locations shown in Site Plan, Figure 2. The observation wells were aligned in both down-valley and cross-valley directions to account for potential variations in

horizontal hydraulic conductivity within the aquifer during data analysis. Wells OW-1 through OW-6 were screened within the Upper Alluvium. Well OW-7 was screened in the Lower Alluvium to observe potential response to pumping in the deeper water-bearing zone, and help to establish the effective thickness of the aquifer underlying the site.

Groundwater Quality

Representative water quality samples were obtained from two of the observation wells (OW-6 and OW-7) after well development was completed. No contaminants were reported above detection limits. Full laboratory analytical reports are presented in Appendix B.

Groundwater Flow System

The full sequence of alluvial soils below the site are saturated and form an aquifer system that is understood to infill the valley of the Wenatchee River. The groundwater table at the site is at a similar elevation to the river, and is expected to be in hydraulic continuity with the river. In such systems, the body of groundwater contained within the aquifer is typically moving down-valley parallel to the river but at a much slower velocity. The river level typically controls groundwater levels in the aquifer system, with hyporheic exchange occurring along the river channel, and groundwater level fluctuations away from the river typically exhibiting an attenuated form of the stage level changes occurring in the river.

Cross Section A-A' (Figure 3) and Cross Section B-B' (Figure 4) are geologic cross sections for the down-valley (section A-A') and cross-valley (section B-B') alignments, as shown on Figure 2. These sections depict the geologic units encountered during the investigation and static water levels measured in the wells prior to the constant-rate pumping test. The water table is located between 2 and 5 feet below ground surface within the fill unit. Generalized water table contours in the vicinity of the test well prior to step-rate testing are shown on Figure 2, and indicate a groundwater gradient toward the northeast of around 0.0052 ft/ft or 27.4 feet/mile.

A full presentation of the Pumping Test Hydrographs is shown in Figure 5, with the Constant-Rate Test Pumping Rate shown in Figure 6; the observed Drawdown in Pumping and Observation Wells during the constant-rate test is plotted against the logarithm of elapsed time (s vs. log t) in Figure 7 and depicts the transient drawdown trends defining the expanding cone of depression at each observation well. Recovery in Pumping and Observation Wells is plotted as residual drawdown against the logarithm of the time ratio (s vs. t/t') for each observation well in Figure 8. A Distance-Drawdown Plot shows a series of synoptic snapshots that depict the lateral development of the cone of depression in Figure 9. An attempt to fit the results to the Hantush (1960) Drawdown Analysis for partially penetrating wells was developed as output from the software program Aqtesolv in Figure 10. Each of these figures includes two plots, depicting aquifer test responses in both down-valley and cross-valley directions.

The static groundwater levels noted in all wells installed south of Mill Road are significantly higher (by approximately 6 feet) than the level measured in B-1; this is consistent with the local gradient shown on Figure 2.

PUMPING TEST IMPLEMENTATION AND OBSERVATIONS

Monitoring and Pumping Equipment

Prior to testing, pressure sensors consisting of solid-state piezoelectric pressure transducers and combined dataloggers (INW Model PT2X), were installed near the base of the test well, each of the seven observation wells (OW-1 through OW-7), the previous test well (DW-01), and an existing monitoring well located on the Phase 1 property (B-1), in the approximate locations shown on Figure 2. The sensors have operating pressure ranges between 30 and 100 pounds per square inch (psi) and are manufactured by Instrumentation Northwest of Kirkland, Washington. Each sensor was set to read water pressure corresponding to the height of the water column in the well as measured by the pressure transducer at one-minute intervals throughout the testing period. Manual measurements of water levels in each of the wells were also recorded to provide verification and calibration for the sensor data. A hydrograph of water level variations measured in each well for the entire constant-rate testing and monitoring period is presented in Figure 5.

A 6-inch-diameter, 15 horsepower Berkeley electric submersible test pump was installed in the test well (TW-1). The test pump was powered by a portable gas-powered electric generator. A temporary discharge pipe, directed west of the test well, was installed to convey the discharge water through a system of baker tanks prior to discharge to Brender Creek. A dispersion system was constructed to reduce the potential for erosion at the discharge outlet.

Step-Rate Pumping Test

A step-rate test was conducted on June 17, 2013, one day prior to the 24-hour constant-rate test. The test was conducted by pumping water from TW-1 at progressively higher pumping rates to monitor response and establish the optimum pumping rate for the constant-rate test. Three pumping rates were achieved during the test, with each step performed for an equal period of time.

Due to problems controlling the discharge rate from the pump, the water level in TW-1 drew down below the pump intake during the third pumping rate of 100 gpm and the pumping rate had to be adjusted down. Because of this, it was determined that data from the step test would not be useful for analysis as the drawdown data would not meet the method assumptions used for step test analysis. However, based on the response to pumping observed during the step test in TW-1, the target pumping rate for the constant-rate test was determined to be between 70 and 85 gpm.

Constant-Rate Pumping Test

Following the step-rate test, water levels in the wells were allowed to recover overnight. The 24-hour constant-rate pumping test was initiated at 08:30 on June 18, 2013, by turning on the portable generator to energize the pump. Discharge and drawdown were monitored continuously. The constant-rate test was performed for 24 hours, with the pump turned off at 08:30 on June 19, 2013. A composite hydrograph showing responses in the pumping well and all seven observation wells, as measured during the pumping and recovery phases of the constant-rate test, is presented on Figures 5.

Discharge

An average pumping rate of 85.4 gpm was established during the test, varying between approximately 78 and 95 gpm. The pumping rate was measured and recorded electronically during the tests using a Blue-White Industries S3 Series Hybrid Ultrasonic Flow Meter. Due to equipment problems, discharge rates during the first 3 hours of the 24-hour test were not recorded by the ultrasonic flow meter. To supplement the ultrasonic flow meter measurements and allow for corrections to the measured flow rates, the pumping rate was also checked periodically by using a stopwatch to record the time taken to fill a 5-gallon bucket. Bucket tests were conducted by taking the average of three tests, and consistently yielded estimates of between 85 and 85.7 gpm. A plot of the resulting flow rate measurements during the constant-rate test is presented in Figure 6.

Water from the test well was pumped into a series of two 21,000 gallon Baker tanks, to allow settlement of any suspended solids, and then discharged to Brender Creek, approximately 400 feet to the west, under permit issued by Ecology. An energy dissipation system was constructed at the flow outlet consisting of a wall of straw bales overlying a large tarp. Water was discharged on the tarp, which flowed and through the straw bales and infiltrated the ground surface near the edge of Brender Creek. No erosion or sediment mobilization was observed at the discharge point at any time during the test. Monitoring of the elevation of Brender Creek was not attempted during the pumping tests because the water course was used to receive groundwater discharged during the testing program.

Samples of discharge water from the pumping well were collected after 1 hour and 23 hours of the constant-rate test and submitted to an accredited laboratory in Redmond, Washington. No contaminants were reported above detection limits. Full laboratory analytical reports are presented in Appendix B.

Drawdown

The water level in the test well (TW-1) dropped 2.45 feet from a pre-test water level of 8.15 feet below top of casing (btoc) within 1 minute in response to pumping. Drawdown increased progressively thereafter, but at a decreasing rate. The water level was at 13.04 feet btoc at the end of the test, resulting in a total drawdown of 4.89 feet, and a specific capacity (pumping rate divided by the drawdown) in the test well of 17.46 gpm per foot of drawdown. A composite drawdown plot showing drawdown response to pumping in all wells is presented as Figure 7.

Figure 7 shows that the water level drawdown response occurs in all observation wells, with exception of B-1, within the first 2 minutes of pumping. Small magnitude changes in water level were recorded in B-1 during the first 100 minutes of the test, and during this time the water level did not appear to respond to pumping by more than a few hundredths of a foot at the most. These fluctuations may be attributed to changes in the level of the Wenatchee River during the test, as this well is located closer to the river.

All observation wells near the test well, and including the previous test well, DW-01, showed drawdown responses of a similar shape that generally included a steep an initial slope, followed by a progressive change to a flatter slope in the later portion of the test.

Recovery

At the end of the drawdown phase, the pump was turned off and water level recovery was monitored manually for 3.5 hours and electronically for approximately 50 hours using the pressure sensors. The pumped well recovered quite rapidly, recovering by more than 50 percent in the first minute, which indicates the occurrence of additional hydraulic losses associated with the entry of water into the well structure (also known as well losses).

After approximately 2 minutes of recovery, the steep cone of depression around the pumped well had flattened out substantially, to a depth of approximately 1.88 feet below the static (pre-test) water level. Recovery was observed in all wells near TW-1 within 2 minutes of pump shutoff. Water levels in the observation wells then continued to recover essentially in unison (Figure 8) until recovery was substantially complete, about 9 hours after the end of the pumping test. After this time, variations in river stage appear to cause a uniform increase in groundwater levels, with residual drawdowns becoming negative, signaling a regional increase in ambient groundwater levels.

Radius of Influence

The progressive development of the cone of depression around TW-1 as the test continued is depicted in a series of snapshots for drawdown recorded at different distances, as shown in Figure 9. Distances are plotted on a logarithmic scale and the cone of depression can be approximated as a straight line through each data set for the selected time elapsed since the test started. The plots indicate an elliptical cone of depression, with a greater radius of influence in the down-valley direction of approximately 880 feet at the end of the test, compared with 530 feet in the cross-valley direction. This suggests a degree of anisotropy in the horizontal hydraulic conductivity of the aquifer.

Monitoring well B-1 (located approximately 1,090 feet from TW-1, north of Mill Road) did not appear to respond directly to the pumping of TW-1, and the distance-drawdown plots for the observation wells around TW-1 (Figure 9) suggests that B-1 is located beyond the radius of influence for the pumping test. Values of transmissivity from the distance-drawdown plots (Figure 9) appear to be biased low, likely due to the effect of recharge from Brender Creek.

PUMPING TEST ANALYSIS

The pumping test provides a large-scale hydraulic stress of the water-bearing formations at the site by creating a hydraulic sink that draws water toward the pumping well, generating a hydraulic gradient manifested in drawdown of water levels in nearby observation wells. Analysis of the test provides information that can be up scaled to provide a basis for the design of an appropriate dewatering system adapted for the proposed remedial excavations. The primary information collected during the test helps to define the site-specific relationship between the rate of pumping from the well and the rate and amount of drawdown occurring at specific distances from the well. Analysis of the test data allows values to be estimated for key aquifer parameters that define this relationship.

Aquifer Parameters

The permeability of a porous water-bearing formation is an intrinsic material property that is proportional to the rate of groundwater flow though the formation. According to Darcy's Law (Darcy, 1856), the flow or seepage of groundwater through a porous formation or aquifer consumes energy, which is manifested as a decrease in water level in the direction of flow. Flow to a well thus causes the water level in the aquifer to draw down, creating a cone of depression in the water table or potentiometric surface around the well.

Water level monitoring in piezometers or observation wells during the pumping test measures the progressive development of the cone of depression within the area or radius of influence that develops around the pumping well, at locations where observation wells have been installed. The drawdown occurring in each observation well is in response to the seepage velocity and hydraulic gradient generated in the aquifer at the observation well location.

Hydraulic Conductivity

The constant of proportionality established in Darcy's Law between the seepage velocity and the hydraulic gradient is known as the *hydraulic conductivity*, which is a measure of the permeability of the formation to groundwater flow. In geotechnical terms, the hydraulic conductivity (previously known as the coefficient of permeability) is conventionally measured in units of centimeters per second (cm/s). A more convenient unit is feet per day (ft/d); when greater than 1 ft/d, the formation is, in most practical situations, considered relatively permeable.

Transmissivity

For pumping test evaluations, the capacity for groundwater flow in an aquifer is better described by the aquifer transmissivity, which is the product of the aquifer thickness and its hydraulic conductivity. The transmissivity thus provides a measure of the amount of groundwater flow that can occur through the full thickness of a water-bearing formation or aquifer at the Site.

For consistent units, hydraulic conductivity is converted from cm/s to ft/d. Multiplying this by the aquifer thickness in feet results in transmissivity with units of square feet per day (ft^2/d).

Storativity

The growth of the cone of depression, and the amount of drawdown produced away from the pumping well, are controlled by *storativity*, a second aquifer parameter. This parameter is defined as the quantity of water released per unit area of aquifer when the water level or water pressure decreases by a unit amount.

If the aquifer has a water table (also known as a *phreatic aquifer*), it is described as being an *unconfined aquifer*, and the storativity value (also known in this case as the *specific yield*) approximates to the drainable porosity of the formation at the water table. If the aquifer is overlain by an impervious confining layer and is under pressure, it forms a confined aquifer, and the storativity (previously known as the *storage coefficient*) is considerably reduced to a value much lower than the drainable porosity. It represents a composite of the compressibility of the aquifer system, which includes the compressibility of the soil grains, the aquifer matrix and the water filling the pores. For intermediate conditions where less pervious materials overly more permeable

native soils, as at Cashmere Mill site, the storativity value may fall in between the high value of specific yield and the low value of purely elastic aquifer compression; these conditions are known as semi-confined.

Conventional Analysis

The first stage of the analysis is to assess the drawdown patterns observed to determine the appropriate aquifer model that best represents the hydraulic characteristics and transient drawdown behavior observed during the test. These assessments are applied to the drawdown trends plotted against the logarithmic of elapsed time (Figure 7).

Drawdown Phase

Figure 7 shows that the observation wells all behaved in a similar manner with generally parallel drawdown trends that all show increasing curvature as the test progressed. The drawdown in well DW-01 was slightly slower to develop. As shown in Figure 7, no apparent drawdown response was observed in the distant observation well, B-1.

The drawdown trends from all wells exhibit a curved shaped that deviates from the simplest aquifer model, which underlies the conventional Cooper-Jacob method for pumping test analysis. However, the application of the Cooper-Jacob method to selected portions of each drawdown trend can help to diagnose the aquifer characteristics that account for the deviations, and help to identify a more rigorous aquifer model that takes better account of the hydrogeologic setting of old Cashmere Mill site.

Using a simplification of the original Well Function derived by Theis (1935), Cooper and Jacob (1946) developed a graphoanalytical method for analyzing data from pumping tests. The method can be applied to the drawdown trend when plotted against elapsed time on a logarithmic axis approximates to a straight line. After a certain minimum time threshold, the drawdown data should approximate to a straight line, the slope of which is proportional to the flow rate from the pumping well, and inversely proportional to the transmissivity of the aquifer.

Drawdown data from the pumping well (TW-1) is plotted in Figure 7, and exhibits an early portion that allows a straight-line fit to the transient drawdown trend. Similarly, drawdown plots from the adjacent observation wells (Figure 7) show curved drawdown trends rather than straight lines, but feature portions after the initial curvature where inflection occurs and a straight-line portion can be fitted to define a slope.

The Copper-Jacob method also allows the storativity value to be estimated. The fitted slope, Δs, is extended back to intercept the time axis at zero drawdown, to provide a time value, t_0. The resulting transmissivity and storativity values derived from drawdown data from each well are listed in Table 2 below.

TABLE 2 CONVENTIONAL PUMPING TEST ANALYSIS RESULTS

Well Number	Distance, *r* (ft)	Drawdown Slope, *Δs* (ft)	Time Intercept, t_o (mins)	Transmissivity, *T* (ft²/d)	Storativity, *S* (–)
TW-1	0.375	0.81	0.0065	3702	0.267
OW-1	25.91	1.498	1.0	2009	0.0047
OW-2	57.41	1.097	1.6	2743	0.0021
OW-3	144.9	0.653	2.5	4606	0.00086
OW-4	204.5	0.555	4.7	5419	0.00095
OW-5	26.75	1.432	1.3	2102	0.006
OW-6	53.92	1.024	1.7	2939	0.006
OW-7	143.5	0.466	4.3	6454	0.0021
DW-01	212	0.282	7.0	10671	0.0026

Using the Cooper-Jacob method on the early-time data, widely differing values of transmissivity are obtained by fitting slopes to the early portion of the drawdown trends observed at the Site. The apparent values of transmissivity for the selected early-time slopes are found to vary between 2009 and 10671 ft²/d. Values of the aquifer storativity also vary significantly.

The table includes a large storativity value calculated for the early slope of the drawdown trend in the pumped well, TW-1, using a constructed well radius of 0.375 feet. The resulting storativity value calculated from the pumping well drawdown response is often found to be erroneous in conventional analyses because of issues related to the hydraulic performance, effective radius after well development, and the hydraulic efficiency of the pumping well.

The values in Table 2 indicate a broad range within which the aquifer characteristics of the Site lie. Their variation and a comparison with the recovery data (below) help to determine which one of a number of potentially appropriate aquifer models needs to be applied to reach a definitive conclusion.

Recovery Phase

A similar graphoanalytical method was developed by Theis (1935) for analyzing the recovery trends observed as water levels in the cone of depression rise or recover after the pump is turned off. The method requires that the recovering water level (or residual drawdown) is plotted against a time ratio, ***t/t'***.

where:

t = the time since pumping started *and*

t' = the time since pumping stopped

Again, the data obtained from recovery of the pumping well and observation wells are plotted as a series of curves rather than a straight line (Figure 8). However, a single line can be fitted to the overall trend of the intermediate and late-time recovery data, with a slope that is close to the intermediate slope used in the drawdown phase. This results in an overall transmissivity value of 4,600 ft^2/d calculated from the recovery data, which is the average of the two values shown on Figure 8.

Under the conventional pumping test analysis procedures, storativity cannot be calculated from the recovery data. However, it is important to note that the recovery trends do not intercept the residual drawdown axis at zero drawdown. All recovery trends shown in Figure 8 intersect the drawdown axis at negative values, which is indicative of a recharge mechanism adding water to the aquifer during the test in response to the drawdown generated by pumping.

Limitations of the Conventional Analysis

From the foregoing, it is clear that the conventional method of pumping test analysis does not provide a coherent or reliable set of values for the aquifer parameters at the Cashmere Mill site. In this section, we examine the limitations of the method, and interpret the deviations in drawdown trends to direct us toward a more sophisticated analytical method — one that provides a better description or "model" of the aquifer conditions that will likely control the degree of drawdown achieved during dewatering operations.

Key Assumptions

The conventional analysis of pumping test drawdown data, using the Cooper-Jacob method and the Theis Recovery method, is constrained by the restrictive assumptions that were required to derive the analytical solution describing transient groundwater flow to a pumping well, which include the following:

- The aquifer is confined, homogeneous, isotropic and fully penetrated by all the wells.
- The aquifer is horizontal, is of uniform thickness and extends infinitely in all radial directions.
- The static groundwater level or piezometric surface of the aquifer forms a horizontal plane.
- Groundwater temperature, density and viscosity are constant.
- Groundwater flow can be described by Darcy's Law.
- The radius of the pumping well is infinitesimal.
- The well is pumped at a constant rate.
- Head losses through the well screen and filter material are negligible.
- Water derived from aquifer storage is discharged instantaneously when the head is lowered.
- All water removed from the well comes from aquifer storage.

Departures from these assumptions result in deviation from the expected straight-line drawdown behavior and also affect the accuracy of the aquifer parameters determined. One of the main differences seen in the Cashmere Mill site drawdown response likely relates to lithologic variations

and inhomogeneity of the aquifer formation, which (from the evidence of the differing boring logs depicted in Figures A-2 through A-10) varies spatially in both thickness and permeability.

Aquifer Thickness

The intermediate cemented layer encountered beneath the site was expected to form an aquitard that might limit the effective depth of the aquifer, but the drawdown response observed in OW-7, completed below the intermediate cemented layer, shows a similar response to all the other observation wells completed above the layer, and static groundwater elevation is similar. The similarity in static levels and drawdown trends suggests that the intermediate layer may not be much lower in permeability and, as a result, the aquifer may be considerably thicker than would otherwise be the case.

Furthermore, the assumptions listed above strictly require a confined aquifer in which the bounding upper and lower layers are impervious. Such conditions rarely occur in practice, and it is the hydraulic properties of partially confining layers and the lateral boundary conditions limiting the extent of the aquifer that often influence the shape of the drawdown trends observed in a practical pumping test.

A number of differing hydrogeological models of aquifer systems have been developed by various authors since the key contribution by Theis in 1935. The different models address specific variations from the idealistic Theis model that underlies the conventional analysis. Each different model results in differing shapes or slopes for the conventionally plotted drawdown data, many of which produce curved rather than straight-line drawdown trends.

Partial Penetration

Given the general similarity in response observed at OW-7, and the relatively shallow screen completions of the other observation wells (Figures 3 & 4), this suggests that partial penetration of the aquifer by the pumped well may be causing some of the deviations observed in the drawdown data. Hantush (1961) observed that such partial penetration effects caused by local curvature of the flow lines within the aquifer entering the limited and offset length of the well screen, would exhibit a characteristic curved shape in the drawdown trend.

This possibility was examined using the pumping test analysis software, Aqtesolve (ref) to simulate the test conditions with partially penetrating wells assuming a range of different aquifer thicknesses. The partial penetration effect can also be enhanced by a difference between horizontal and vertical permeability in the aquifer, and this case was examined. A number of different partial penetration models were tried with varying aquifer thicknesses and degrees of anisotropy, but none produced the degree of curvature observed in the drawdown trends for the Cashmere data.

Aquitard Leakage

Only by adding aquitard leakage to the partially penetrating scenarios was it possible to replicate the late-time curvature of the drawdown trends. An example of output from the Hantush (1960) model in Aqtesolv that includes leakage (with depletion of storage) from aquitards both above and

below the main aquifer is included in Figure 10. The corresponding sets of aquifer parameter values for each profile are listed in Table 3 below.

TABLE 3. SUMMARY OF HANUTSH LEAKY AQUIFER ANALYSIS PARAMETERS

Parameter Name	Symbol and Units	Down-Valley (A-A')	Cross-Valley (B-B')
Aquifer Transmissivity	*T*, feet^2/day	4,409	4,307
Aquifer Thickness	*B*, feet	70	70
Aquifer Storativity	*S*, Unitless	1.1E-03	2.4E-03
Top Aquitard Leakage Factor	1/*B'*, feet^{-1}	2.4E-5	1.5E-3
Bottom Aquitard Leakage Factor	1/*B"*, feet^{-1}	1.0E-3	0
Top Aquitard Storativity Factor	*ß'/r*, feet^{-1}	2.39E-5	2.39E-5
Bottom Aquitard Storativity Factor	*ß"/r*, feet^{-1}	1.0E-4	0
Top Aquitard Thickness	*b'*, feet	10	10
Bottom Aquitard Thickness	*b"*, feet	10	10

This represents one possible interpretation of aquifer conditions at the Site, but is not fully consistent with our understanding of the hydrogeology because the implied geology required in the model does not correspond with our understanding of the real geology at the site. For example, the intermediate layer does not appear to be acting as a significant aquitard that could contribute the leakage required in this model that features arbitrary aquitards both above and below the aquifer.

For the intermediate cemented layer to act as such an aquitard, one requirement would be that the hydraulic head in the source layer beneath the aquifer would have to maintain a steady static groundwater head throughout the period of the test. However, the drawdown data from OW-7 proves that this did not happen, and that the full thickness of permeable soils at the Site was affected by pumping from TW-1.

Diagnostic Drawdown Comparison

To help identify a more appropriate aquifer model, we prepared a diagnostic plot that compares the drawdown observed in the pumping well and all observation wells together. This is done by plotting the drawdown against the ratio, $\boldsymbol{t/r^2}$.

where:

$\boldsymbol{t}$ = the elapsed time since pumping started *and*

$\boldsymbol{r}$ = the radial distance from the pumping well.

In the resulting composite drawdown plot, each of the drawdown curves is shifted to compensate for the radial distance of each observation point from the pumping well. The plot of the drawdown in in all wells versus t/r^2 is presented in Composite Drawdown Plot (s vs. t/r^2), Figure 11.

As with the conventional analysis, the data obtained during pumping plot as a series of curves rather than a straight line (Figure 11). However, a single bounding line can be fitted to the overall drawdown trend and analyzed using the Cooper-Jacob (1946) straight-line method. This results in an overall transmissivity value of 4,600 ft^2/d calculated from the composite drawdown data, which is the average of the two values shown on Figure 11, and compares well with values from the recovery data plotted on Figure 8.

Visual assessment of the deviations of the drawdown trends from the Theis type-curve, considered together with the geologic conditions at the site, can help in identifying an aquifer hydraulic model that is more representative than the classic Theis model. Diagnostic observations from Figure 11 are as follows:

1. Although each drawdown curve exhibits curvature on this plot, the lower edge of the curves considered together forms a bounding slope, with late-time trends curving away from this slope and flattening out.
2. The early-time data in each the drawdown trend also departs from the bounding slope; this effect is most pronounced in the closet observation wells and is considered to reflect partial penetration.
3. The pumping well data (TW-1) help to extend the bounding slope, after accounting for moderate well losses.
4. The observation well data deviate from the bounding slope in the order of increasing distance from the pumped well; this could suggest a leaky system with additional water entering the aquifer across or through an aquitard layer.
5. Alternatively, the flattening of the late-time data relative to the bounding slope could be caused by a nearby source of recharge, such as Brender Creek.

In addition, three characteristics from the drawdown and recovery analyses support the influence of recharge boundary conditions:

- Flattening of the drawdown trends in Figure 7, especially at late time.
- Extrapolation of the recovery trends (Figure 8) to a negative drawdown value at $t/t' = 1$.
- The difference in drawdown responses observed in wells parallel and perpendicular to Brender Creek.

Based on these observations, the aquifer model used to analyze the pumping tests, and thus to better describe groundwater flow and achievable drawdown at the Site, should take into account the presence of a partial recharge boundary resulting from nearby Brender Creek and should also include well losses as an adjustment to the drawdown measured in the pumping well.

In contrast, the presence of recharge boundary conditions can pose a significant constraint on the magnitude of drawdown achievable within an excavation by pumping groundwater from dewatering wells. The recharge tends to cause drawdowns to stabilize, rather than continuing to increase, as the Theis model would suggest.

The Hunt Aquifer Model

As discussed by Sophocleous *et al.* (1995), the Theis (1941) and Hantush (1965) analytical models that include fully penetrating recharge boundaries fail to adequately represent the physical conditions representative of alluvial aquifer systems hydraulically connected to surface streams that clearly do not fully penetrate the full thickness of the aquifer. Further research by others eventually led to wide-reaching modifications of the stream depletion and drawdown analysis in the proximity of surface streams as first published by Hunt (1999), which effectively eliminated the generally unrealistic concept that the river penetrates the full aquifer thickness, and included a calculation for stream depletion. Prior to Hunt's work, which has been further refined in subsequent publications (Hunt 2003a, 2003b, 2008), most hydrogeologists would consider a river as forming a full hydraulic boundary assigned a defined hydraulic head that was fully transferred into the adjacent aquifer as a potentially infinite source of recharge.

The Hunt analysis defines a term for quantifying the hydraulic connection that exists through the semi-pervious streambed: the so-called streambed conductance is proportional to the streambed conductivity, river width, and inversely proportional to streambed thickness. Over the last 10+ years, Hunt's model has gained increasing acceptance in the hydrogeology world as the most appropriate way to analyze many stream-aquifer interactions that involve pumping from a nearby well (e.g., Fox *et al.* 2010). In 2003, Hunt generalized the model to include the effect of a semi-confining layer (Hunt, and in 2008, he included a finite width for the stream channel, which is considered to be straight.

The analytical concept is not perfect, and still represents a simplification of the often complex geologic and hydrologic conditions at a real world site; however, it has been found to generally provide a good match to drawdown data observed in monitoring wells located within the cone of depression, and is used as a good model to analyze the effects of pumping from wells that are influenced by an adjacent source of recharge. The results of our analysis using the Hunt (2008) model are shown in Hunt (2008) Drawdown Analysis, Figure 12 and Hunt (2008) Recovery Analysis, Figure 13 and summarized in Table 4 below.

TABLE 4. SUMMARY OF HUNT (2008) ANALYSIS PARAMETERS

Parameter Name	Symbol and Units	Down-Valley (A-A')	Cross-Valley (B-B')
Aquifer Transmissivity	*T*, feet^2/day	3,400	3,400
Aquifer Conductivity	*K*, feet/day	34	34
Aquifer Thickness	*B*, feet	100	100
Aquifer Storativity	*S*, Unitless	1.5E-03	1.0E-03
Aquifer Specific Yield	*Sy*, Unitless	0.002	0.02
River Bank Distance	*L*, feet	225	225
Aquitard Thickness	*B'*, feet	10	15
Aquitard Conductivity	*K'*, feet/day	1.13E-02	2.83E-03
Aquitard Leakage	$\sqrt{(TB'/K')}$, feet	1,732	4,242
River Width	γ*L*, feet	50	50
Streambed Thickness	*B"*, feet	4	4
Streambed Conductivity	*K"*, feet/day	2.27E+00	2.83E-01

The Hunt model takes account of many contributing factors that could influence the relationship between pumping and drawdown at the Cashmere Site, including:

- The distance from the pumped well to the stream bank;
- The orientation of all piezometers relative to the stream bank;
- The finite width of the stream channel;
- The limited depth of the stream channel relative to the aquifer thickness;
- The likely presence of a low-permeability streambed of finite thickness;
- The presence of a shallow semi-confining layer (wood waste) with different hydraulic properties; and
- The overall site setting within an alluvial valley of finite width.

However, it does not include the effect of partial penetration, which is limited to a horizontal (radial) distance around the pumping well that is approximately 1.5 times the aquifer thickness. Judging from the compensated drawdown plots (Figure 11), partial penetration appears to affect drawdown trends only in observation wells that are closer than approximately 100 feet to the pumping well. This would support the perception that the aquifer thickness at the site is approximately 60 to 70 feet thick.

DEWATERING CONCLUSIONS AND RECOMMENDATIONS

This dewatering assessment included performance of a full-scale pumping test with drawdowns monitored in series of observation wells. The pumping test was successfully performed to develop a cone of depression in the native water-bearing soils underlying the Site. Conventional analysis of

the test data proved to be inconclusive due to heterogeneity of the subsurface conditions, and the proximity of partially effective recharge from shallow bodies of surface water adjacent to the Site, with conflicting values calculated for aquifer transmissivity and other key parameters. However, a more sophisticated method of pumping test analysis that considered features of the site, including the shallow wetland system formed by Brender Creek and the lower permeability of the shallow wood waste layer produced improved results by providing an acceptable simulation of both drawdown and recovery phases in the pumping well and most observation wells.

Based on our analysis of the pumping test and application of its results in a dewatering design model, we conclude that it is feasible to dewater the main excavation (area of the deeper anticipated wood waste) area required for the Phase 2 activities at the site. However, well depth, well spacing and well design will likely be critical to the success of the dewatering operations. On this basis, we recommend the following:

- We recommend a minimum of eighteen new dewatering wells located within the perimeter of the area planned for excavation of wood waste.
- Wells should be set at a depth of 25 feet or to penetrate approximately 3 feet into the intermediate unit, if this is identified during drilling.
- Conventional temporary dewatering wells constructed using a bucket auger should be completed in drilled boreholes having a minimum diameter of 20 inches, with machine-slotted PVC well-screen set within a suitable graded filter pack.
- Alternatively, if water-supply well construction methods are employed, using air-rotary drilling with casing and telescopic wire-wrapped wellscreen, then a natural filter pack must be fully developed.
- Well completions should include a casing and screen assembly at least 10 inches nominal diameter.
- Well screens should be no less than 20 feet in length, set between depths of 5 and 25 feet.
- Well screens should be machine-slotted or wire wrapped with a size of 0.050 inches (50-slot).
- The annulus around the well screen should be filled with a filter pack of graded coarse sand and fine gravel to match the well screen slot size.

We also recommend that dewatering operations be performed by a specialist dewatering subcontractor. If dewatering is performed as anticipated in this analysis, it will be important that the contractor understands their responsibilities and can execute the work competently. The contractor should be required to prepare a detailed submittal in the form of a Temporary Dewatering Plan in advance of the work to demonstrate understanding of the project needs. The contractor should be required to install a minimum system of eighteen new dewatering wells focused around the main excavation area in Phase 2. This, and additional requirements, have been included in suggested revisions to the Dewatering Specification for Phase 2 (provided separately).

SUMMARY OF RESULTS AND DESIGN CONSIDERATIONS

A full-scale aquifer pumping test was conducted on a 10-inch-diameter test well installed near the south end of the site to evaluate aquifer characteristics and to analyze the feasibility of construction dewatering for the proposed wood waste removal. The following is a summary of the hydrogeologic assessment:

1. Eight boreholes were drilled to depths ranging from 20 to 42 feet below ground surface on the southern portion of the site.
2. All of the boreholes were completed as wells — seven 2-inch-diameter monitoring wells and one 10-inch-diameter test well (OW-1 through OW-7).
3. A temporary test pump was installed in the test well (TW-1), and a 24-hour pumping test was conducted at an average rate of 85.4 gpm between June 18 and 19, 2013.
4. Pressure sensors were installed in all eight wells to record water levels continuously during the test and to monitor recovery for two days after the test. Additionally, pressure sensors were installed in two existing wells (DW-01 and B-1) located on the south and north portions of the site, respectively.
5. At the end of the test, the total drawdown in pumping well was 4.89 feet. Drawdown recorded in the observation wells were 2.29 feet in OW-1 (r = 25.91 feet); 1.84 feet in OW-2 (r = 57.41 feet); 1.17 feet in OW-3 (r = 144.90 feet); 0.9 feet in OW-4 (r = 204.50 feet); 2.08 feet in OW-5 (r = 26.75 feet); 1.64 feet in OW-6 (r = 53.92 feet); 0.85 feet in OW-7 (r = 143.50 feet).

Based on the analysis of the drawdown and recovery water level data analyzed using the Hunt (2008) method, the apparent aquifer transmissivity in the vicinity of the test well is 3,400 ft^2/d. The pumping test has demonstrated that pumping from the aquifer beneath the wood waste will induce recharge from the Brender Creek wetland system that extends around the south of the site. The effect will be to reduce drawdowns and increase pumping rates compared with unbounded aquifer assumptions.

Dewatering System Design Considerations

The analysis of the full-scale pumping test that has been completed using the Hunt (2008) aquifer model and analysis method provides a working basis for the development of a dewatering system design using wells similar in construction and pumping yield to the test well. To be conservative, the dewatering design should be predicated on the set of parameter values determined by the Hunt (2008) analysis that conservatively allows for the recharge effect of Brender Creek, as this will reduce predicted drawdowns compared other more conventional dewatering design models.

The dewatering system design using multiple dewatering wells can be based on the distance-drawdown curve (Figure 9) by applying the principle of superposition to estimate minimum drawdowns that should develop as the individual cones of depression coalesce across the site. On this basis, dewatering wells installed at an average spacing of between 50 and 100 feet should generate drawdowns of between 10 and 5 feet, respectively as a result of drawdown interference. Variable spacing can be used to optimize well locations that concentrate greater drawdown in areas where deeper excavation is required. This approach has been taken to develop a provisional

well layout for Phase 2 consisting of 18 new dewatering wells, as shown in Proposed Dewatering Well Locations, Figure 14. Recommended locations for four additional monitoring wells are also shown ion Figure 14.

Higher values of transmissivity may apply in different areas of the site away from the test well, and will generally give higher pumping rates for a given dewatering objective. However, lower permeability conditions can also cause problems for dewatering design, because they tend to steepen the cone of depression and reduce the radius of influence. Such variations in site conditions cannot be encompassed in the initial design but can be accommodated by monitoring the effect of individual dewatering wells then making adjustments as the dewatering system is installed, tested and put into operation.

It will be important to demonstrate adequate drawdown of the groundwater table has been accomplished before excavations are allowed to begin. We recommend maintaining the existing observation wells (OW-1 through OW-7) and installing four new groundwater monitoring wells to evaluate system performance prior to excavation. Figure 14 illustrates the recommended locations for the four monitoring wells (MW-1 through MW-4). Additional detailed recommendations for groundwater monitoring to demonstrate adequate drawdown are included in the Dewatering Specifications.

To provide a basis for bidding Phase 2, we have used the provisional well layout shown in Figure 14 as a minimum required initial system that must be installed and made operational by the contractor before proceeding with excavation on Phase 2. An alternative approach could involve subdividing the Phase 2 site into segments and making sure that wells required for each segment of the work are operational before allowing excavation of the segment to proceed. This approach is important to emphasis as it encourages proactive dewatering that removes groundwater from beneath the site before excavation is attempted, and should be included in the bid schedule as a lump sum item that is required of the contractor.

Proactive dewatering in advance will have additional benefits in terms of drying out the working area, and draining some of the absorbed water from material to be excavated. If executed correctly, the dewatering will increase excavation efficiency and reduce the overall time (and cost) required to remediate the site. In addition, imported structural fill can be placed and compacted in moisture-controlled conditions with less risk of becoming too wet to compact properly.

The bid schedule also should include line-item cost for each additional dewatering well (fully operational as an addition to the minimum required initial system) as well as a line-item cost for each additional monitoring well, in case more are required during implementation of Phase 2.

LIMITATIONS

We have prepared this report for the exclusive use of the Washington State Department of Ecology, the Port of Chelan and its design team for the Cashmere Mill site remedial excavation. Our report contains focused information, specifically for evaluation of an existing site based on a limited pumping test completed in June 2013.

The limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices at the time this report was prepared. No warranty or other conditions, express or implied, should be understood. A fuller description of our Report Limitations is provided in Appendix C.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

REFERENCES

Cooper, H.H. and Jacob, C.E. (1946),"A Generalized Graphical Method for Evaluating Formation Constants and Summarizing Well Field History," Am. Geophys. Union Trans., vol. 27 (4), pp. 526-534.

Darcy, H.(1856), Les Fontaines Publiques de la Ville de Dijon: Paris, V. Dalmont, 647 p. (trans. P. Bobeck, 2004, Kendall/Hunt Publishing Co., Dubuque, Iowa, 506 p.).

Fox, G.A., Heeren, D.M., & M.A. Kizer (2010), "Evaluation of Alluvial Well Depletion Analytical Solutions from a Stream-Aquifer Analysis Test along the North Canadian River in Oklahoma," 2010 ASCE EWRI World and Environmental Resources Congress.

GeoEngineers (2010), Preliminary Geotechnical Engineering Services, Redevelopment of Cashmere Mill Site Mill Road and Sunset Highway, Cashmere, Washington. March 5, 2010.

Hantush, M.S., (1960). Modification of the theory of leaky aquifers, Jour. of Geophys.Res., Vol. 65, No. 11, pp. 3713-3725.

Hantush, M. S., (1961), "Aquifer Tests on Partially Penetrating Wells," Journal of the Hyd. Div., Proceedings of the American Society of Civil Engineers, vol. 87, no. HY5, pp. 171-194.

Hantush, M.S., (1965), "Wells Near Streams with Semi-pervious Beds," Journal of Geophysical Research, 70(12), 2829-2838.

Hunt B. (1999), "Unsteady Stream Depletion from Ground-water Pumping," Ground Water, 37(1), 98-102.

Hunt, B. (2003a), "Unsteady Stream Depletion When Pumping from Semi-confined Aquifer," ASCE Journal of Hydrologic Engineering, Vol. 8, No.1, 12-19.

Hunt, B. (2003b), "Field-Data Analysis for Stream Depletion," ASCE Journal of Hydrologic Engineering, 8(4): 222-225.

Hunt, B. (2008), "Stream Depletion for Streams and Aquifers with Finite Widths", ASCE Journal of Hydrologic Engineering, Vol. 13, No. 2, 80-89.

MFA (2013) "Site Characterization Report, Former Cashmere Mill Site, Cashmere, Washington" prepared by Maul, Foster, Alongi, Inc., Project No. 0779.02.01, March 20, 2013

RH2 (2012a), "Former Mill Site, Wood Waste, Soil and Groundwater, Characterization Plan", prepared for Port of Chelan County by RH2 Engineering, September 21, 2012.

RH2 (2012b), "Technical Memorandum Construction Dewatering at the Former Cashmere Mill Site", prepared for Port of Chelan County by RH2 Engineering November 7, 2012.

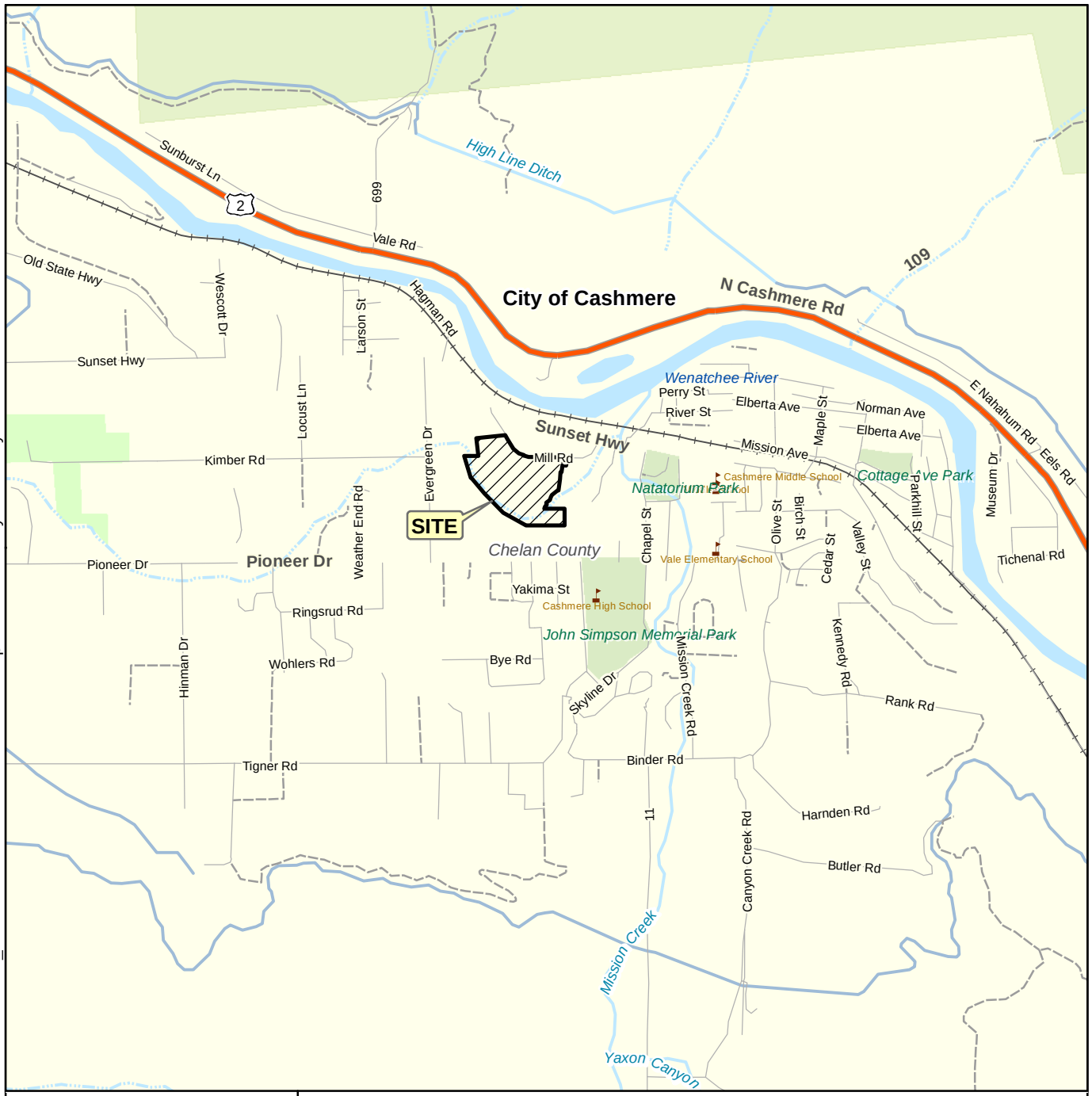
Sophocleous, M., Koussis, A., Martin, J. L., & Perkins, S.P. (1995), "Evaluation of Simplified Stream-Aquifer Depletion Models for Water Rights Administration," Ground Water; V33 N4; P579-588.

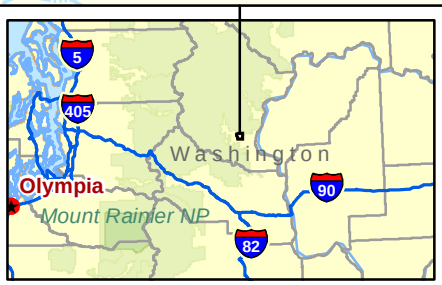
Theis, C.V. (1935), The Relation Between Lowering the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Ground Water Storage," Eos Trans. American Geophysical Union, 16, 519– 524.

Theis C.V. (1941), "The Effect of a Well on the Flow of a Nearby Stream," Transactions of the American Geophysical Union, Vol 22, No. 3: 734-738.

FIGURES

GeoEngineers





N
W
E
S

2,000 0 2,000

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Maps 2005

Transverse Mercator, State Plane South, North American Datum 1983
North arrow oriented to grid north

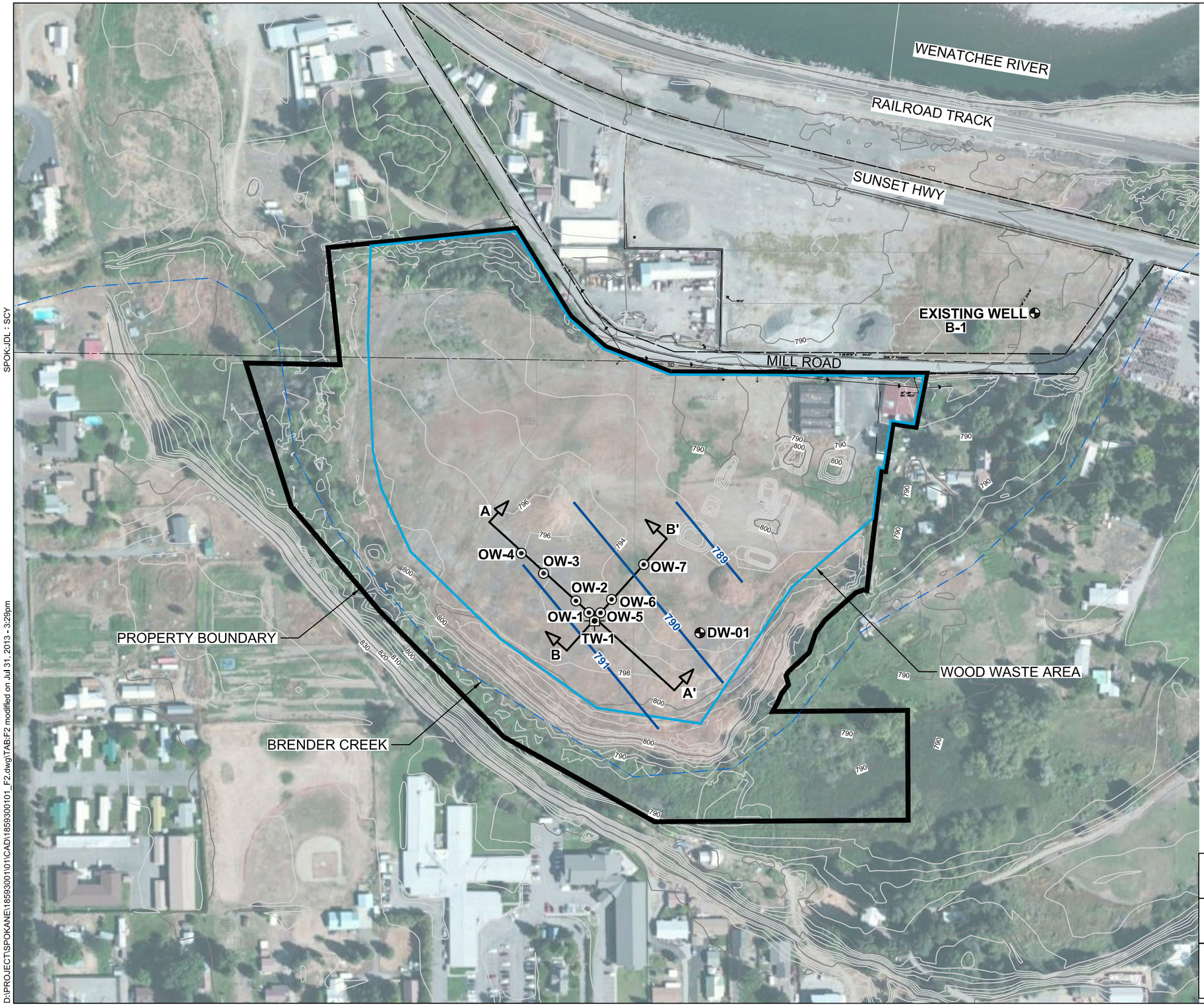
Vicinity Map

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 1

Office: SPOK Path: D:\PROJECTS\SPOKANE\18593001\GIS\18593001_F1.mxd Map Revised: 08 July 2013 syi



Legend

- **OW-1** — Observation well number and approximate location
- **TW-1** — Dewatering test well number and approximate location
- **EXISTING WELL** — Existing well approximate location (RH2 Engineering, Inc. 2012)
- **791** — Groundwater elevation pre constant-rate test
- Ground surface topographic contour (2 ft. interval)
- Wood waste area
- **A A'** — Approximate cross section location

N W E S

200 0 200
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Survey drawing provided by RH2 Engineering, Inc. and aerial photo provided by ESRI I3 Imagery Aerial.

Site Plan

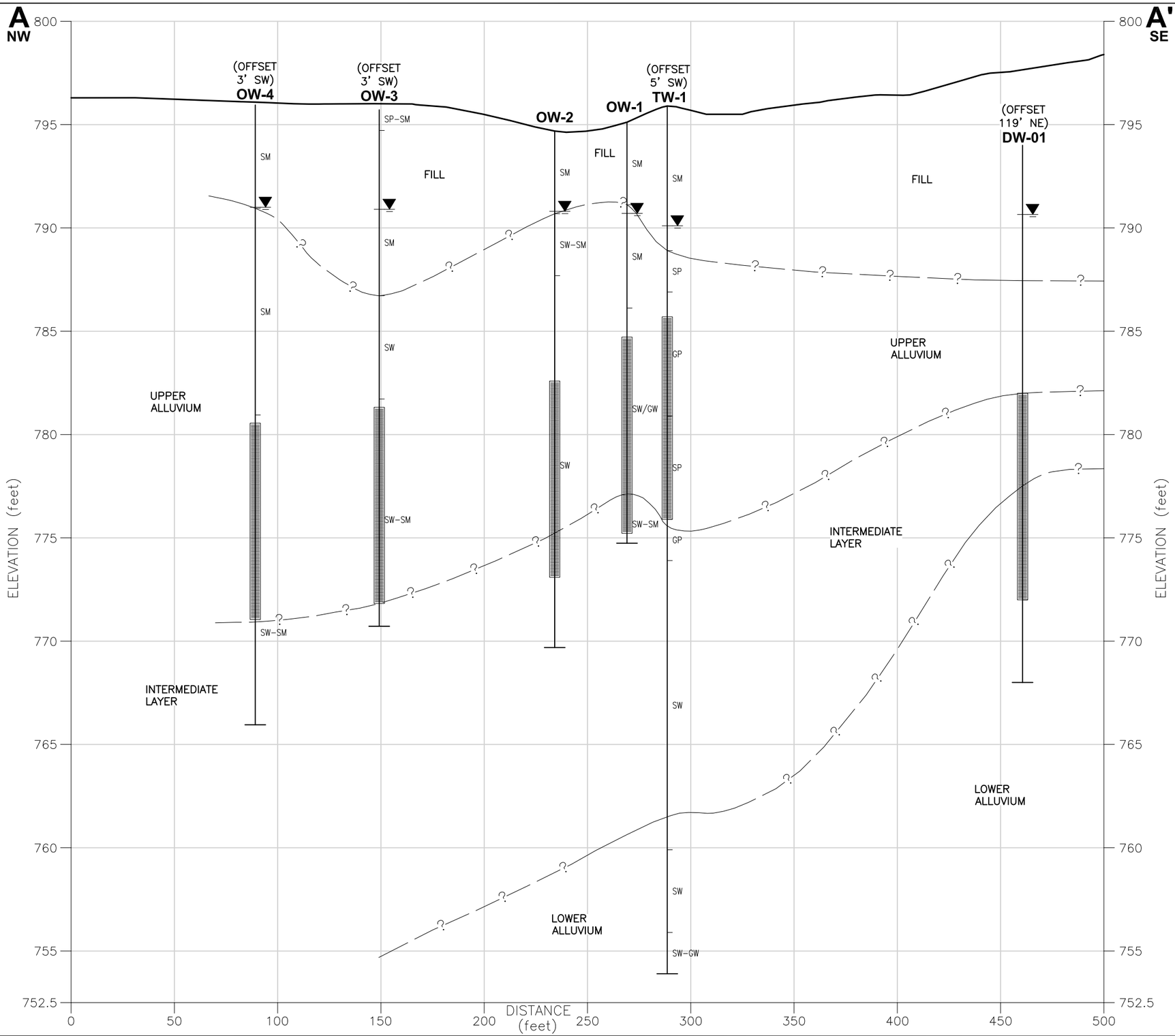
Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

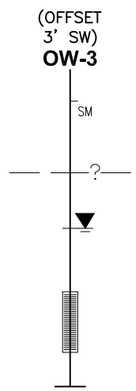
GeoEngineers

Figure 2

SPOK;JDL : SCY

D:\PROJECTS\SPOKANE\185930010\1\CAD\185930010\1_F2.dwg\TAB:F2 modified on Jul 31, 2013 - 3:29pm





EXPLANATION:

WELL NUMBER AND APPROXIMATE LOCATION

SOIL TYPE AT SAMPLE LOCATION

SOIL CONTACT

MEASURED GROUNDWATER LEVEL IN WELL BELOW TOP OF WELL CASING

SCREEN LOCATION

50 0 50
Horizontal Scale in Feet

5 0 5
Vertical Scale in Feet
Vertical Exaggeration: 10X

Notes:

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. Refer to Figure 2 for location of Cross Section.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Cross Section A-A'

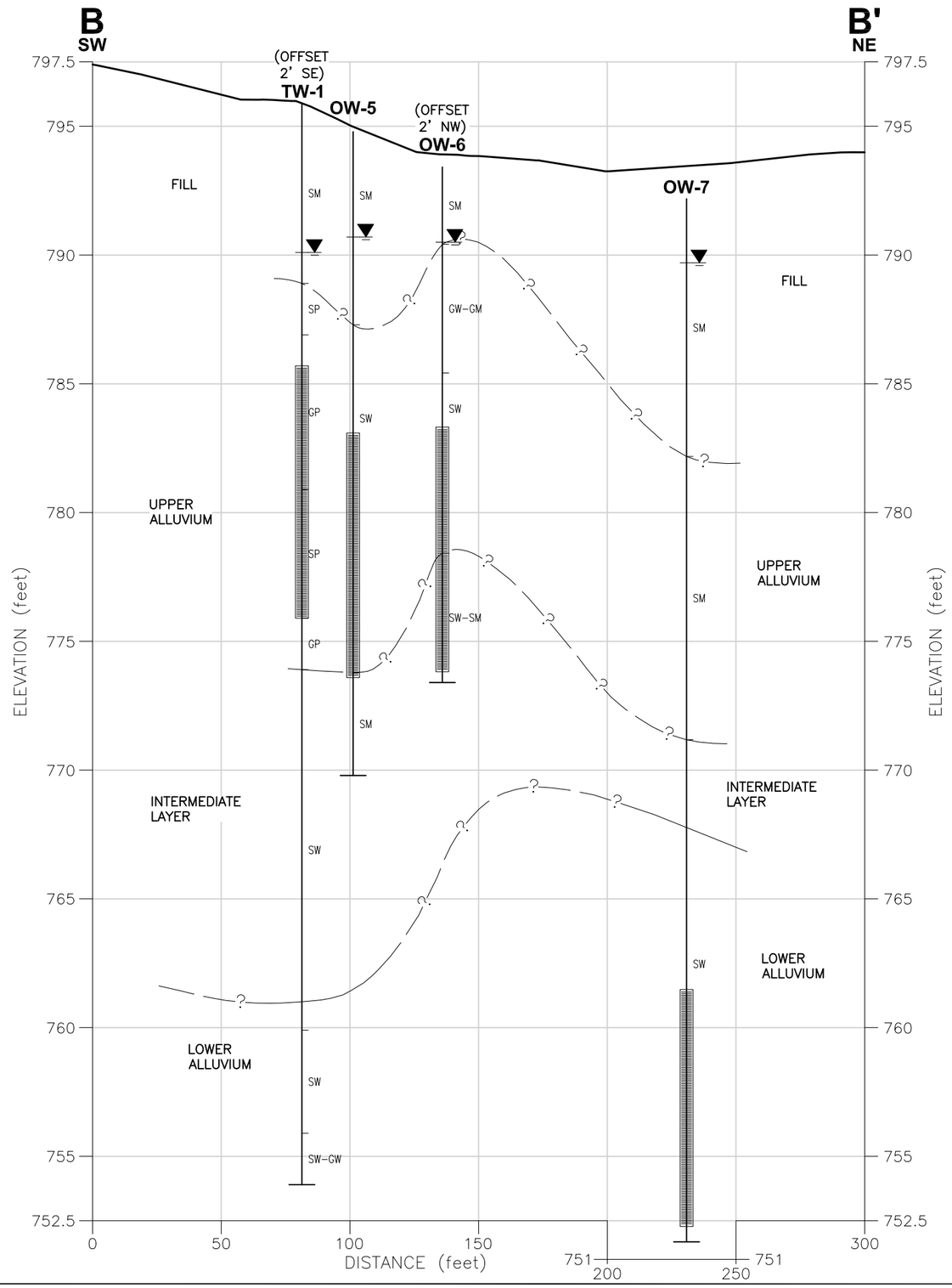
Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 3

SPOK;JDL : SCY

D:\PROJECT\SPOKANE\185930010\01\CAD\185930010_F3_F4.dwg\TAB:F3 modified on Jul 30, 2013 - 6:11pm



(OFFSET 2' NW)
OW-6

SM

EXPLANATION:

- WELL NUMBER AND APPROXIMATE LOCATION
- SOIL TYPE AT SAMPLE LOCATION
- SOIL CONTACT
- MEASURED GROUNDWATER LEVEL IN WELL BELOW TOP OF WELL CASING
- SCREEN LOCATION

50 0 50
Horizontal Scale in Feet

5 0 5
Vertical Scale in Feet
Vertical Exaggeration: 10X

Notes:
1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. Refer to Figure 2 for location of Cross Section.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

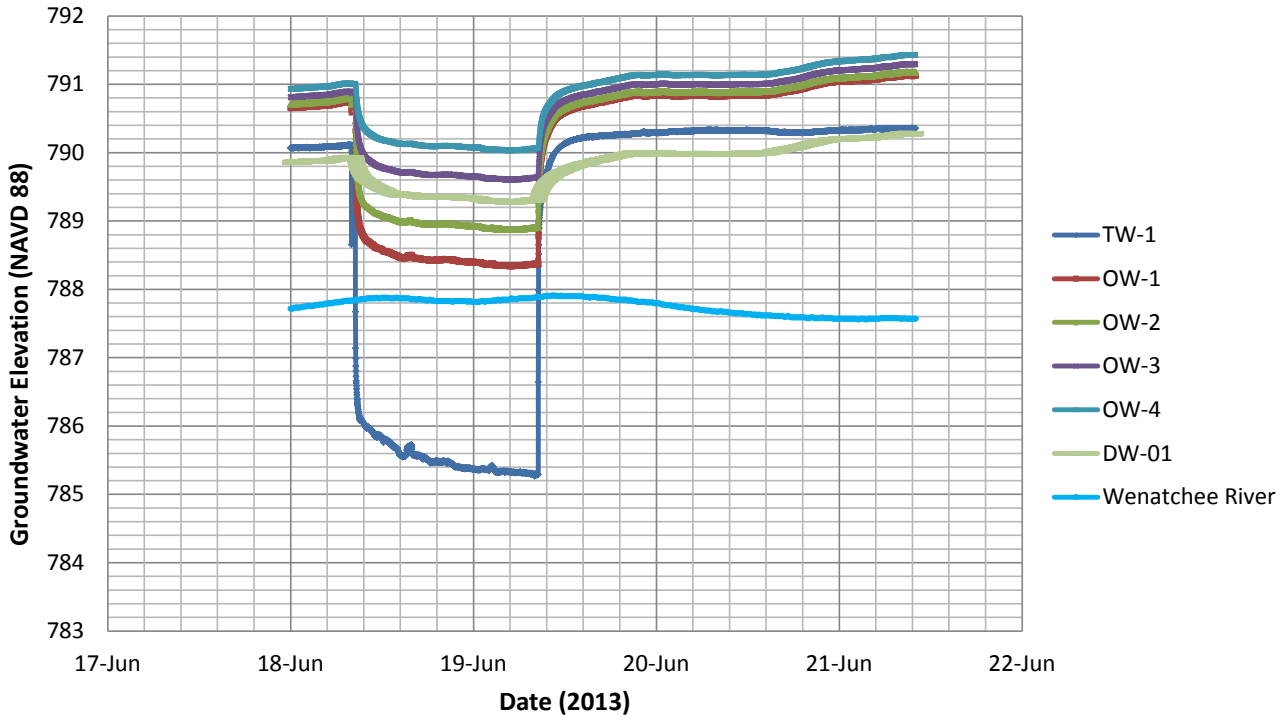
Cross Section B-B'

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

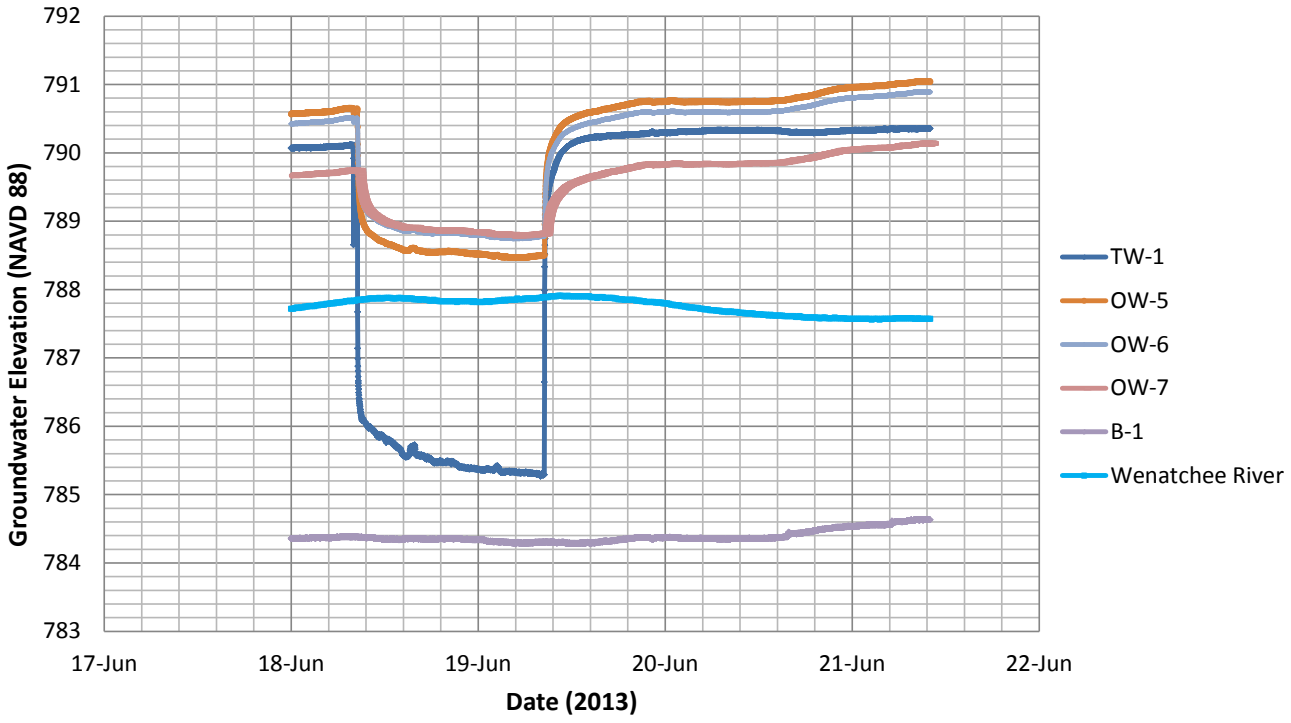
GeoEngineers

Figure 4

(a) Hydrograph - Section A-A' (Down-Valley)



(b) Hydrograph - Section B-B' (Cross-Valley)



Notes:

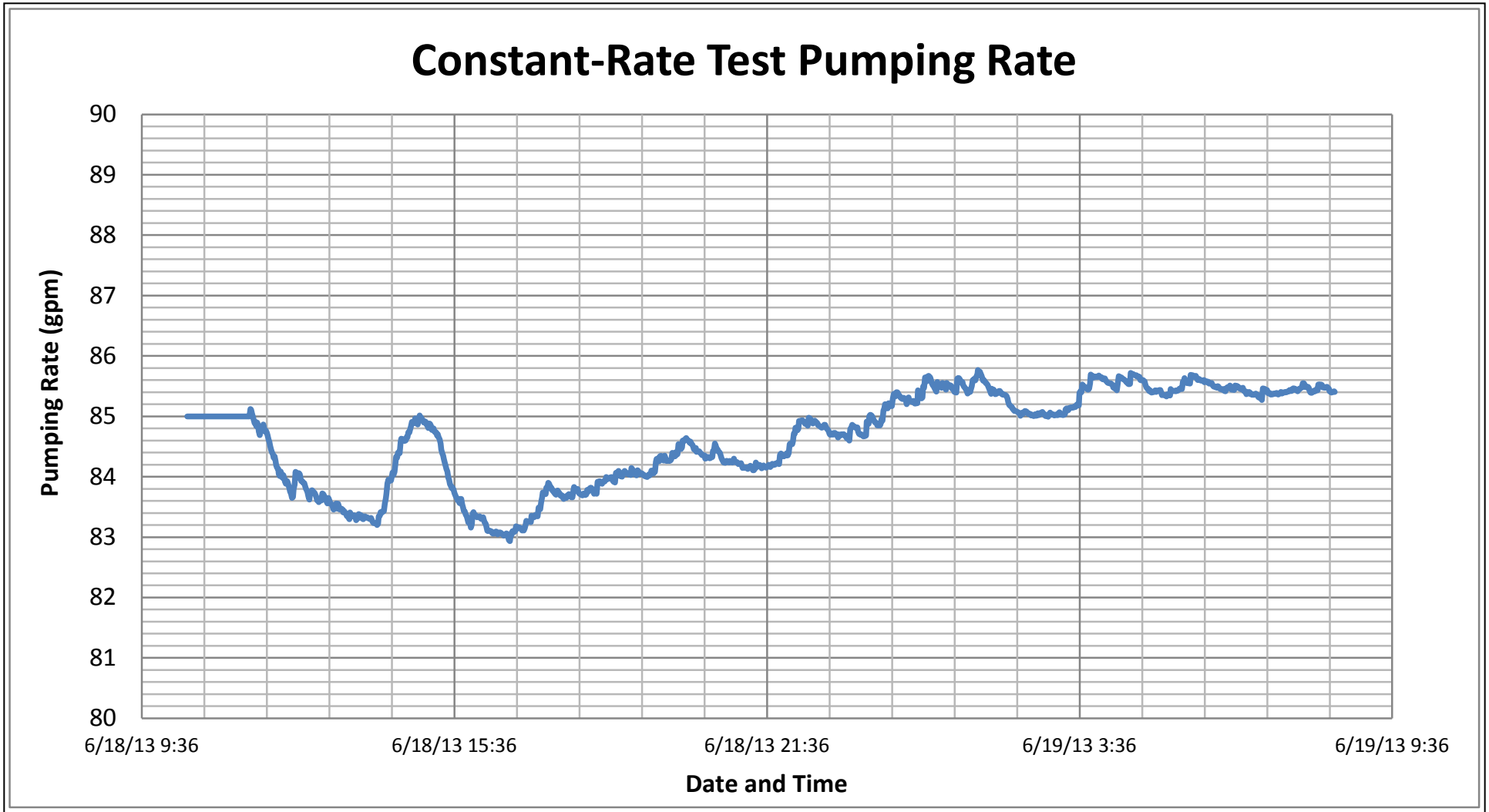
1. Wenatchee River elevation data from USGS gauging station 12462500 at Monitor, WA, located approximately 100 feet lower in elevation than the site. An arbitrary value of 83 feet was added to the data to plot river changes during the test period.
2. Data is organized by alignment of observation wells relative to the test well, with down-valley being oriented NW-SE and cross-valley being oriented NE-SW, as depicted in Figures 2, 3, and 4.

Pumping Test Hydrograph

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 5



Notes:

1. The pumping rate was measured and recorded electronically during the tests using a Blue-White Industries S3 Series Hybrid Ultrasonic Flow Meter.
2. Pumping rates were not recorded for the first 3 hours of the test due to equipment malfunction.

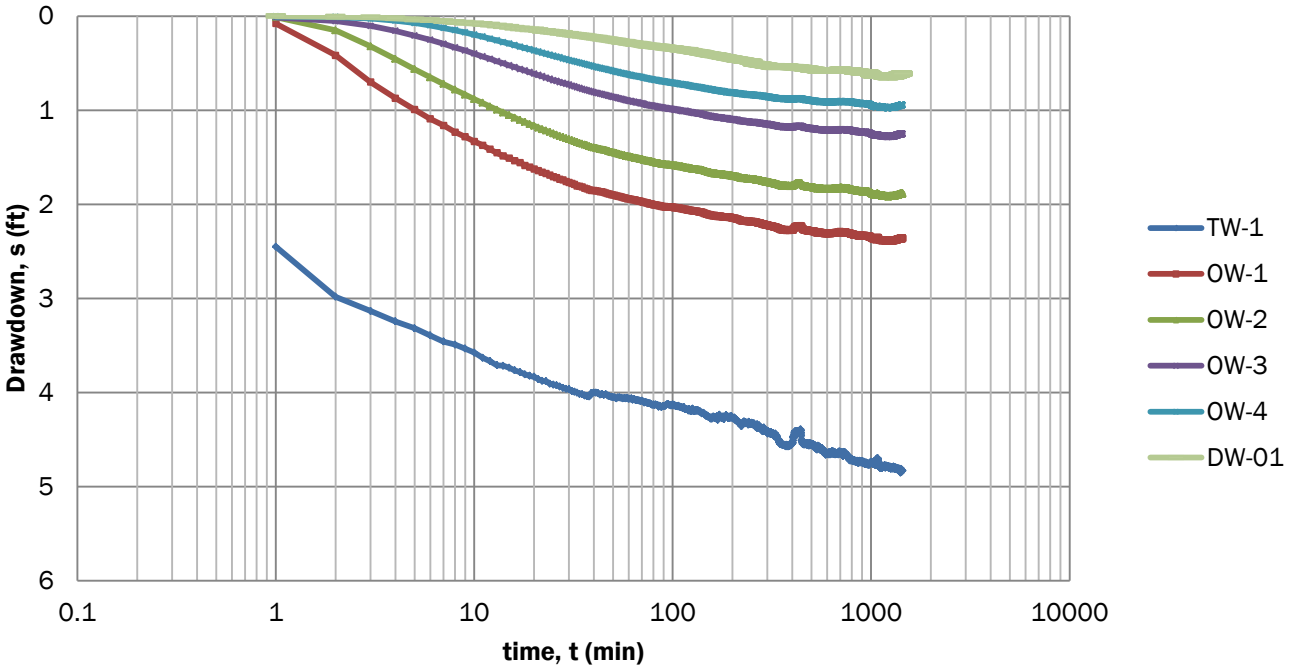
Constant-Rate Test Pumping Rate

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

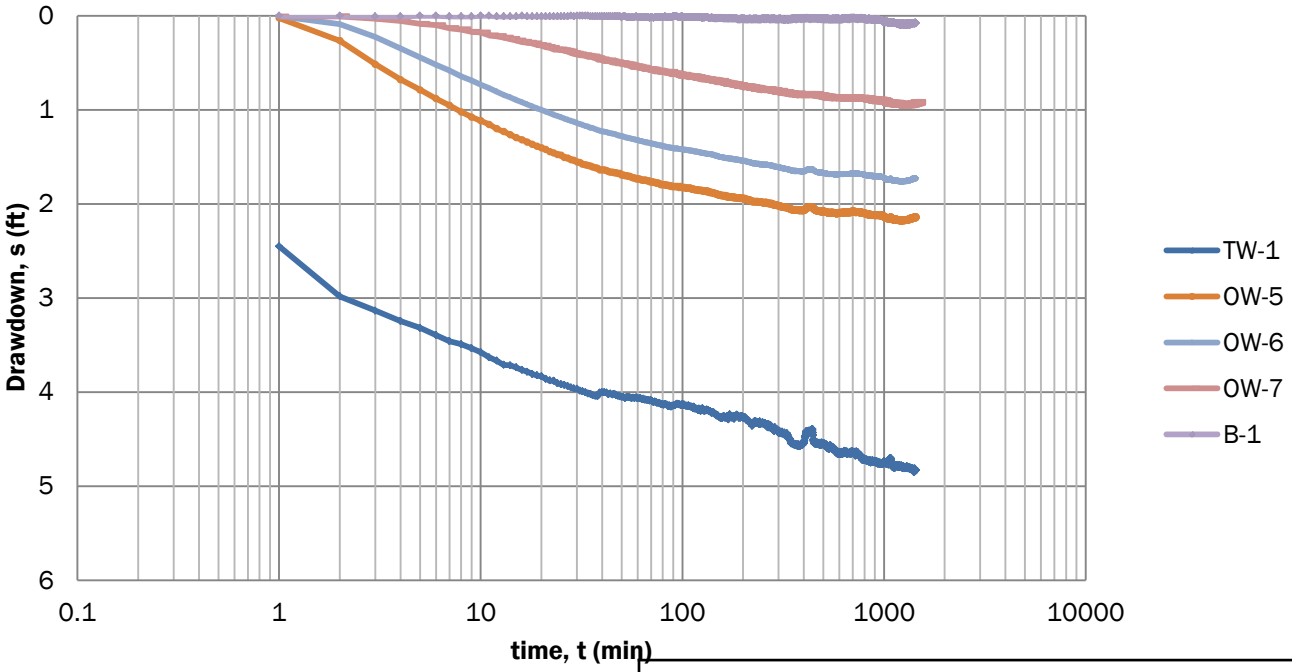
GeoEngineers

Figure 6

Drawdown Data (*s* vs. *t*) - Section A-A' (Down-Valley)



Drawdown Data (*s* vs. *t*) - Section B-B' (Cross-Valley)



Notes:

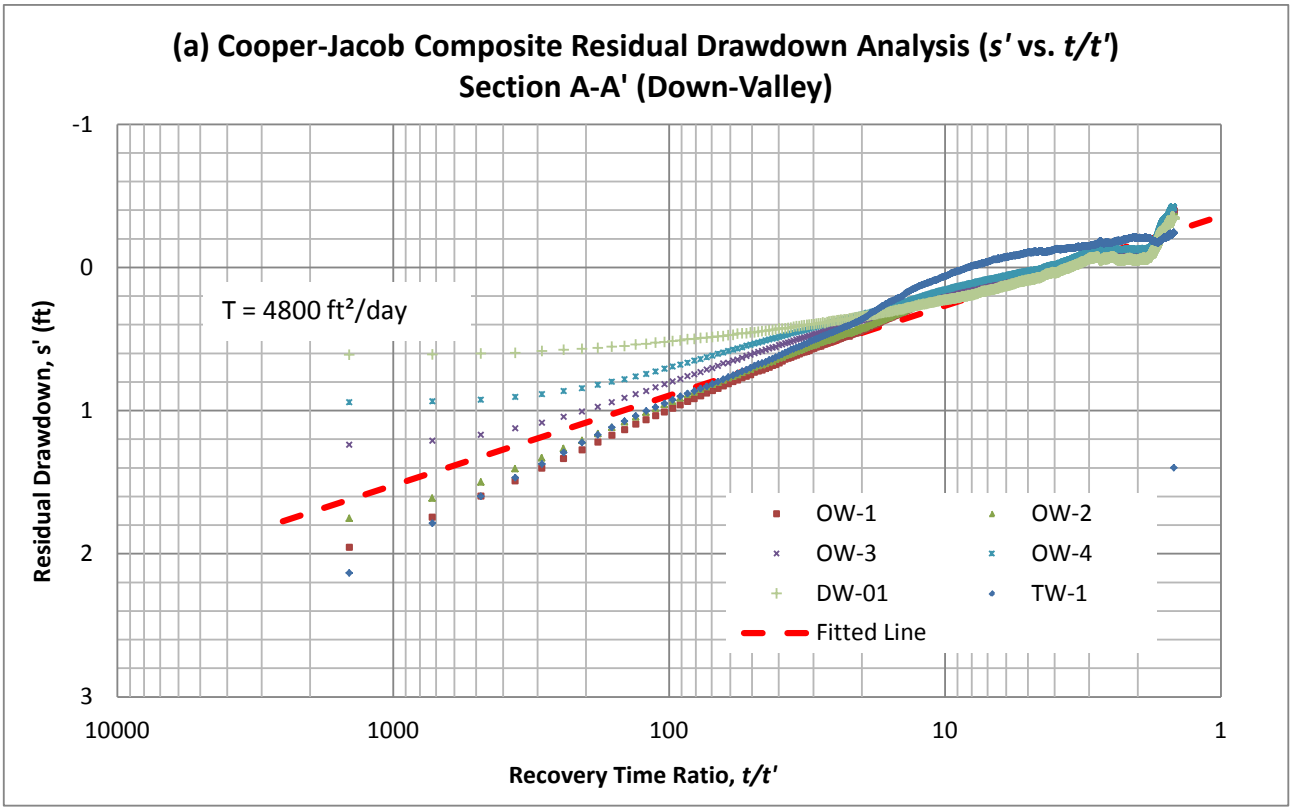
1. Data is organized by alignment of observation wells relative to the test well, with down-valley being oriented NW-SE and cross-valley being oriented NE-SW, as depicted in Figures 2, 3, and 4.

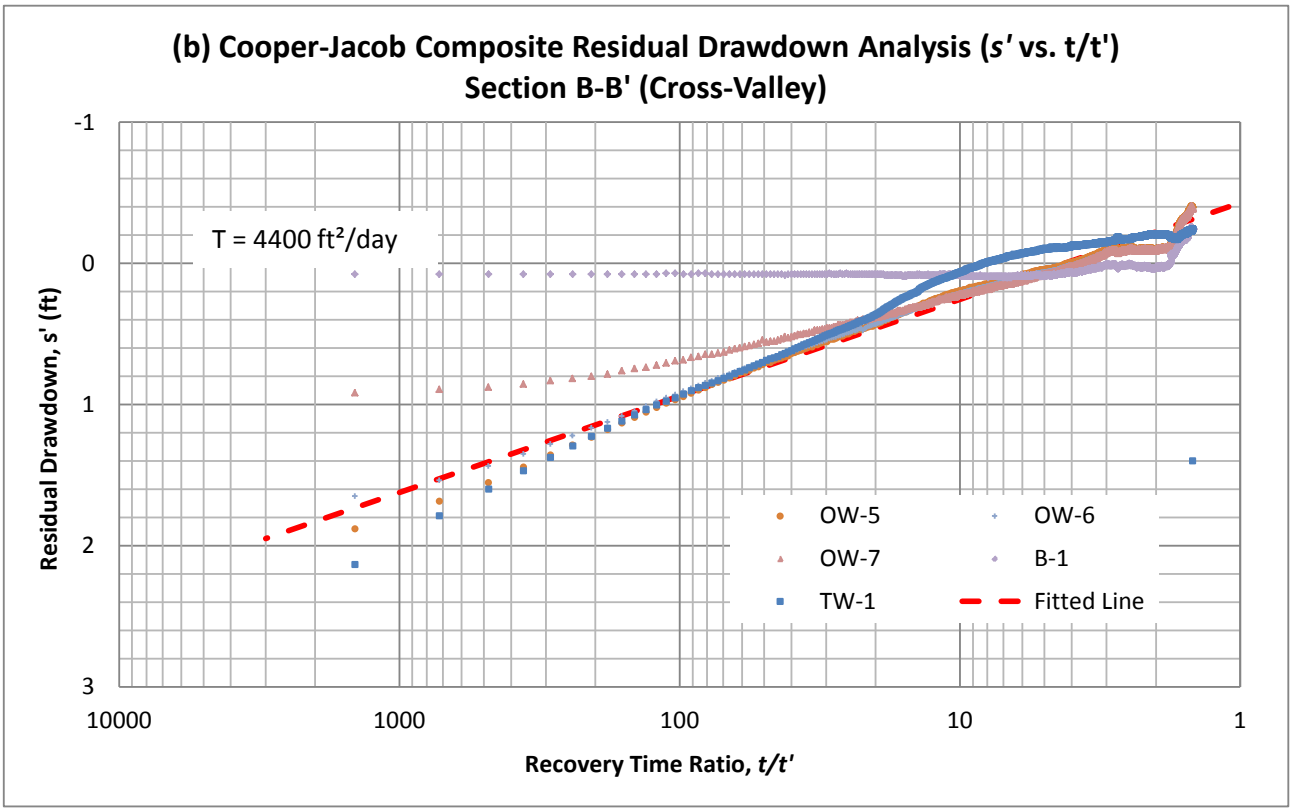
Drawdown in Pumping and Observation Wells (*s vs. t*)

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 7





Notes:

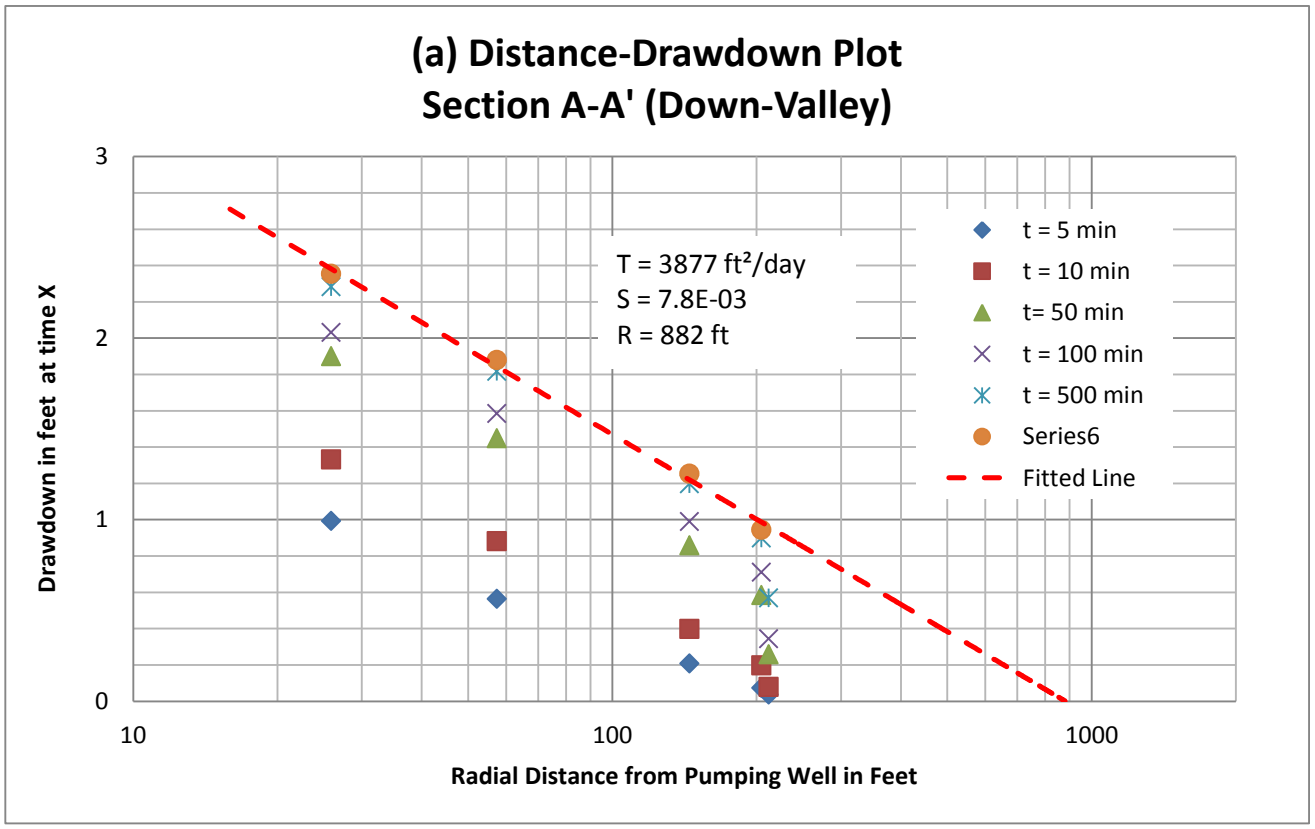
1. Data is organized by alignment of observation wells relative to the test well, with down-valley being oriented NW-SE and cross-valley being oriented NE-SW, as depicted in Figures 2, 3, and 4.
2. Analysis conducted using Theis (1935).

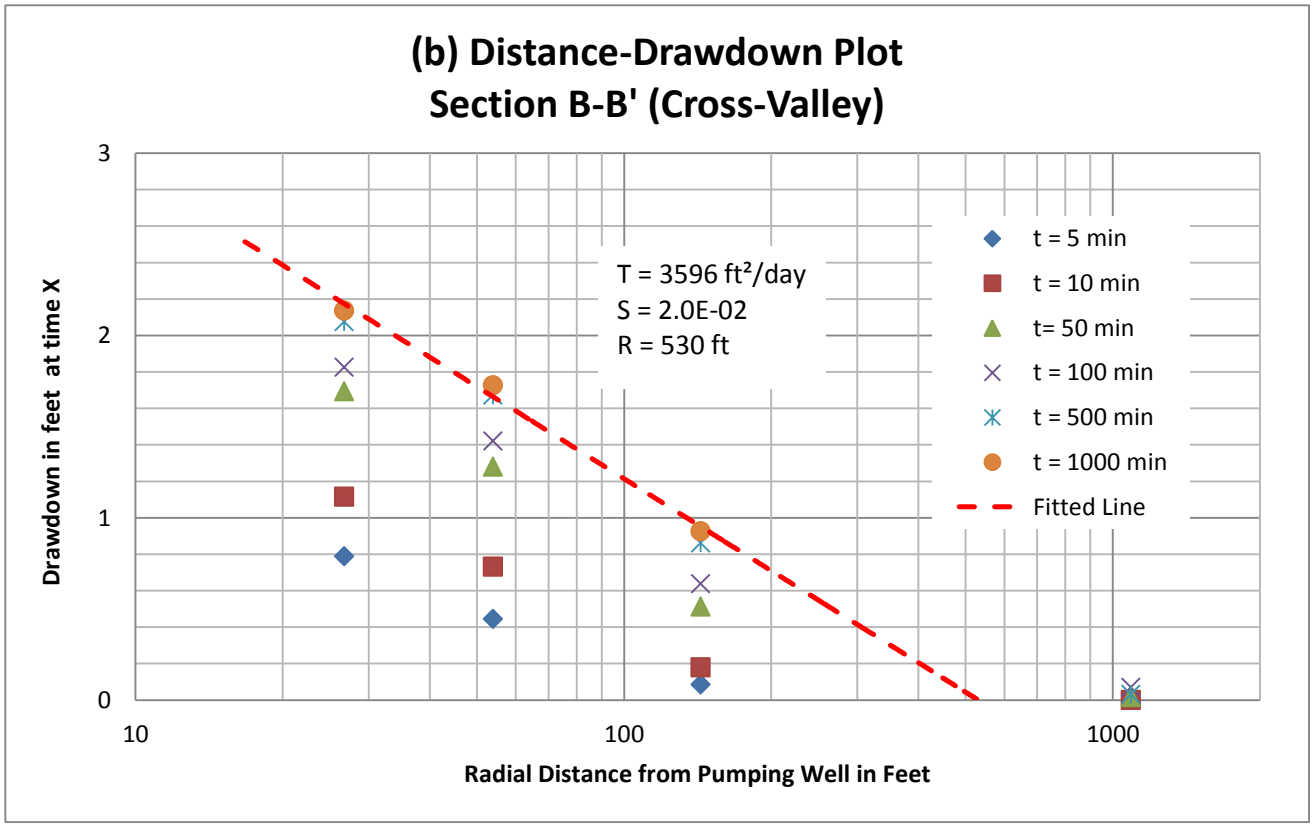
Recovery in Pumping and Observation Wells (*s vs. t/t'*)

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 8





Notes:

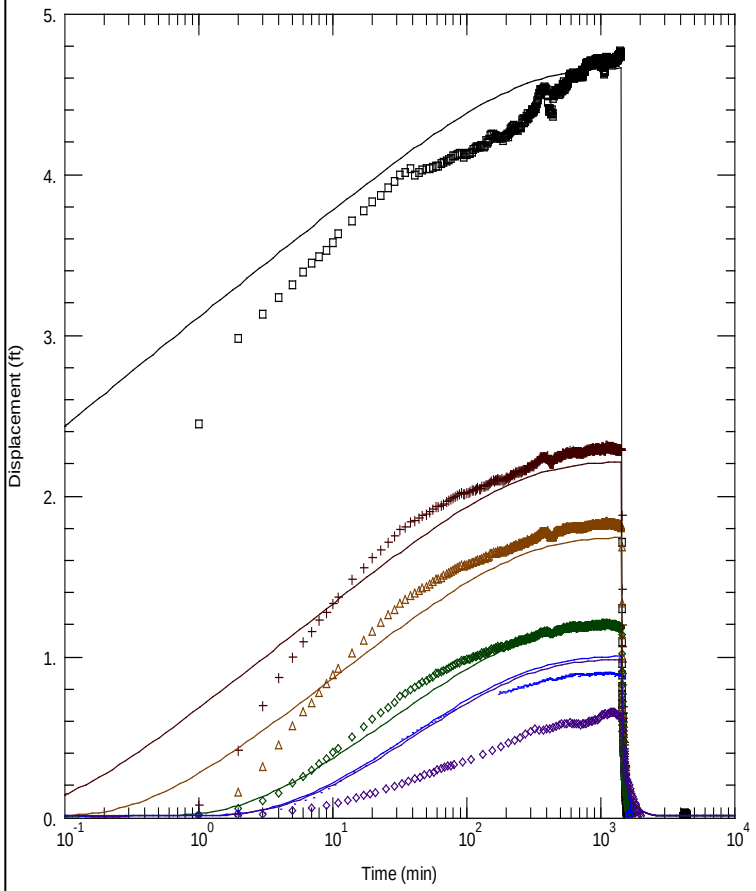
1. Data is organized by alignment of observation wells relative to the test well, with down-valley being oriented NW-SE and cross-valley being oriented NE-SW, as depicted in Figures 2, 3, and 4.
2. Analysis conducted using Cooper-Jacob (1946).

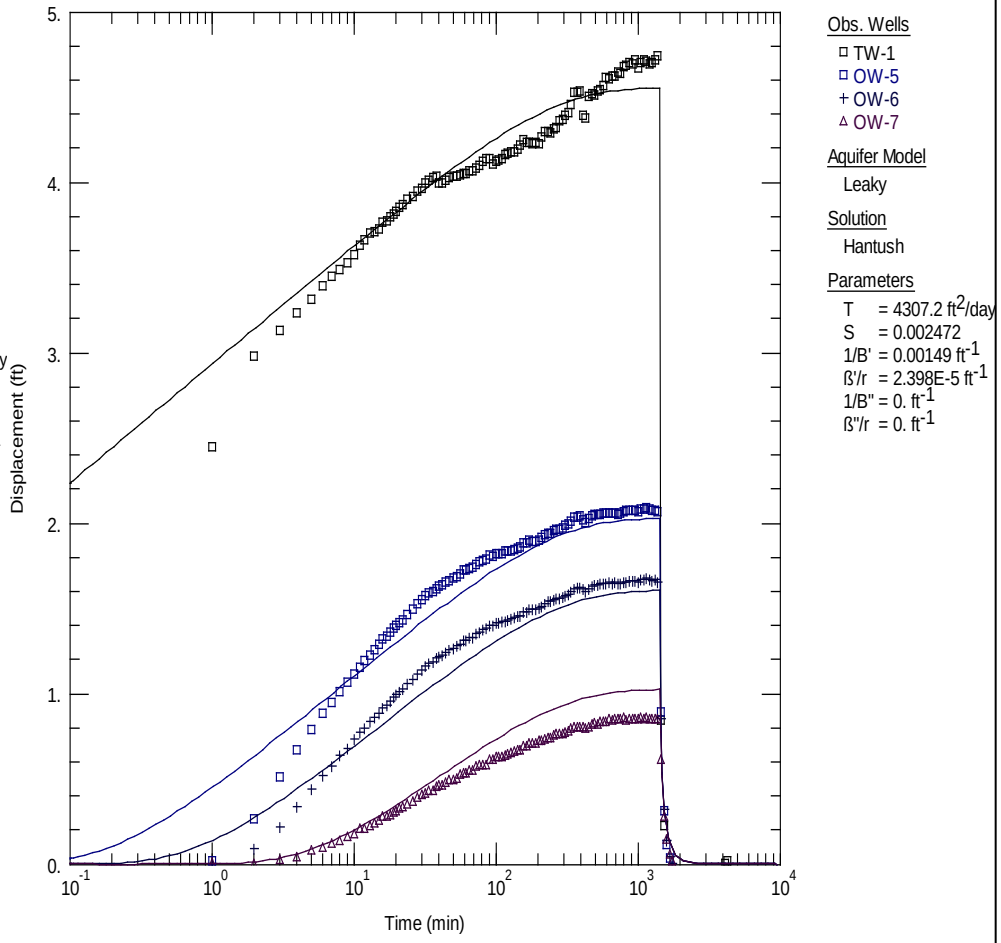
Distance Drawdown Plot

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 9





Notes:

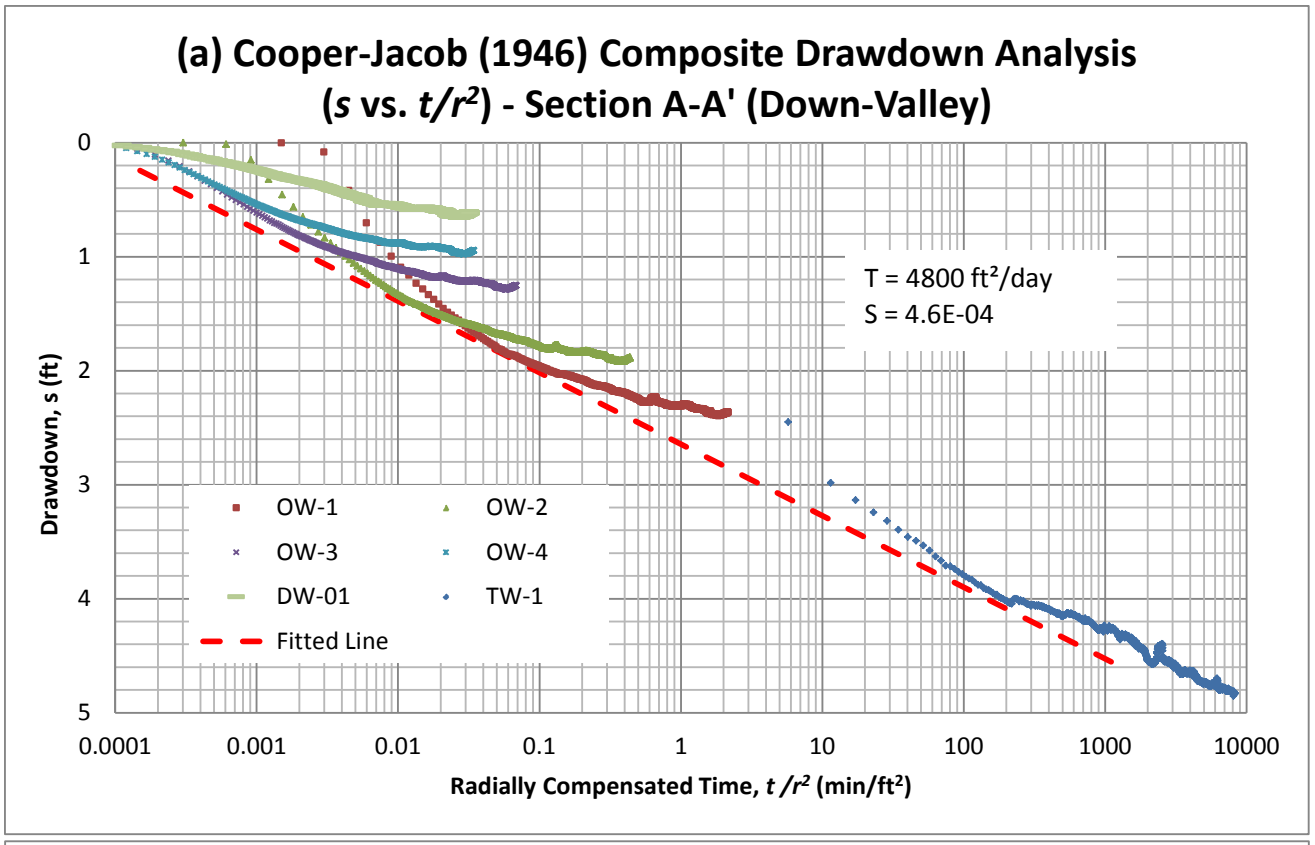
1. Analysis conducted using using Aqtesolve (2007) software Version 4.5 using Hantush (1960).
2. Hantush (1960) analysis originally presented in: Hantush, MS (1960). Modification of the Theory of Leaky Aquifers, Journal of Geophysical Research, Vol. 65, No. 11.

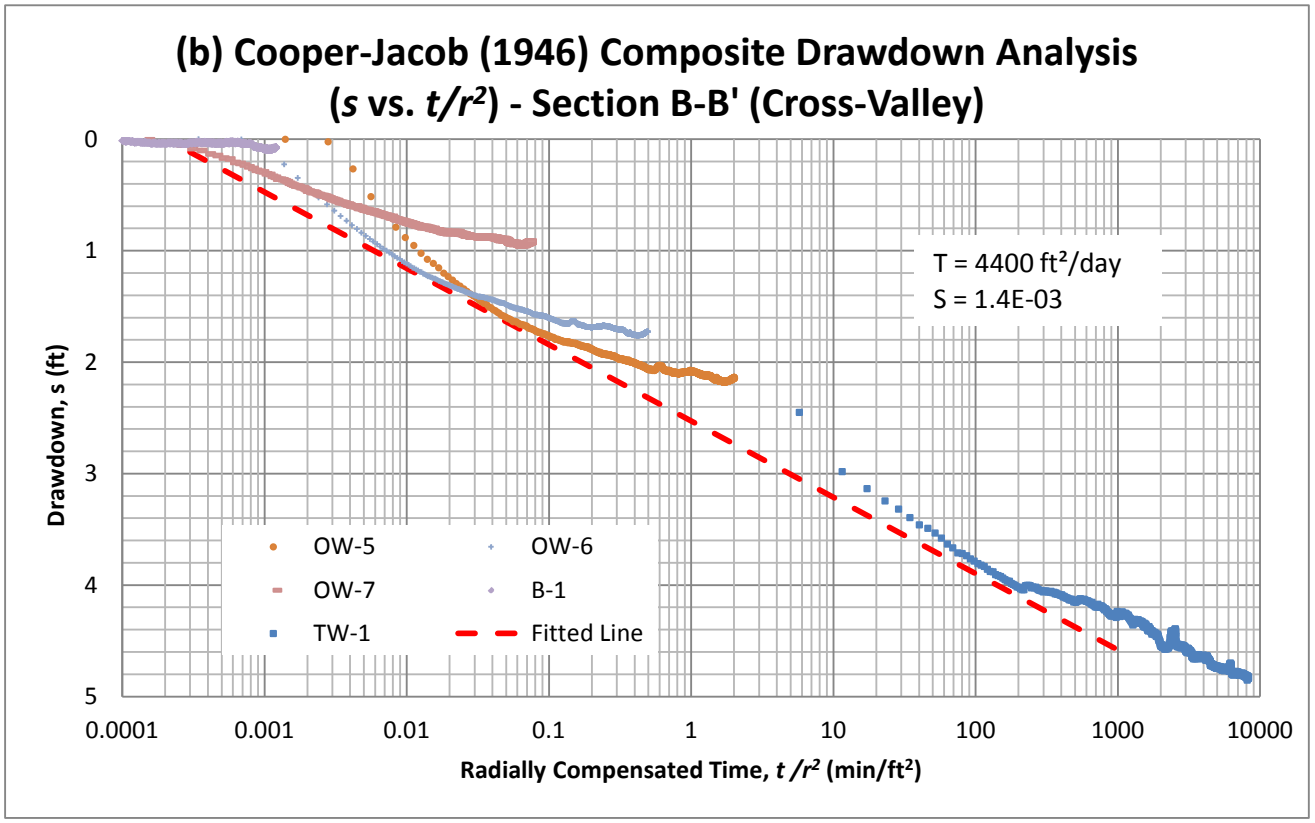
Hantush (1960) Drawdown Analysis – Aqtesolve Output

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 10





Notes:

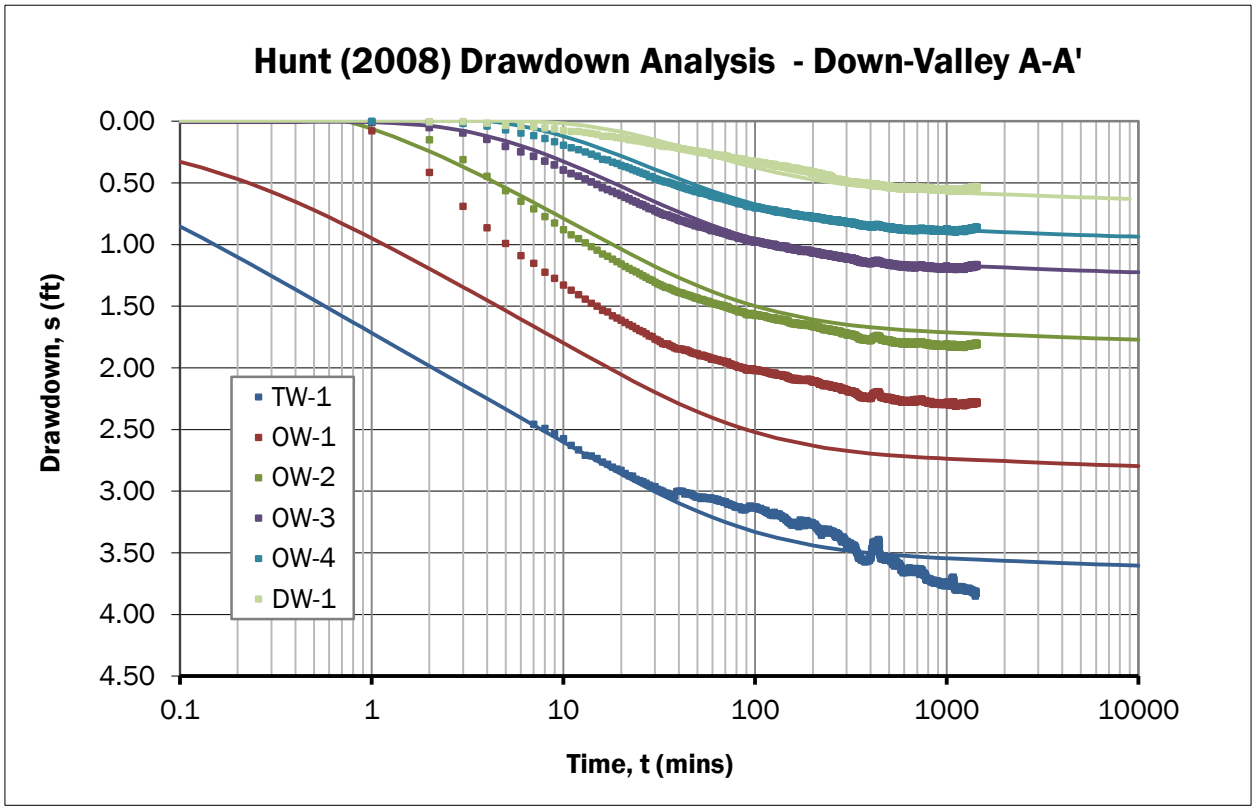
1. The drawdown data presented here is organized by alignment of observation wells relative to the test well, with down-valley being oriented NW-SE and cross-valley being oriented NE-SW, as shown in the cross section alignments A-A' and B-B', respectively, and as depicted in Figures 2, 3, and 4.
2. Analysis conducted using Cooper-Jacob (1946).

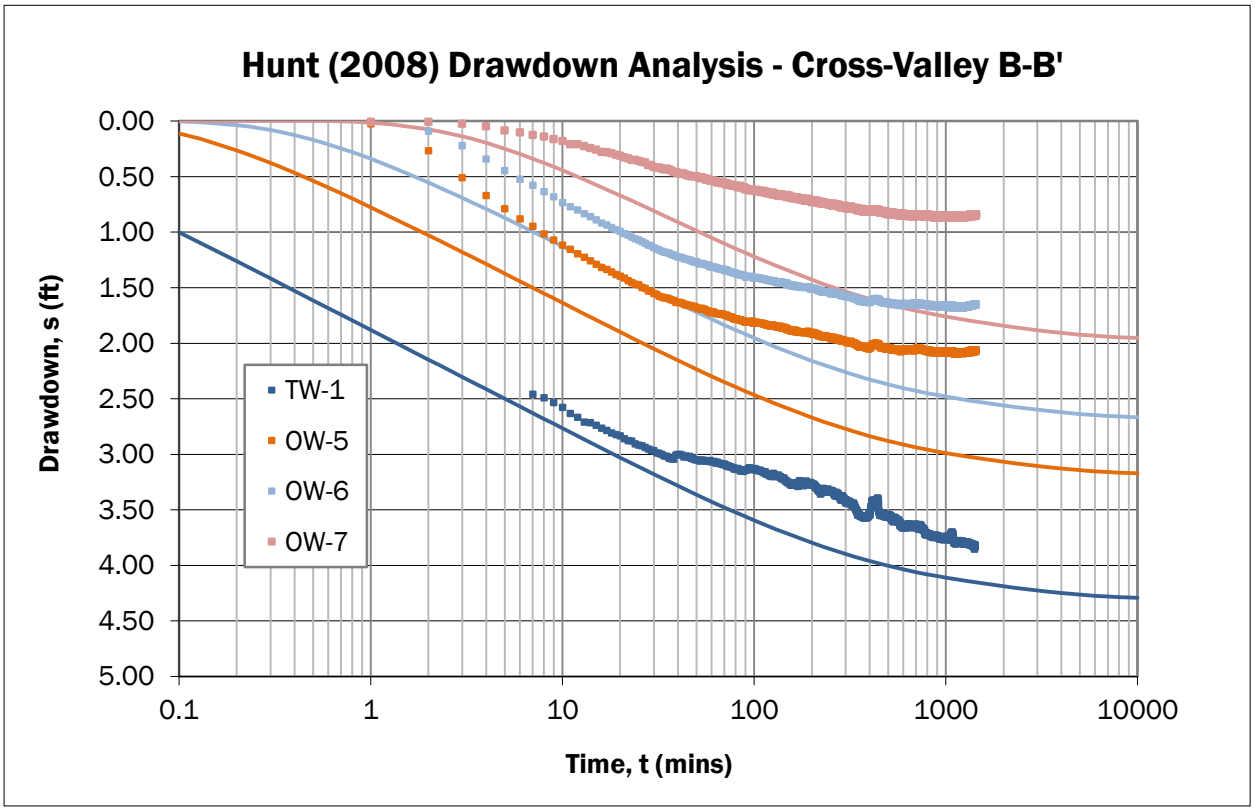
Composite Drawdown Plot (*s vs. t/r²*)

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 11





Notes:

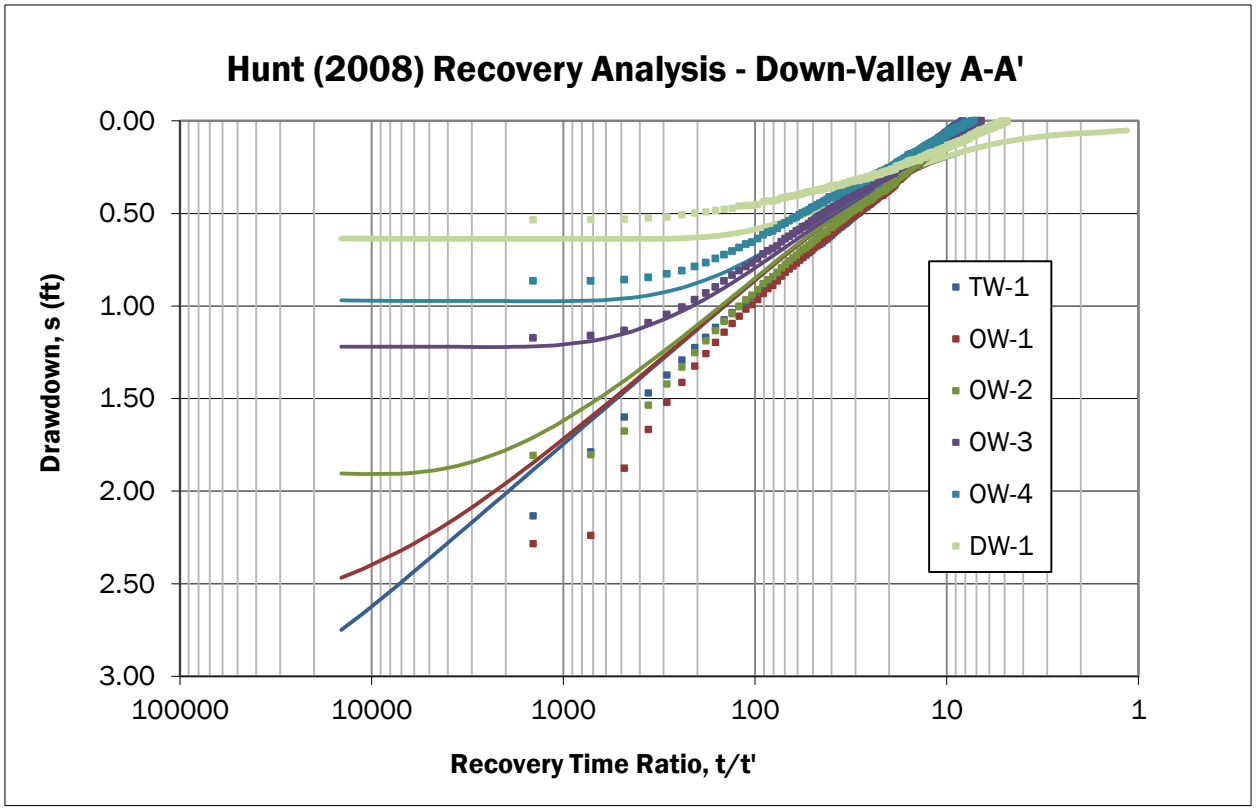
1. Drawdown analysis completed using the analytical method presented in: Hunt, B. (2008), "Stream Depletion for Streams and Aquifers with Finite Widths", ASCE Journal of Hydrologic Engineering, Vol. 13, No. 2, 80-89.

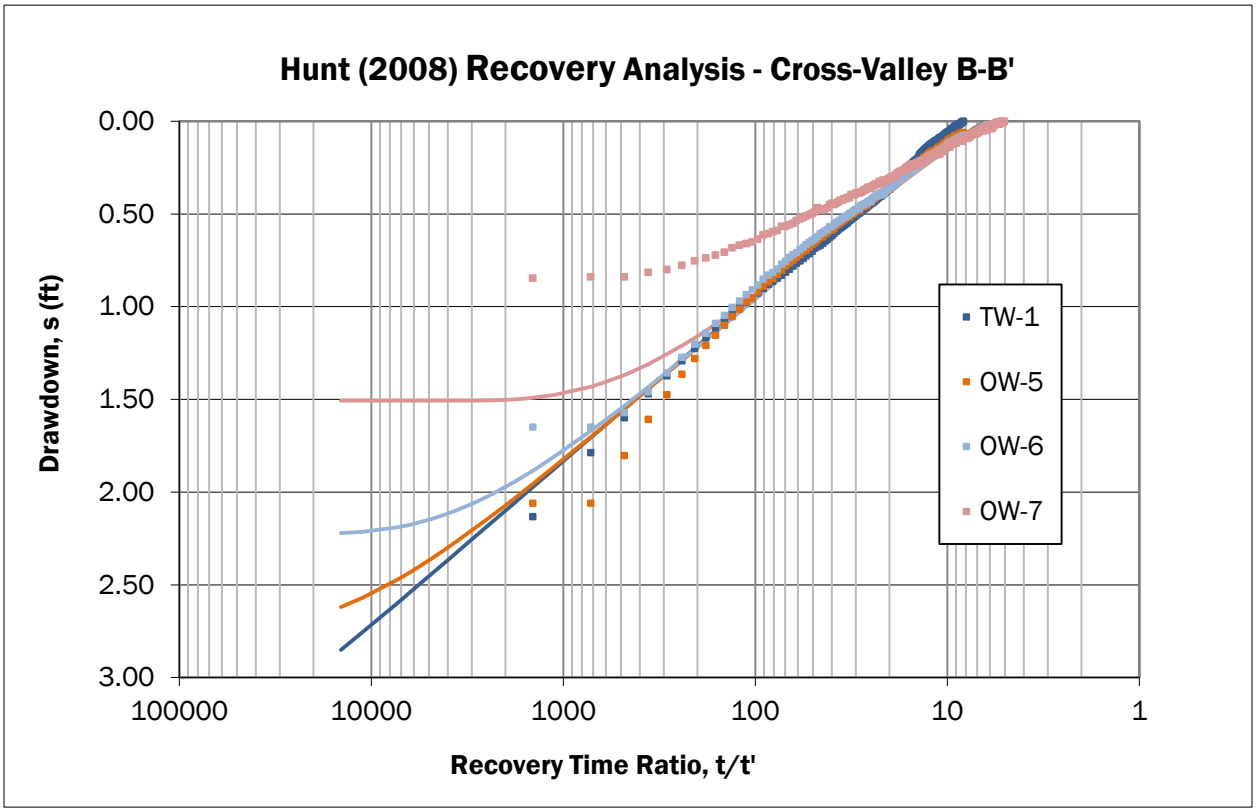
Hunt (2008) Drawdown Analysis

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 12





Notes:

1. Drawdown analysis completed using the analytical method presented in: Hunt, B. (2008), "Stream Depletion for Streams and Aquifers with Finite Widths", ASCE Journal of Hydrologic Engineering, Vol. 13, No. 2, 80-89.

Hunt (2008) Recovery Analysis

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

Figure 13

SUNSET HWY

MILL ROAD

EXISTING WELL B-1

DW-09 DW-10 MW-4 DW-08 DW-11 DW-07 MW-3 DW-12 DW-06 DW-05 DW-13 DW-04 OW-7 DW-14 MW-2 OW-4 OW-3 OW-2 OW-6 OW-1 OW-5 TW-1 DW-01 DW-03 DW-02 DW-18 DW-19 DW-17 MW-1 DW-16 DW-15

PROPERTY BOUNDARY

BRENDER CREEK

WOOD WASTE AREA

Legend

- OW-1 — Observation well number and approximate location
- TW-1 — Dewatering test well number and approximate location
- DW-01 — Existing well approximate location (RH2 Engineering, Inc. 2012)
- DW-02 — Proposed dewatering well number and approximate location
- MW-1 — Proposed monitoring well number and approximate location
- Bottom of wood waste elevation contour (2 ft. interval)
- Ground surface topographic contour (2 ft. interval)
- Wood waste area

N W E S

150 0 150
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Survey drawing provided by RH2 Engineering, Inc.

Proposed Dewatering Well Locations

Dewatering Assessment
Cashmere Mill Site Remedial Excavation
Cashmere, Washington

GeoEngineers

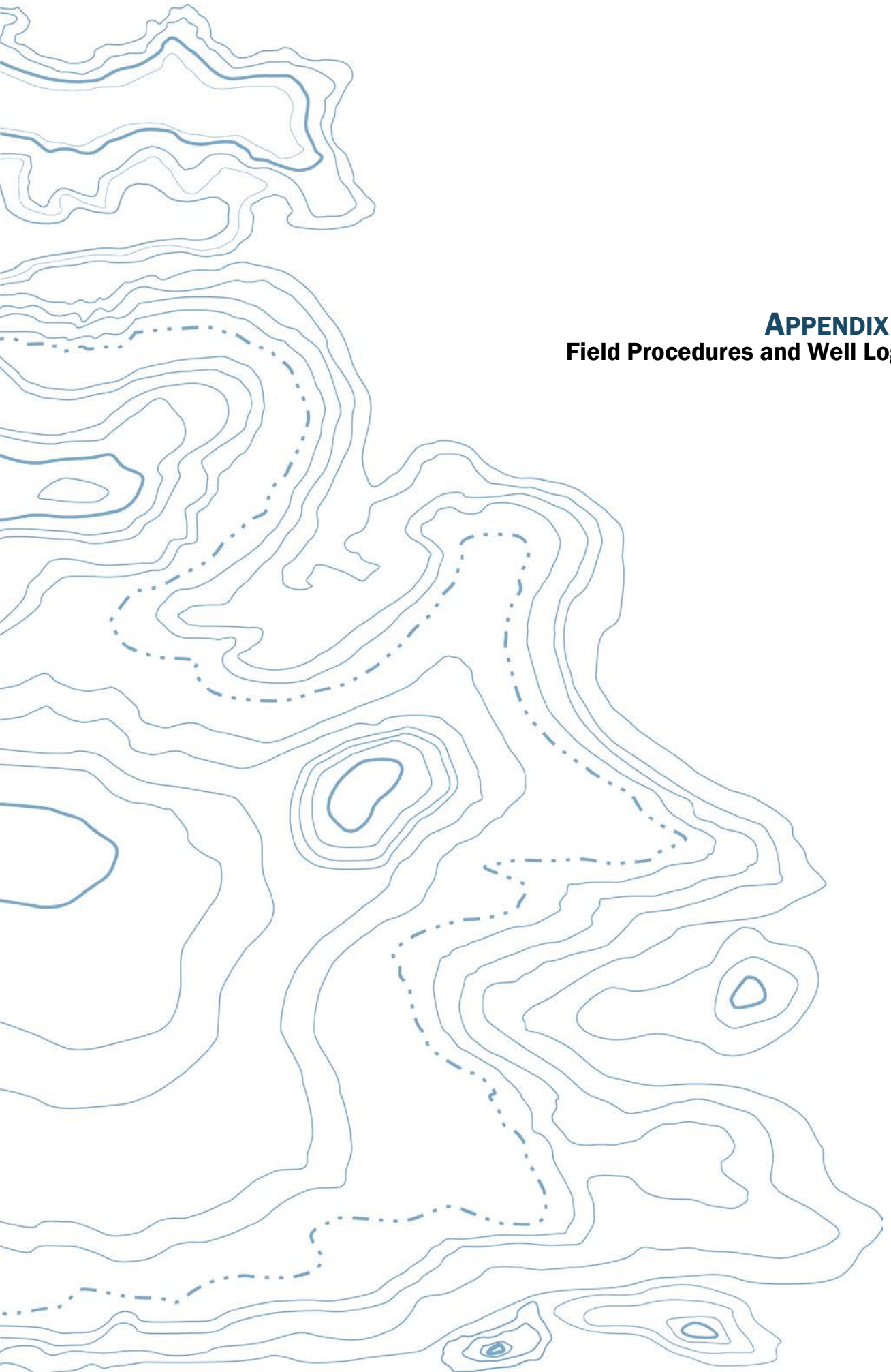
Figure 14

SPOK;JDL : SCY

D:\PROJECTS\SPOKANE\185930010\1\CAD\185930010\1_F14.dwg\TAB:F14 modified on Jul 30, 2013 - 2:55pm

APPENDICES

GeoEngineers



APPENDIX A
Field Procedures and Well Logs

APPENDIX A
FIELD PROCEDURES AND WELL LOGS

Field Explorations

Subsurface soil and groundwater conditions at the site were explored by drilling eight boring and observation well completions. The drilling was completed using air-rotary drilling techniques by Tumwater Drilling to depths of 20.38 to 42 feet below ground surface. The locations of the explorations were determined in the field by measuring distances from existing site features using a measuring tape. The approximate locations of the observation wells are shown on the Site Plan, Figure 2.

Logging of Soil Borings

Each boring was continuously monitored by a geologist or engineer from our firm who observed and classified the soil encountered, and prepared a detailed log of each boring. Soil encountered in the borings was classified in the field in general accordance with ASTM International (ASTM) D-2488, the Standard Practice for Classification of Soils, Visual-Manual Procedure, which is summarized in Figure A-1. Air-Rotary monitoring well logs are provided in Logs of Monitoring Wells, Figures A-2 through A-9.

Field Screening Methods

GeoEngineers' representative performed field-screening tests on soil samples obtained from the project site. Field-screening results were used as a general guideline to assess areas of possible petroleum-related contamination. The field-screening methods used include: (1) visual screening; (2) water sheen screening; and (3) headspace vapor screening using a MiniRae Photo Ionization Detector (PID) calibrated to isobutylene.

Visual screening consisted of observing soil for stains and discolored soil indicative of petroleum-related contamination.

Water sheen screening involved placing soil in a pan of water and observing the water surface for signs of sheen. Sheen screening can detect both volatile and nonvolatile petroleum hydrocarbons. Sheens observed are classified as follows:

No Sheen (NS)	No visible sheen on the water surface.
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly. Natural organic matter in the soil may produce a slight sheen.
Moderate Sheen (MS)	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface.
Heavy Sheen (HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen.

Headspace vapor screening involved placing a soil sample in a plastic sample bag. Air was sealed in the bag, and the bag was shaken to expose the soil to the air trapped in the bag. The probe of the PID was inserted into the bag and PID readings were recorded. Headspace vapor screening targeted volatile petroleum hydrocarbon compounds. In this application, the PID measured concentration of organic vapors ionizable by a 10.6 electron volt (ev) lamp in the range between 1.0 and 2,000 parts per million (ppm), with a resolution of ±2 ppm.

Field screening results can be site specific. The effectiveness of field screening can vary with temperature, moisture content, organic content, soil type and type and age of contaminant. The presence or absence of a sheen or headspace vapors did not necessarily indicate the presence or absence of petroleum hydrocarbons.

Monitoring Well Construction, Development, and Surveying

Observation wells OW-1 through OW-7 and TW-1 were constructed in accordance with WAC 173-160, Section 400, Washington State Resource Protection Well Construction Standards. Monitoring well installation was observed by a GeoEngineers field geologist or engineer, who maintained a detailed log of the materials and depths of the well. Well construction details, including the depths of the well screen and filter packs are shown on Figures A-2 through A-9.

Observation wells OW-1 through OW-7were constructed using 2-inch-diameter PVC well casings and screens (0.02-inch slotted). The Test Well TW-1 was constructed using a 10-inch diameter steel casing and a 9-inch-diameter telescoping 0.06-inch steel well screen. The annular space in each well was sealed between the top of the filter pack and the ground surface with bentonite to minimize the potential for infiltration from precipitation, surface water, or groundwater from shallower zones into the screened zone. The bottom approximately 20 feet of TW-1 was backfilled with pressure grout and allowed to set up prior to setting the well. A lockable and removable compression-type cap was placed at the top of the PVC well casing. A flush-mount above-grade steel monument equipped with a watertight cover was installed to protect the PVC well casing. A concrete surface seal was placed around the monument at the ground surface to divert surface water away from the well location.

Observation wells OW-1 through OW-7 were developed between June 3rd and June 6th to stabilize the filter pack and formation materials surrounding the well screen, and restore the hydraulic connection between the well screen and the surrounding soil. Each well screen was gently surged with a surge block and water was removed with decontaminated submersible pump several times during the development process.

The test well, TW-1, and observation wells, OW-1 through OW-7, were surveyed by Landline Surveyors, Inc. of Levenworth, Washington, under contract to the Port of Chelan. The ground surface adjacent to the wells and the tops of well casings elevations were surveyed and the data provided to GeoEngineers, Inc. on July 26, 2013. The horizontal and vertical datums used by Landline Surveyors, Inc. were NAD83 and NAVD88, respectively.

Groundwater Sampling

The wells were allowed to equilibrate after well development and subsequently sampled on June 5, 2013 and June 18 and 19, 2013. Before sampling, VOCs in the well headspace were measured with a PID by first inserting the PID into the well casing immediately after removing the well cap. To assess for the presence or absence of floating petroleum (free product), a disposal bailer was lowered into each well until it partially penetrated the groundwater table. The bailer was then recovered and the thickness of free product floating on top of groundwater, if present, was measured.

Each groundwater sample was obtained using low-flow purging methods. The groundwater samples were transferred in the field to laboratory-prepared sample containers and placed into an ice chest containing ice. The VOA sample containers were filled completely to eliminate headspace in the container. Groundwater samples were packaged and transported to Onsite Environmental for analysis. Chain-of-custody procedures were observed during transport of the groundwater samples.

Decontamination Procedures

A designated area was established to decontaminate drilling equipment and reusable sampling equipment. Decontamination fluids were retained and transferred to 55-gallon drums. Drilling equipment was cleaned using high-pressure/low-volume methods.

Soil sampling equipment was decontaminated in accordance with the following procedures before each sampling attempt or measurement.

1. Brush equipment with a nylon brush to remove large particulate matter.
2. Rinse with potable tap water.
3. Wash with non-phosphate detergent solution (Liquinox® and potable tap water).
4. Rinse with potable tap water.
5. Rinse with distilled water.

Handling of Investigation-Derived Waste (IDW)

Drill cuttings generated during drilling, were spread out on the ground near the wells. Purge water generated during well development and aquifer testing was temporarily stored in baker tanks, pending analytical testing, prior to discharge to Brender Creek.

Disposable items, such as sample tubing, gloves, paper towels, etc., were placed in plastic bags after use and deposited in trash receptacles for disposal as solid waste.

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
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING 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, ROCK FLOUR, 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% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Material Description Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
PPM	Parts per million
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

GeoEngineers

FIGURE A-1

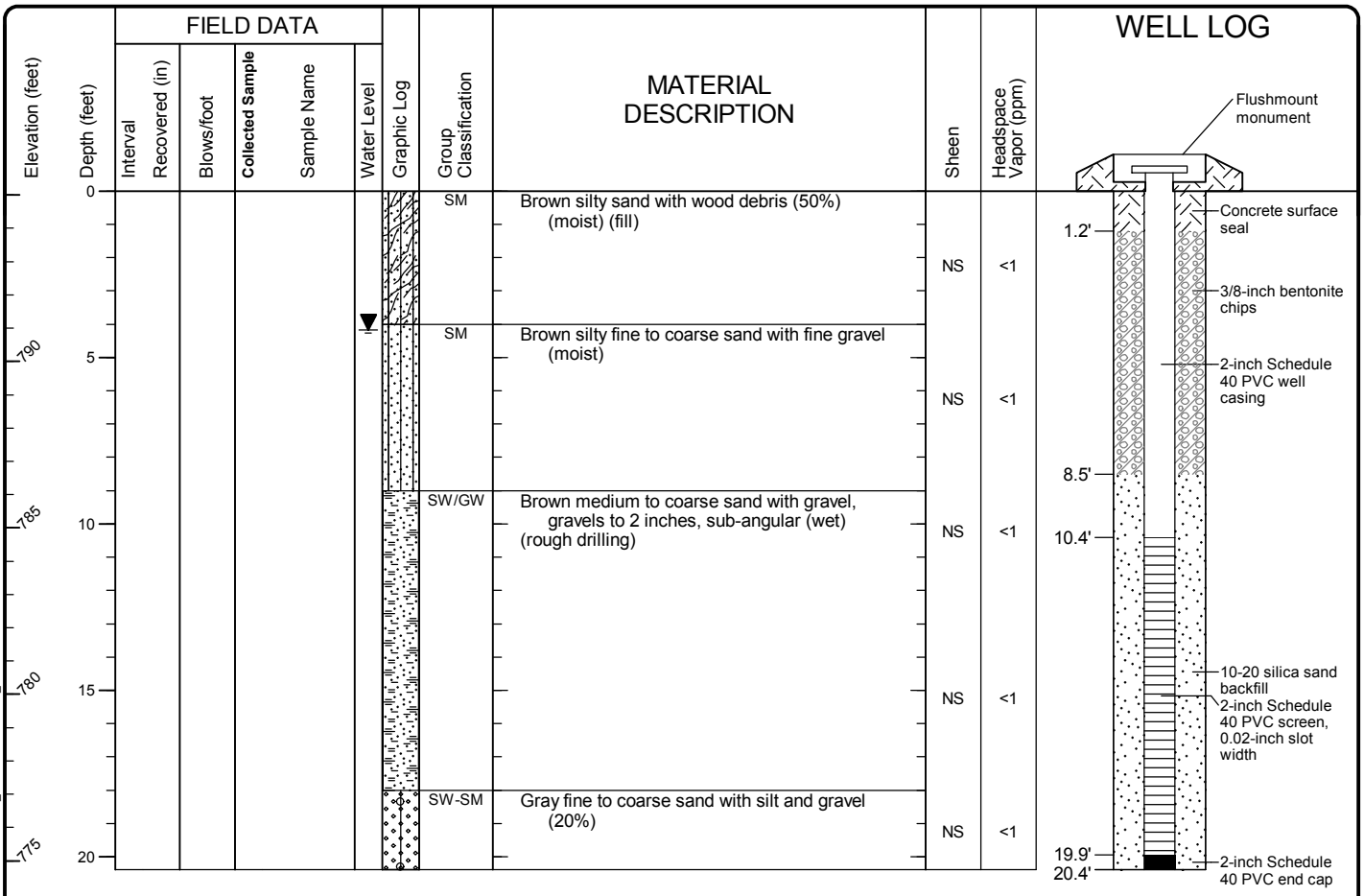
Drilled	Start	End	Total Depth (ft)	Logged By	Driller	Drilling Method
	6/5/2013	6/5/2013	20.38	CTB / JDL	Tumwater Drilling	Air-Rotary

Hammer Data	Pneumatic Casing Hammer	Drilling Equipment	Schramm T45OWS Rotodrill
Surface Elevation (ft)	795.12	Top of Casing Elevation (ft)	794.9
Vertical Datum	NAVD88		
Easting (X)	1727334.9713	Horizontal Datum	NAD83
Northing (Y)	189642.5857		

DOE Well I.D.: BHT 704
A 2 (in) well was installed on 6/7/2013 to a depth of 20.38 (ft).

Groundwater		
Date Measured	Depth to Water (ft)	Elevation (ft)
6/7/2013	4.2	790.7

Notes:



Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well OW-1

GeoEngineers

Project:	Cashmere Mill Site Remedial Excavation
Project Location:	Cashmere, Washington
Project Number:	18593-001-01

Figure A-2
Sheet 1 of 1

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
6/5/2013	6/5/2013	25	CTB / JDL	Tumwater Drilling	Air-Rotary

Hammer Data	Pneumatic Casing Hammer	Drilling Equipment	Schramm T45OWS Rotodrill
Surface Elevation (ft) / Vertical Datum	794.6 NAVD88	Top of Casing Elevation (ft)	794.5
Easting (X) / Northing (Y)	1727309.9723 / 189663.0704	Horizontal Datum	NAD83

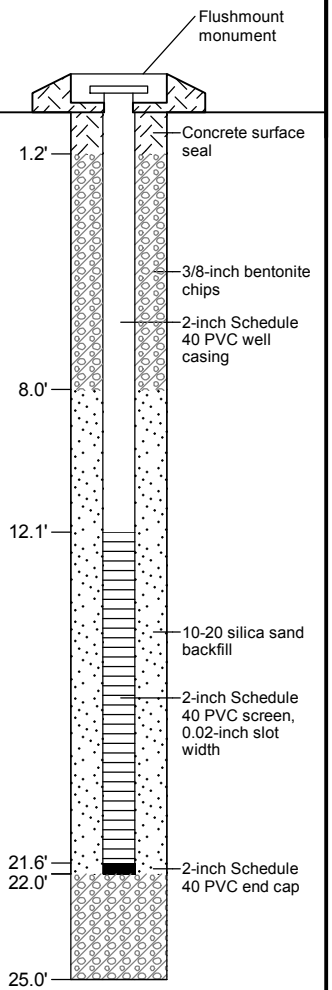
DOE Well I.D.: BHT 705
A 2 (in) well was installed on 6/7/2013 to a depth of 22.08 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
6/7/2013	3.7	790.8

Notes: Site specific horizontal datum, benchmark = 100 feet elevation

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0							SM	Brown silty sand with gravel and wood debris (40%) (fill)	NS	<1
790	5							SW-SM	Brownish-gray fine to coarse sand with silt and gravel (wet)	NS	<1
									Water encountered during drilling		
								SW	Brownish-gray medium to coarse sand with gravel (wet)		
785	10									NS	<1
780	15									NS	<1
									Increased sand content		
775	20							SW-SM	Brownish-gray fine to coarse sand with gravel and silt	NS	<1
									(rough, slow drilling)		
770	25								(slow drilling due to boulder)		

WELL LOG



Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well OW-2

GeoEngineers

Project: Cashmere Mill Site Remedial Excavation
Project Location: Cashmere, Washington
Project Number: 18593-001-01

Figure A-3
Sheet 1 of 1

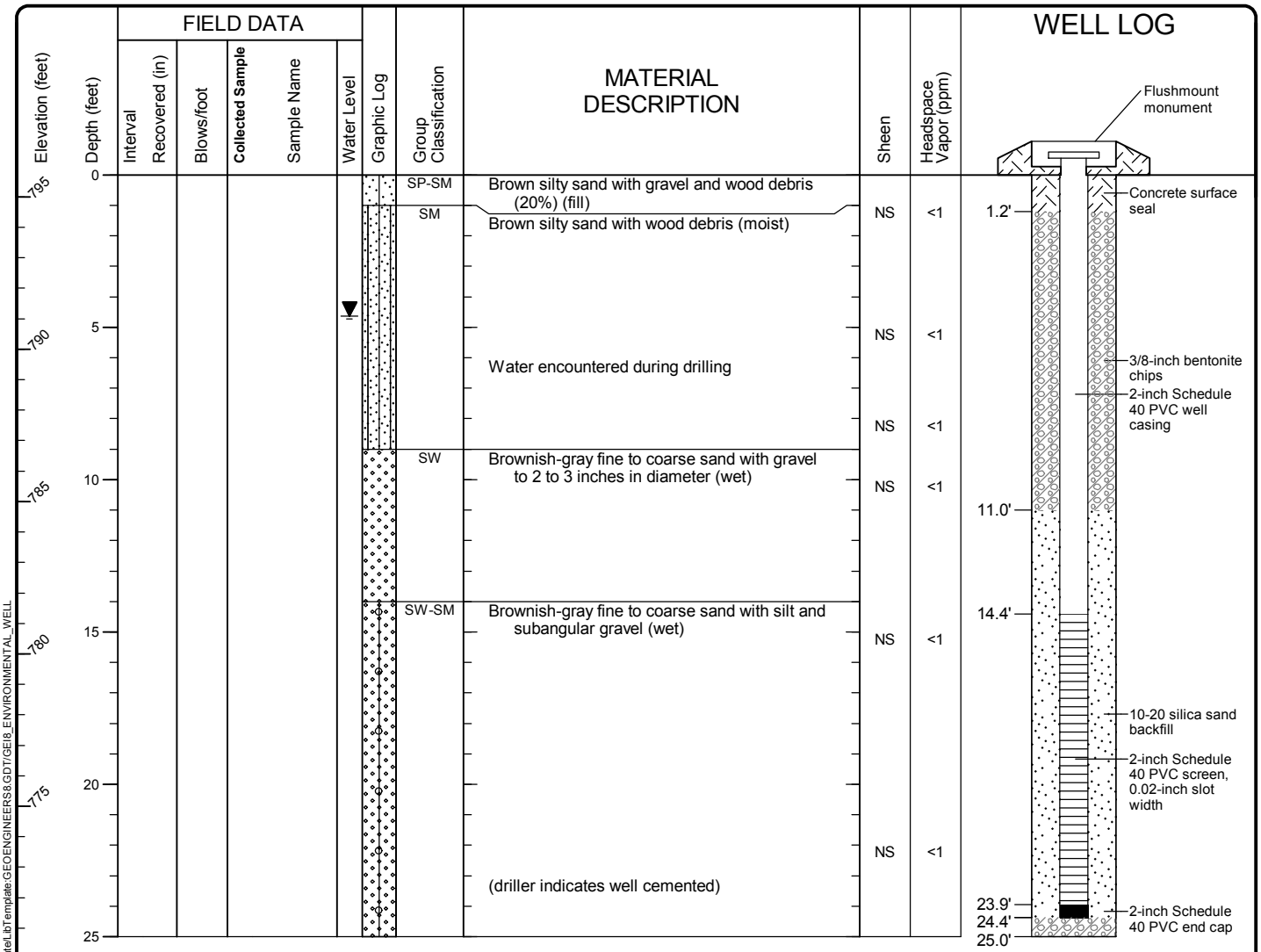
Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
6/6/2013	6/6/2013	25	CTB / JDL	Tumwater Drilling	Air-Rotary

Hammer Data	Pneumatic Casing Hammer	Drilling Equipment	Schramm T45OWS Rotodrill
Surface Elevation (ft)	795.72	Top of Casing Elevation (ft)	795.5
Vertical Datum	NAVD88		
Easting (X)	1727243.4327	Horizontal Datum	NAD83
Northing (Y)	189720.4161		

DOE Well I.D.: BHT 706
A 2 (in) well was installed on 6/7/2013 to a depth of 24.38 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
6/7/2013	4.6	790.9

Notes: Site specific horizontal datum, benchmark = 100 feet elevation



Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well OW-3

GeoEngineers

Project: Cashmere Mill Site Remedial Excavation
Project Location: Cashmere, Washington
Project Number: 18593-001-01

Figure A-4
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	6/6/2013	6/6/2013	30	CTB	JDL	Tumwater Drilling	Air-Rotary

Hammer Data	Pneumatic Casing Hammer	Drilling Equipment	Schramm T45OWS Rotodrill
Surface Elevation (ft)	795.95	Top of Casing Elevation (ft)	795.8
Vertical Datum	NAVD88		
Easting (X)	1727198.9227	Horizontal Datum	NAD83
Northing (Y)	189760.8235		

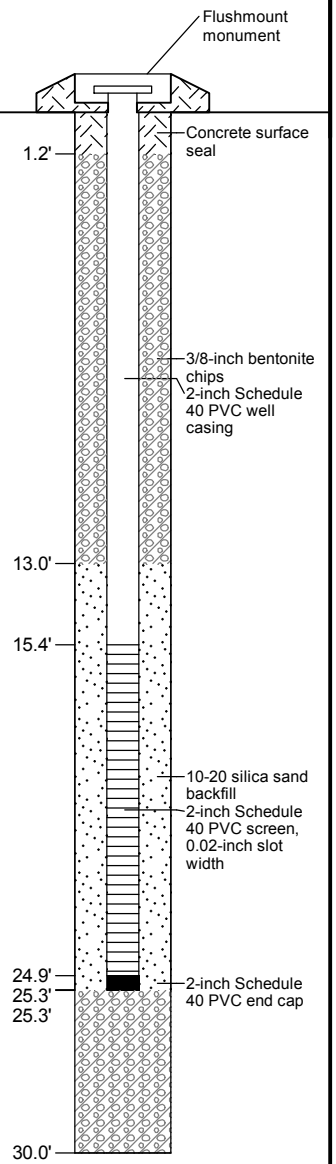
DOE Well I.D.: BHT 707
A 2 (in) well was installed on 6/7/2013 to a depth of 25.32 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
6/7/2013	4.8	791.0

Notes: Site specific horizontal datum, benchmark = 100 feet elevation

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
795	0							SM	Brown silty sand with gravel with wood debris (50%) (moist) (fill)	NS	<1
790	5					▼		SM	Brown silty sand with trace fine gravel (moist)	NS	<1
									Grades to coarse sand (wet)		
785	10										
780	15							SW-SM	Brownish-gray fine to coarse sand with silt and gravel (wet)	NS	<1
775	20								Grades to coarse sand		
										NS	<1
									Grades to fine sand		
770	25							SP	Brownish-gray fine sand with silt and fine subangular gravel	NS	<1
	30										

WELL LOG



Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well OW-4

GeoEngineers

Project:	Cashmere Mill Site Remedial Excavation
Project Location:	Cashmere, Washington
Project Number:	18593-001-01

Figure A-5
Sheet 1 of 1

Spokane: Date:7/30/13 Path:W:\SPOKANE\PROJECTS\18\18593001\01\GINT\18593001.GPJ DBTemplate\LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_WELL

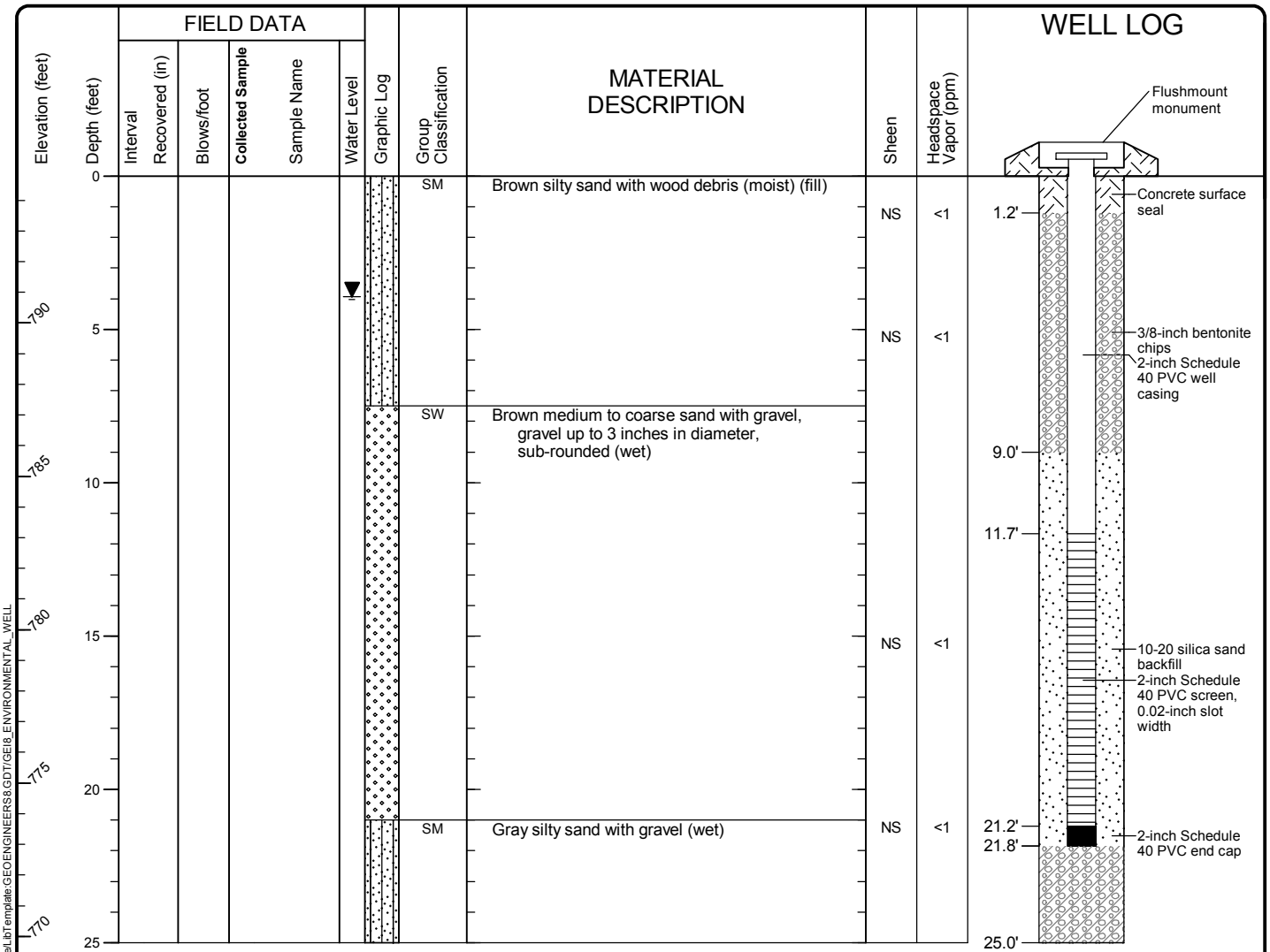
Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
6/5/2013	6/5/2013	25	CTB / JDL	Tumwater Drilling	Air-Rotary

Hammer Data	Pneumatic Casing Hammer	Drilling Equipment	Schramm T45OWS Rotodrill
Surface Elevation (ft)	794.79	Top of Casing Elevation (ft)	794.6
Vertical Datum	NAVD88		
Easting (X)	1727362.5478	Horizontal Datum	NAD83
Northing (Y)	189644.604		

DOE Well I.D.: BHT 703
A 2 (in) well was installed on 6/7/2013 to a depth of 21.64 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
6/7/2013	3.9	790.7

Notes: Site specific horizontal datum, benchmark = 100 feet elevation



Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well OW-5

GeoEngineers

Project:	Cashmere Mill Site Remedial Excavation
Project Location:	Cashmere, Washington
Project Number:	18593-001-01

Figure A-6
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Driller	Drilling Method
	6/4/2013	6/4/2013	20.02	CTB / JDL	Tumwater Drilling	Air-Rotary

Hammer Data	Pneumatic Casing Hammer	Drilling Equipment	Schramm T45OWS Rotodrill
Surface Elevation (ft) / Vertical Datum	793.42 NAVD88	Top of Casing Elevation (ft)	793.2
Easting (X) / Northing (Y)	1727383.1706 189663.0491	Horizontal Datum	NAD83

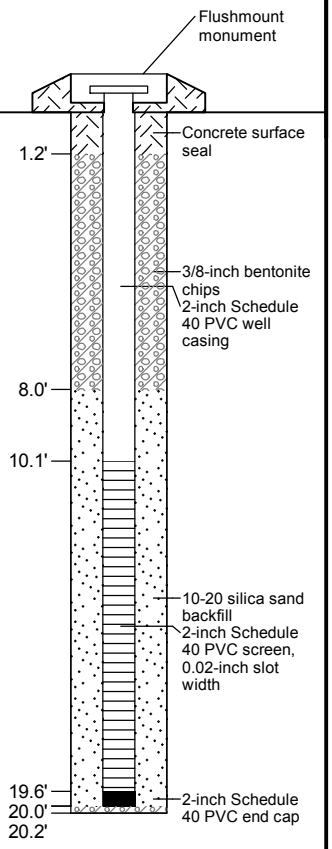
DOE Well I.D.: BHT 702
A 2 (in) well was installed on 6/7/2013 to a depth of 20 (ft).

Groundwater	Depth to Water (ft)	Elevation (ft)
Date Measured		
6/7/2013	2.7	790.5

Notes: Site specific horizontal datum, benchmark = 100 feet elevation

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0							SM	Brown silty fine to coarse sand with wood debris (40%) (moist) (fill)	NS	<1
790								GW-GM	Dark gray gravel with silt and sand, gravel to 2 inches in diameter, sub-rounded (wet)		
	5									NS	<1
785								SW	Gray medium to coarse sand with gravel, gravel to 2 inches in diameter (wet)		
	10									NS	<1
780											
	15							SW-SM	Gray medium to coarse sand with silt and gravel (wet) Rough drilling Gravel content increases	NS	<1
775									Sand content increases		
	20										

WELL LOG



Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well OW-6

GeoEngineers

Project: Cashmere Mill Site Remedial Excavation
Project Location: Cashmere, Washington
Project Number: 18593-001-01

Figure A-7
Sheet 1 of 1

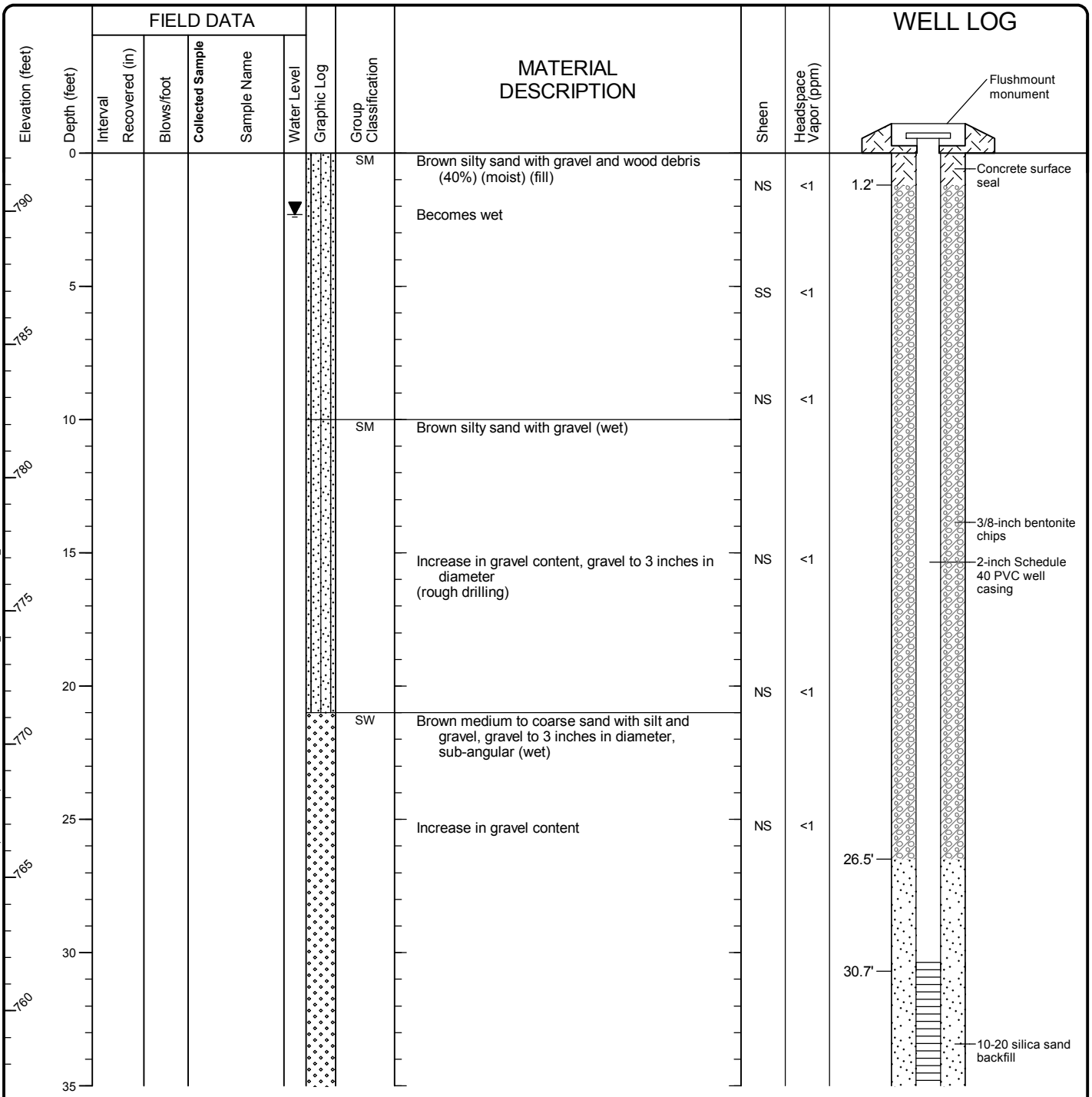
Drilled	Start	End	Total Depth (ft)	Logged By	Driller	Drilling Method
	6/4/2013	6/4/2013	40.5	CTB / JDL	Tumwater Drilling	Air-Rotary

Hammer Data	Pneumatic Casing Hammer	Drilling Equipment	Schramm T45OWS Rotodrill
Surface Elevation (ft) / Vertical Datum	792.18 / NAVD88	Top of Casing Elevation (ft)	792.0
Easting (X) / Northing (Y)	1727437.01 / 189734.6893	Horizontal Datum	NAD83

DOE Well I.D.: BHT 701
A 2 (in) well was installed on 6/7/2013 to a depth of 40.34 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
6/7/2013	2.3	789.7

Notes: Site specific horizontal datum, benchmark = 100 feet elevation



Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well OW-7

GeoEngineers

Project: Cashmere Mill Site Remedial Excavation
Project Location: Cashmere, Washington
Project Number: 18593-001-01

Figure A-8
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name	FIELD DATA: Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
755	35								Brown medium to coarse sand with silt and gravel (continued)	NS	<1	2-inch Schedule 40 PVC screen, 0.02-inch slot width
	40											39.9' 40.3' 40.5' 2-inch Schedule 40 PVC end cap

Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well OW-7 (continued)

GeoEngineers

Project: Cashmere Mill Site Remedial Excavation
Project Location: Cashmere, Washington
Project Number: 18593-001-01

Figure A-8
Sheet 2 of 2

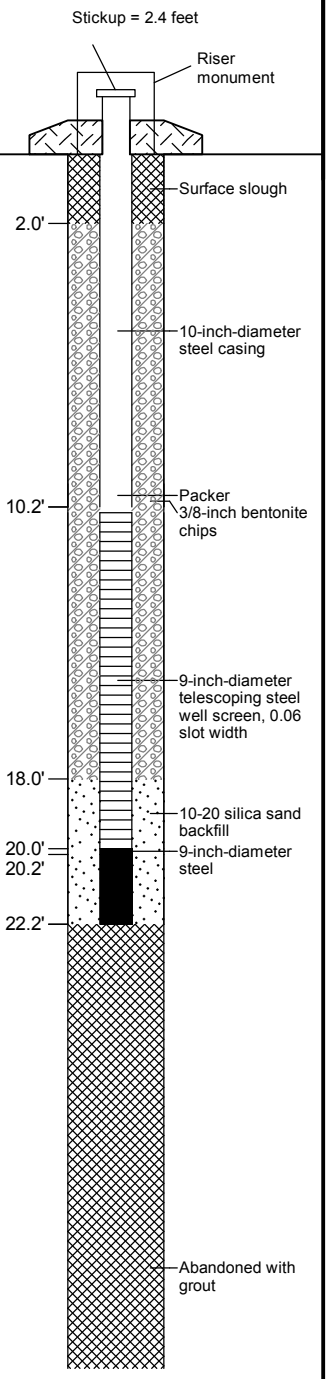
Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	6/3/2013	6/3/2013	42	CTB	JDL	Tumwater Drilling	Air-Rotary

Hammer Data	Drilling Equipment	DOE Well I.D.: BHT 593 A 2 (in) well was installed on 6/7/2013 to a depth of 22.2 (ft).
Pneumatic Casing Hammer	Schramm T45OWS Rotodrill	
Surface Elevation (ft) 795.9 Vertical Datum NAVD88	Top of Casing Elevation (ft) 798.3	Groundwater Date Measured: 6/7/2013 — Depth to Water (ft): 8.2 — Elevation (ft): 790.1
Easting (X) 1727349.2138 Northing (Y) 189621.3675	Horizontal Datum NAD83	

Notes: Site specific horizontal datum, benchmark = 100 feet elevation

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
795	0							SM	Brown silty sand with 50% wood debris and scattered logs (moist) (fill)	NS	<1
790	5									NS	<1
								SP	Gray sand with gravel and silt (10% wood debris) (moist)		
785	10							GP	Gray gravel with sand and silt, gravel to 2 inches diameter, sub-rounded (wet) (scattered wood debris)	NS	<1
780	15							SP	Gray fine sand with gravel and silt, gravel up to 3 inches in diameter, sub-rounded (wet) Driller indicates from 16 to 31 feet reduced water production	NS	<1
775	20							GP	Gray fine to coarse gravel with fine sand, angular to subangular gravel to 3 inches in diameter (wet)	NS	<1
								SW	Gray fine to coarse sand with gravel, gravel to 2 inches in diameter, sub-angular (wet) (slow drilling)		
770	25									NS	<1
765	30									NS	<1
								SP	Gray fine sand with gravel (wet)		
	35								Increased water production		

WELL LOG



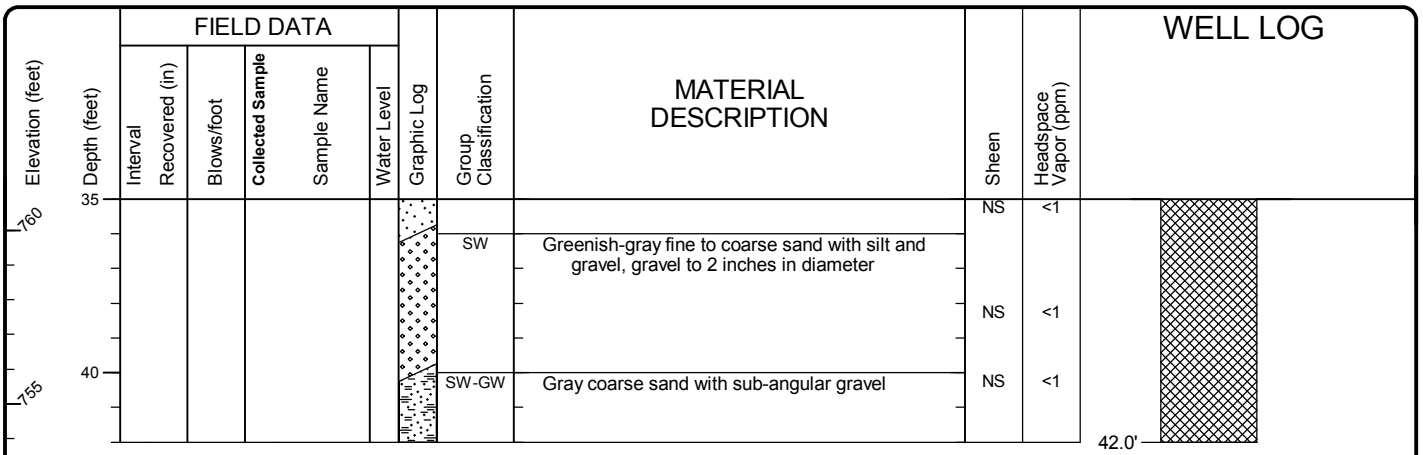
Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well TW-1

GeoEngineers

Project: Cashmere Mill Site Remedial Excavation
Project Location: Cashmere, Washington
Project Number: 18593-001-01

Figure A-9
Sheet 1 of 2



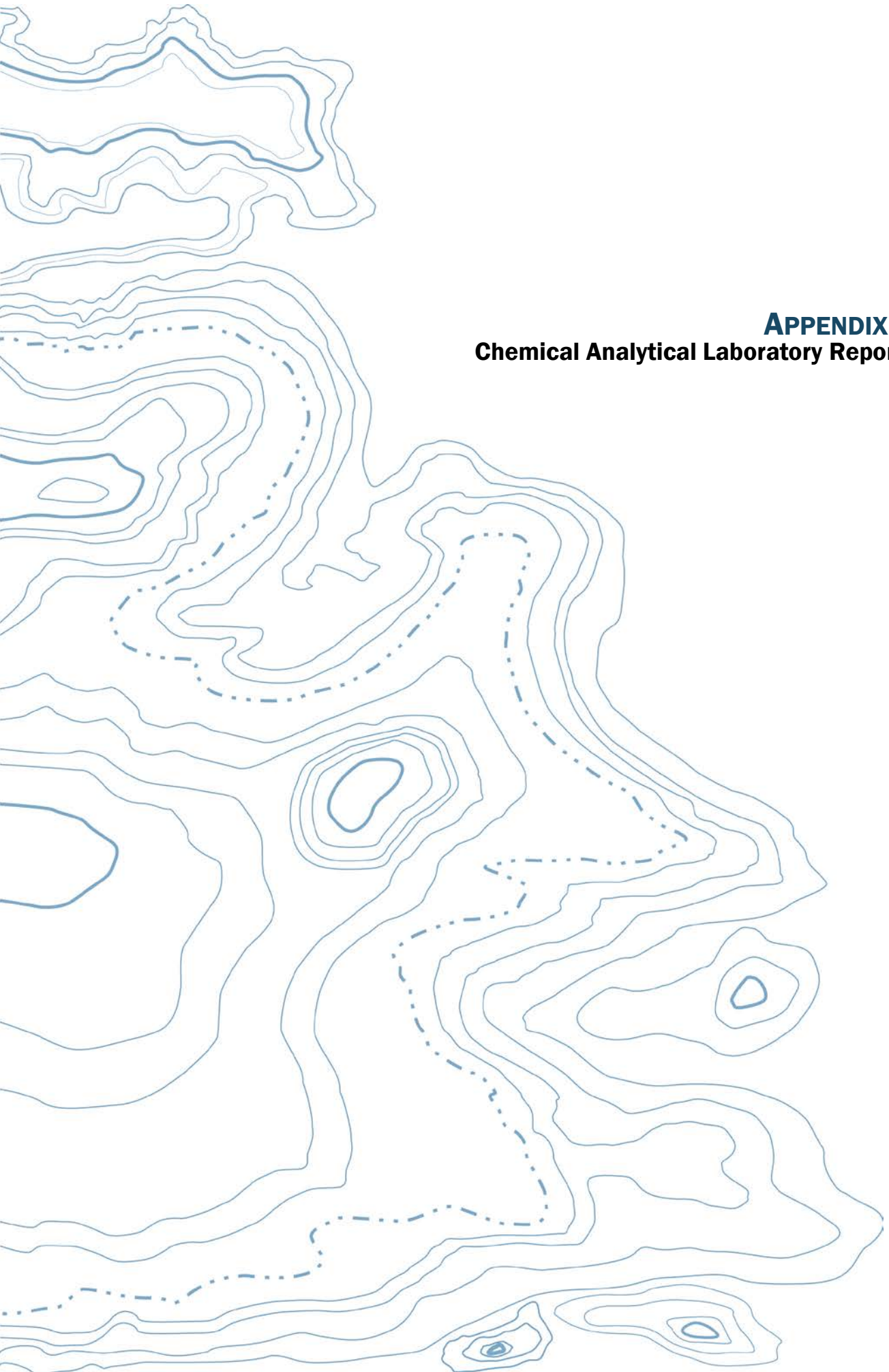
Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well TW-1 (continued)

GeoEngineers

Project: Cashmere Mill Site Remedial Excavation
Project Location: Cashmere, Washington
Project Number: 18593-001-01

Figure A-9
Sheet 2 of 2



APPENDIX B
Chemical Analytical Laboratory Reports

APPENDIX B
CHEMICAL ANALYTICAL LABORATORY REPORTS

Samples

Chain-of-custody procedures were followed during the transport of the field samples to On-Site Environmental, Inc. located in Seattle, Washington. The samples were held in cold storage pending extraction and/or analysis. The analytical results and quality control records are included in this appendix.

Analytical Data Review

The laboratory maintains an internal quality assurance/quality control (QA/QC) program as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike (MS) recoveries, matrix spike duplicate (MSD) recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory reports. The laboratory compared each group of samples with the existing data quality goals and did not note any exceptions in their laboratory report associated with project groundwater samples, dated June 10, 2013 and June 25, 2013.

Analytical Data Review Summary

We reviewed the laboratory internal quality assurance/quality control (QA/QC) in the context of data quality goals. Based on our review, in our opinion, the quality of the analytical data is acceptable for the intended use.

OnSite Environmental Inc.

14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

June 10, 2013

Jacob Letts
GeoEngineers, Inc.
600 Stewart, Suite 1700
Seattle, WA 98101-1233

Re: Analytical Data for Project 18593-001-01
Laboratory Reference No. 1306-059

Dear Jacob:

Enclosed are the analytical results and associated quality control data for samples submitted on June 7, 2013.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

Case Narrative

Samples were collected on June 5, 2013 and received by the laboratory on June 7, 2013. They were maintained at the laboratory at a temperature of 2°C to 6°C.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
OW-6-0613	06-059-01	Water	6-5-13	6-7-13	
OW-7-0613	06-059-02	Water	6-5-13	6-7-13	

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

NWTPH-Gx

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-6-0613**					
Laboratory ID:	06-059-01					
Gasoline	**ND**	100	NWTPH-Gx	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*91*	*71-116*				
Client ID:	**OW-7-0613**					
Laboratory ID:	06-059-02					
Gasoline	**ND**	100	NWTPH-Gx	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*94*	*71-116*				

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-6-0613**					
Laboratory ID:	06-059-01					
Diesel Range Organics	**ND**	0.27	NWTPH-Dx	6-7-13	6-7-13	
Lube Oil Range Organics	**ND**	0.43	NWTPH-Dx	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*86*	*50-150*				
Client ID:	**OW-6-0613**					
Laboratory ID:	06-059-01					
Diesel Range Organics	**ND**	0.27	NWTPH-Dx	6-7-13	6-7-13	X1
Lube Oil Range Organics	**ND**	0.43	NWTPH-Dx	6-7-13	6-7-13	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*90*	*50-150*				
Client ID:	**OW-7-0613**					
Laboratory ID:	06-059-02					
Diesel Range Organics	**ND**	0.26	NWTPH-Dx	6-7-13	6-7-13	
Lube Oil Range Organics	**ND**	0.41	NWTPH-Dx	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*84*	*50-150*				
Client ID:	**OW-7-0613**					
Laboratory ID:	06-059-02					
Diesel Range Organics	**ND**	0.26	NWTPH-Dx	6-7-13	6-7-13	X1
Lube Oil Range Organics	**ND**	0.41	NWTPH-Dx	6-7-13	6-7-13	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*101*	*50-150*				

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

VOLATILES by EPA 8260C
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-6-0613**					
Laboratory ID:	06-059-01					
Dichlorodifluoromethane	ND	0.30	EPA 8260C	6-7-13	6-7-13	
Chloromethane	ND	1.0	EPA 8260C	6-7-13	6-7-13	
Vinyl Chloride	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromomethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Chloroethane	ND	1.0	EPA 8260C	6-7-13	6-7-13	
Trichlorofluoromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1-Dichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Acetone	ND	5.0	EPA 8260C	6-7-13	6-7-13	
Iodomethane	ND	1.3	EPA 8260C	6-7-13	6-7-13	
Carbon Disulfide	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Methylene Chloride	ND	1.0	EPA 8260C	6-7-13	6-7-13	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Methyl t-Butyl Ether	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1-Dichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Vinyl Acetate	ND	1.0	EPA 8260C	6-7-13	6-7-13	
2,2-Dichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Butanone	ND	5.0	EPA 8260C	6-7-13	6-7-13	
Bromochloromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Chloroform	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Carbon Tetrachloride	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1-Dichloropropene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Benzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Trichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Dibromomethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromodichloromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	6-7-13	6-7-13	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Methyl Isobutyl Ketone	ND	2.0	EPA 8260C	6-7-13	6-7-13	
Toluene	ND	1.0	EPA 8260C	6-7-13	6-7-13	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-7-13	6-7-13	

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

VOLATILES by EPA 8260C
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-6-0613**					
Laboratory ID:	06-059-01					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Tetrachloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,3-Dichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Hexanone	ND	2.0	EPA 8260C	6-7-13	6-7-13	
Dibromochloromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dibromoethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Chlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Ethylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
m,p-Xylene	ND	0.40	EPA 8260C	6-7-13	6-7-13	
o-Xylene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Styrene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromoform	ND	1.0	EPA 8260C	6-7-13	6-7-13	
Isopropylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
n-Propylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Chlorotoluene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
4-Chlorotoluene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,3,5-Trimethylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
tert-Butylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2,4-Trimethylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
sec-Butylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
p-Isopropyltoluene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
n-Butylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	6-7-13	6-7-13	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Hexachlorobutadiene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Naphthalene	ND	1.0	EPA 8260C	6-7-13	6-7-13	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*106*	*66-120*				
Toluene-d8	*102*	*70-120*				
4-Bromofluorobenzene	*95*	*63-120*				

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

VOLATILES by EPA 8260C
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-7-0613**					
Laboratory ID:	06-059-02					
Dichlorodifluoromethane	ND	0.30	EPA 8260C	6-7-13	6-7-13	
Chloromethane	ND	1.0	EPA 8260C	6-7-13	6-7-13	
Vinyl Chloride	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromomethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Chloroethane	ND	1.0	EPA 8260C	6-7-13	6-7-13	
Trichlorofluoromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1-Dichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Acetone	ND	5.0	EPA 8260C	6-7-13	6-7-13	
Iodomethane	ND	1.3	EPA 8260C	6-7-13	6-7-13	
Carbon Disulfide	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Methylene Chloride	ND	1.0	EPA 8260C	6-7-13	6-7-13	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Methyl t-Butyl Ether	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1-Dichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Vinyl Acetate	ND	1.0	EPA 8260C	6-7-13	6-7-13	
2,2-Dichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Butanone	ND	5.0	EPA 8260C	6-7-13	6-7-13	
Bromochloromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Chloroform	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Carbon Tetrachloride	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1-Dichloropropene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Benzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Trichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Dibromomethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromodichloromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	6-7-13	6-7-13	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Methyl Isobutyl Ketone	ND	2.0	EPA 8260C	6-7-13	6-7-13	
Toluene	ND	1.0	EPA 8260C	6-7-13	6-7-13	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-7-13	6-7-13	

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

VOLATILES by EPA 8260C
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-7-0613**					
Laboratory ID:	06-059-02					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Tetrachloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,3-Dichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Hexanone	ND	2.0	EPA 8260C	6-7-13	6-7-13	
Dibromochloromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dibromoethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Chlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Ethylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
m,p-Xylene	ND	0.40	EPA 8260C	6-7-13	6-7-13	
o-Xylene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Styrene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromoform	ND	1.0	EPA 8260C	6-7-13	6-7-13	
Isopropylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
n-Propylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Chlorotoluene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
4-Chlorotoluene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,3,5-Trimethylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
tert-Butylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2,4-Trimethylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
sec-Butylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
p-Isopropyltoluene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
n-Butylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	6-7-13	6-7-13	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Hexachlorobutadiene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Naphthalene	ND	1.0	EPA 8260C	6-7-13	6-7-13	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*109*	*66-120*				
Toluene-d8	*102*	*70-120*				
4-Bromofluorobenzene	*97*	*63-120*				

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

SEMIVOLATILES EPA 8270D/SIM
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-6-0613**					
Laboratory ID:	06-059-01					
n-Nitrosodimethylamine	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Pyridine	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Phenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Aniline	**ND**	4.9	EPA 8270D	6-7-13	6-7-13	
bis(2-Chloroethyl)ether	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2-Chlorophenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
1,3-Dichlorobenzene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
1,4-Dichlorobenzene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Benzyl alcohol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
1,2-Dichlorobenzene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2-Methylphenol (o-Cresol)	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
bis(2-Chloroisopropyl)ether	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
(3+4)-Methylphenol (m,p-Cresol)	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
n-Nitroso-di-n-propylamine	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Hexachloroethane	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Nitrobenzene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Isophorone	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2-Nitrophenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2,4-Dimethylphenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
bis(2-Chloroethoxy)methane	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2,4-Dichlorophenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
1,2,4-Trichlorobenzene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Naphthalene	**ND**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
4-Chloroaniline	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Hexachlorobutadiene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
4-Chloro-3-methylphenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2-Methylnaphthalene	**ND**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
1-Methylnaphthalene	**ND**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
Hexachlorocyclopentadiene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2,4,6-Trichlorophenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2,3-Dichloroaniline	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2,4,5-Trichlorophenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2-Chloronaphthalene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2-Nitroaniline	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
1,4-Dinitrobenzene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Dimethylphthalate	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
1,3-Dinitrobenzene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2,6-Dinitrotoluene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
1,2-Dinitrobenzene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Acenaphthylene	**ND**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
3-Nitroaniline	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

SEMIVOLATILES EPA 8270D/SIM
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-6-0613**					
Laboratory ID:	06-059-01					
2,4-Dinitrophenol	**ND**	4.9	EPA 8270D	6-7-13	6-7-13	
Acenaphthene	**0.36**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
4-Nitrophenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2,4-Dinitrotoluene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Dibenzofuran	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2,3,5,6-Tetrachlorophenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
2,3,4,6-Tetrachlorophenol	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Diethylphthalate	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
4-Chlorophenyl-phenylether	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
4-Nitroaniline	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Fluorene	**0.17**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
4,6-Dinitro-2-methylphenol	**ND**	4.9	EPA 8270D	6-7-13	6-7-13	
n-Nitrosodiphenylamine	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
1,2-Diphenylhydrazine	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
4-Bromophenyl-phenylether	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Hexachlorobenzene	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Pentachlorophenol	**ND**	4.9	EPA 8270D	6-7-13	6-7-13	
Phenanthrene	**ND**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
Anthracene	**ND**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
Carbazole	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Di-n-butylphthalate	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Fluoranthene	**ND**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
Benzidine	**ND**	4.9	EPA 8270D	6-7-13	6-7-13	
Pyrene	**ND**	0.098	EPA 8270D/SIM	6-7-13	6-7-13	
Butylbenzylphthalate	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
bis-2-Ethylhexyladipate	**ND**	4.9	EPA 8270D	6-7-13	6-7-13	
3,3'-Dichlorobenzidine	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Benzo[a]anthracene	**0.015**	0.0098	EPA 8270D/SIM	6-7-13	6-7-13	
Chrysene	**0.011**	0.0098	EPA 8270D/SIM	6-7-13	6-7-13	
bis(2-Ethylhexyl)phthalate	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Di-n-octylphthalate	**ND**	0.98	EPA 8270D	6-7-13	6-7-13	
Benzo[b]fluoranthene	**ND**	0.0098	EPA 8270D/SIM	6-7-13	6-7-13	
Benzo(j,k)fluoranthene	**ND**	0.0098	EPA 8270D/SIM	6-7-13	6-7-13	
Benzo[a]pyrene	**ND**	0.0098	EPA 8270D/SIM	6-7-13	6-7-13	
Indeno[1,2,3-cd]pyrene	**ND**	0.0098	EPA 8270D/SIM	6-7-13	6-7-13	
Dibenz[a,h]anthracene	**ND**	0.0098	EPA 8270D/SIM	6-7-13	6-7-13	
Benzo[g,h,i]perylene	**ND**	0.0098	EPA 8270D/SIM	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
2-Fluorophenol	*34*	*17 - 81*				
Phenol-d6	*27*	*10 - 89*				
Nitrobenzene-d5	*55*	*35 - 110*				
2-Fluorobiphenyl	*68*	*45 - 110*				
2,4,6-Tribromophenol	*76*	*39 - 125*				
Terphenyl-d14	*88*	*58 - 111*				

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

SEMIVOLATILES EPA 8270D/SIM
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-7-0613**					
Laboratory ID:	06-059-02					
n-Nitrosodimethylamine	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Pyridine	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Phenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Aniline	**ND**	4.8	EPA 8270D	6-7-13	6-7-13	
bis(2-Chloroethyl)ether	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2-Chlorophenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
1,3-Dichlorobenzene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
1,4-Dichlorobenzene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Benzyl alcohol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
1,2-Dichlorobenzene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2-Methylphenol (o-Cresol)	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
bis(2-Chloroisopropyl)ether	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
(3+4)-Methylphenol (m,p-Cresol)	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
n-Nitroso-di-n-propylamine	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Hexachloroethane	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Nitrobenzene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Isophorone	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2-Nitrophenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2,4-Dimethylphenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
bis(2-Chloroethoxy)methane	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2,4-Dichlorophenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
1,2,4-Trichlorobenzene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Naphthalene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
4-Chloroaniline	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Hexachlorobutadiene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
4-Chloro-3-methylphenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2-Methylnaphthalene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
1-Methylnaphthalene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
Hexachlorocyclopentadiene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2,4,6-Trichlorophenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2,3-Dichloroaniline	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2,4,5-Trichlorophenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2-Chloronaphthalene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2-Nitroaniline	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
1,4-Dinitrobenzene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Dimethylphthalate	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
1,3-Dinitrobenzene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2,6-Dinitrotoluene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
1,2-Dinitrobenzene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Acenaphthylene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
3-Nitroaniline	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

SEMIVOLATILES EPA 8270D/SIM
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**OW-7-0613**					
Laboratory ID:	06-059-02					
2,4-Dinitrophenol	**ND**	4.8	EPA 8270D	6-7-13	6-7-13	
Acenaphthene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
4-Nitrophenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2,4-Dinitrotoluene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Dibenzofuran	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2,3,5,6-Tetrachlorophenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
2,3,4,6-Tetrachlorophenol	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Diethylphthalate	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
4-Chlorophenyl-phenylether	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
4-Nitroaniline	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Fluorene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
4,6-Dinitro-2-methylphenol	**ND**	4.8	EPA 8270D	6-7-13	6-7-13	
n-Nitrosodiphenylamine	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
1,2-Diphenylhydrazine	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
4-Bromophenyl-phenylether	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Hexachlorobenzene	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Pentachlorophenol	**ND**	4.8	EPA 8270D	6-7-13	6-7-13	
Phenanthrene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
Anthracene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
Carbazole	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Di-n-butylphthalate	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Fluoranthene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
Benzidine	**ND**	4.8	EPA 8270D	6-7-13	6-7-13	
Pyrene	**ND**	0.096	EPA 8270D/SIM	6-7-13	6-7-13	
Butylbenzylphthalate	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
bis-2-Ethylhexyladipate	**ND**	4.8	EPA 8270D	6-7-13	6-7-13	
3,3'-Dichlorobenzidine	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Benzo[a]anthracene	**ND**	0.0096	EPA 8270D/SIM	6-7-13	6-7-13	
Chrysene	**ND**	0.0096	EPA 8270D/SIM	6-7-13	6-7-13	
bis(2-Ethylhexyl)phthalate	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Di-n-octylphthalate	**ND**	0.96	EPA 8270D	6-7-13	6-7-13	
Benzo[b]fluoranthene	**ND**	0.0096	EPA 8270D/SIM	6-7-13	6-7-13	
Benzo(j,k)fluoranthene	**ND**	0.0096	EPA 8270D/SIM	6-7-13	6-7-13	
Benzo[a]pyrene	**ND**	0.0096	EPA 8270D/SIM	6-7-13	6-7-13	
Indeno[1,2,3-cd]pyrene	**ND**	0.0096	EPA 8270D/SIM	6-7-13	6-7-13	
Dibenz[a,h]anthracene	**ND**	0.0096	EPA 8270D/SIM	6-7-13	6-7-13	
Benzo[g,h,i]perylene	**ND**	0.0096	EPA 8270D/SIM	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
2-Fluorophenol	*30*	*17 - 81*				
Phenol-d6	*25*	*10 - 89*				
Nitrobenzene-d5	*51*	*35 - 110*				
2-Fluorobiphenyl	*64*	*45 - 110*				
2,4,6-Tribromophenol	*72*	*39 - 125*				
Terphenyl-d14	*84*	*58 - 111*				

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

NWTPH-Gx
QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0607W1					
Gasoline	**ND**	100	NWTPH-Gx	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*98*	*71-116*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	06-059-01										
	ORIG	DUP									
Gasoline	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Surrogate:											
Fluorobenzene						*91*	*91*	*71-116*			

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0607W1					
Diesel Range Organics	**ND**	0.25	NWTPH-Dx	6-7-13	6-7-13	X1
Lube Oil Range Organics	**ND**	0.40	NWTPH-Dx	6-7-13	6-7-13	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*89*	*50-150*				
Laboratory ID:	MB0607W1					
Diesel Range Organics	**ND**	0.13	NWTPH-Dx	6-7-13	6-7-13	
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				

Analyte	Result		Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE							
Laboratory ID:	06-049-04						
	ORIG	DUP					
Diesel Range Organics	**ND**	**ND**			NA	NA	
Lube Oil Range Organics	**ND**	**ND**			NA	NA	
Surrogate:							
o-Terphenyl			*84* *78*	*50-150*			

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

VOLATILES by EPA 8260C
METHOD BLANK QUALITY CONTROL
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0607W1					
Dichlorodifluoromethane	ND	0.30	EPA 8260C	6-7-13	6-7-13	
Chloromethane	ND	1.0	EPA 8260C	6-7-13	6-7-13	
Vinyl Chloride	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromomethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Chloroethane	ND	1.0	EPA 8260C	6-7-13	6-7-13	
Trichlorofluoromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1-Dichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Acetone	ND	5.0	EPA 8260C	6-7-13	6-7-13	
Iodomethane	ND	1.3	EPA 8260C	6-7-13	6-7-13	
Carbon Disulfide	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Methylene Chloride	ND	1.0	EPA 8260C	6-7-13	6-7-13	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Methyl t-Butyl Ether	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1-Dichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Vinyl Acetate	ND	1.0	EPA 8260C	6-7-13	6-7-13	
2,2-Dichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Butanone	ND	5.0	EPA 8260C	6-7-13	6-7-13	
Bromochloromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Chloroform	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Carbon Tetrachloride	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1-Dichloropropene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Benzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Trichloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Dibromomethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromodichloromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	6-7-13	6-7-13	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Methyl Isobutyl Ketone	ND	2.0	EPA 8260C	6-7-13	6-7-13	
Toluene	ND	1.0	EPA 8260C	6-7-13	6-7-13	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-7-13	6-7-13	

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

VOLATILES by EPA 8260C
METHOD BLANK QUALITY CONTROL
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0607W1					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Tetrachloroethene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,3-Dichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Hexanone	ND	2.0	EPA 8260C	6-7-13	6-7-13	
Dibromochloromethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dibromoethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Chlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Ethylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
m,p-Xylene	ND	0.40	EPA 8260C	6-7-13	6-7-13	
o-Xylene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Styrene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromoform	ND	1.0	EPA 8260C	6-7-13	6-7-13	
Isopropylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Bromobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	6-7-13	6-7-13	
n-Propylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
2-Chlorotoluene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
4-Chlorotoluene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,3,5-Trimethylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
tert-Butylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2,4-Trimethylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
sec-Butylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
p-Isopropyltoluene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
n-Butylbenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	6-7-13	6-7-13	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Hexachlorobutadiene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Naphthalene	ND	1.0	EPA 8260C	6-7-13	6-7-13	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*103*	*66-120*				
Toluene-d8	*101*	*70-120*				
4-Bromofluorobenzene	*95*	*63-120*				

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

VOLATILES by EPA 8260C
SB/SBD QUALITY CONTROL

Matrix: Water
Units: ug/L

Analyte	Result		Spike Level		Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANKS										
Laboratory ID:	SB0607W1									
	SB	SBD	SB	SBD	SB	SBD				
1,1-Dichloroethene	**11.5**	**11.6**	10.0	10.0	115	116	65-141	1	15	
Benzene	**10.6**	**11.0**	10.0	10.0	106	110	77-125	4	15	
Trichloroethene	**9.41**	**9.24**	10.0	10.0	94	92	80-125	2	15	
Toluene	**10.4**	**10.1**	10.0	10.0	104	101	80-125	3	15	
Chlorobenzene	**11.0**	**10.6**	10.0	10.0	110	106	80-140	4	15	
Surrogate:										
Dibromofluoromethane					*103*	*109*	*66-120*			
Toluene-d8					*102*	*101*	*70-120*			
4-Bromofluorobenzene					*96*	*97*	*63-120*			

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

SEMIVOLATILES by EPA 8270D/SIM
METHOD BLANK QUALITY CONTROL
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0607W1					
n-Nitrosodimethylamine	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Pyridine	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Phenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Aniline	**ND**	5.0	EPA 8270D	6-7-13	6-7-13	
bis(2-Chloroethyl)ether	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2-Chlorophenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
1,3-Dichlorobenzene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
1,4-Dichlorobenzene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Benzyl alcohol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
1,2-Dichlorobenzene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2-Methylphenol (o-Cresol)	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
bis(2-Chloroisopropyl)ether	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
(3+4)-Methylphenol (m,p-Cresol)	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
n-Nitroso-di-n-propylamine	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Hexachloroethane	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Nitrobenzene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Isophorone	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2-Nitrophenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2,4-Dimethylphenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
bis(2-Chloroethoxy)methane	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2,4-Dichlorophenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
1,2,4-Trichlorobenzene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Naphthalene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
4-Chloroaniline	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Hexachlorobutadiene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
4-Chloro-3-methylphenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2-Methylnaphthalene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
1-Methylnaphthalene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
Hexachlorocyclopentadiene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2,4,6-Trichlorophenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2,3-Dichloroaniline	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2,4,5-Trichlorophenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2-Chloronaphthalene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2-Nitroaniline	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
1,4-Dinitrobenzene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Dimethylphthalate	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
1,3-Dinitrobenzene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2,6-Dinitrotoluene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
1,2-Dinitrobenzene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Acenaphthylene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
3-Nitroaniline	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

SEMIVOLATILES by EPA 8270D/SIM
METHOD BLANK QUALITY CONTROL
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0607W1					
2,4-Dinitrophenol	**ND**	5.0	EPA 8270D	6-7-13	6-7-13	
Acenaphthene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
4-Nitrophenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2,4-Dinitrotoluene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Dibenzofuran	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2,3,5,6-Tetrachlorophenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
2,3,4,6-Tetrachlorophenol	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Diethylphthalate	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
4-Chlorophenyl-phenylether	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
4-Nitroaniline	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Fluorene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
4,6-Dinitro-2-methylphenol	**ND**	5.0	EPA 8270D	6-7-13	6-7-13	
n-Nitrosodiphenylamine	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
1,2-Diphenylhydrazine	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
4-Bromophenyl-phenylether	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Hexachlorobenzene	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Pentachlorophenol	**ND**	5.0	EPA 8270D	6-7-13	6-7-13	
Phenanthrene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
Anthracene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
Carbazole	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Di-n-butylphthalate	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Fluoranthene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
Benzidine	**ND**	5.0	EPA 8270D	6-7-13	6-7-13	
Pyrene	**ND**	0.10	EPA 8270D/SIM	6-7-13	6-7-13	
Butylbenzylphthalate	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
bis-2-Ethylhexyladipate	**ND**	5.0	EPA 8270D	6-7-13	6-7-13	
3,3'-Dichlorobenzidine	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Benzo[a]anthracene	**ND**	0.010	EPA 8270D/SIM	6-7-13	6-7-13	
Chrysene	**ND**	0.010	EPA 8270D/SIM	6-7-13	6-7-13	
bis(2-Ethylhexyl)phthalate	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Di-n-octylphthalate	**ND**	1.0	EPA 8270D	6-7-13	6-7-13	
Benzo[b]fluoranthene	**ND**	0.010	EPA 8270D/SIM	6-7-13	6-7-13	
Benzo(j,k)fluoranthene	**ND**	0.010	EPA 8270D/SIM	6-7-13	6-7-13	
Benzo[a]pyrene	**ND**	0.010	EPA 8270D/SIM	6-7-13	6-7-13	
Indeno[1,2,3-cd]pyrene	**ND**	0.010	EPA 8270D/SIM	6-7-13	6-7-13	
Dibenz[a,h]anthracene	**ND**	0.010	EPA 8270D/SIM	6-7-13	6-7-13	
Benzo[g,h,i]perylene	**ND**	0.010	EPA 8270D/SIM	6-7-13	6-7-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
2-Fluorophenol	*47*	*17 - 81*				
Phenol-d6	*37*	*10 - 89*				
Nitrobenzene-d5	*72*	*35 - 110*				
2-Fluorobiphenyl	*75*	*45 - 110*				
2,4,6-Tribromophenol	*74*	*39 - 125*				
Terphenyl-d14	*87*	*58 - 111*				

Date of Report: June 10, 2013
Samples Submitted: June 7, 2013
Laboratory Reference: 1306-059
Project: 18593-001-01

SEMIVOLATILES by EPA 8270D/SIM
SB/SBD QUALITY CONTROL

Matrix: Water
Units: ug/L

Analyte	Result		Spike Level		Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANKS										
Laboratory ID:	SB0607S1									
	SB	SBD	SB	SBD	SB	SBD				
Phenol	**18.6**	**16.9**	40.0	40.0	47	42	28 - 70	10	30	
2-Chlorophenol	**32.7**	**29.3**	40.0	40.0	82	73	41 - 100	11	34	
1,4-Dichlorobenzene	**15.5**	**13.7**	20.0	20.0	78	69	34 - 95	12	33	
n-Nitroso-di-n-propylamine	**16.5**	**15.4**	20.0	20.0	83	77	48 - 98	7	30	
1,2,4-Trichlorobenzene	**16.4**	**14.7**	20.0	20.0	82	74	34 - 97	11	30	
4-Chloro-3-methylphenol	**35.8**	**38.1**	40.0	40.0	90	95	60 - 116	6	27	
Acenaphthene	**18.2**	**17.9**	20.0	20.0	91	90	51 - 100	2	25	
4-Nitrophenol	**23.5**	**26.2**	40.0	40.0	59	66	26 - 74	11	40	
2,4-Dinitrotoluene	**21.2**	**21.6**	20.0	20.0	106	108	59 - 117	2	28	
Pentachlorophenol	**37.1**	**40.6**	40.0	40.0	93	102	29 - 133	9	39	
Pyrene	**22.1**	**23.2**	20.0	20.0	111	116	58 - 121	5	28	
Surrogate:										
2-Fluorophenol					*47*	*42*	*17 - 81*			
Phenol-d6					*37*	*34*	*10 - 89*			
Nitrobenzene-d5					*69*	*63*	*35 - 110*			
2-Fluorobiphenyl					*74*	*68*	*45 - 110*			
2,4,6-Tribromophenol					*72*	*74*	*39 - 125*			
Terphenyl-d14					*84*	*87*	*58 - 111*			

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a Sulfuric acid/Silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260C, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

Chain of Custody

Page 1 of 1

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company: GeoEngineers
Project Number: 165293-001-01
Project Name: Cashmere Mill
Project Manager: Jacob Letts
Sampled by: Chris Brown

Turnaround Request (in working days)
(Check One)
☐ Same Day ☒ 1 Day
☐ 2 Days ☐ 3 Days
☐ Standard (7 Days) (TPH analysis 5 Days)
☐ _____ (other)

Laboratory Number: 06-059

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (ANALYZE BOTH ACID & NON)	Volatiles 8260C	Halogenated Volatiles 8260C	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals/ MTCA Metals (circle one)	TCLP Metals	HEM (oil and grease) 1664A	% Moisture
1	OW-6-0613	6/5/13	1610	W	9			X	X	X		X									
2	OW-7-0613	6/5/13	1745	W	9			X	X	X		X									

	Signature	Company	Date	Time
Relinquished				
Received		CORE	6/7/13	1010
Relinquished				
Received				
Relinquished				
Received				

Comments/Special Instructions

Reviewed/Date

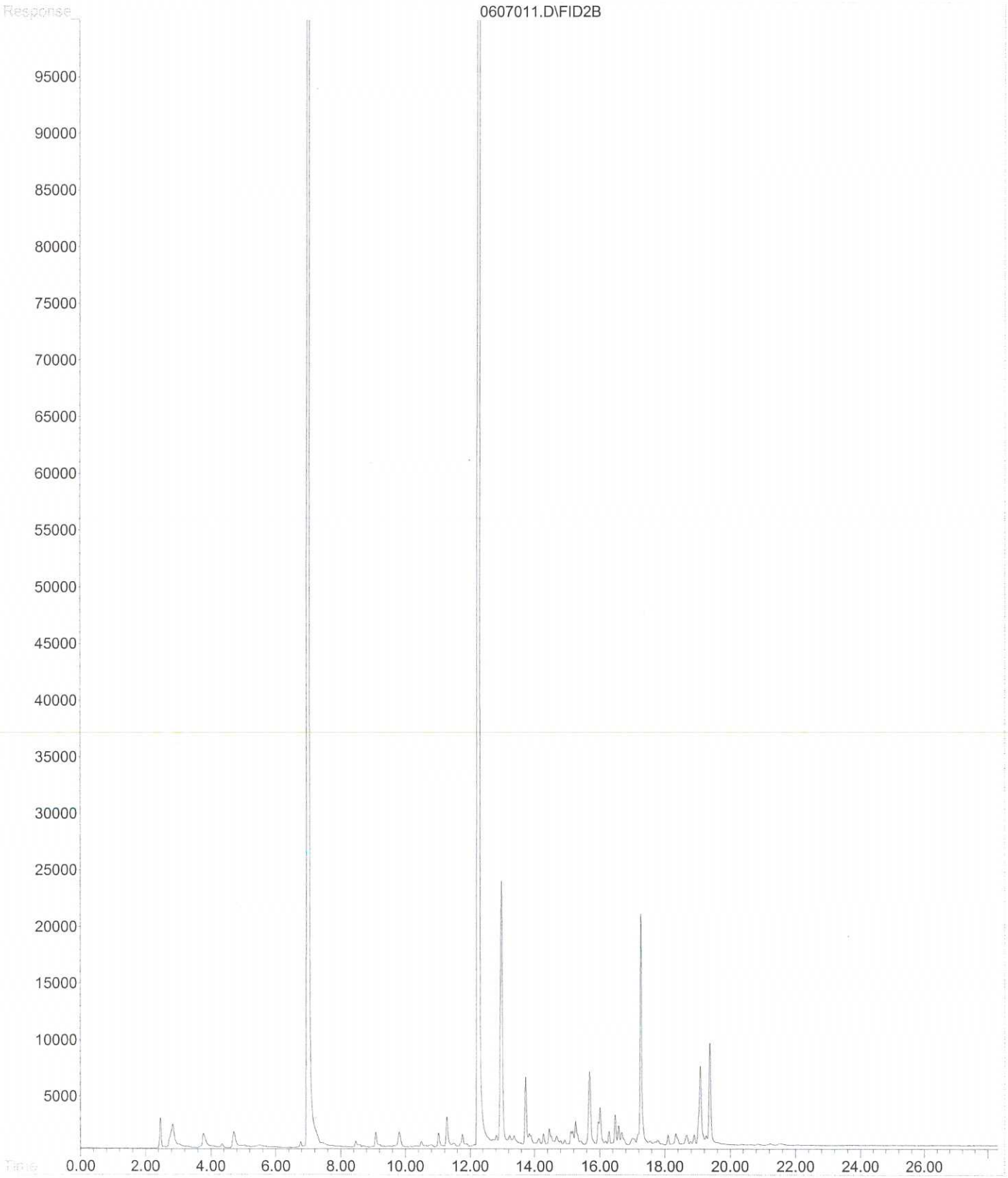
Reviewed/Date

Chromatograms with final report ☐

Data Package: Level III ☐ Level IV ☐

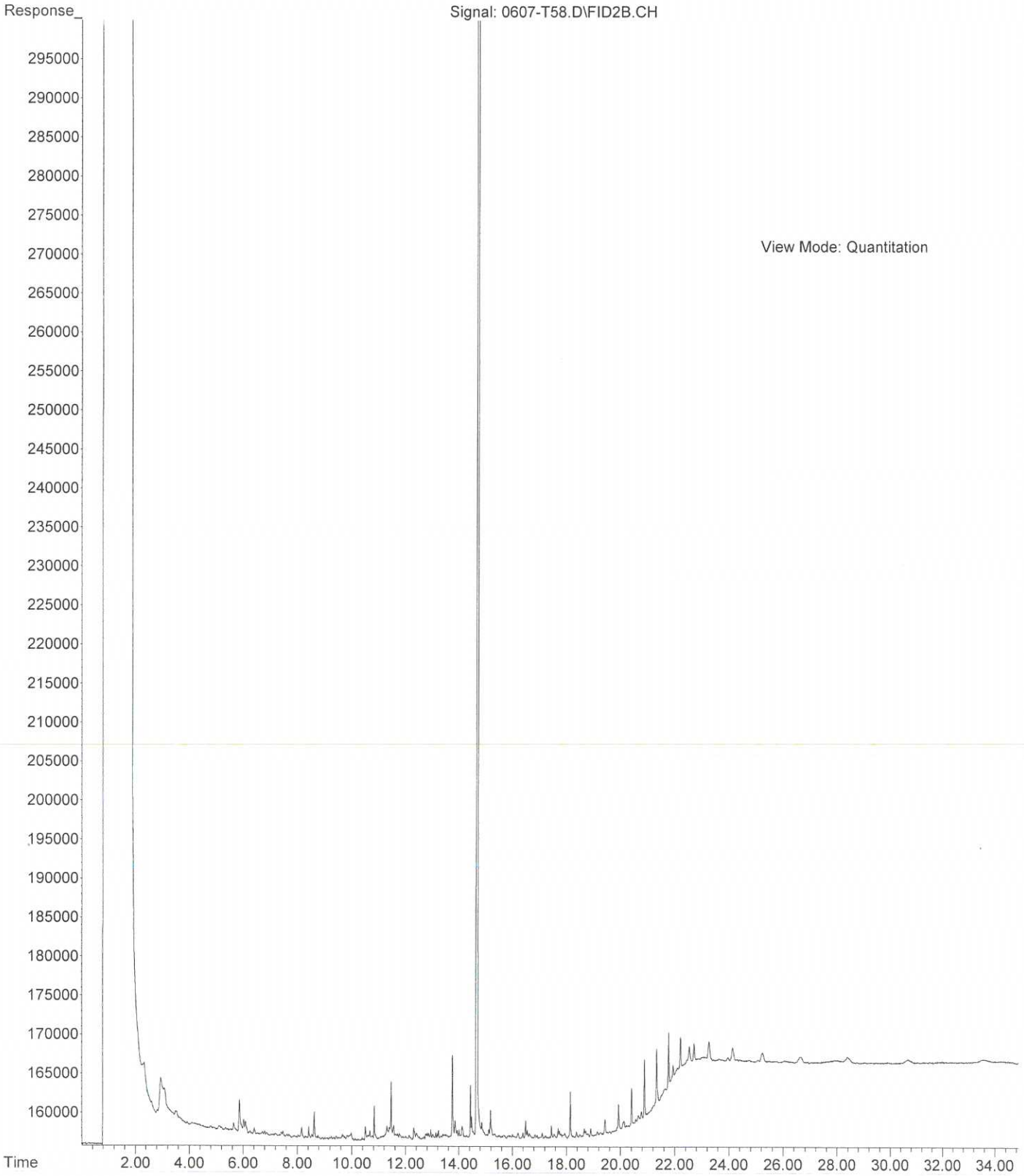
Electronic Data Deliverables (EDDs) ☐ _____

File : X:\BTEX\DARYL\DATA\D130607\0607011.D
Operator :
Acquired : 7 Jun 2013 17:50 using AcqMethod 130509B.M
Instrument : Daryl
Sample Name: 06-059-01i
Misc Info : V2-31-27
Vial Number: 11

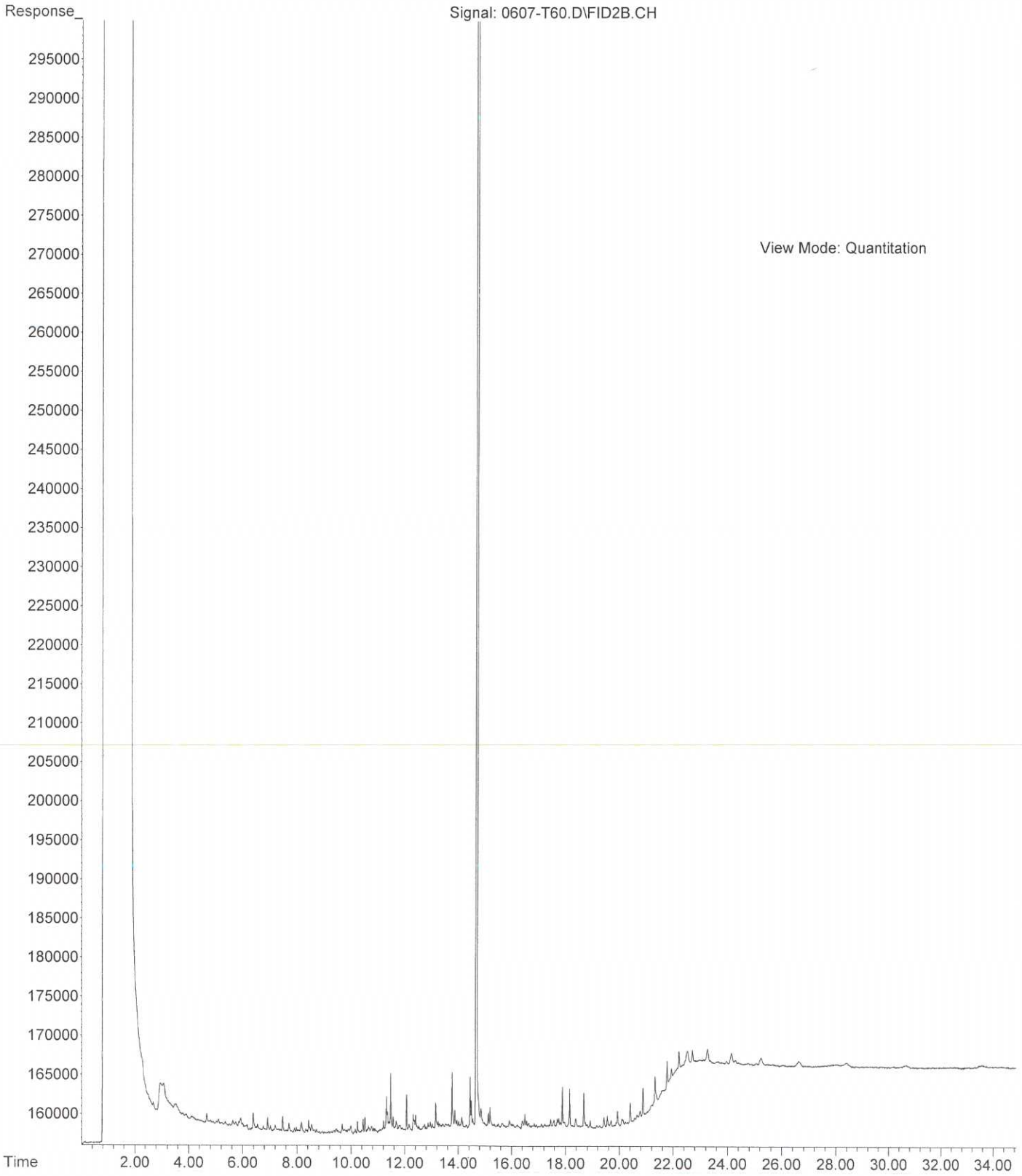


File : X:\BTEX\DARYL\DATA\D130607\0607015.D
Operator :
Acquired : 7 Jun 2013 20:05 using AcqMethod 130509B.M
Instrument : Daryl
Sample Name: 06-059-02i
Misc Info : V2-31-27
Vial Number: 15

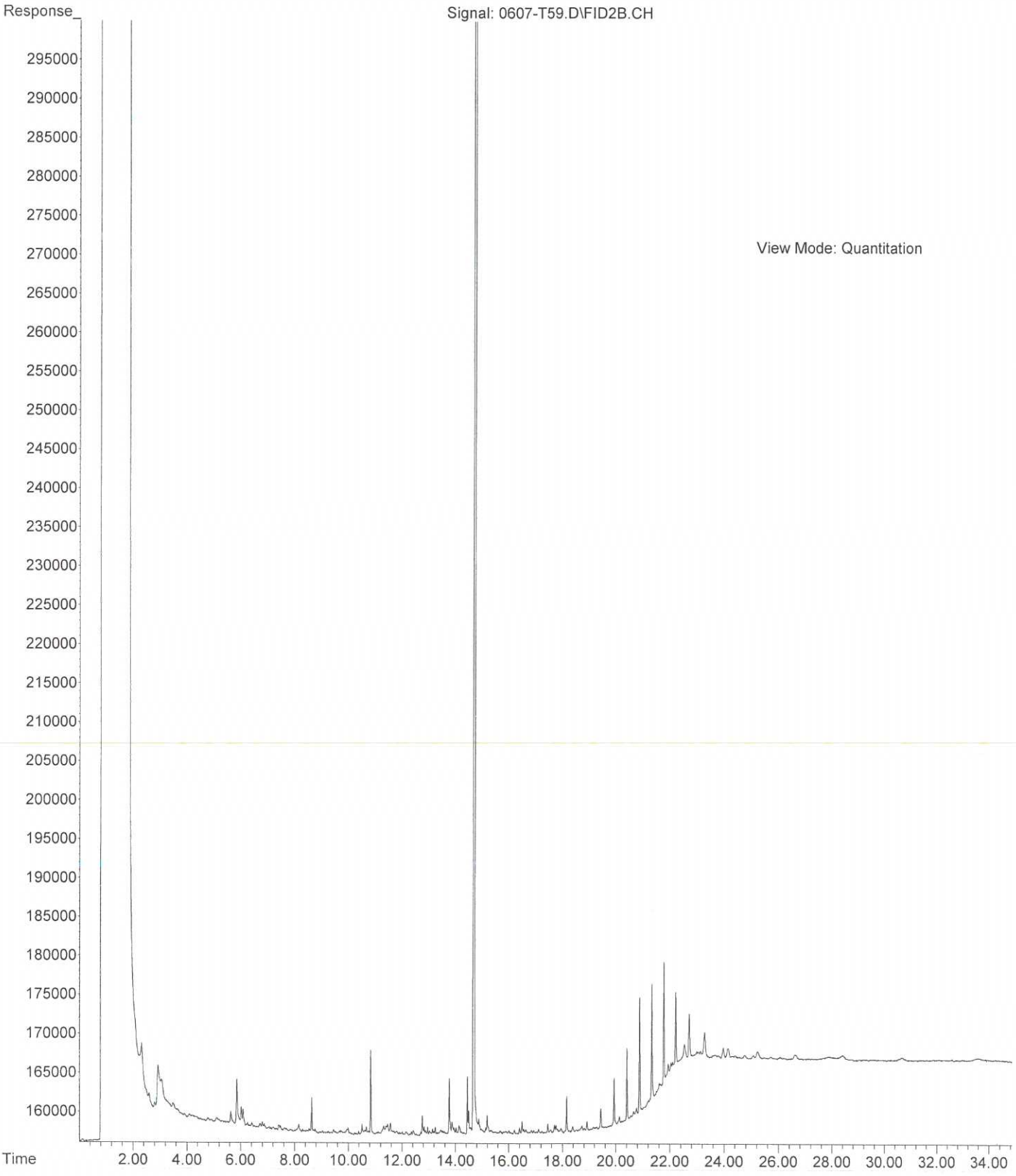
File : X:\DIESELS\TERI\DATA\T130607.SEC\0607-T58.D
Operator : ZT
Acquired : 07 Jun 2013 15:51 using AcqMethod T130516F.M
Instrument : Teri
Sample Name: 06-059-01 ACU
Misc Info :
Vial Number: 58



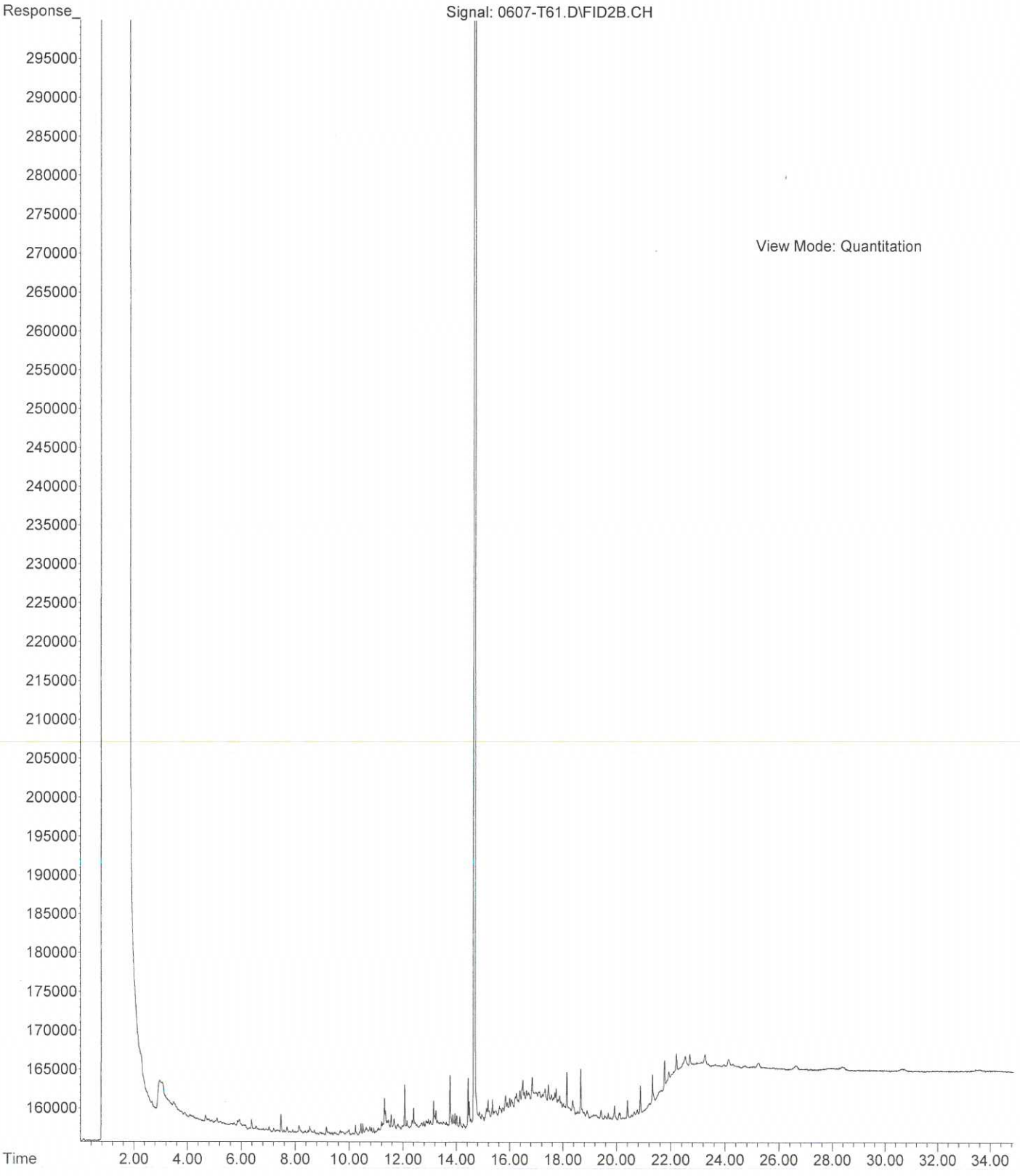
File : X:\DIESELS\TERI\DATA\T130607.SEC\0607-T60.D
Operator : ZT
Acquired : 07 Jun 2013 17:18 using AcqMethod T130516F.M
Instrument : Teri
Sample Name: 06-059-01
Misc Info :
Vial Number: 60



File : X:\DIESELS\TERI\DATA\T130607.SEC\0607-T59.D
Operator : ZT
Acquired : 07 Jun 2013 16:34 using AcqMethod T130516F.M
Instrument : Teri
Sample Name: 06-059-02 ACU
Misc Info :
Vial Number: 59



File : X:\DIESELS\TERI\DATA\T130607.SEC\0607-T61.D
Operator : ZT
Acquired : 07 Jun 2013 18:02 using AcqMethod T130516F.M
Instrument : Teri
Sample Name: 06-059-02
Misc Info :
Vial Number: 61



OnSite Environmental Inc.

14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

June 25, 2013

Jodie Lamb
GeoEngineers, Inc.
600 Stewart, Suite 1700
Seattle, WA 98101-1233

Re: Analytical Data for Project 18593-001-01
Laboratory Reference No. 1306-168

Dear Jodie:

Enclosed are the analytical results and associated quality control data for samples submitted on June 19, 2013.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

Case Narrative

Samples were collected on June 18 and 19, 2013 and received by the laboratory on June 19, 2013. They were maintained at the laboratory at a temperature of 2°C to 6°C.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
Pumping Test 1	06-168-01	Water	6-18-13	6-19-13	
Pumping Test 2	06-168-02	Water	6-19-13	6-19-13	

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

NWTPH-Gx

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 1**					
Laboratory ID:	06-168-01					
Gasoline	**ND**	100	NWTPH-Gx	6-20-13	6-20-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*88*	*71-112*				
Client ID:	**Pumping Test 2**					
Laboratory ID:	06-168-02					
Gasoline	**ND**	100	NWTPH-Gx	6-20-13	6-20-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*91*	*71-112*				

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 1**					
Laboratory ID:	06-168-01					
Diesel Range Organics	**ND**	0.26	NWTPH-Dx	6-24-13	6-24-13	
Lube Oil Range Organics	**ND**	0.42	NWTPH-Dx	6-24-13	6-24-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*84*	*50-150*				
Client ID:	**Pumping Test 2**					
Laboratory ID:	06-168-02					
Diesel Range Organics	**ND**	0.26	NWTPH-Dx	6-24-13	6-24-13	
Lube Oil Range Organics	**ND**	0.42	NWTPH-Dx	6-24-13	6-24-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*76*	*50-150*				

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 1**					
Laboratory ID:	06-168-01					
Diesel Range Organics	**ND**	0.26	NWTPH-Dx	6-24-13	6-24-13	X1
Lube Oil Range Organics	**ND**	0.42	NWTPH-Dx	6-24-13	6-24-13	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*106*	*50-150*				
Client ID:	**Pumping Test 2**					
Laboratory ID:	06-168-02					
Diesel Range Organics	**ND**	0.26	NWTPH-Dx	6-24-13	6-24-13	X1
Lube Oil Range Organics	**ND**	0.42	NWTPH-Dx	6-24-13	6-24-13	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*97*	*50-150*				

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

VOLATILES by EPA 8260C
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 1**					
Laboratory ID:	06-168-01					
Dichlorodifluoromethane	ND	0.27	EPA 8260C	6-24-13	6-24-13	
Chloromethane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Vinyl Chloride	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromomethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Chloroethane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Trichlorofluoromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1-Dichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Acetone	ND	5.0	EPA 8260C	6-24-13	6-24-13	
Iodomethane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Carbon Disulfide	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Methylene Chloride	ND	1.0	EPA 8260C	6-24-13	6-24-13	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Methyl t-Butyl Ether	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1-Dichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Vinyl Acetate	ND	1.0	EPA 8260C	6-24-13	6-24-13	
2,2-Dichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Butanone	ND	5.0	EPA 8260C	6-24-13	6-24-13	
Bromochloromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Chloroform	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Carbon Tetrachloride	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1-Dichloropropene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Benzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Trichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Dibromomethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromodichloromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	6-24-13	6-24-13	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Methyl Isobutyl Ketone	ND	2.0	EPA 8260C	6-24-13	6-24-13	
Toluene	ND	1.0	EPA 8260C	6-24-13	6-24-13	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-24-13	6-24-13	

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

VOLATILES by EPA 8260C
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 1**					
Laboratory ID:	06-168-01					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Tetrachloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,3-Dichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Hexanone	ND	2.0	EPA 8260C	6-24-13	6-24-13	
Dibromochloromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dibromoethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Chlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Ethylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
m,p-Xylene	ND	0.40	EPA 8260C	6-24-13	6-24-13	
o-Xylene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Styrene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromoform	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Isopropylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
n-Propylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Chlorotoluene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
4-Chlorotoluene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,3,5-Trimethylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
tert-Butylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2,4-Trimethylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
sec-Butylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
p-Isopropyltoluene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
n-Butylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Hexachlorobutadiene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Naphthalene	ND	1.3	EPA 8260C	6-24-13	6-24-13	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*98*	*62-122*				
Toluene-d8	*97*	*70-120*				
4-Bromofluorobenzene	*93*	*71-120*				

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

VOLATILES by EPA 8260C
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 2**					
Laboratory ID:	06-168-02					
Dichlorodifluoromethane	ND	0.27	EPA 8260C	6-24-13	6-24-13	
Chloromethane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Vinyl Chloride	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromomethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Chloroethane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Trichlorofluoromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1-Dichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Acetone	ND	5.0	EPA 8260C	6-24-13	6-24-13	
Iodomethane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Carbon Disulfide	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Methylene Chloride	ND	1.0	EPA 8260C	6-24-13	6-24-13	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Methyl t-Butyl Ether	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1-Dichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Vinyl Acetate	ND	1.0	EPA 8260C	6-24-13	6-24-13	
2,2-Dichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Butanone	ND	5.0	EPA 8260C	6-24-13	6-24-13	
Bromochloromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Chloroform	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Carbon Tetrachloride	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1-Dichloropropene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Benzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Trichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Dibromomethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromodichloromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	6-24-13	6-24-13	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Methyl Isobutyl Ketone	ND	2.0	EPA 8260C	6-24-13	6-24-13	
Toluene	ND	1.0	EPA 8260C	6-24-13	6-24-13	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-24-13	6-24-13	

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

VOLATILES by EPA 8260C
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 2**					
Laboratory ID:	06-168-02					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Tetrachloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,3-Dichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Hexanone	ND	2.0	EPA 8260C	6-24-13	6-24-13	
Dibromochloromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dibromoethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Chlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Ethylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
m,p-Xylene	ND	0.40	EPA 8260C	6-24-13	6-24-13	
o-Xylene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Styrene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromoform	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Isopropylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
n-Propylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Chlorotoluene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
4-Chlorotoluene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,3,5-Trimethylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
tert-Butylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2,4-Trimethylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
sec-Butylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
p-Isopropyltoluene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
n-Butylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Hexachlorobutadiene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Naphthalene	ND	1.3	EPA 8260C	6-24-13	6-24-13	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*98*	*62-122*				
Toluene-d8	*97*	*70-120*				
4-Bromofluorobenzene	*94*	*71-120*				

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

SEMIVOLATILES EPA 8270D/SIM
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 1**					
Laboratory ID:	06-168-01					
n-Nitrosodimethylamine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Pyridine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Phenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Aniline	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
bis(2-Chloroethyl)ether	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Chlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,3-Dichlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,4-Dichlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Benzyl alcohol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,2-Dichlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Methylphenol (o-Cresol)	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
bis(2-Chloroisopropyl)ether	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
(3+4)-Methylphenol (m,p-Cresol)	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
n-Nitroso-di-n-propylamine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Hexachloroethane	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Nitrobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Isophorone	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Nitrophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4-Dimethylphenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
bis(2-Chloroethoxy)methane	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4-Dichlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,2,4-Trichlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Naphthalene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
4-Chloroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Hexachlorobutadiene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
4-Chloro-3-methylphenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Methylnaphthalene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
1-Methylnaphthalene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Hexachlorocyclopentadiene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4,6-Trichlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,3-Dichloroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4,5-Trichlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Chloronaphthalene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Nitroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,4-Dinitrobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Dimethylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,3-Dinitrobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,6-Dinitrotoluene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,2-Dinitrobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Acenaphthylene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
3-Nitroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

SEMIVOLATILES EPA 8270D/SIM
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 1**					
Laboratory ID:	06-168-01					
2,4-Dinitrophenol	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
Acenaphthene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
4-Nitrophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4-Dinitrotoluene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Dibenzofuran	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,3,5,6-Tetrachlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,3,4,6-Tetrachlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Diethylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
4-Chlorophenyl-phenylether	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
4-Nitroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Fluorene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
4,6-Dinitro-2-methylphenol	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
n-Nitrosodiphenylamine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,2-Diphenylhydrazine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
4-Bromophenyl-phenylether	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Hexachlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Pentachlorophenol	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
Phenanthrene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Anthracene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Carbazole	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Di-n-butylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Fluoranthene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Benzidine	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
Pyrene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Butylbenzylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
bis-2-Ethylhexyladipate	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
3,3'-Dichlorobenzidine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Benzo[a]anthracene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Chrysene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
bis(2-Ethylhexyl)phthalate	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
Di-n-octylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Benzo[b]fluoranthene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Benzo(j,k)fluoranthene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Benzo[a]pyrene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Indeno[1,2,3-cd]pyrene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Dibenz[a,h]anthracene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Benzo[g,h,i]perylene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
2-Fluorophenol	*46*	*17 - 81*				
Phenol-d6	*34*	*10 - 89*				
Nitrobenzene-d5	*68*	*35 - 110*				
2-Fluorobiphenyl	*78*	*45 - 110*				
2,4,6-Tribromophenol	*97*	*39 - 125*				
Terphenyl-d14	*88*	*58 - 111*				

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

SEMIVOLATILES EPA 8270D/SIM
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 2**					
Laboratory ID:	06-168-02					
n-Nitrosodimethylamine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Pyridine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Phenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Aniline	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
bis(2-Chloroethyl)ether	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Chlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,3-Dichlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,4-Dichlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Benzyl alcohol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,2-Dichlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Methylphenol (o-Cresol)	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
bis(2-Chloroisopropyl)ether	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
(3+4)-Methylphenol (m,p-Cresol)	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
n-Nitroso-di-n-propylamine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Hexachloroethane	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Nitrobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Isophorone	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Nitrophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4-Dimethylphenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
bis(2-Chloroethoxy)methane	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4-Dichlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,2,4-Trichlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Naphthalene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
4-Chloroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Hexachlorobutadiene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
4-Chloro-3-methylphenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Methylnaphthalene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
1-Methylnaphthalene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Hexachlorocyclopentadiene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4,6-Trichlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,3-Dichloroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4,5-Trichlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Chloronaphthalene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2-Nitroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,4-Dinitrobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Dimethylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,3-Dinitrobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,6-Dinitrotoluene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,2-Dinitrobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Acenaphthylene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
3-Nitroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

SEMIVOLATILES EPA 8270D/SIM
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Pumping Test 2**					
Laboratory ID:	06-168-02					
2,4-Dinitrophenol	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
Acenaphthene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
4-Nitrophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,4-Dinitrotoluene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Dibenzofuran	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,3,5,6-Tetrachlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
2,3,4,6-Tetrachlorophenol	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Diethylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
4-Chlorophenyl-phenylether	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
4-Nitroaniline	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Fluorene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
4,6-Dinitro-2-methylphenol	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
n-Nitrosodiphenylamine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
1,2-Diphenylhydrazine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
4-Bromophenyl-phenylether	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Hexachlorobenzene	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Pentachlorophenol	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
Phenanthrene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Anthracene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Carbazole	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Di-n-butylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Fluoranthene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Benzidine	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
Pyrene	**ND**	0.096	EPA 8270D/SIM	6-21-13	6-21-13	
Butylbenzylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
bis-2-Ethylhexyladipate	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
3,3'-Dichlorobenzidine	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Benzo[a]anthracene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Chrysene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
bis(2-Ethylhexyl)phthalate	**ND**	4.8	EPA 8270D	6-21-13	6-21-13	
Di-n-octylphthalate	**ND**	0.96	EPA 8270D	6-21-13	6-21-13	
Benzo[b]fluoranthene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Benzo(j,k)fluoranthene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Benzo[a]pyrene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Indeno[1,2,3-cd]pyrene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Dibenz[a,h]anthracene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Benzo[g,h,i]perylene	**ND**	0.0096	EPA 8270D/SIM	6-21-13	6-21-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
2-Fluorophenol	*47*	*17 - 81*				
Phenol-d6	*36*	*10 - 89*				
Nitrobenzene-d5	*73*	*35 - 110*				
2-Fluorobiphenyl	*86*	*45 - 110*				
2,4,6-Tribromophenol	*103*	*39 - 125*				
Terphenyl-d14	*92*	*58 - 111*				

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

NWTPH-Gx
QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0620W1					
Gasoline	**ND**	100	NWTPH-Gx	6-20-13	6-20-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*95*	*71-112*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	06-168-02										
	ORIG	DUP									
Gasoline	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Surrogate:											
Fluorobenzene						*91*	*84*	*71-112*			

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0624W1					
Diesel Range Organics	**ND**	0.25	NWTPH-Dx	6-24-13	6-24-13	
Lube Oil Range Organics	**ND**	0.40	NWTPH-Dx	6-24-13	6-24-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*79*	*50-150*				

Analyte	Result		Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE							
Laboratory ID:	06-168-01						
	ORIG	DUP					
Diesel Range Organics	**ND**	**ND**			NA	NA	
Lube Oil Range Organics	**ND**	**ND**			NA	NA	
Surrogate:							
o-Terphenyl			*84* *87*	*50-150*			

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0624W1					
Diesel Range Organics	**ND**	0.25	NWTPH-Dx	6-24-13	6-24-13	X1
Lube Oil Range Organics	**ND**	0.40	NWTPH-Dx	6-24-13	6-24-13	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*102*	*50-150*				

Analyte	Result		Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE							
Laboratory ID:	06-168-01						
	ORIG	DUP					
Diesel Range Organics	**ND**	**ND**			NA	NA	X1
Lube Oil Range Organics	**ND**	**ND**			NA	NA	X1
Surrogate:							
o-Terphenyl			*106* *99*	*50-150*			

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

VOLATILES by EPA 8260C
METHOD BLANK QUALITY CONTROL
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0624W1					
Dichlorodifluoromethane	ND	0.27	EPA 8260C	6-24-13	6-24-13	
Chloromethane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Vinyl Chloride	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromomethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Chloroethane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Trichlorofluoromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1-Dichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Acetone	ND	5.0	EPA 8260C	6-24-13	6-24-13	
Iodomethane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Carbon Disulfide	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Methylene Chloride	ND	1.0	EPA 8260C	6-24-13	6-24-13	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Methyl t-Butyl Ether	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1-Dichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Vinyl Acetate	ND	1.0	EPA 8260C	6-24-13	6-24-13	
2,2-Dichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Butanone	ND	5.0	EPA 8260C	6-24-13	6-24-13	
Bromochloromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Chloroform	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Carbon Tetrachloride	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1-Dichloropropene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Benzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Trichloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Dibromomethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromodichloromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	6-24-13	6-24-13	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Methyl Isobutyl Ketone	ND	2.0	EPA 8260C	6-24-13	6-24-13	
Toluene	ND	1.0	EPA 8260C	6-24-13	6-24-13	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	6-24-13	6-24-13	

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

VOLATILES by EPA 8260C
METHOD BLANK QUALITY CONTROL
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0624W1					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Tetrachloroethene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,3-Dichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Hexanone	ND	2.0	EPA 8260C	6-24-13	6-24-13	
Dibromochloromethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dibromoethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Chlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Ethylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
m,p-Xylene	ND	0.40	EPA 8260C	6-24-13	6-24-13	
o-Xylene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Styrene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromoform	ND	1.0	EPA 8260C	6-24-13	6-24-13	
Isopropylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Bromobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	6-24-13	6-24-13	
n-Propylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
2-Chlorotoluene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
4-Chlorotoluene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,3,5-Trimethylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
tert-Butylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2,4-Trimethylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
sec-Butylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
p-Isopropyltoluene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
n-Butylbenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	6-24-13	6-24-13	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Hexachlorobutadiene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Naphthalene	ND	1.3	EPA 8260C	6-24-13	6-24-13	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	6-24-13	6-24-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*95*	*62-122*				
Toluene-d8	*96*	*70-120*				
4-Bromofluorobenzene	*94*	*71-120*				

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

VOLATILES by EPA 8260C
SB/SBD QUALITY CONTROL

Matrix: Water
Units: ug/L

Analyte	Result		Spike Level		Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANKS										
Laboratory ID:	SB0624W1									
	SB	SBD	SB	SBD	SB	SBD				
1,1-Dichloroethene	**8.71**	**8.27**	10.0	10.0	87	83	63-142	5	17	
Benzene	**9.43**	**9.38**	10.0	10.0	94	94	78-125	1	15	
Trichloroethene	**8.83**	**8.50**	10.0	10.0	88	85	80-125	4	15	
Toluene	**9.56**	**9.51**	10.0	10.0	96	95	80-125	1	15	
Chlorobenzene	**10.6**	**10.2**	10.0	10.0	106	102	80-140	4	15	
Surrogate:										
Dibromofluoromethane					*95*	*96*	*62-122*			
Toluene-d8					*97*	*97*	*70-120*			
4-Bromofluorobenzene					*94*	*93*	*71-120*			

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

SEMIVOLATILES by EPA 8270D/SIM
METHOD BLANK QUALITY CONTROL
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0621W1					
n-Nitrosodimethylamine	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Pyridine	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Phenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Aniline	**ND**	5.0	EPA 8270D	6-21-13	6-21-13	
bis(2-Chloroethyl)ether	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2-Chlorophenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
1,3-Dichlorobenzene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
1,4-Dichlorobenzene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Benzyl alcohol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
1,2-Dichlorobenzene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2-Methylphenol (o-Cresol)	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
bis(2-Chloroisopropyl)ether	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
(3+4)-Methylphenol (m,p-Cresol)	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
n-Nitroso-di-n-propylamine	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Hexachloroethane	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Nitrobenzene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Isophorone	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2-Nitrophenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2,4-Dimethylphenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
bis(2-Chloroethoxy)methane	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2,4-Dichlorophenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
1,2,4-Trichlorobenzene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Naphthalene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
4-Chloroaniline	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Hexachlorobutadiene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
4-Chloro-3-methylphenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2-Methylnaphthalene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
1-Methylnaphthalene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
Hexachlorocyclopentadiene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2,4,6-Trichlorophenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2,3-Dichloroaniline	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2,4,5-Trichlorophenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2-Chloronaphthalene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2-Nitroaniline	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
1,4-Dinitrobenzene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Dimethylphthalate	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
1,3-Dinitrobenzene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2,6-Dinitrotoluene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
1,2-Dinitrobenzene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Acenaphthylene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
3-Nitroaniline	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

SEMIVOLATILES by EPA 8270D/SIM
METHOD BLANK QUALITY CONTROL
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0621W1					
2,4-Dinitrophenol	**ND**	5.0	EPA 8270D	6-21-13	6-21-13	
Acenaphthene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
4-Nitrophenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2,4-Dinitrotoluene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Dibenzofuran	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2,3,5,6-Tetrachlorophenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
2,3,4,6-Tetrachlorophenol	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Diethylphthalate	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
4-Chlorophenyl-phenylether	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
4-Nitroaniline	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Fluorene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
4,6-Dinitro-2-methylphenol	**ND**	5.0	EPA 8270D	6-21-13	6-21-13	
n-Nitrosodiphenylamine	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
1,2-Diphenylhydrazine	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
4-Bromophenyl-phenylether	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Hexachlorobenzene	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Pentachlorophenol	**ND**	5.0	EPA 8270D	6-21-13	6-21-13	
Phenanthrene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
Anthracene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
Carbazole	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Di-n-butylphthalate	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Fluoranthene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
Benzidine	**ND**	5.0	EPA 8270D	6-21-13	6-21-13	
Pyrene	**ND**	0.10	EPA 8270D/SIM	6-21-13	6-21-13	
Butylbenzylphthalate	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
bis-2-Ethylhexyladipate	**ND**	5.0	EPA 8270D	6-21-13	6-21-13	
3,3'-Dichlorobenzidine	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Benzo[a]anthracene	**ND**	0.010	EPA 8270D/SIM	6-21-13	6-21-13	
Chrysene	**ND**	0.010	EPA 8270D/SIM	6-21-13	6-21-13	
bis(2-Ethylhexyl)phthalate	**ND**	5.0	EPA 8270D	6-21-13	6-21-13	
Di-n-octylphthalate	**ND**	1.0	EPA 8270D	6-21-13	6-21-13	
Benzo[b]fluoranthene	**ND**	0.010	EPA 8270D/SIM	6-21-13	6-21-13	
Benzo(j,k)fluoranthene	**ND**	0.010	EPA 8270D/SIM	6-21-13	6-21-13	
Benzo[a]pyrene	**ND**	0.010	EPA 8270D/SIM	6-21-13	6-21-13	
Indeno[1,2,3-cd]pyrene	**ND**	0.010	EPA 8270D/SIM	6-21-13	6-21-13	
Dibenz[a,h]anthracene	**ND**	0.010	EPA 8270D/SIM	6-21-13	6-21-13	
Benzo[g,h,i]perylene	**ND**	0.010	EPA 8270D/SIM	6-21-13	6-21-13	
Surrogate:	*Percent Recovery*	*Control Limits*				
2-Fluorophenol	*52*	*17 - 81*				
Phenol-d6	*40*	*10 - 89*				
Nitrobenzene-d5	*72*	*35 - 110*				
2-Fluorobiphenyl	*82*	*45 - 110*				
2,4,6-Tribromophenol	*101*	*39 - 125*				
Terphenyl-d14	*90*	*58 - 111*				

Date of Report: June 25, 2013
Samples Submitted: June 19, 2013
Laboratory Reference: 1306-168
Project: 18593-001-01

SEMIVOLATILES by EPA 8270D/SIM
SB/SBD QUALITY CONTROL

Matrix: Water
Units: ug/L

Analyte	Result		Spike Level		Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANKS										
Laboratory ID:	SB0621W1									
	SB	SBD	SB	SBD	SB	SBD				
Phenol	**16.4**	**15.1**	40.0	40.0	41	38	28 - 70	8	30	
2-Chlorophenol	**29.0**	**27.1**	40.0	40.0	73	68	41 - 100	7	34	
1,4-Dichlorobenzene	**13.2**	**12.0**	20.0	20.0	66	60	34 - 95	10	33	
n-Nitroso-di-n-propylamine	**12.6**	**12.6**	20.0	20.0	63	63	48 - 98	0	30	
1,2,4-Trichlorobenzene	**14.0**	**12.5**	20.0	20.0	70	63	34 - 97	11	30	
4-Chloro-3-methylphenol	**27.9**	**28.7**	40.0	40.0	70	72	60 - 116	3	27	
Acenaphthene	**13.9**	**14.2**	20.0	20.0	70	71	51 - 100	2	25	
4-Nitrophenol	**17.8**	**19.7**	40.0	40.0	45	49	26 - 74	10	40	
2,4-Dinitrotoluene	**14.9**	**16.1**	20.0	20.0	75	81	59 - 117	8	28	
Pentachlorophenol	**31.6**	**33.5**	40.0	40.0	79	84	29 - 133	6	39	
Pyrene	**17.1**	**17.6**	20.0	20.0	86	88	58 - 121	3	28	
Surrogate:										
2-Fluorophenol					*50*	*47*	*17 - 81*			
Phenol-d6					*39*	*36*	*10 - 89*			
Nitrobenzene-d5					*70*	*65*	*35 - 110*			
2-Fluorobiphenyl					*76*	*77*	*45 - 110*			
2,4,6-Tribromophenol					*95*	*98*	*39 - 125*			
Terphenyl-d14					*83*	*86*	*58 - 111*			

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a Sulfuric acid/Silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260C, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

Chain of Custody

Page 1 of 1

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company: GeoEngineers
Project Number: 18593-001-01
Project Name: Cashmere Mill
Project Manager: Jodie Lamb
Sampled by: Jacob Letts

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☒ Standard (7 Days) (TPH analysis 5 Days)
☐ _____ (other)

Laboratory Number: 06-168

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx *	Volatiles 8260C	Halogenated Volatiles 8260C	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals/ MTCA Metals (circle one)	TCLP Metals	HEM (oil and grease) 1664A	% Moisture
1	Pumping Test 1	6/18	1200	W	10			X	X	X		X									
2	Pumping Test 2	6/19	0730	W	10			X	X	X		X									

	Signature	Company	Date	Time
Relinquished		GeoEngineers	6/19	1615
Received		OSE	6/19/13	1615
Relinquished				
Received				
Relinquished				
Received				

Comments/Special Instructions
Same Analytes as previous Cashmere Mill Samples.
* Diesel is with and without Silica gel cleanup.

Reviewed/Date

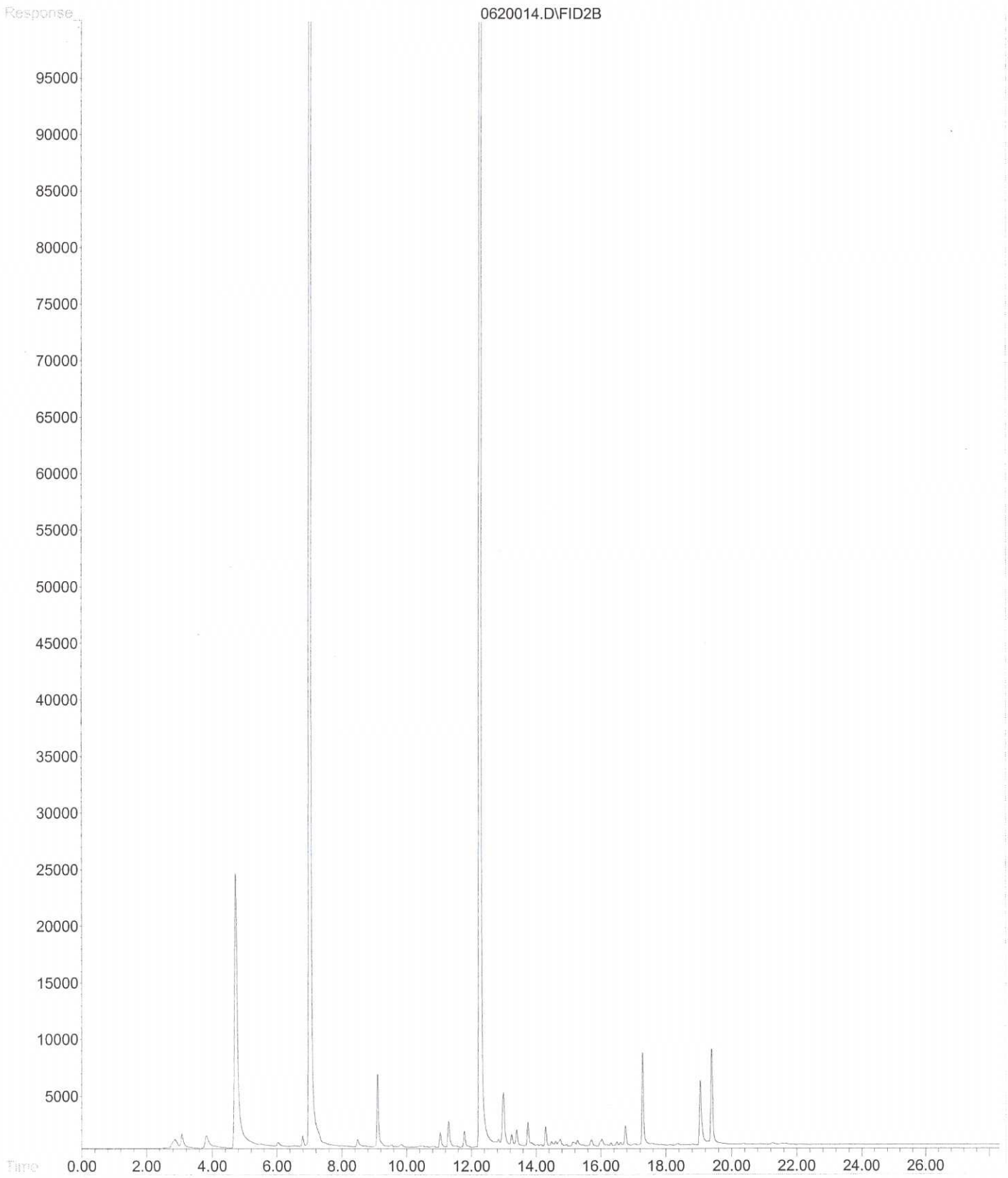
Reviewed/Date

Chromatograms with final report ☐

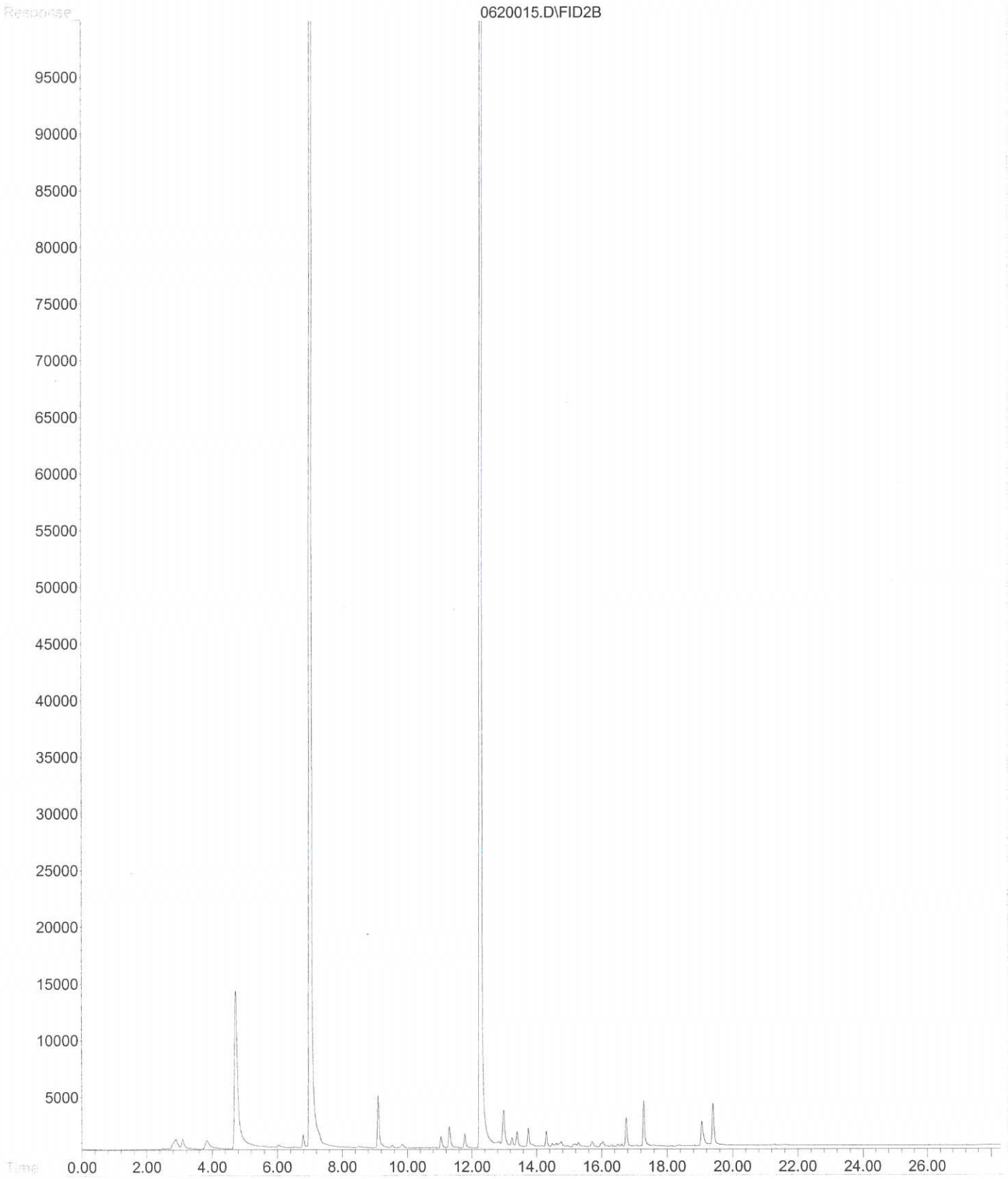
Data Package: Level III ☐ Level IV ☐

Electronic Data Deliverables (EDDs) ☐ _____

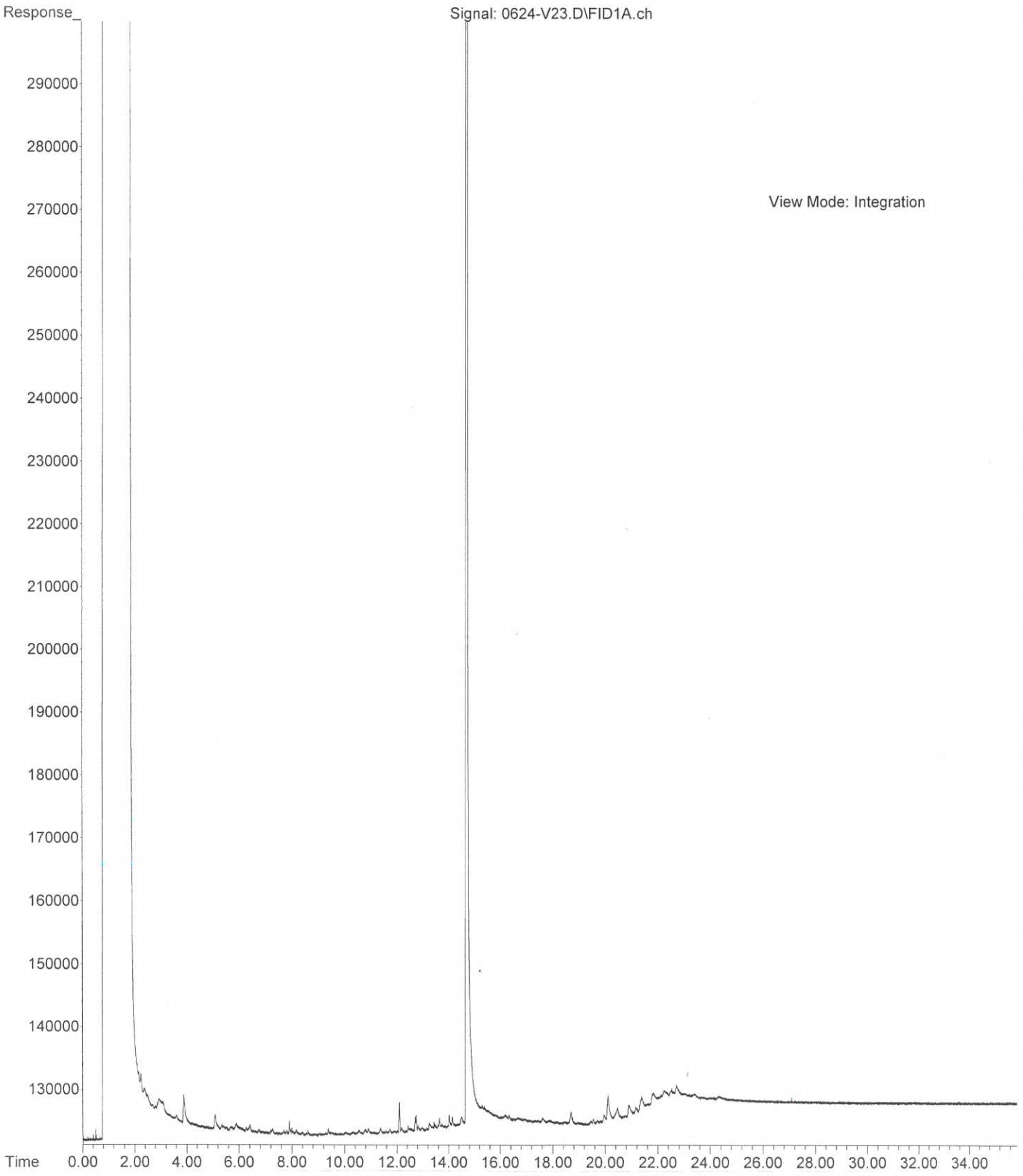
File : X:\BTEX\DARYL\DATA\D130620\0620014.D
Operator :
Acquired : 20 Jun 2013 23:31 using AcqMethod 130610B.M
Instrument : Daryl
Sample Name: 06-168-01f
Misc Info : V2-31-27
Vial Number: 14



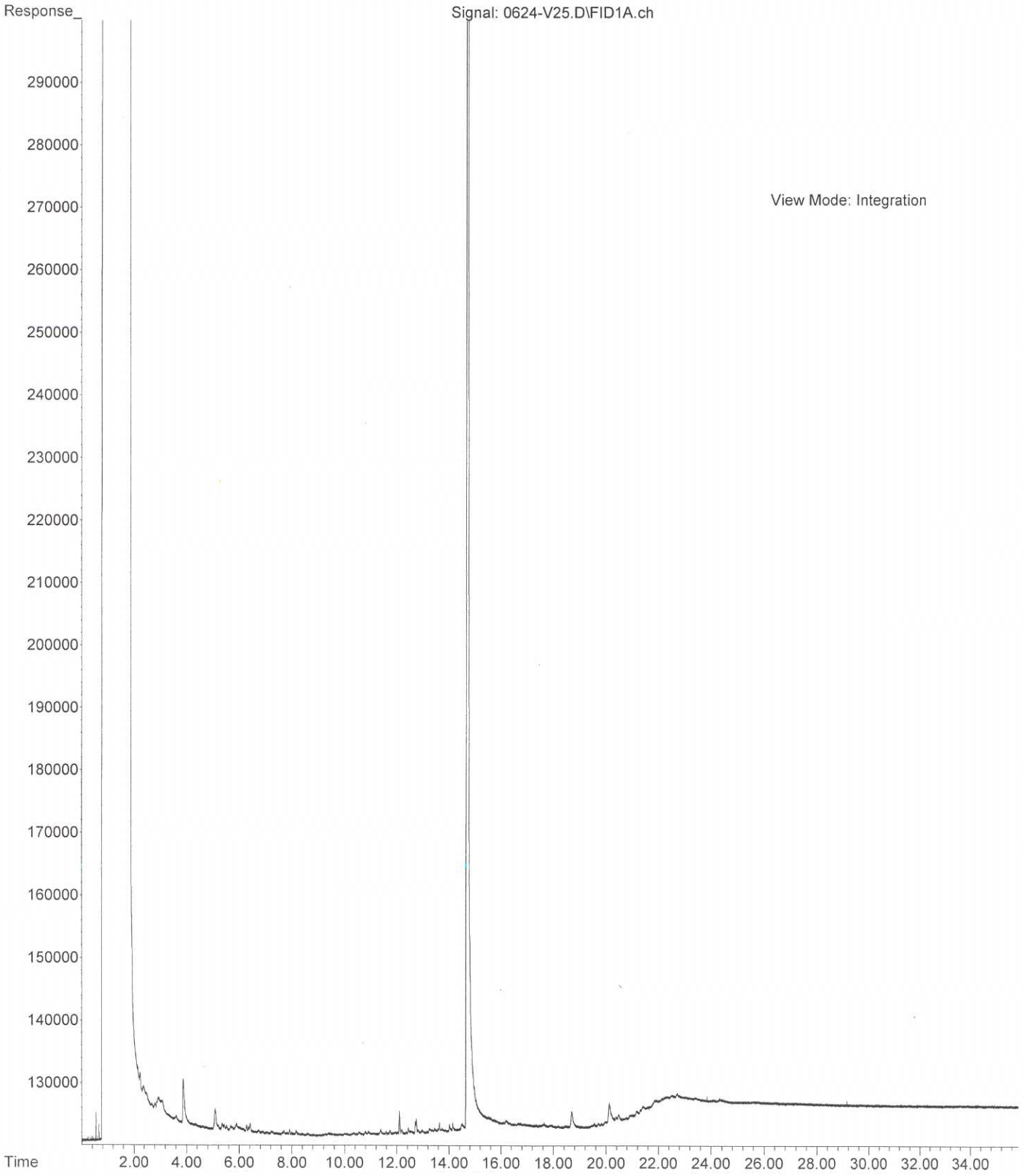
File : X:\BTEX\DARYL\DATA\D130620\0620015.D
Operator :
Acquired : 21 Jun 2013 00:06 using AcqMethod 130610B.M
Instrument : Daryl
Sample Name: 06-168-02f
Misc Info : V2-31-27
Vial Number: 15



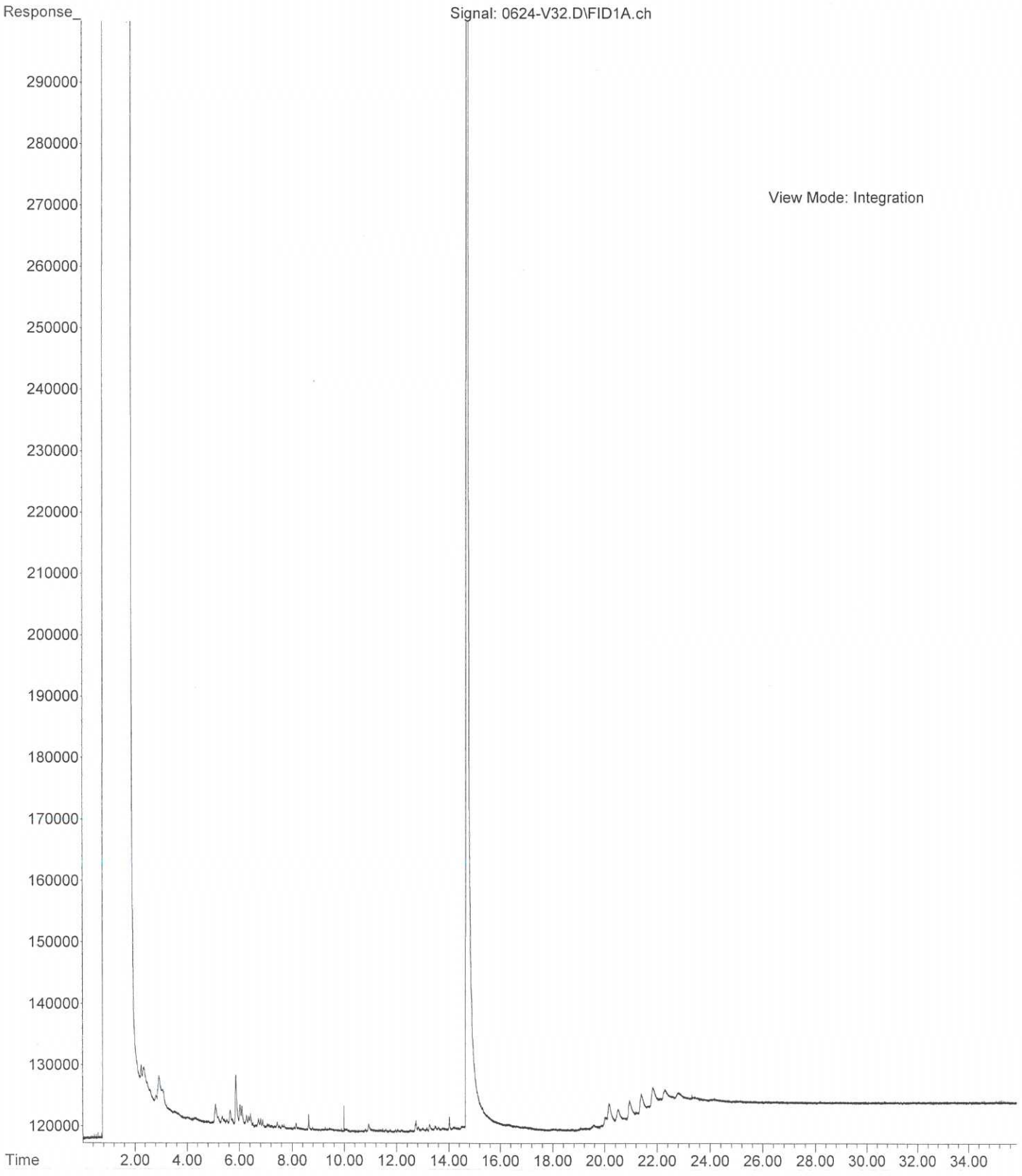
File :C:\msdchem\2\DATA\V130624\0624-V23.D
Operator :
Acquired : 25 Jun 2013 1:02 using AcqMethod V130618F.M
Instrument : Vigo
Sample Name: 06-168-01
Misc Info :
Vial Number: 23



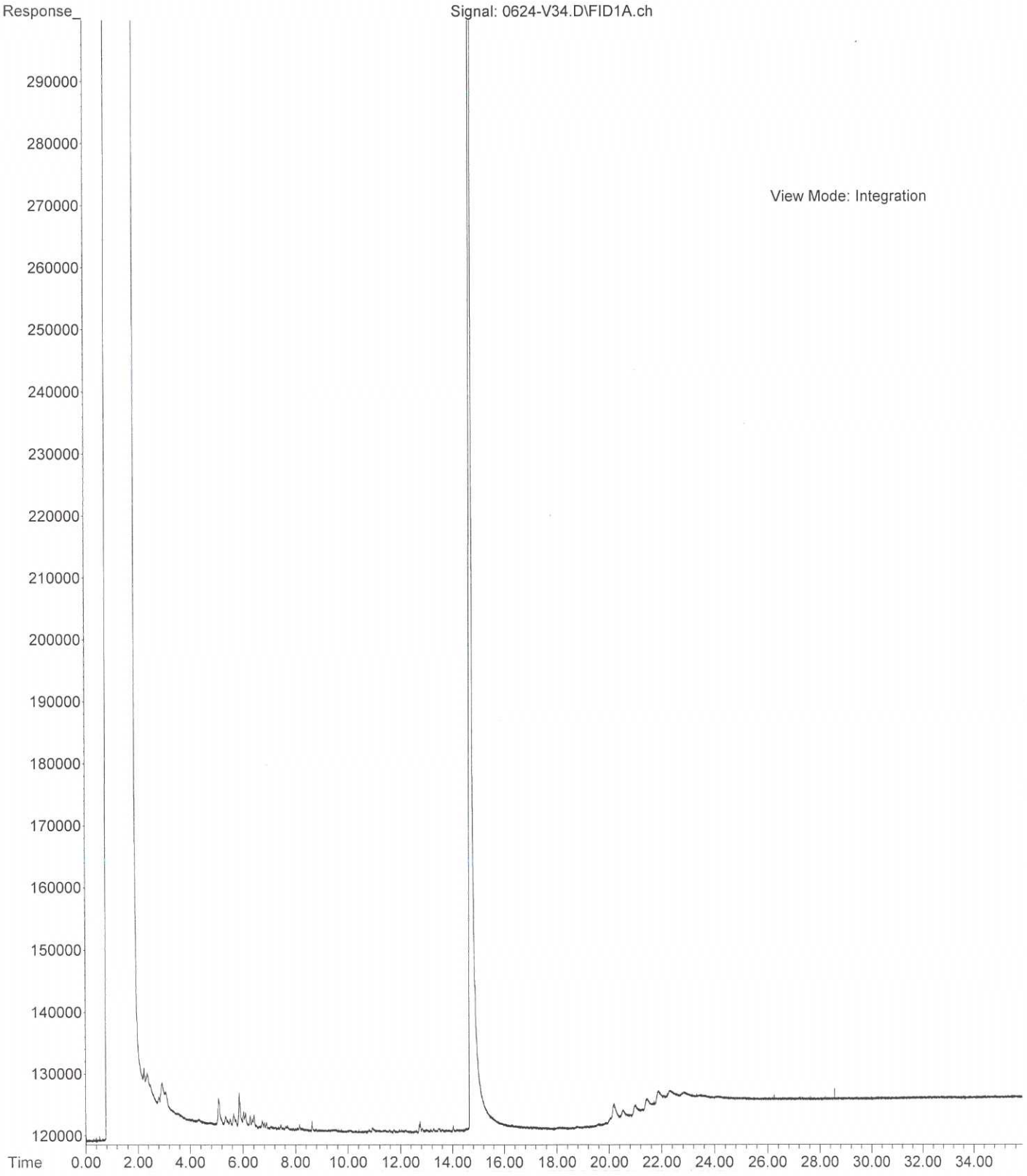
File : C:\msdchem\2\DATA\V130624\0624-V25.D
Operator :
Acquired : 25 Jun 2013 2:24 using AcqMethod V130618F.M
Instrument : Vigo
Sample Name: 06-168-02
Misc Info :
Vial Number: 25

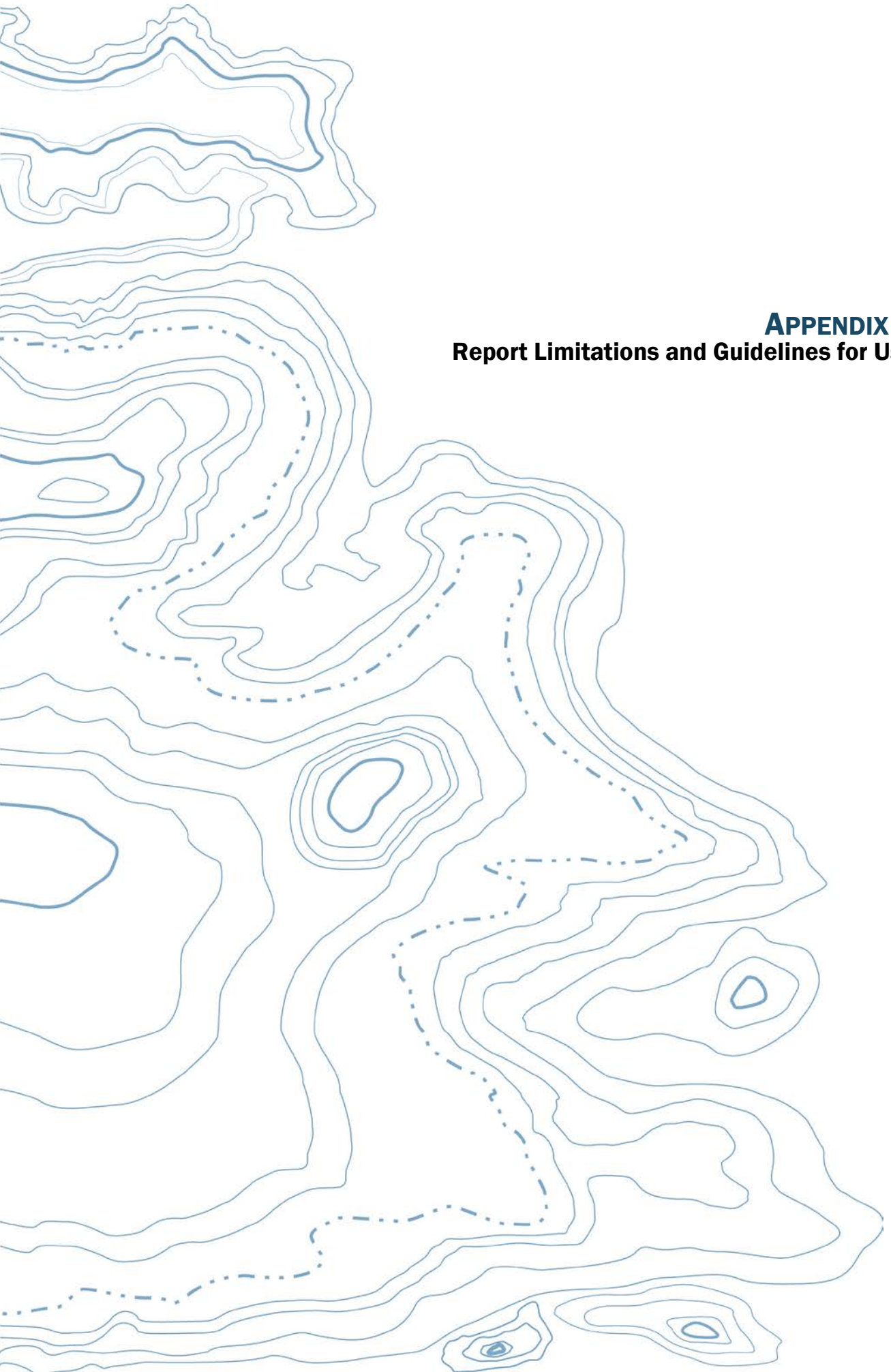


File :C:\msdchem\2\DATA\V130624\0624-V32.D
Operator :
Acquired : 25 Jun 2013 7:11 using AcqMethod V130618F.M
Instrument : Vigo
Sample Name: 06-168-01 ACU
Misc Info :
Vial Number: 32



File :C:\msdchem\2\DATA\V130624\0624-V34.D
Operator :
Acquired : 25 Jun 2013 8:34 using AcqMethod V130618F.M
Instrument : Vigo
Sample Name: 06-168-02 ACU
Misc Info :
Vial Number: 34





APPENDIX C
Report Limitations and Guidelines for Use

APPENDIX C
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Geotechnical Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the exclusive use of the Washington State Department of Ecology, the Port of Chelan, and their designated project team members for the planned remedial excavation at the Cashmere Mill site. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A Geotechnical Engineering or Geologic Report Is Based on a Unique Set of Project-specific Factors

This report has been prepared for the planned remedial excavation at the Cashmere Mill site in Cashmere, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

Most Geotechnical and Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Geotechnical Engineering Report Recommendations Are Not Final

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

Contractors Are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor’s procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory “limitations” provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these “Report Limitations and Guidelines for Use” apply to your project or site.

Geotechnical, Geologic and Environmental Reports Should Not Be Interchanged

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants and no conclusions or inferences should be drawn regarding Biological Pollutants, as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.

Have we delivered World Class Client Service?
Please let us know by visiting **www. geoengineers.com/feedback**.

GeoEngineers