FINAL REMEDIAL INVESTIGATION REPORT
BOTHELL RIVERSIDE SITE
BOTHELL, WASHINGTON

HWA Project No. 2007-098-2018

Prepared for

City of Bothell

December 18, 2017

HWA GEOSCIENCES INC.

• Geotechnical Engineering
• Hydrogeology
• Geoenvironmental Services
• Inspection & Testing

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1. INTRODUCTION

This final Remedial Investigation Report (RI) was prepared for the Bothell Riverside site (Site) located in Bothell, Washington. The RI was conducted under Agreed Order DE 6295, executed in 2009 and amended in April 2010 and in 2013, between the City of Bothell (City) and the Washington State Department of Ecology (Ecology) to address soil and ground water contamination related to historical releases of hazardous substances at the Site. Requirements under the Agreed Order include preparation of an RI Report followed by the development of a Feasibility Study/draft Cleanup Action Plan (FS/dCAP).

RI and Interim Action activities were performed between December 2009 and April 2017 following Ecology's approval of the final RI/FS Work Plan (Ecology letter dated August 18, 2009) and in accordance with the Ecology-approved project work plans (Parametrix, 2009a; HWA, 2012; HWA, 2013). This report documents the results of the RI and interim action soil and ground water cleanups conducted in 2010, 2013, 2014 and 2017 at the Site (see Figure 1). The City owns the Site, a portion of which accommodates the newly realigned State Route (SR) 522. The remnant portion of the former property north of the new roadway will be redeveloped as part of the City's overall Downtown Revitalization Plan; the portion of the former property south of the new roadway will be incorporated into the City's park system. Figure 2 depicts the alignment of SR 522 through the Site and adjacent properties.

Three interim action cleanups were conducted prior to this RI: 1) a soil excavation and removal cleanup conducted in 2010 (before roadway realignment) to address total petroleum hydrocarbon (TPH) impacts, 2) a ground water pump-and-treat system installed in 2014 to address halogenated volatile organic (HVOC) impacts to ground water and surface water, and 3) a second soil excavation and removal cleanup conducted in 2017 to address residual TPH impacts. These interim actions address different contaminants in different (not co-located) areas from two separate releases. These areas are referred to as the Riverside TPH Site and the Riverside HVOC Site in subsequent sections of this report.

Tasks performed to-date to fulfill the Agreed Order include:

1. Preparation and submittal of the *Remedial Investigation and Feasibility Study Work Plan* (HWA, 2009) to Ecology;
2. Remedial investigation (RI) activities in 2009;
3. Initiation of a feasibility study (FS) in 2009;

4. Preparation and submittal of the *Bothell Riverside Remedial Investigation/Feasibility Study,* and associated *Draft Cleanup Action Plan* which were not finalized or approved pending completion of interim actions and monitoring (Parametrix, 2009a, b);
5. Preparation and submittal to Ecology of the *Remedial Investigation Feasibility Study Final Work Plan, Bothell Landing Site Bothell, Washington*, September 19, 2011 (HWA, 2011b) and Addendum 1 adopting the approved area-wide network (December 2011) including wells at the Riverside site
6. Completion of the 2010 initial phase of interim action petroleum soil cleanup and subsequent reporting (*Documentation of Interim Action at Bothell Riverside Site)* (HWA, 2011);
7. Preparation and submittal of a *Focused Feasibility Study* (HWA, 2012) and *Interim Action Work Plan* (HWA, 2013) to Ecology for HVOC impacts to ground water and surface water;
8. Draft RI report completed in August 2015; and,
9. Installation of a ground water pump-and-treat system to address HVOC impacts to ground water and surface water in 2014.
10. Completion of the 2017 interim action petroleum soil cleanup and subsequent reporting (*Riverside TPH Site Residual Soil Excavation Report, Bothell, Washington)* (HWA, 2017a);

Remaining tasks to fulfill terms and conditions of the Agreed Order include preparation of this Final RI/FS report (Deliverables 5 & 6), and draft cleanup action plan (dCAP, Deliverable 7). However, with Ecology's June 22, 2015 email concurrence, Deliverables 5 & 6 have been modified into draft & final RI reports, and Deliverable 7 has been modified into two FS and two dCAP reports addressing each contaminant type.

1.1 LOCATION AND DESCRIPTION

The Agreed Order defined the Bothell Riverside site (hereafter referred to as the "original site" or "former property boundary") as a former two-acre property where petroleum hydrocarbon impacts were discovered. The "original site" has since been redefined as discussed later, in Sections 4 & 6.3 of this report. The two-acre parcel no longer exists in its original configuration, which includes public right-of-way for the newly constructed and re-aligned SR 522, and portions of newly formed parcels on the north and south sides of the new roadway. The "original site" is listed by Ecology under Facility Site ID No. 53578168 and UST Site ID No 200550, located at latitude 47.75902 and longitude -122.20652.

The remnant portions of the former two-acre property and vacated former SR 522 roadway have been conjugated into new City parcels and are being sold to private parties for redevelopment. The southern portion of the property will become a part of the City's park system.

Per MTCA, a "Site" is "*any site or area where a hazardous substance…has been deposited, stored, disposed of, or placed, or otherwise come to be located*." Site boundaries are established through the RI process. Whereas the "original site" was initially defined as a two-acre property (which no longer exists due to re-platting of parcels and construction of the new roadway) the findings of this RI establish two Bothell Riverside site boundaries as shown in Figures 2 and 3. These sites are separate and distinct and are the subject sites identified in this report as: 1) the Riverside TPH Site, and 2) the Riverside HVOC Site.

1.2 AUTHORIZATION / SCOPE OF WORK

HWA GeoSciences' (HWA) work for this project was authorized under an On-Call Hazardous Materials Services Consultant Agreement with the City dated April 2010. HWA's scope of work for this portion of the project included:

- Perform environmental assessments, prepare technical documentation and develop remedial designs for cleanup of contaminated downtown properties.
- Provide permitting support
- Provide contract bid phase services
- Assist in coordinating with State and Federal environmental regulatory agencies
- Conduct cleanup monitoring, confirmation sampling, backfill & compaction monitoring
- Prepare the 2011 Interim Action Soil Cleanup Report, 2012 Focused Feasibility Study, 2013 Ground Water Interim Action Work Plan, 2016 Soil Gas Survey/ Source Investigation report, 2017 Interim Action Soil Cleanup Report, and 2017 Further Delineation of Site Boundary for Ultra and Riverside HVOC Sites, Reconnaissance Ground Water Sampling Report.
- Install and operate the ground water treatment system from 2014 to the present, and provide quarterly ground water monitoring reports.
- Prepare this RI, and subsequent FS and dCAPs

1.3 OBJECTIVES

The objective of this RI Report is to meet the requirements of the Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Cleanup Regulation (Washington Administrative Code [WAC] 173-340) (Ecology, 2007) to characterize the sites and to evaluate any proposed remedial actions to address the contamination.

The purpose of the RI is to investigate and delineate the potential presence and extent of soil and ground water impacts at the sites. The RI is designed to characterize existing conditions, including physical characteristics, nature and extent of contaminants of concern, media impacted, source areas, contaminant migration pathways, rates, directions, and potential receptors, and develop site conceptual models. This was accomplished using existing data as well as conducting site-specific investigations.

The primary environmental concerns are 1) impacts associated with petroleum- impacted soil related to historic petroleum releases, and 2) HVOC impacts to ground water and surface water from an unknown source located nearby and upgradient (CDM, 2009).

Specific objectives of the RI include:

- Determine the lateral and vertical extent of TPH impacts in soil and ground water at the Riverside TPH Site
- Determine the lateral and vertical extent of HVOC impacts in soil and ground water at the Riverside HVOC Site
- Investigate the geology, hydrogeology, and ground water flow/transport characteristics, including the potential for preferential contaminant migration pathways (e.g. utility trenches)
- Develop a site conceptual models (exposure pathways and receptors), and
- Establish cleanup standards and remedial action objectives

1.4 HISTORIC PROPERTY USE AND PREVIOUS SITE ASSESSMENTS

The City acquired the former two-acre Riverside property in May 1990. Details of historic property use and the several site assessments performed to date at the Site can be found in SEACOR (1990, 1991), RZA AGRA (1992), GTI (1993, 1994), ECOSS (2008), HWA (2008), Parametrix (2009a), and CDM (2009). The following is a summary of those assessments.

A "Flying A" gasoline service station operated between 1946 and the early 1960s. The service station had at least two 1,000 gallon underground storage tanks (USTs); one UST contained gasoline and the other diesel fuel. The service station building was demolished sometime after 1965. The two USTs were apparently removed before 1990. Investigative work in the early 1990s discovered residual soil and ground water contamination attributed to the service station operation. Debris including discarded containers of motor oil, anti-freeze, and transmission fluid were also found (RZA, 1992).

Approximately 4,700 cubic yards of petroleum impacted soil were excavated, treated on-site by bioremediation, and returned to the former excavation and surrounding ground surface in the early 1990s. In 2008 HWA conducted a Phase II environmental site assessment (ESA), a geophysical survey, and a geotechnical investigation. HWA's findings documented the presence of lube oil-range petroleum hydrocarbons in soil at concentrations greater than MTCA cleanup levels within and in the vicinity of the former soil excavation. HWA's Phase II ESA also documented the presence of halogenated volatile organic compounds (HVOCs) at concentrations greater than MTCA cleanup levels in ground water at more than one on-site location. There were no documented local HVOC sources, and these compounds were likely related to upgradient sources. The geophysical survey identified no USTs remaining at the Site (HWA, 2008).

Additional investigations (CDM, 2009; Parametrix, 2009a) confirmed the presence and extent of petroleum affected soil in the former excavation area and the presence of HVOCs in ground water.

The 2010 and 2017 petroleum soil cleanups, and 2014 ground water treatment system are described in Section 3.

1.5 CURRENT AND PLANNED SITE USE

Prior to the soil cleanup, the original two-acre property was undeveloped and used for parking. After completion of the re-aligned SR 522 roadway in 2013, the remnant portion of the original two-acre property south of the new roadway is still undeveloped and used for parking. The portion north of the new roadway is currently vacant and hydro-seeded, and awaiting redevelopment as part of the City's overall Downtown Revitalization Plan.

2 ENVIRONMENTAL SETTING

2.1 PHYSICAL CONDITIONS / TOPOGRAPHY

Figure 3 shows the two sites; Riverside HVOC site and Riverside TPH site. This area is generally flat with an elevation of approximately 35 feet above mean sea level. The surrounding land is generally flat or slopes to the south towards the Sammamish River. The Riverside TPH site is now almost entirely under the new SR 522 roadway, and is around 100 feet north of the Sammamish River. The Riverside HVOC site includes a gravel-surfaced parking area, the paved 180th Street roadway, and the vegetated north bank of the Sammamish River.

2.2 GEOLOGY

Based on field observations during the RI, soils at both sites typically consists of approximately four to nine feet of silty sand to sandy silt fill with occasional debris, over alluvial soil consisting of inter-bedded silt, sandy silt, peat, and silty sand to a depth of up to 50 feet below ground surface (bgs). A buried soil horizon (paleosol) was observed at some locations at the fill-alluvium contact.

Most fill material appears to be derived from three sources: 1) circa 1940's property development on the north portion within the "former property boundary" along Woodinville Drive, 2) dredge and soil spoils placed on the southerly portion within the "former property boundary" after realignment of the Sammamish River in the 1960s, and 3) approximately 4,700 cubic yards of excavated fill material placed back into its former excavation in 1992 and 1993 along with 1,200 cubic yards of imported fill.

Below the fill is predominantly medium-dense to dense sand with variable gravel, silty sand, silt and peat to a depth of up to 50 feet bgs. Peat or silt beds with high organic content up to 2 feet thick are present within the alluvial soil, generally at depths greater than 10 feet bgs. These organic-rich beds appear to underlie most of the area but may not represent a contiguous layer.

Beneath these alluvial deposits is a stiff to hard clay or silt with a thickness of at least 14 feet. This unit is inferred to be a drift deposit of glacial-lacustrine origin. Boring logs for various investigations are included in Appendix A. Figures 4, 5, and 6 illustrate geologic cross-sections through the Riverside HVOC site.

2.3 HYDROGEOLOGY

Ground water occurs at both sites approximately 8 to 16 feet bgs, with a shallower depths occurring in the wet season. Based on ground water elevation surveys at and in the vicinity of the sites, ground water flow is inferred to be to the southeast, toward the Sammamish River. Figure 7 presents a potentiometric surface developed from ground water elevation data collected in November 2009. Appendix B contains ground water gradient maps prepared on other dates.

The horizontal hydraulic conductivity for both sites was estimated using slug test data collected during the 2009 RI/FS. Based on evaluation of the results from the slug test, the estimated hydraulic conductivity for shallow, unconfined ground water beneath the sites ranged from 4.8 x 10-3 to 1.8 x 10-2 feet per minute (7 to 26 feet/day); the mean hydraulic conductivity determined from the slug test data is 13.1 feet/day.

HWA estimated the travel time of shallow ground water at both sites. Ground water particle velocity is described by the following relationship:

V = K i / P, where: V= particle velocity
K= hydraulic conductivity
i = hydraulic gradient
P = effective porosity

Based on estimates of horizontal hydraulic conductivity of around 7 to 26 feet/day, an assumed effective porosity of 0.25 (typical of sands), and measured gradients of 0.032 to 0.042 foot/foot, estimated horizontal ground water particle flow velocity may range from approximately 1 to 4 feet per day in the shallow aquifer.

Other physical characteristics of soil in the shallow, unconfined ground water zone include an estimated porosity (based on ex-situ analysis) ranging from 0.25 to 0.32, wet density ranging from 123.2 to 139.5 pounds per cubic foot, and dry density ranging from 107.2 to 127.4 pounds per cubic foot (Parametrix, 2009a).

2.4 SURFACE WATER HYDROLOGY

Surface water features in the vicinity include:

1) Horse Creek, which exits from a culvert beneath the adjacent Bothell Landing property to the west, and runs south along that boundary. It then flows under 180th street in a culvert and discharges to the Sammamish River. Flow to this drainage will be largely re-routed to a new drainage system (consisting of pipes and open channel segments) constructed some 300 feet west of the old Horse Creek channel, sometime in 2015.

2) The Sammamish River, which is located approximately 100 feet south of the Riverside TPH site and is adjacent to the Riverside HVOC Site. Ground water from the Riverside HVOC site discharged to the river prior to installation of the gradient control / pump-and-treat system in 2014.

3 INTERIM ACTIONS

Three interim action cleanups have been performed to-date: 1) a soil excavation and removal cleanup conducted in 2010 (before the SR522 roadway realignment) to address petroleum hydrocarbon impacts in soil, 2) a ground water pump-and-treat system to address HVOC impacts to ground water and surface water was installed in 2014, and 3) a second soil excavation and removal cleanup conducted in 2017 to address residual TPH impacts. These interim actions address the different contaminants at the Riverside TPH site and Riverside HVOC site.

3.1 PETROLEUM SOIL CLEANUP

2010 - The interim action for contaminated soil at the Riverside TPH Site included excavation and off-site disposal of impacted soils. The City engaged a construction contractor, Hos Brothers Construction of Woodinville, Washington (Contractor), to perform the interim action in September 2010. Prior to soil cleanup, the Contractor fenced and grubbed the work area in preparation for the soil cleanup and subsequent construction of the SR 522 realignment. HWA, acting as environmental consultant for the City of Bothell, monitored the soil excavation and off-site transport, and sampled soil to confirm cleanup levels in soil were achieved.

2017 – In July 2016, the City informed Ecology that as part of their due diligence, a prospective developer represented by Farallon Consulting (Farallon) had encountered petroleum contaminated soils during a Limited Subsurface Investigation on the northern portion of the Riverside Site. The City subsequently met with Ecology and submitted a "Residual Soil Excavation Work Plan" (October 12, 2016), thereafter receiving Ecology's concurrence to implement the remediation work.

According to Farallon's report, soil samples collected from four borings indicated that residual petroleum impacted soils above MTCA Method A cleanup levels were present in one of the soil borings, FB-5 (Figures 8, 8a). Based on the results of the Farallon FB-5 boring, a residual soil excavation interim action was conducted to address the remaining TPH contaminated soils at the Bothell Riverside TPH Site. This soil cleanup at the Site included excavation and off-site disposal of all accessible impacted soils.

The interim action for contaminated soil at the Riverside TPH Site included excavation and off-site disposal of impacted soils. The City engaged a construction contractor, Interwest Construction Inc. (ICI) of Burlington, Washington to perform the interim action soil cleanup during January 2017 excavation activities, and Kane Environmental Inc. (Kane) with subcontractor Spooner Contracting, LLC, to perform the interim action soil cleanup during the second round of cleanup in March/April 2017. HWA personnel monitored the cleanup activities and sampled soil to confirm successful cleanup.

3.1.1 Pre-Cleanup Characterization

2010 - Prior to large scale excavation activities at the Riverside TPH site, HWA personnel conducted test pit characterization (i.e., "pot holing") to delineate clean overburden soils, and to assess the lateral and vertical extent of TPH-impacted soils with respect to previous investigations.

Test pit characterization included collecting samples of TPH-impacted soil for analysis of petroleum hydrocarbon fractionation and other target compounds in order to calculate MTCA Method B risk-based soil cleanup levels for protection of human health and potable ground water. The results of the of the Method B risk analysis are included in Appendix C and summarized in Table 1.

Eleven test pits were excavated on September 22 and 23, 2010. Test pit locations are shown on Figure 8. Test pits were excavated to a maximum depth of 7 feet bgs. HWA collected 21 representative soil samples at various depths from the test pits and submitted 17 of the samples for chemical analysis. Test pit data indicated that an estimated 470 cubic yards (approximately 750 tons) of soil could be stockpiled on site for subsequent reuse.

OnSite Environmental Inc. of Redmond, Washington, an Ecology-accredited laboratory, performed the soil chemical analyses. Table 2 summarizes the analytical data.

2017 - Prior to the 2017 excavation activities at the Site, HWA personnel reviewed documentation of previous investigations and remedial excavations to assess the lateral and vertical extent of TPH-impacted soils in the vicinity of the Farallon FB-5 boring. HWA then marked the estimated excavation area and completed utility locates to identify all public and private underground utilities.

3.1.2 Soil Excavation

2010 - The Contractor excavated contaminated soil at the Riverside TPH Site on September 27 and 28, 2010. HWA personnel directed the cleanup based upon prior sampling, as well as field screening information such as soil color, odor, and photoionization detector readings. When the screening information indicated clean soil, HWA collected confirmation samples for laboratory analysis to document that the soils left in-place met Site cleanup levels.

Contaminated soil was excavated generally to depth of previous test pit and other exploration sampling which was found to meet the cleanup levels. The approximate limits of soil excavation are shown on Figure 8. The final excavation was approximately 100 by 70 feet in its maximum width and length. The depth of the excavation was approximately 4 feet below ground surface. This is consistent with descriptions of the 1992-1993 cleanup, in which clean imported fill was placed in the bottom of the (then) 8 to 9 foot-deep cleanup excavation, and pre-existing soils that

were bio-treated were subsequently placed on top of the imported fill (RZA, 1992). Based on these finding, it appears the 1992 bio-treatment was not entirely successful in meeting cleanup levels.

The Contractor excavated and transported 971.65 tons of soil to the CEMEX USA (formerly Rinker) Inert Materials Landfill facility in Everett, Washington for thermal desorption treatment followed by permitted landfill disposal. Assuming a bulk density of 1.6 tons per bank cubic yard, the volume of soil excavated and transported to CEMEX was approximately 610 cubic yards.

2017 - During the first round of excavation activities, ICI excavated contaminated soil at the Site on January 10, 12, 13, and 18, 2017. During the second round, Kane/Spooner continued excavation activities at the Site on March 20, 23, 24, 27 through 31, and April 3, 2017. HWA personnel directed the cleanup based upon prior investigations and remedial excavation activities, as well as field screening information such as soil color, odor, and photoionization detector readings. When the screening information indicated clean soil, HWA collected confirmation samples for laboratory analysis to document that the soils left in place met the Site cleanup levels.

Contaminated soil was excavated generally to a depth ranging from 10 to 12.5 feet below ground surface (bgs), which was found to meet the cleanup levels for the bottom of the excavation. The approximate limits of soil excavation are shown on Figure 8a. The final excavation was approximately 65 by 55 feet in its maximum width and length, respectively.

During the January cleanup, ICI excavated and transported 934.22 tons of soil to the CEMEX USA (formerly Rinker) Inert Materials Landfill facility in Everett, Washington for thermal desorption treatment followed by permitted landfill disposal.

During the March/April cleanup, 333.64 tons of soil were excavated and transported to CEMEX. An additional 613.41 tons were transported to a Waste Management transfer station in Woodinville, Washington, for transport and permitted disposal at the Waste Management landfill in Columbia Ridge, Oregon, for a total of approximately 947 tons excavated and disposed of properly during the March/April round of cleanup, and approximately 1,881 tons for all 2017 cleanup excavations.

3.1.3 Confirmation Sampling

2010 - HWA personnel collected 8 excavation sidewall and 4 excavation bottom samples to confirm soil cleanup (Table 2). Confirmation sample locations are shown on Figure 8. Five pre-excavation test pit samples collected at the limits of the excavation, and test pit samples collected beyond the limits of excavation are included in Table 2 as confirmation samples because the soils represented by those samples did not contain chemicals of potential concern at concentrations exceeding cleanup levels. Chemical analysis results for soil samples from the

Riverside TPH excavation (summarized in Table 2) indicate that the interim action achieved Site cleanup levels.

2017 - During the January 2017 excavation activities, HWA personnel collected a total of 21 excavation sidewall and 4 excavation bottom samples to confirm soil cleanup (Table 2). Of the 21 sidewall and 4 bottom samples, 7 of the sidewall and 2 of the bottom location samples were over-excavated due to laboratory results indicating contaminants of concern (COC)s were above the MTCA regulatory cleanup levels. In addition, three confirmation samples collected, one from the northwest sidewall (sample R-PEX-32-10) and two from the south (sample R-PEX-19-10) and southeast (sample R-PEX-28-10) sidewalls, exhibited gasoline concentrations of 39, 64 and 86 mg/kg, respectively, which is above the established MTCA Method A cleanup level of 30 mg/kg. Soils in these areas were temporarily left in place but were later over-excavated during the second round of excavating in March/April 2017.

During the March/April 2017 excavation activities, HWA personnel collected a total of 23 sidewall and 5 excavation bottom samples to confirm soil cleanup (Table 2). Of the 23 sidewall and 5 bottom samples, 5 of the sidewall and 1 of the bottom location samples were over-excavated and re-sampled due to cleanup level exceedances.

Figure 8a depicts confirmation sample locations. Table 2 includes laboratory data for the interim action residual soil cleanup conducted at the Site.

Backfill samples from January and March were tested for TPHd, TPHo, TPHg, and BTEX, and did not contain any of these constituents above laboratory reporting limits. Table 2 includes results from one backfill sample that contained TPH and was subsequently rejected to be utilized as backfill.

3.1.4 Ground Water Management

2010 - The excavation depth was approximately 4 feet below ground surface and did not encounter ground water. Nor did precipitation water accumulate in the open excavation in quantities requiring removal. Thus, the Contractor did not need to manage ground water during soil excavation. Instead, the Contractor graded the excavation to allow precipitation water to accumulate in a sump at the north end of the excavation where it infiltrated into the soil.

2017 - The excavation depth ranged from 10 to 12.5 feet bgs. Minimal perched ground water seepage was encountered at a depth of approximately 8 feet bgs in the excavation. In addition, precipitation that occurred during excavation activities accumulated in the excavation. During the January 2017 excavation activities, ICI managed the water accumulation by pumping water from the excavation into a Baker holding tank, allowing sediments to settle, and discharging of the water utilizing an existing King County Industrial Waste Division permit obtained by ICI for temporary discharge of water generated during dewatering activities. During the March/April

2017 excavation activities, Kane contracted Marine Vacuum Services, Inc. to remove any groundwater encountered and/or accumulated precipitation using a 2,500-gallon Vacuum truck to dewater the excavation prior to digging.

3.1.5 Riverside TPH Site Restoration

2010 - After excavation of contaminated soil and receipt of confirmation sample analytical results, the Contractor backfilled and compacted the excavation with a combination of clean, imported, structural fill soils meeting the requirements of Select Borrow, per WSDOT Standard Specification 2-03.3(14)K, and previously excavated soils from the Riverside TPH Site that were tested and found to meet cleanup levels. The imported select borrow was obtained from CEMEX, who mined the sandy soils from a quarry in Granite Falls, Washington (i.e. native quarry materials not excavated or reused from any developed property).

The select borrow and native soils were compacted to Method B of WSDOT Standard Specification 2-03.3(14)C (i.e. 90 percent of maximum dry density as determined using test method ASTM D 1557 [Modified Proctor]) below two feet bgs, and 95 percent of maximum dry density for the upper two feet. A portion of the remediation area was hydro-seeded for erosion control, while the remainder was graded with weather-resistant surfacing material.

2017 - Due to contaminated soils being temporarily left in place after the January cleanup on the northwest, south and southeast sidewalls of the January excavation, a layer of polyethylene sheeting (Visqueen) was placed along the sidewalls of the excavation as an indicator of the boundary between the contaminated soils and the clean backfill and in an effort to keep clean backfill soils from becoming adversely impacted. ICI then backfilled and compacted the excavation with clean imported structural fill soils meeting the requirements of Select Borrow, per WSDOT Standard Specification 2-03.3(14)K. The imported select borrow was obtained from Wetlands Creations, who mined the soils from their facility in Monroe, Washington (i.e., native quarry materials not excavated or reused from any developed property).

During the March/April round of excavation and prior to backfilling and compaction activities, Kane imported and placed one to two feet of quarry spalls, obtained from CalPortland located in Kenmore, Washington, on the bottom of the excavation to approximately one foot above the ground water level. This was performed to ensure ground water did not mix with the structural fill soils, ultimately helping with compaction efforts. A filter fabric was placed on top of the layer of quarry spalls and the excavation was then backfilled and compacted with clean imported gravel borrow from CalPortland. Additionally, a layer of 5/8-inch minus crushed rock was placed and compacted in the top six inches of fill where the original paved driveway was located just off of State Route 522 leading into the Baskin Robbins and Gallo De Oro Mexican restaurant parking lot. This was to act as a temporary driveway until repaving could be completed at a later date.

During backfilling activities, the select and gravel borrow were compacted to Method B of WSDOT Standard Specification 2-03.3(14)C, i.e., 90 percent of maximum dry density as determined using test method ASTM D 1557 (Modified Proctor) below four bgs, and 95 percent of maximum dry density for the upper four feet. Due to softer soils (peat) encountered in the bottom of the excavation, the first two lifts of backfill were placed and spread in layers of approximately two-feet of uncompacted thickness. Subsequent backfill lifts were placed and spread in layers not more than 10 inches in uncompacted thickness.

3.2 HVOC GROUND WATER CLEANUP

Ground water cleanup to address HVOC impacts to surface water were initiated in 2014, per the Focused Feasibility Study (HWA, 2012) and Interim Action Work Plan (HWA, 2013). This included design and installation of a ground water pump-and-treat system to capture and treat HVOC-impacted ground water at the Riverside HVOC site.

3.2.1 System Design

The treatment system is designed to maintain hydraulic control of HVOC-impacted ground water discharging to the Sammamish River. Achieving hydraulic control of the ground water involves a sufficient number, location, and spacing of wells, with pumping rates that are designed to modify the gradient such that impacted ground water flows into the wells, not into the river. Well spacing and pumping rates were determined via a capture zone analysis using numerical ground water modeling (HWA, 2012), with input parameters derived from previous remedial investigation work (e.g. gradient mapping, aquifer testing (Parametrix, 2009a)). Actual pumping rates are adjusted during operation of the system based on well performance and water levels.

The system includes six extraction wells at roughly 40 foot spacings. Figure 3 shows the extraction well locations. The wells are constructed of four-inch diameter PVC, with 20 feet of mill-slotted well screen set at a depths of 15 to 35 feet below grade. The wells are fitted with electric submersible pumps, which are wired to pump controllers which control pump cycling.

Electric wires and pump discharge lines are routed underground from the wells to a locked treatment system enclosure, which houses the electrical service, controls, discharge piping, manifold, sampling ports, flow meters, and sanitary sewer discharge port. The total discharge is then routed via an underground four-inch diameter side sewer to a sanitary sewer manhole in 180th street.

Pumped ground water is discharged under permit to a sanitary sewer for treatment at a King County wastewater treatment plant. HVOC contaminants at the concentrations detected are acceptable by King County Industrial Waste Division (KCIWD) for discharge and treatment. The HVOCs are treated by the standard primary and secondary wastewater treatment processes (e.g., activated sludge, facultative lagoons, etc.), or will volatilize prior to reaching the treatment

areas, in the sewer lines, manholes, treatment plant headworks, solids removal, and aeration basins.

3.2.2 Monitoring

Performance monitoring is currently being performed to confirm that the interim action maintains ground water cleanup standards. Performance monitoring includes collection of ground water samples from the extraction wells and selected monitoring wells, as described below:

Sample type	Sampling location	Sampling Frequency / Rationale
Preliminary Point of Compliance	Extraction well 1 Extraction well 2 Extraction well 3 Extraction well 4 Extraction well 5 (added 12/16) Extraction well 6 (added 12/16) RMW-7	Quarterly for one year, then modify based on results and consultation with Ecology (e.g. move to semi-annual if concentrations stabilize)
Combined discharge	Combined discharge at sewer manhole or manifold	As required by KCIWD permit
Nearby wells	BC-3 RMW-4 RMW-5 RMW-6 RMW-8 RMW-9 RMW-10 RMW-12 (added 12/16) RMW-13 (added 12/16)	Semiannual for one year, then modify based on results and consultation with Ecology to check for water quality impacts due to pumping

Performance monitoring samples are analyzed for HVOCs and field parameters, per the Interim Action work plan (HWA, 2013). Other elements of performance monitoring include:

- Monitoring flow meter readings to document volumes of water discharged to sewer;
- Recording ground water elevations in pumping and nearby monitoring wells; and,
- Preparing ground water gradient maps to confirm plume capture.

3.2.3 System Operation

Since startup in January 2013, the treatment system has pumped approximately 9 million gallons of ground water. Average flows have been around 10,000 to 15,000 gallons

per day. Several of the wells are impacted by iron-fixing bacteria, which requires periodic cleaning and flushing of the wells, well screens, pumps, lines, meters, and valves.

In order to confirm plume capture by the system, HWA measured ground water levels in nearby monitoring wells during pumping. There are not enough monitoring wells near the pumping wells to create a ground water gradient map accurately depicting the capture area, although if drawdown is sufficient in wells located across and along the gradient relative to the pumping wells, then capture in all directions can be assumed. HWA performed an interference pumping test in April and May 2015 to demonstrate hydraulic capture of the pumping system. Water levels were measured in the pumping and nearby monitoring wells during rest periods (pumps off) and during pumping. Data-logging pressure transducers were installed in two pumping wells and a monitoring well located between them, with periodic manual measurements of the other wells. Drawdowns measured in the pumping and nearby wells are summarized below:

Well	Drawdown (feet)
EW-1	6.0
EW-2	11.1
EW-3	2.9
EW-4	10.7
RMW-6	3.7
RMW-10	6.9
BC-3	1.8

Based on the capture zone analysis conducted during the focused feasibility study (HWA, 2012) the drawdowns are sufficient to capture ground water travelling to the river.

4 REMEDIAL INVESTIGATION

RI activities were performed between 2009 and April 2017 following Ecology's approval of the final RI/FS Work Plan (Ecology letter dated August 2009), and the subsequent completion of the SR522 roadway realignment, followed by one year of groundwater monitoring as part of the Bothell Landing area-wide monitoring.

RI activities included investigations to define the nature and extent of contamination in soil and ground water, and interim actions to remediate petroleum-impacted soil. Conclusions regarding the nature and extent of TPH and HVOC concentrations in ground water:

1. Gasoline concentrations were detected in ground water at concentrations below MTCA Method A cleanup levels, and were believed to originate from one or more of the USTs associated with a former gasoline station located at the Riverside TPH Site.

2. The solvent plume originating from Ultra Cleaners site was not associated with HVOC concentrations in groundwater beneath the Riverside HVOC Site (CDM, 2009, HWA, 2017b).

These conclusions were reached when data gaps were filled regarding the extent of TPH and HVOC concentrations in groundwater. Data gaps were filled after the SR522 roadway was decommissioned and previously unexplored areas were accessible to sampling.

Based in part on these data and conclusions, two distinct contamination areas were subsequently identified at the Riverside site:

1. The Riverside TPH site; and,

2. The Riverside HVOC site.

5 QUARTERLY GROUND WATER MONITORING

One year (four quarters) of groundwater monitoring for both the Riverside TPH site and the Riverside HVOC site ,was performed as part of the area-wide groundwater network as established by Ecology under the Bothell Landing Agreed Order (Re: Phase 3 RI activities in Section 5 of the approved Bothell Landing RI Work Plan, HWA 2011). Copies of the quarterly monitoring reports showing well locations and analytical results are included in Appendix D, including a map of the area-wide network.

The monitoring activities were conducted for four quarters between May 2014 and March 2015, with letter reports documenting the test results submitted to Ecology on a quarterly basis. Some wells identified in the Ecology-approved groundwater monitoring network for the Site were retained and sampled for the duration of the 1-year monitoring event.

Quarterly ground water monitoring reports were also prepared for the HVOC Site pump and treat system, from May 2013 to the present.

Ground water monitoring at both sites is discussed in the following sections. For evaluation purposes, both historical and current ground water data were compared to MTCA Method A Cleanup Levels for Ground Water (WAC 173-340-900 Table 720-1). Historical ground water analytical data are presented in Appendix B. Ground water analytical data collected by HWA are presented in Table 3. Monitoring well locations are shown on Figure 3. Monitoring well logs are included in Appendix A. Copies of laboratory reports from the quarterly ground water monitoring events are included in Appendix D. Appendix E contains a data quality assessment of the laboratory data.

5.1 PETROLEUM HYDROCARBONS

Ground water samples were collected and analyzed for petroleum hydrocarbons during both the 2008 Phase II (HWA, 2008) and the 2009 RI/FS investigations (Parametrix, 2009a). During the 2008 Phase II investigation, the sample collected from monitoring well BC-5 contained lube-oil-range petroleum hydrocarbons at 0.72 milligrams per liter (mg/L), which exceeded the MTCA Method A cleanup level of 0.5 mg/L. This well is located within the former excavation footprint. When the well was re-sampled during the 2009 RI/FS investigation, petroleum hydrocarbons were not detected above the laboratory reporting limits.

Gasoline-range petroleum hydrocarbons were detected at a concentration of 0.31 mg/L in R-9 during the 2008 Phase II investigation. No other petroleum hydrocarbons were detected during the 2008 or 2009 investigations. Benzene was detected in ground water at one boring location (R-9) during the 2008 Phase II investigation at a concentration exceeding MTCA Method A

cleanup levels. Benzene was not detected in ground water at any additional locations during the 2008 or 2009 investigations.

Because no ground water samples prior to the 2010 soil cleanup exceeded cleanup levels, no ground water monitoring for petroleum hydrocarbons was conducted after the soil cleanup.

5.2 HVOCs

Tetrachloroethylene (PCE) and its degradation products such as trichloroethylene (TCE), cis-1,2-dichloroethylene (DCE), and vinyl chloride (VC) were first detected in ground water at the Riverside HVOC Site in borings R-2, R-3, R-4, R-5, and R-10 during the 2008 Phase II investigation. These borings were completed between 12 and 20 feet bgs. Concentrations of PCE ranged from 3.9 µg/L in R-10 to 320 µg/L in R-4. TCE was detected at several locations with a maximum concentration of 140 µg/L at R-4. This concentration exceeded the MTCA Method A cleanup level of 5 µg/L for TCE.

VC exceeding the MTCA Method A cleanup level of 0.2 µg/L was detected in R-5. Monitoring wells BC-3 and BC-5 were also sampled during the 2008 Phase II investigation. PCE (110 µg/L) and TCE (120 µg/L) were detected in BC-3 at concentrations exceeding their respective MTCA Method A cleanup levels for ground water. No HVOCs were detected above laboratory reporting limits in the sample collected from BC-5.

During the 2009 RI/FS investigation, eight new monitoring wells were installed to better assess the nature and extent of the HVOC contamination previously identified at the Riverside HVOC Site. The wells were installed at depths ranging from approximately 22 to 42 feet bgs. RMW-10 was completed to approximately 42 feet bgs and was completed in the lower portion of the water-bearing zone. Monitoring wells RMW-7, RMW-8, and RMW-9 were installed to better assess migration of the HVOC plume.

Monitoring well RMW-7 is located southeast of the former property boundary. PCE (50 µg/L) and TCE (120 µg/L) were detected in RMW-7 at concentrations exceeding their respective MTCA Method A cleanup levels. VC was also detected in RMW-7 at 22 µg/L, which exceeded the MTCA Method A cleanup level. In RMW-7 cis-1,2-DCE was also detected at a concentration of 190 µg/L. RMW-8 is located east of the former property boundary. PCE and TCE were detected in RMW-8, but at concentrations below their MTCA Method A cleanup level; cis-1,2-DCE and trans-1,2-DCE were also detected at this location.

No HVOCs were detected in RMW-9, located north of the former property boundary. Only PCE was detected in RMW-10 (0.24 µg/L), but was below the MTCA Method A cleanup level. All other HVOCs were below laboratory reporting limits. Existing well BC-3 was also sampled during the 2009 RI/FS investigation. This well is located roughly 25 feet east of RMW-10. PCE (130 µg/L), TCE (120 µg/L), and cis-1,2-DCE (49 µg/L) were detected in the sample collected

from BC-3. PCE and TCE exceeded their respective MTCA Method A cleanup levels. The HVOC concentrations at BC-3 and RMW-10 varied significantly possibly indicating that these wells were completed in different water-bearing zones or that the HVOCs detected in BC-3 have not migrated vertically (downward) to reach the screened interval in RMW-10.

During the 2009 CDM remedial investigation, three borings (B14 through B16) were installed just north of the former property boundary. PCE was detected in ground water from B14 (5.9 µg/L) at concentrations exceeding MTCA Method A cleanup levels. PCE was also detected in B15 (3.9 µg/L) and B16 (0.21 µg/L), but at concentrations that did not exceed MTCA Method A cleanup levels. TCE and cis-1,2-DCE were also detected in B14 and B15.

The data up to that time suggested the source of HVOCs in ground water at the Riverside HVOC site may have been the Ultra Custom Care Cleaners site, located up-gradient approximately 200 feet north, due to the identical contaminant suite, absence of any known PCE source at or near the Riverside HVOC site, and no known use of PCE in automotive or fueling facilities (such as those formerly operating at the Riverside TPH site).

Further studies by CDM in 2011 and 2013 (CDM 2011, CDM 2013) included numerous direct push borings and one-time ground water samples between the Ultra Custom Care Cleaners site and the Riverside HVOC site, in order to delineate the Ultra Custom Care Cleaners HVOC plume. The CDM 2009 study included borings and ground water samples on private properties south of the Ultra site. Two of the borings were located down-gradient of a former cleaners, although records do not indicate if it was a dry cleaning facility. The facility was called Bothell Cleaners, located at 10029 Main Street, and operated from the 1940s to the 1960's (ECOSS, 2008). CDM's results did not indicate any HVOCs down-gradient of the former Bothell Cleaners location.

The CDM 2011 study included similar sampling along the former SR522 roadway north of the former Riverside property, including several borings and ground water samples within deep (below ground water) utility trench backfill. CDMs findings did not show a continuous pattern of HVOC detections in ground water between the Ultra and the Riverside HVOC site, nor in the utility trenches, therefore it appears the Riverside HVOC plume is either due to some unknown on site source, or possibly a small secondary release from a leaking sanitary or storm sewer, originating from the Ultra site.

Ground water monitoring was resumed in 2014 after installation of the ground water pump-and-treat system installed at the Riverside HVOC site to address HVOC impacts to ground water and surface water. Quarterly sampling of the extraction wells indicates generally decreasing HVOC concentrations with other variations in concentration which may be seasonal (Figure 9). Examination of data from RMW-7 shows a similar pattern, with elevated HVOC concentrations generally in fall or winter, corresponding with a decrease in ground water levels (Figure 10).

A soil gas investigation was conducted in January and February 2016, which included installation and analysis of 35 passive soil gas samplers at the south part of the Riverside HVOC Site. Results of this study indicated the predominant HVOC detected was PCE, which is the main contaminant of concern at the Riverside HVOC Site. The pattern of PCE detections suggest the highest relative concentrations at the northeast end of the study area, upgradient of the ground water treatment system and near RMW-12 (HWA, 2016).

A reconnaissance ground water sampling study targeting deeper ground water zones was conducted in 2017. Ground water samples were collected from areas between the known extents of the Ultra and Riverside HVOC plumes to address data gaps regarding the extent of HVOCs in deeper portions of the aquifer. The objectives of this study included delineating the southern end of the Ultra plume, determining if there is any potential upgradient source of the Riverside HVOC plume, and characterizing HVOCs at depths of 25' bgs or deeper.

Reconnaissance ground water sampling was conducted from March 20 to April 5, 2017. Ten borings were advanced to depths ranging between 40 and 45.5 feet bgs utilizing a truck mounted hollow stem auger drill rig. Reconnaissance ground water samples were collected via temporary wells installed at three separate depth intervals in each boring, a shallow (1-20 feet bgs), an intermediate (18-34 feet bgs), and a deep (35-45 feet bgs) ground water interval depth. Sampling intervals within these general ranges were selected based on occurrence of ground water, filed screening indications, and lithology (i.e., preference given to sandier, more permeable layers).

Based on the ground water analytical results obtained from this investigation, the downgradient, southern end of the HVOC plume from the Ultra Site extends further south and southeast than previously estimated, with low HVOC detections in the intermediate and deeper portions of the aquifer. The PCE concentrations decrease with distance traveled to the southeast, and with depth from the intermediate to the deeper zone. It appears that the Ultra Site HVOC plume is not likely a potential upgradient source of HVOC ground water impacts to the Riverside Site. The highest HVOC concentrations south of Main Street were detected at RMW-12 and some of the Riverside extraction wells. RMW-12 is located adjacent to the strongest anomaly detected by the soil gas survey conducted in this area, suggesting a possible HVOC source of the Riverside plume in this area.

5.3 METALS

Arsenic is not a known contaminant at either the Riverside TPH site or the Riverside HVOC site. Arsenic was detected in all four samples analyzed during the 2009 RI/FS investigation. Concentrations in both BC-5 (0.0066 mg/L) and RMW-6 (0.0051 mg/L) exceeded the MTCA Method A cleanup level of 0.005 mg/L. Arsenic concentrations in soil were below laboratory reporting limits for all soil samples collected at both sites.

Where Riverside TPH Site and Riverside HVOC Site are situated, Ecology (2015) determined a natural background of 6.6 µg/L for the Puget Sound Lowlands. Ecology has concluded that the highest beneficial use for groundwater is drinking water. Therefore, the relevant cleanup level for this site is 10 µg/L, which is the EPA's current maximum Contaminant Level (MCL) for arsenic in drinking water. The concentrations of arsenic in the groundwater detected in monitoring wells RMW6, RMW7, RMW10, BC5 are less than the cleanup level of 10 µg/L.

5.4 DATA QUALITY ASSESSMENT

Appendix D contains copies of the laboratory reports. Appendix E contains a data quality assessment. No quality control issues were identified and all reported data should be considered valid as qualified, and acceptable for further use.

6 NATURE AND EXTENT OF CONTAMINATION

6.1 RIVERSIDE TPH SITE

6.1.1 Chemicals of Concern (COCs)

Soil COCs

Based on a previous version of draft Bothell Riverside Site Remedial Investigation/ Feasibility Study (Parametrix, 2009a), chemicals of potential concern (COPCs) present in the Riverside TPH site soils prior to the interim action cleanup were lube oil-range petroleum hydrocarbons associated with the former USTs. The first Interim Action Work Plan (Parametrix, 2010) included diesel-range petroleum hydrocarbons as additional soil COPCs. Because diesel-range petroleum hydrocarbons were never detected in soils at concentrations exceeding MTCA Method A or B cleanup levels concentrations during the Phase II ESA, 2009 RI activities, or soil interim action cleanup, they should be dropped as chemicals of concern (COCs) for this RI.

Groundwater COCs

The *Interim Action Work Plan* (Parametrix, 2010) included diesel- and lube oil-range petroleum hydrocarbons and arsenic as COPCs in ground water. Because diesel-range petroleum hydrocarbons were never detected in ground water at concentrations exceeding MTCA Method A or B cleanup levels during the Phase II ESA, 2009 RI activities, or interim action cleanup, they should not be included in the COC list for the Riverside TPH site.

Arsenic should be removed from the COC list based on evidence indicating that it is naturally occurring and associated with native peat deposits in this area.

COC Summary

Based on the above listed information, COCs for the site are as follows:

- Soil - Lube oil-range total petroleum hydrocarbons
- Ground water - None

6.1.2 Extent of Contamination

Soil – Based on prior Phase II site assessments, interim actions, and RI activities described above, there are no remaining impacts to soil at this Site.

Ground water – Based on prior Phase II site assessments, interim actions, and RI activities described above, there are no remaining impacts to ground water at the TPH Site.

6.2 RIVERSIDE HVOC SITE

6.2.1 Chemicals of Concern

Soil COCs

Soil samples were analyzed for HVOCs during both the 2008 Phase II Environmental Site Assessment (ESA) (HWA, 2008) and the 2009 RI/FS (Parametrix, 2009). While some HVOC compounds were present in the ground water, none were detected at concentrations greater than the MTCA Method A cleanup levels in soil.

During HWA's 2008 Phase II ESA, PCE and TCE were detected in the soil sample from boring BC-3 at 17.5 feet bgs at 5.9 milligrams per kilogram (mg/kg). PCE was detected in the soil sample from boring R-4 at 8 feet bgs at 9 mg/kg. Both of these samples were collected from within the water-bearing zone. For the 2009 RI/FS, minimal HVOC concentrations were detected in collected soil samples. In RMW-6 cis-1,2-dichloroethene (DCE) was detected at 4.5 mg/kg at 15 feet bgs. During the 2009 CDM Phase II ESA (CDM, 2009), three borings (B14 through B16) were advanced just north of the former property. PCE was detected in B15 (0.027 mg/kg) at 10 feet bgs and B16 (0.0041 mg/kg) at 13 feet bgs. These concentrations did not exceed MTCA Method A cleanup levels.

It is likely that the low HVOC concentrations identified in soil samples are associated with ground water contamination. The locations and concentrations of HVOC contamination are consistent with areas having the highest concentrations of HVOCs in ground water.

Ground Water COCs

Based on a previous version of the *Bothell Riverside Site Remedial Investigation/Feasibility Study* (Parametrix, 2009a), chemicals of potential concern (COPCs) present in Site ground water were associated with chlorinated solvent releases. For ground water, the COPCs listed in the 2009 RI/FS included only HVOCs.

COC Summary

- Soil - None
- Ground water - HVOCs (PCE, TCE, DCE, and VC)

6.2.2 Extent of Contamination

Soil – Based on prior Phase II site assessments, interim actions, and RI activities described above, there are no remaining impacts to soil at this Site.

Ground water – Based on prior Phase II site assessments, interim actions, and RI activities described above, there are remaining impacts to ground water at this Site, and they include HVOCs PCE, TCE, DCE and VC. These impacts are being addressed by the on-going second interim action (pump & treat).

6.3 Conclusion

The two separate site boundaries which encompass the extent of contamination for the Riverside TPH site and the Riverside HVOC site as defined by the completed RI, are shown in Figures 2 and 3, which describe two separate sites that are discrete and distinct and located on different portions of the former Riverside property.

6.4 DISCUSSION & RECOMMENDATIONS

Based on the analytical results and data evaluation results presented in previous sections of this report, we recommend the Riverside site as a whole be redefined into two distinct Sites representing the TPH and HVOC contamination areas. Proposed new boundaries for the Riverside TPH Site and the Riverside HVOC Site are illustrated on Figures 2 and 3.

Separating the Riverside TPH Site from the Riverside HVOC Site is consistent with the site conceptual model for the Site as a whole, which indicates that the two contaminated areas, which are not comingled or co-located, resulted from separate and unrelated sources and releases.

Separating the two areas is a logical progression for the Riverside Site as a whole, and would have the beneficial effect of allowing the City of Bothell and Ecology to move the Sites forward independently of each other while maintaining focus on the COCs specific to each area.

This flexibility would provide Ecology the means to assign an NFA status if the TPH Site meets final cleanup goals prior to the HVOC Site. Knowing that the Sites can be closed independently of each other would provide the City of Bothell with an incentive to be pro-active in terms of in terms of remediation approach and time-frame, knowing that a portion of the site could soon be made available for redevelopment. If this occurs, then all future remedial efforts (including financial) could be applied to remediating the HVOC Site.

In addition, disassociating the TPH Site from the HVOC Site would allow both parties to focus on the specific issues pertaining to each Site, which is expected to result in greater refinement of the cleanup approaches and shorten total cleanup time-frame for the Site as a whole.

In response to Ecology's approval of this RI report and the above recommendations, the City of Bothell will submit an FS/dCAP for the TPH Site and an FS/dCAP for the HVOC Site.

7 REFERENCES

CDM, 2009, *Draft Phase II Environmental Site Assessment, City of Bothell Crossroads Redevelopment Project, Bothell, Washington,* Prepared for King County Solid Waste Division, June 26, 2009.

CDM, 2011, *Supplemental Phase II Environmental Site Assessment Former Raincheck Cleaners – Offsite Area 18304 Bothell Way NE Bothell, Washington* Prepared for King County Solid Waste Division, August 17, 2011.

CDM, 2013, *Summary of Findings Additional Plume Delineation, City of Bothell Crossroads Redevelopment Project, SR527 and SR522, Bothell, Washington,* Prepared for King County Solid Waste Division. June 10, 2013.

ECOSS (Environmental Coalition of South Seattle), 2008, *City of Bothell Revenue Development Area, Report on Tax Parcel History Through 1972*. Prepared for The King County Brownfields Program, King County Solid Waste Division, and King County Department of Natural Resources and Parks, January 2008.

GTI, 1993, *Riverside Project Activity Update, Plan of Action Completion, SR 522 and NE 180th Street*. September 8, 1993

GTI, 1994, *Groundwater Monitoring Report, SR 522 and NE 180th Street, Riverside Property, Bothell, Washington*. Prepared for Texaco Environmental Services. October 5, 1994.

HWA GeoSciences, 2007, *Arsenic In Ground Water, Bothell Downtown Redevelopment Projects Area, Bothell, Washington,* March 7, 2011.

HWA GeoSciences, 2008, *Phase II Environmental Site Assessment Riverside Property Bothell, Washington*, July 2008.

HWA GeoSciences, 2009, *Remedial Investigation And Feasibility Study Work Plan Riverside Property Bothell, Washington,* August 26, 2009.

HWA GeoSciences, 2011, *Documentation of Interim Action At Bothell Riverside Site Bothell, Washington,* February 2, 2011.

HWA GeoSciences, 2012, *Focused Feasibility Study Bothell Riverside Site Bothell, Washington,* September 5, 2012.

HWA GeoSciences, 2013, *Interim Action Work Plan Bothell Riverside Site Bothell, Washington,* January 7, 2013.

HWA, 2016, *Soil Gas Survey/ Source Investigation, Riverside HVOC Site, Bothell, Washington,* February 26, 2016.

HWA, 2017a, *Riverside TPH Site Residual Soil Excavation Report, Bothell, Washington,* May 5, 2017.

HWA, 2017b. *Further Delineation of Site Boundary for Ultra and Riverside HVOC Sites, Reconnaissance Ground Water Sampling Letter Report, Bothell, WA*, May 12, 2017

Parametrix, 2009a, *Bothell Riverside Remedial Investigation/Feasibility Study*, Revision No. 0, Prepared by Parametrix, Bellevue, Washington, November 2009.

Parametrix, 2009b. *Bothell Riverside Draft Cleanup Action Plan*, Revision No. 1. Prepared by Parametrix, Bellevue, Washington, December 2009.

Parametrix, 2010, *Interim Action Work Plan Bothell Riverside Site Revision No. 2*. Prepared for City of Bothell, April 2010.

RZA AGRA, Inc., 1992, *Site Remediation, Phase 1, Riverside Property, SR 522 and Bothell-Everett Highway, Bothell, Washington.* Prepared for Texaco Environmental Services. February 1992.

Schlumberger Water Services, 2009, Visual MODFLOW Version 2009.1, www.slb.com/services/additional/water.aspx

SEACOR, 1990, *Site Investigation, City of Bothell Riverside Property, Bothell, Washington.* Prepared for City of Bothell. October 12, 1990.

SEACOR, 1991, *Preliminary Groundwater Investigation, Riverside Property, Bothell, Washington*. Prepared for Bothell Fire Department. February 22.

U.S. EPA, 1989, *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A), Interim Final*, Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. July 1989.

Washington State Department of Ecology, 2007, *Model Toxics Control Act Cleanup Regulation, Chapter 173-340 WAC*, Publication No. 94-06, dated October 12.

Washington Department of Ecology, 2009, *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*, Washington State Department of

Ecology, Toxics Cleanup Program, Publication no. 09-09-047, Review DRAFT, October 2009.

Table 1
Summary of Method B Soil TPH Risk Calculations
Bothell Riverside Site

Release area	Former service station(s)				
TPH Type	**Lubricating oil**				
Sample	**R-TP-1-3**	**R-TP-2-3**	**R-TP-7-3**	**R-TP-8-3**	**R-TP-9-2**
Calculated Method B TPH cleanup level for direct skin contact (mg/Kg)	4,977	5,013	6,403	6,666	1,824
Most stringent soil risk criterion for direct skin contact	cPAHs mixture	Hazard Index	Hazard Index	cPAHs mixture	cPAHs mixture
Method B soil TPH concentration protective of ground water (mg/Kg)	100% NAPL[1]	100% NAPL	100% NAPL	100% NAPL	100% NAPL
Most stringent soil risk criterion for protection of ground water	Hazard Index Total risk 1E-5 cPAHs mixture	Hazard Index Total risk 1E-5 cPAHs mixture	Hazard Index Total risk 1E-5 cPAHs mixture	Hazard Index Total risk 1E-5 cPAHs mixture	Hazard Index Total risk 1E-5 cPAHs mixture
Method A soil cleanup levels (mg/Kg)	2000 (D) 2000 (O) 5 (Naphthalenes)[2] 0.10 (cPAHs TEC)[3]				

Notes:
1 - 100% NAPL means soil containing free product would not produce a TPH concentration ≥800 µg/L in ground water
2 - Sum of Napthalene + 1-Methylnaphthalene + 2-Methylnaphthalene
3 - Toxic Equivalent Concentration of carcinogenic polynuclear aromatic hydrocarbons (cPAHs) per WAC 173-340-708(e)

TABLE 2
SOIL CLEANUP ANALYTICAL RESULTS
BOTHELL RIVERSIDE SITE
(all results in milligrams per kilogram (mg/kg))

Sample Location	Sample Depth ft bgs	Confirmation Sample[1]		Diesel	Oil	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	Total Naphthalenes[2]	cPAHs TEC[3]	NOTES
		Sidewall	Bottom										
R-TP-1-3	3			<140	**1100**						**0.017**	**0.016**	Excavated
R-TP-1-7	7			<79	**440**								Excavated
R-TP-2-3	3			**130**	**820**						**0.056**	**0.009**	Excavated
R-TP-3-3	3	X		<27	<54								
R-TP-4-4	4	X		<130	**840**								
R-TP-4-6	6												
R-TP-5-3	3	X		<110	**650**								
R-TP-6-2	2	X		<75	**490**								
R-TP-6-6	6			<37	**320**								
R-TP-7-3	3			<130	**750**						**0.040**	**0.001**	Excavated
R-TP-7-7	7			<28	**160**								Excavated
R-TP-8-3	3			<160	**940**						**0.045**	**0.010**	Excavated
R-TP-8-6	6			<40	**300**								Excavated
R-TP-9-2	2			<67	**550**						**0.1439**	**0.017**	Excavated
R-TP-9-7	7			<28	**220**								Excavated
R-TP-10-4	4	X		<110	**680**								
R-TP-11-3	3			**74**	**660**								
R-TP-11-5	5			<28	<57								
R-PEX-1-4	4		X	**72**	**720**								
R-PEX-2-4	4		X	**84**	**690**								
R-PEX-3-4	4		X	**52**	**530**								
R-PEX-4-2	2	X		<94	**640**								
R-PEX-5-2	2	X		**78**	**710**								
R-PEX-6-2	2	X		<140	**1800**								
R-PEX-7-4	4		X	**81**	**710**								
2017 Residual Soil Cleanup													
R-PEX-8-11	11		X	<110	**500**	**44**	<0.080	<0.40	<0.40	**1.1**			Excavated, Sample ID REX-B1-11 in Laboratory Report
R-PEX-9-11	11		X	<110	**760**	**150**	<0.080	<0.40	<0.40	**32.58**			Excavated, Sample ID REX-B2-11 in Laboratory Report
R-PEX-10-10	10	X		<87	**300**	**420**	**0.064**	**0.097**	**0.32**	**0.64**			Excavated, Sample ID REX-1-10 in Laboratory Report
R-PEX-11-10	10	X		<70	<60	**420**	**0.089**	**0.18**	**0.44**	**1.19**			Excavated, Sample ID REX-EW-10 in Laboratory Report
R-PEX-12-5	5	X		<27	**86**	**15**	<0.020	<0.056	<0.056	<0.056			Excavated, Sample ID REX-EW-5 in Laboratory Report
R-PEX-13-10	10	X		<73	**240**	**34**	<0.020	<0.063	<0.063	<0.063			Excavated, Sample ID REX-SW-10 in Laboratory Report
R-PEX-14-5	5	X		<460	**3500**	**18**	**0.04**	<0.060	<0.060	**0.08**			Excavated, Sample ID REX-SW-5 in Laboratory Report
R-PEX-15-10	10	X		<890	<57	**3200**	**1.6**	**1.5**	**1.7**	**6.5**			Excavated, Sample ID REX-WW-10 in Laboratory Report
R-PEX-16-5	5	X		<27	<54	<5.4	<0.020	<0.054	<0.054	<0.054			Excavated, Sample ID REX-WW-5 in Laboratory Report
R-PEX-17-10	10	X		<32	<64	**11**	<0.020	<0.068	<0.068	<0.068			Sample ID REX-NW-10 in Laboratory Report
R-PEX-18-5	5	X		<27	**70**	<5.4	<0.020	<0.054	<0.054	<0.054			Sample ID REX-NW-5 in Laboratory Report
R-PEX-19-10	10	X		<37	**190**	**64**	**0.021**	<0.061	**0.23**	**0.21**			Excavated
R-PEX-20-5	5	X		**89**	**690**	<5.6	<0.020	<0.056	<0.056	<0.056			
R-PEX-21-10	10	X		<30	<60	**8.7**	<0.020	<0.061	<0.061	<0.061			
R-PEX-22-5	5	X		<27	<54	<5.7	<0.020	<0.057	<0.057	<0.057			
R-PEX-23-12.5	12.5		X	<54	<110	<15	<0.029	<0.15	<0.15	**0.28**			
R-PEX-24-12.5	12.5		X	<110	**350**	<35	<0.071	<0.35	<0.35	<0.35			
R-PEX-25-5	5	X		<27	<54	<5.5	<0.020	<0.055	<0.055	<0.055			
R-PEX-26-10	10	X		<29	<57	**12**	<0.020	<0.049	<0.049	<0.049			
R-PEX-27-5	5	X		<26	<53	<5.5	<0.020	<0.055	<0.055	<0.055			
R-PEX-28-10	10	X		<60	**270**	**86**	<0.020	<0.069	<0.069	**0.17**			Excavated
R-PEX-29-5	5	X		**150**	**1100**	**22**	<0.020	<0.061	<0.061	<0.061			
R-PEX-30-10	10	X		**110**	**450**	<5.3	<0.020	<0.053	<0.053	<0.053			
R-PEX-31-5	5	X		<27	<55	<5.9	<0.020	<0.059	<0.059	<0.059			
R-PEX-32-10	10	X		<29	<58	**39**	<0.020	<0.059	<0.059	<0.059			Excavated
R-PEX-33-6	6	X		<630	**130**	**740**	**0.59**	<0.65	**4.5**	<1.3			Excavated
R-PEX-34-8	8	X		**110**	**620**	**130**	**0.33**	<0.47	**0.48**	<0.47			Excavated
R-PEX-35-10	10'	X		<310	**1200**	**380**	**0.46**	<0.42	**2.4**	**3.35**			Excavated
R-PEX-36-5	5'	X		<27	<54	<6.0	<0.020	<0.060	<0.060	<0.060			Excavated
R-PEX-37-9	9'	X		**520**	**140**	**1500**	**0.13**	<0.65	**8.1**	<2.6			Excavated
R-PEX-38-8	8'	X		<28	<58	<5.8	<0.020	<0.058	<0.058	<0.058			
R-PEX-39-11	11'	X		**140**	**470**	**81**	**0.02**	<0.064	**0.073**	<0.064			Excavated
R-PEX-40-5	5'	X		<27	<53	<5.4	<0.020	<0.054	<0.054	<0.054			
R-PEX-41-9	9'	X		<29	<57	<5.6	<0.020	<0.056	<0.056	<0.056			
R-PEX-42-10	10'		X	<90	**490**	<42	<0.085	<0.42	<0.42	**1.6**			
R-PEX-43-11	11'		X	<60	**230**	<23	<0.045	<0.23	<0.23	<0.23			
R-PEX-44-5	5'	X		<89	**310**	<40	<0.081	<0.40	<0.40	<0.40			
R-PEX-45-9	9'	X		<31	<62	<6.3	<0.020	<0.063	<0.063	<0.063			
R-PEX-46-11	11'		X	<52	**120**	<19	<0.037	<0.19	<0.19	<0.19			
R-PEX-47-5	5'	X		<32	<65	<7.2	<0.020	<0.072	<0.072	<0.072			
R-PEX-48-10	10'	X		<30	<61	<6.4	<0.020	<0.064	<0.064	<0.064			
R-PEX-49-5	5'	X		**69**	**1100**	<4.8	**0.025**	<0.048	<0.048	<0.048			
R-PEX-50-12	12'	X		<29	<58	<6.0	<0.20	<0.060	<0.060	<0.060			
R-PEX-51-5	5'	X		**120**	**970**	<6.4	**0.023**	<0.064	<0.064	<0.064			
R-PEX-52-11	11'	X		<28	<57	<6.0	<0.020	<0.060	<0.060	<0.060			
R-PEX-53-6	6'	X		**69**	**680**	<6.1	<0.020	<0.061	<0.061	<0.061			
R-PEX-54-10	10'	X		<31	**70**	<6.1	<0.020	<0.061	<0.061	<0.061			
R-PEX-55-5	5'	X		<31	<62	<7.2	<0.020	<0.072	<0.072	<0.072			
R-PEX-56-10	10'	X		<30	**64**	<6.1	<0.020	<0.061	<0.061	<0.061			
R-PEX-57	11'		X	<29	**76**	<5.6	<0.020	<0.056	<0.056	<0.056			
R-PEX-58-9	9'	X		<30	<59	<6.0	<0.020	<0.060	<0.060	<0.060			
R-PEX-59-9	9'	X		<31	<62	<6.3	<0.020	<0.063	<0.063	<0.063			
R-PEX-60-11	11'		X	<31	**120**	<6.7	<0.020	<0.067	<0.067	<0.067			
2017 Residual Soil Cleanup Backfill													
Backfill #1	NA	NA	NA	<27	**240**	<4.2	<0.020	<0.042	<0.042	<0.042			January 2017, Soil rejected, this backfill not used
Backfill #2	NA	NA	NA	<27	<55	<4.3	<0.020	<0.043	<0.043	<0.043			January 2017, second backfill source acecpted
Backfill #4	NA	NA	NA	<26	<53	<5.6	<0.020	<0.056	<0.056	<0.056			March 2017 backfill, accepted
Backfill #5	NA	NA	NA	<26	<53	<6.5	<0.020	<0.065	<0.065	<0.065			March 2017 backfill, accepted
Backfill #6	NA	NA	NA	<27	<53	<6.0	<0.020	<0.060	<0.060	<0.060			March 2017 backfill, accepted
Stockpile													
R-TP-1-3	3			<140	**1100**						**0.017**	**0.016**	
R-TP-2-3	3			**130**	**820**						**0.056**	**0.009**	
R-TP-5-3	3			<110	**650**								
R-TP-6-2	2			<75	**490**								
R-TP-7-3	3			<130	**750**						**0.040**	**0.001**	
R-TP-9-2	2			<67	**550**						**0.1439**	**0.017**	
MTCA Method A Cleanup Level[4]				2000		100/30[4]	0.03	7	6	9	5	0.100	
MTCA Method B Cleanup Level[5]				1824		84							

Notes:
< - Not detected at laboratory's reporting limit
Blank - Sample was not analyzed for this constituent
NA - Not applicable
Bold - Analyte Detected
Bold/Highligh - Analyte detected above MTCA Method A soil cleanup level
- Sample in area that was subsequently excavated
1 - Confirmation that soil remaining in place meets MTCA cleanup levels
2 - Sum of Naphthalene + 1-Methylnaphthalene + 2-Methylnaphthalene
3 - Toxic Equivalent Concentration of carcinogenic polynuclear aromatic hydrocarbons (cPAHs) per WAC 173-340-708(e)
4 - Washington Model Toxics Control Act Method A (Table 740-1) soil cleanup levels for unrestricted land use
5 - Method B TPH cleanup levels are site specific values calculated using MTCATPH1.1

Table 3
Bothell Riverside Site
Ground Water Analytical Results

			FIELD PARAMETERS							HVOCs					NOTES
Monitoring Well Identification	Screened Interval (ft bgs)	Date Sampled	Depth to Water (ft below MP)	pH (units)	Conductivity (µS)	Temp (°C)	Dissolved Oxygen (mg/L)	Oxygen Reduction Potential (ORP)	Settable Solids (mg/L)	Tetrachloro-ethene (µg/L)	Trichloro-ethene (µg/L)	(cis) 1,2-Dichloro-ethene (µg/L)	(trans) 1,2-Dichloro-ethene (µg/L)	Vinyl chloride (µg/L)	
		Cleanup Levels*								**0.69**	**2.5**	**16 (B)**	**100 (B)**	**0.2**	
		KCIWD Limits							**7.00**	**240**	**500**	**Total <2000**		**12**	
		6/24/14													Wellhead buried under new landscaping
		12/19/14	12.2	6.59	1183	14.6	1.70			**0.79**	**0.33**	<0.20	<0.20	<0.20	
		6/23/15	13.09	5.76	987	17.67	0.00	-125.70		**0.52**	**0.72**	<0.20	<0.20	<0.20	
RMW-4	**15-25**	12/8/15	11.95	5.99	510	14.9	0.00	-69.90		**2.2**	**0.56**	<0.20	<0.20	<0.2	
		6/29/16	12.22	5.17	400	15.31	4.22	91.50		**3.6**	**0.46**	<0.20	<0.20	<0.20	
		12/21/16	11.48	6.2	293.5	14.5	0.43	0.00		**4.3**	**0.51**	<0.20	<0.20	<0.20	
		6/28/17	11.48	6.41	225	14.65	1.57	65.3		**3.9**	**0.49**	<0.20	<0.20	<0.20	
		5/24/13	11.51	6.70	932	13.9	1.00			**1.7**	<0.2	<0.2		<0.20	
		6/24/14	14.51	6.48	740	14.5	0.15			**1.4**	**0.40**	<0.20	<0.20	<0.20	
		12/19/14	13.61	6.28	1226	13.3	0.55			**1.3**	**0.32**	**0.22**	<0.20	<0.20	
RMW-5	**12-22**	6/23/15	14.26	6.28	953	16.1	0.00	-127.10		**0.66**	**0.36**	<0.20	<0.20	<0.20	
		12/8/15	13.29	5.83	318	14.54	18.61	-90.40		**1.6**	<0.20	<0.20	<0.20	<0.2	
		6/29/16	13.41	6.18	356	14.43	1.71	-2.00		**1.1**	**0.31**	<0.20	<0.20	<0.20	
		12/22/16	13.01	6.48	483.9	13.7	0.27	-106.2		**1.0**	<0.20	**0.23**	<0.20	<0.20	
		6/29/17	13.26	6.65	0.438	13.85	0.46	-89.3		**2.0**	<0.20	<0.20	<0.20	<0.20	
		9/14/09								<0.2	**0.27**	**3.6**		**5.3**	
		5/24/13	10.42	6.68	467	14.3	1.40			<0.2	<0.2	**2.7**		**3.4**	
		6/24/14	14.79	6.47	407	14.2	0.13			**0.34**	**0.60**	**0.42**	<0.20	<0.20	
		12/19/14	13.31	6.09	294	14.3	0.82			**0.47**	<0.20	<0.20	<0.20	<0.20	
RMW-6	**15-25**	6/23/15	13.65	6.12	283	15.2	0.00	8.00		<0.20	**1.4**	**0.88**	<0.20	<0.20	
		12/8/15	12.46	6.00	232	14.99	0.00	-40.10		<0.2	**2.7**	**1.0**	<0.20	<0.20	
		6/29/16	13.14	6.39	194	15.34	1.64	35.50		<0.20	**2.5**	**1.3**	<0.20	<0.20	
		12/21/16	12.21	6.47	179.8	14.8	0.57	88.20		<0.20	**0.39**	**0.5**	<0.20	<0.20	
		6/28/17	12.68	6.60	171	14.21	1.11	140.50		<0.20	**0.41**	**0.3**	<0.20	<0.20	
		9/14/09								**50**	**120**	**190**		**22**	
		5/24/13	16.31	6.80	447	16.2	0.30			**9**	**33**	**65**		**9.3**	
		4/4/14	16.65	6.50	1969	12.9	0.55			**0.75**	**3.8**	**35**	**0.54**	**8.3**	
		6/25/14	16.55	6.48	865	15.2	0.03			**5.2**	**24**	**80**	**1.1**	**9.9**	
		9/22/14	17.54	6.96	386	18.2	5.25			<1.0	**3.2**	**170**	**1.6**	**47**	
		12/19/14	17.49	6.06	683	15.4	0.73			**2.9**	**8.9**	**150**	**1.4**	**34**	
		3/18/15	16.66	6.35	1127	14.9	1.87			<0.40	**1.5**	**57**	**0.64**	**20**	
		6/23/15	17.41	5.97	508	17.96	0	-70.3		<0.40	**3.1**	**95**	**1.2**	**9.6**	
RMW-7	**15-25**	9/11/15	18.50	6.22	464	21.54	3.23			**4.2**	**23**	**110**	**1.4**	**14**	
		12/8/15	15.97	5.96	274	15.92	0.00	-12.3		**3.5**	**8.7**	**85**	**0.87**	**9.0**	
		3/31/16	16.94	6.40	403	14.63	2	38.9		**1.5**	**6.8**	**84**	**0.91**	**35**	
		6/29/16	17.11	6.28	297	16.57	1.2	30.3		**2.3**	**14**	**65**	**0.68**	**12**	
		9/30/16	18.28	6.12	419	16.81	0.69	31.3		**2.4**	**7.8**	**89**	<1.0	**13**	
		12/22/16	15.89	6.34	368.4	15.8	0.19	-34.1		**1.1**	**4.1**	**88**	**0.93**	**24**	
		4/5/17	16.43	6.26	318.9	13	0.3	19.5		**1.2**	**2.4**	**12**	<0.20	**0.86**	
		6/28/17	16.65	6.50	283	15.49	0.78	5.9		**1.3**	**1.9**	**33**	**0.5**	**1.9**	
		10/10/17	18.26	6.33	438	17.38	3.18	176.6		**1.0**	**2.3**	**47**	**0.67**	**25**	
		9/15/09								**0.46**	**2.6**	**1.3**		<0.2	
		5/24/13	18.81	6.42	494	16.4	0.10			**0.5**	**0.85**	**0.44**		<0.2	
		6/25/14	19.62	6.27	650	15.7	0.20			<0.20	<0.20	<0.20	<0.20	<0.20	
		12/19/14	20.63	6.18	431	14.5	0.84			**0.7**	<0.20	<0.20	<0.20	<0.20	
RMW-8	**20-30**	6/23/15	20.87	5.74	333	26.9	0.27	-61.20		<0.20	<0.20	<0.20	<0.20	<0.20	
		12/8/15	19.42	5.83	344	15.15	1.51	44.30		<0.2	**0.39**	**0.47**	<0.20	<0.2	
		6/29/16	20.5	6.27	216	17.47	2.05	32.00		<0.20	<0.20	<0.20	<0.20	<0.20	
		12/22/16	20.58	6.13	297.3	14.6	0.31	32.80		**0.31**	**0.66**	**0.37**	<0.20	<0.20	
		6/28/17	19.73	6.21	213	16.03	0.84	120.90		<0.20	<0.20	<0.20	<0.20	<0.20	
		9/15/09								<0.20	<0.20	<0.20		<0.20	
RMW-9		5/24/13	13.65	6.38	247	15.7	4.00			<0.20	<0.20	<0.20		<0.20	
		6/24/14											<0.20		Well abandoned during SR 522 construction
		12/19/14	15.31	6.16	182	15.7	2.92			**0.79**	<0.20	<0.20	<0.20	<0.20	
	20-30	6/23/15	4.00	5.93	139	18.7	4.20	70.40		<0.20	<0.20	<0.20	<0.20	<0.20	
RMW-9R		12/8/15	15.92	5.75	163	15.61	3.29	94.30		<0.2	<0.2	<0.2	<0.20	<0.2	
		6/29/16	15.31	6.53	132	15.91	11.2	94.90		<0.20	<0.20	<0.20	<0.20	<0.20	
		12/22/16	14.78	6.19	151	16	7.68	85.30		<0.20	<0.20	<0.20	<0.20	<0.20	
		6/29/17	13.55	6.06	0.103	16.75	7.95	122.10		<0.20	<0.20	<0.20	<0.20	<0.20	
		5/24/13	11.85	6.52	247	13.3	6.60			<0.20	<0.20	<0.20		<0.20	
		6/24/14	15.00	6.19	361	15.4	1.08			<0.20	<0.20	<0.20	<0.20	<0.20	
		12/19/14	14.80	6.08	284	15.0	2.03			**0.69**	<0.20	<0.20	<0.20	<0.20	
RMW-10	**32-42**	6/23/15	20.40	6.43	233	17.3	7.28	37.00		<0.20	<0.20	<0.20	<0.20	<0.20	
		12/8/15	19.69	5.94	134	14.69	5.41	50.00		<0.2	<0.2	<0.2	<0.20	<0.2	
		6/29/16	13.6	6.68	166	15.83	8.35	29.20		<0.20	<0.20	<0.20	<0.20	<0.20	
		12/21/16	13.63	6.31	152.4	14.3	3.25	133.8		<0.20	<0.20	<0.20	<0.20	<0.20	
		6/28/17	14.05	6.6	207	15.4	2.83	112.6		<0.20	<0.20	<0.20	<0.20	<0.20	
		7/25/16	16.25	6.3	0.442	17.68	1.53	21.7		**120**	**19**	**14**	<1.0	<1.0	
RMW-12	15-25	12/21/16	13.1	5.9	305	15	0.25	103.3		**61**	**14**	**21**	**0.34**	**1.6**	
		6/28/17	13.1	6.09	368	14.54	1.87	144.8		**130**	**27**	**29**	<1.0	<1.0	
		7/25/16	14.95	5.19	0.333	17.4	2.5	183.5		<0.20	<0.20	**1.8**	<0.20	**0.24**	
RMW-13	15-25	12/22/16	16.61	6.36	351.4	16.0	0.16	-8.2		<0.20	<0.20	**1.2**	<0.20	<0.20	
		6/28/17	15.23	6.42	448.0	14.7	0.71	25.3		<0.20	<0.20	**0.5**	<0.20	<0.20	
		9/5/08								**110**	**120**	**46**		<1	
		5/24/13	12.95	6.55	342	15.1	4.00			**25**	**11**	**4**		<0.20	
		6/24/14	14.41	6.06	426	14.8	2.40			**11**	**4.0**	**0.75**	<0.20	<0.20	
		12/19/14	15.61	6.07	298	14.8	1.82			**7.7**	**2.1**	**0.44**	<0.20	<0.20	
BC-3	**15-25**	6/23/15	18.30	5.68	161	21.2	364.00	123.40		**3.8**	**0.9**	<0.20	<0.20	<0.20	
		12/8/15	15.3	5.59	248	15.17	6.05	120.80		**5.3**	**1.3**	**0.29**	<0.20	<0.20	
		6/29/16	16.95	5.9	167	15.84	6.97	52.20		**3.7**	**0.93**	<0.20	<0.20	<0.20	
		12/21/16	14.25	5.9	245.6	14.6	1.48	175.8		**5.9**	**1.5**	**0.57**	<0.20	<0.20	
		6/28/17	16.43	6.04	265	14.86	3.67	147.6		**6.8**	**1.9**	**0.8**	<0.20	<0.20	
		4/4/14	27.90							**17**	**3**	**1.2**		<0.20	
		6/25/14	14.78	6.61	0.10	18.3	5.68			**27**	**8.1**	**6.5**	<0.20	<0.20	
		9/22/14													Pump not working
		12/19/14		6.42	107	17.3	4.99			**21**	**2.6**	**0.82**	<0.20	<0.20	
		3/18/15		7.01	167	15.9	3.65			**2.8**	**0.27**	<0.20	<0.20	<0.20	
		6/23/15								**22**	**2**	**0.95**	<0.20	<0.20	
		9/11/15	15.86	6.01	160	19.54	2.99	-49.88		**41**	**2.2**	**0.79**	<0.20	<0.20	
EW-1	**12.5-32.5**	12/8/15													Pump not working
		3/31/16		6,27	227	15.94	6.55	80.2		**22**	**2.8**	**2.5**	<0.20	<0.20	
		6/29/16		6.37	192	16.7	8.1	47.5		**24**	**4.2**	**4.5**	<0.20	<0.20	
		9/30/16		5.63	193	14.21	4.1	90.1		**20**	**2.0**	**2.3**	<0.20	<0.20	
		1/5/17		6.64	315	12.05	4.6	47.3		**1.1**	<0.20	<0.20	<0.20	<0.20	
		4/5/17		5.89	368.2	15.9	2.34	136		**13**	**1.2**	**0.85**	<0.20	<0.20	
		6/29/17		6.44	192	18.11	3.17	128.3		**8.9**	**0.77**	**0.7**	<0.20	<0.20	
		10/10/17		6.49	226	15.28	7.34	298.8		**15**	**0.81**	**0.5**	<0.20	<0.20	
		4/4/14	23.70							**13**	**2.8**	**1.5**		<0.20	
		6/25/14	17.10	6.58	143	16.5	2.21			**28**	**3.8**	**1.5**	<0.20	<0.20	
		9/22/14								**66**	**16**	**12**	<0.40	<0.40	
		12/19/14		7.01	204	15.8	2.31			**44**	**12**	**12**	<0.40	<0.40	
		3/18/15		6.87	251	15.0	2.16			**22**	**6.5**	**4.3**	<0.20	<0.20	
		6/23/15								**8.6**	**2.4**	**1.8**	<0.20	<0.20	
EW-2	**15-35**	9/11/15	19.89	6.11	235	19.9	2.84	-56.8		**6.5**	**0.62**	<0.20	<0.20	<0.20	
		12/8/15		5.92	201	15.12	2.43	595.1		**16**	**2.6**	**2.4**	<0.20	<0.20	
		3/31/16		5.75	218	15,21	8.58	129.9		**16**	**4.0**	**3.7**	<0.20	<0.20	
		6/29/16		6.46	185	15.75	6.85	48.3		**17**	**4.1**	**3.2**	<0.20	<0.20	
		9/30/16		5.94	191	14.24	3.97	73.9		**21**	**6.2**	**5.6**	<0.20	<0.20	
		1/5/17		6.67	192	12.08	3.8	31.3		**24**	**3.6**	**1.7**	<0.20	<0.20	
		4/5/17		6.38	258.7	16.2	5.08	123.4		**11**	**3.2**	**2.2**	<0.20	<0.20	
		6/29/17		6.51	185	19.5	2.5	125.6		**16**	**4.8**	**3.6**	<0.20	<0.20	
		10/10/17		6.73	215	16.35	6.2	300.9		**3.0**	**0.45**	**0.23**	<0.20	<0.20	

Monitoring Well Identification	Screened Interval (ft bgs)	Date Sampled	Depth to Water (ft below MP)	pH (units)	Conductivity (µS)	Temp (°C)	Dissolved Oxygen (mg/L)	Oxygen Reduction Potential (ORP)	Settable Solids (mg/L)	Tetrachloro-ethene (µg/L)	Trichloro-ethene (µg/L)	(cis) 1,2-Dichloro-ethene (µg/L)	(trans) 1,2-Dichloro-ethene (µg/L)	Vinyl chloride (µg/L)	
		4/4/14	23.80							**49**	**14**	**7.2**		**0.61**	
		6/25/14	19.00	6.58	182	16.4	6.34			**41**	**14**	**12**	<0.40	<0.40	
		9/22/14								**190**	**59**	**33**	<1.0	**1.10**	
		12/19/14		6.82	275	15.9	6.02			**21**	**6.4**	**6**	<0.20	<0.20	
		3/18/15		6.78	322	15.4	5.47			**140**	**46**	**29**	<1.0	<1.0	
		6/23/15								**87**	**24**	**9**			
		9/11/15	20.86	6.56	354	19.89	2.53	-65.78		**81**	**28**	**14**	<0.40	<0.40	
EW-3	**14-34**	12/8/15		5.82	247	16.59	2.36	160		**33**	**11**	**7.8**	<0.20	**0.38**	
		3/31/16		6.20	358	19.57	2.28	87.5		**72**	**21**	**16**	<0.20	**0.64**	
		6/29/16		6.28	304	19.37	6.51	45.9		**79**	**24**	**14**	<0.40	**0.43**	
		9/30/16		5.84	386	18.59	1.11	51.7		**50**	**18**	**10**	<0.20	**0.63**	
		1/5/17		6.37	319	13.32	2.6	27.5		**95**	**30**	**20**	<0.40	**0.46**	
		4/5/17		5.99	434.8	18.7	1.21	105.6		**150**	**57**	**30**	<1.0	**1.3**	
		6/29/17		6.27	330	26.59	2.65	133		**270**	**79**	**59**	<1.0	**1.4**	
		10/10/17		6.38	305	18.4	6.17	221.5		**69**	**25**	**16**	<0.40	**0.41**	
		4/4/14	12.50												Pump not working
		6/25/14	17.30	6.46	0.22	16.0	1.73			**1.7**	**1.8**	**1.1**	<0.20	**0.38**	
		9/22/14								**45**	**10**	**7.4**	<0.20	**0.87**	
		12/19/14		6.68	105	16.6	1.99			**1.2**	**1.6**	**1.1**	<0.20	**0.27**	
		3/18/15								**15**	**4.8**	**3.2**	<0.20	<0.20	
		6/23/15								**0.85**	**2.8**	**1.7**	<0.20	**0.37**	
		9/11/15	18.84	6.23	125	19.22	2.55	-65.32		**1.8**	**2.1**	**0.92**	<0.20	**0.28**	
EW-4	**11-31**	12/8/15		5.84	424	22.04	0	214		<0.20	**1.6**	**2.9**	<0.20	**0.85**	
		3/31/16		6.61	354	15.91	1.47	2.0		<0.20	**2.5**	**2.0**	<0.20	**0.31**	
		6/29/16		6.54	344	19.19	6.99	33.0		<0.20	**1.2**	**3.5**	<0.20	**0.61**	
		9/30/16		8.14	373	17.05	0.95	12.0		<0.20	**0.88**	**4.0**	<0.20	**0.75**	
		1/5/17		6.67	325	12.21	1.8	-67.9		**0.33**	**3.2**	**1.8**	<0.20	**0.29**	
		4/5/17		6.37	409.2	15.9	0.82	-12.2		**0.2**	**3**	**1.7**	<0.20	**0.25**	
		6/29/17		6.73	343	19.88	1.12	-47.6		<0.20	**0.9**	**2.6**	<0.20	**0.24**	
															Pump not working
		1/5/17		6.61	270	12.71	1.29	-45.1		**5.0**	**4.0**	**9.4**	<0.20	**2.5**	
EW-5	**15-35**	4/5/17		6.27	511.9	14.8	1.22	23.9		**6.9**	**5.2**	**15.0**	**0.28**	**3.8**	
		6/29/17		6.58	239	18.98	4.41	66.7		**8.6**	**3.8**	**10**	<0.20	**0.49**	
		10/10/17		6.58	350	18.81	2.65	262.6		**0.36**	**0.94**	**8.6**	<0.20	**1.8**	
		1/5/17		6.62	166	4.13	5.65	-17.8		**2.4**	**0.54**	<0.20	<0.20	<0.20	
EW-6	**15-35**	4/5/17		6.2	252.7	15.2	2.47	60.2		**2.1**	**0.94**	**1.2**	<0.20	<0.20	
		6/29/17		6.67	280	20.23	4.05	29.5		**0.56**	**0.63**	**2.0**	<0.20	**0.31**	
		10/10/17		6.56	274	17.42	2.68	289.3		**20**	**7.2**	**18**	**0.2**	**0.46**	
		4/4/14	NA	6.48	443	15.3				**25**	**6.3**	**3**	<0.20	<0.20	
		6/25/14	NA	6.40	200	16.4	1.43		0.0	**30**	**8.4**	**5.9**	<0.20	**0.38**	
		9/22/14	NA						0.2	**79**	**18**	**13**	<0.40	<0.40	
		12/18/14	NA							**11**	**2.7**	**2.5**	<0.20	<0.20	
		3/18/15	NA	6.54	230	15.1	1.89		0.1	**25**	**7.4**	**4.7**	<0.20	<0.20	
		6/23/15	NA							**11**	**2.3**	**1.5**	<0.20	<0.20	
		9/11/15	NA	6.23	245	20.55	2.68	-65.3	0	**7.9**	**1.5**	**0.77**	<0.20	<0.20	
DISCH	**NA**	12/8/15	NA	6.15	267	17.2	3.9	18		**68**	**21**	**15**	**0.23**	**0.91**	
		3/31/16	NA	6.57	261	16.26	6.78	50.6		**21**	**5.5**	**4.4**	<0.20	<0.20	
		6/29/16	NA	6.71	214	16.83	6.14	13.7		**24**	**5.7**	**4.6**	<0.20	<0.20	
		9/30/16	NA	6.39	219	14.52	2.9	20.6		**16**	**4.4**	**3.6**	<0.20	**0.22**	
		1/5/17								**27**	**8.6**	**5.3**	<0.20	**0.23**	
		4/5/17								**5.4**	**2.3**	**2.4**	<0.20	**0.32**	
		6/29/17		6.49	235	19.32	2.9	57.6		**15**	**4.6**	**6.5**	<0.20	**0.3**	
		10/10/17		6.52	260	16.75	2.25	302.6		**11**	**3.3**	**6.8**	<0.20	**0.21**	
QC Samples			**FIELD PARAMETERS**							**HVOCs**					**NOTES**
DUP 6/25/14		6/25/14								**28**	**8.4**	**6.4**	<0.20	**0.37**	Duplicate of DISCH 6/25/14
DUP 12/19/14		12/19/14								**0.92**	<0.20	<0.20	<0.20	<0.20	Duplicate of RMW-8 12/19/2014
Trip Blank		6/25/14								<0.20	<0.20	<0.20	<0.20	<0.20	
DUP 9/22/14		9/22/14								**66**	**16**	<0.40	<0.40	<0.40	Duplicate of EX2 9/22/2014
Trip Blank		3/18/15								<0.20	<0.20	<0.20	<0.20	<0.20	
DUP		3/18/15								<0.40	**1.0**	**54**	**0.65**	**19**	Duplicate of RMW-7 3/18/2015
Trip Blank		9/11/15								<0.20	<0.20	<0.20	<0.20	<0.20	
DUP		9/11/15								**23**	1.7	**0.62**	<0.20	<0.20	
Trip Blank		12/8/15								<0.2	<0.2	<0.2	<0.20	<0.2	
DUP		12/8/15								**2.8**	**0.6**	<0.2	<0.2	<0.2	Duplicate of RMW-4 12/8/15
Trip Blank		12/22/16								<0.20	<0.20	<0.20	<0.20	<0.20	
DUP		12/22/16								<0.20	<0.20	**1.2**	<0.20	<0.20	
Trip Blank		6/28/17								<0.20	<0.20	<0.20	<0.20	<0.20	
DUP		6/28/17								**1.2**	**2**	**35**	**0.53**	**1.8**	Duplicate of RMW-7 6/28/17
Trip Blank		10/10/17								<0.20	<0.20	<0.20	<0.20	<0.20	
DUP		10/10/17								**2.6**	**0.37**	**0.22**	<0.20	<0.20	Duplicate of EW-2 10/10/17

Bold indicates analyte detected at a concentration greater than the laboratory reporing limit

Yellow highlight indicates analyte exceeds MTCA cleanup level

*Cleanup Levels:

Tetrachloroethene: Surface Water Applicable or Relevant and Appropriate Requirements (ARARs)- Human Health - Fresh Water - Clean Water Act § 304

Trichloroethene: Surface Water ARARs- Human Health - Fresh Water - Clean Water Act § 304

1,1- Dichloroethene:

(cis) 1,2- Dichloroethene: Ground Water, Method B, Non-carcinogen, Standard Formula Value

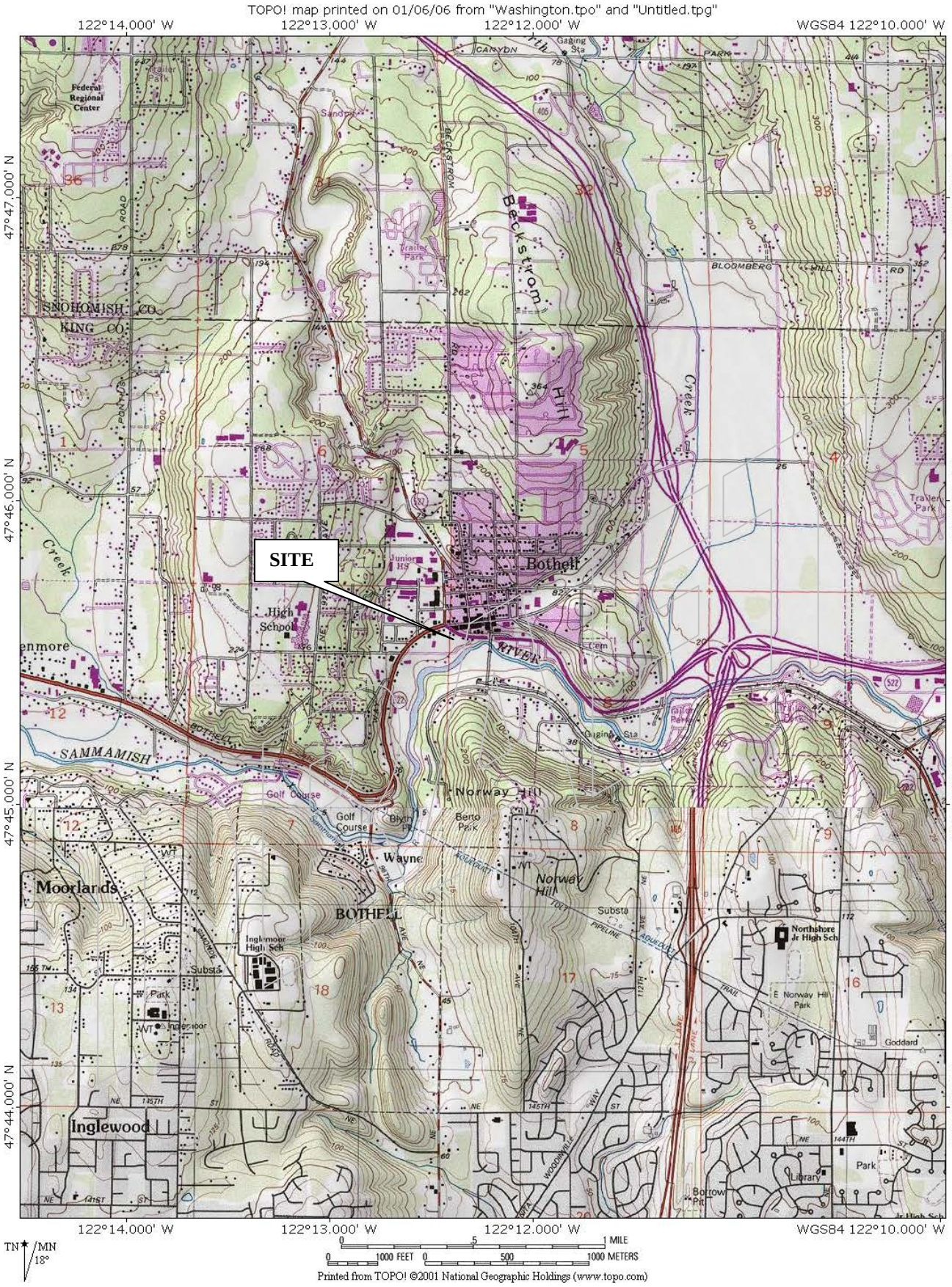
(trans) 1,2- Dichloroethene: Ground Water ARAR - State Primary Maximum Contaminant Level

Vinyl chloride: Practical Quantitation Limits / Reporting Limits Achievable by Local Accredited Labs

KCIWD = King County Industrial Waste Discharge limit

Blank – Not analyzed

NA – Not applicable



SITE VICINITY

FIGURE NO.
1

HWA GEOSCIENCES INC.

BOTHELL RIVERSIDE RI REPORT
BOTHELL, WASHINGTON

PROJECT NO.
2007-098

EXPLANATION OF SYMBOLS

- MW — AREA WIDE WELLS MONITORED
- UCCMW — ULTRA CUSTOM CARE CLEANERS WELL MONITORED
- MW — RIVERSIDE WELLS MONITORED
- MW — BOTHELL PAINT WELLS MONITORED
- MW — WELLS NOT MONITORED
- MW — DECOMMISSIONED WELLS
- SB — SOIL BORINGS
- CLEANUP CONFIRMATION SOIL SAMPLE > MTCA
- SOIL CLEANUP AREAS
- SITE
- HVOC PLUMES
- ORIGINAL PARCELS
- NEW PARCELS

N W E S

0 25 50 75 100

SR-527 BOTHELL WAY NE

NE 183rd ST

MAIN ST

ULTRA CUSTOM CARE CLEANERS

Ultra Custom Care Cleaners HVOC Plume

BOTHELL HERTZ SITE AND ARSENIC INSTITUTIONAL CONTROL AREA

BOTHELL SERVICE CENTER

BOTHELL LANDING SITE TPH INSTITUTIONAL CONTROL AREA

Bothell Service Center HVOC Plume

Riverside HVOC Plume

BOTHELL PAINT ARSENIC AND TPH INSTITUTIONAL CONTROL AREA

LOT D

BOTHELL LANDING

LOT E F G

LOT C

CITY ROW

CITY PARCEL

BOTHELL PAINT

BOTHELL HERTZ

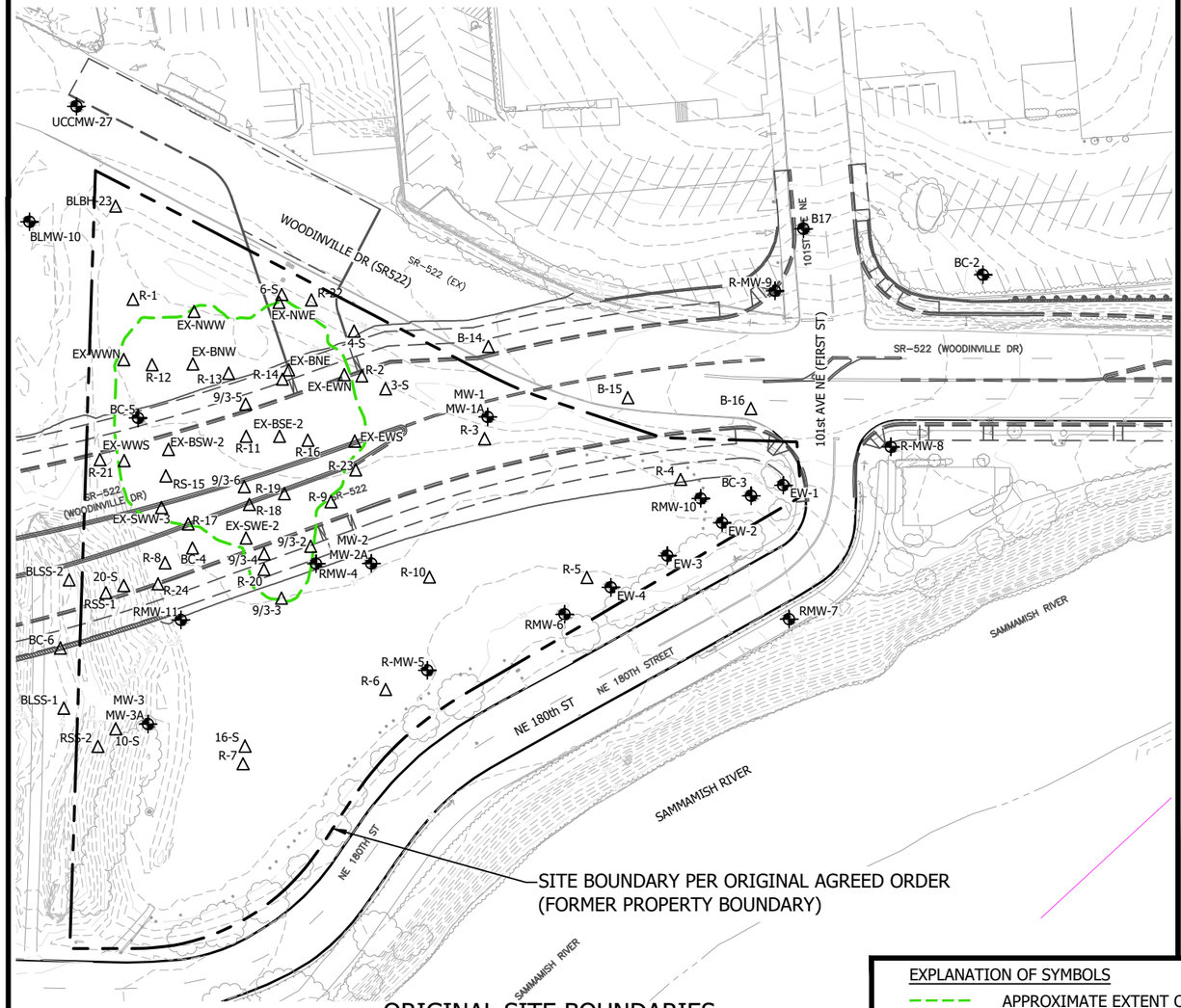
BOTHELL LANDING ARSENIC INSTITUTIONAL CONTROL AREA

RIVERSIDE TPH SITE

RIVERSIDE HVOC SITE

HWA GeoSciences Inc.	BOTHELL RIVERSIDE RI REPORT BOTHELL WASHINGTON	VICINITY MAP	DRAWN BY BFM CHECK BY NN DATE FIGURE NO. 2 PROJECT NO. 2007-098 T2020

S:\2007 PROJECTS\2007-098-22 BOTHELL CROSSROADS\CAD 2007-098\12.15.2017\HWA 2007-098-21 T2020 (FIG 2).DWG <Fig 2> Plotted: 12/17/2017 10:43 AM



ORIGINAL SITE BOUNDARIES
(AS DEPICTED IN THE AGREED ORDER)

FINIAL SITE BOUNDARIES
(AS DEFINED IN THE RI REPORT)

EXPLANATION OF SYMBOLS

- APPROXIMATE EXTENT OF 2010-2017 CLEANUP EXCAVATION
- APPROXIMATE PROPERTY BOUNDARY
- SITE BOUNDARY
- R-8 SOIL BORING OR TEST PIT LOCATIONS
- R-MW-10 MONITORING WELL LOCATIONS

N

0' 30' 60' 120'
SCALE: 1"=60'

HWA GEOSCIENCES INC.

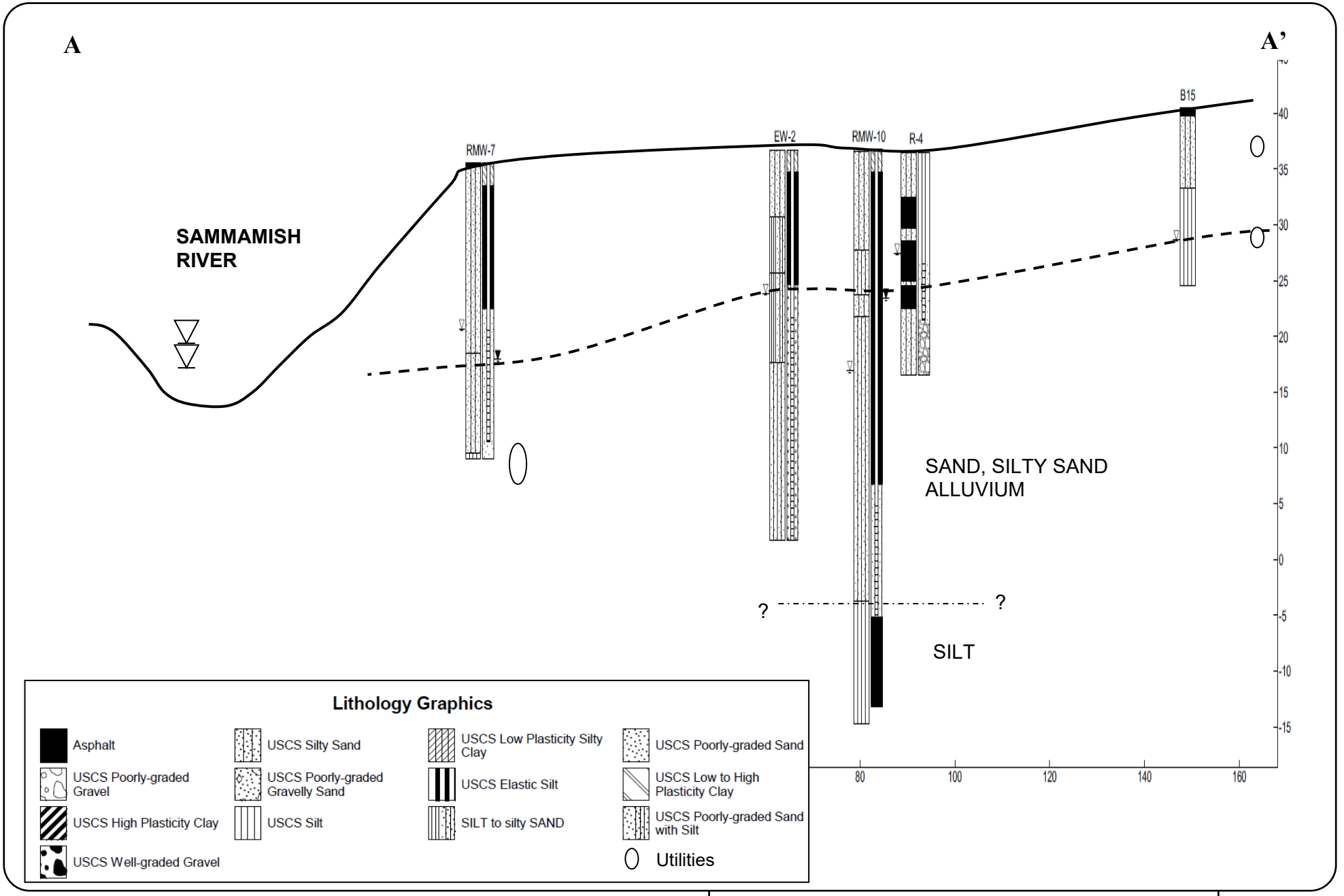
BOTHELL RIVERSIDE RI REPORT
BOTHELL, WASHINGTON

SITE BOUNDARIES

DRAWN BY BFM
CHECK BY AS
DATE 09.23.15

FIGURE NO. 3
PROJECT NO. 2007-098 T2018

S:\2007 PROJECTS\2007-098 22 BOTHELL CROSSROADS\CAD 2007-098\12.15.2017\HWA 2007-098-21 T2018 (FIG 3A).DWG <Riverside HVOC Fig 3A> Plotted: 12/17/2017 12:32 PM



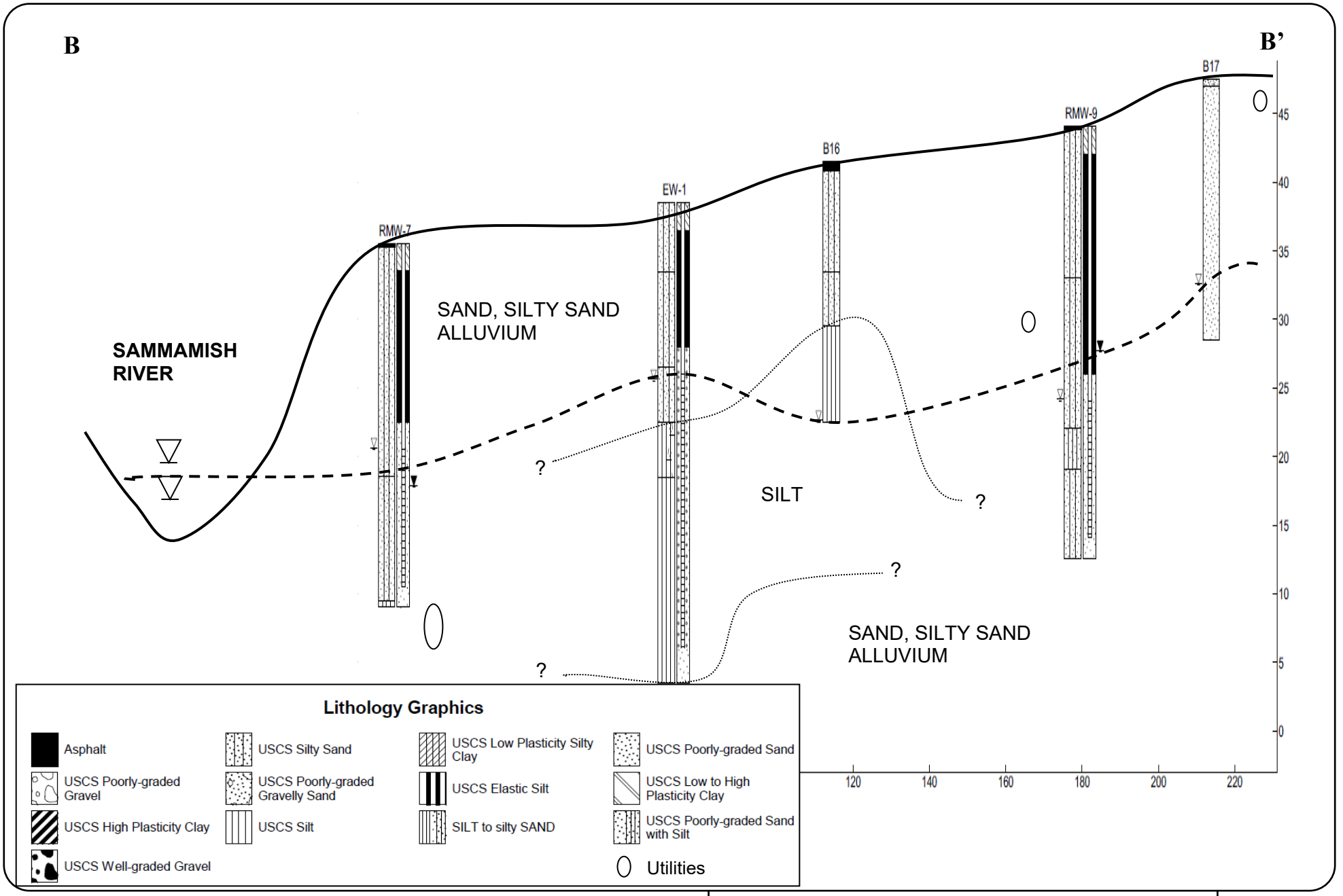
HWA GeoSciences Inc.

CROSS SECTION A-A"

BOTHELL RIVERSIDE RI REPORT
BOTHELL, WASHINGTON

FIGURE NO.
4

PROJECT NO.
2007-098



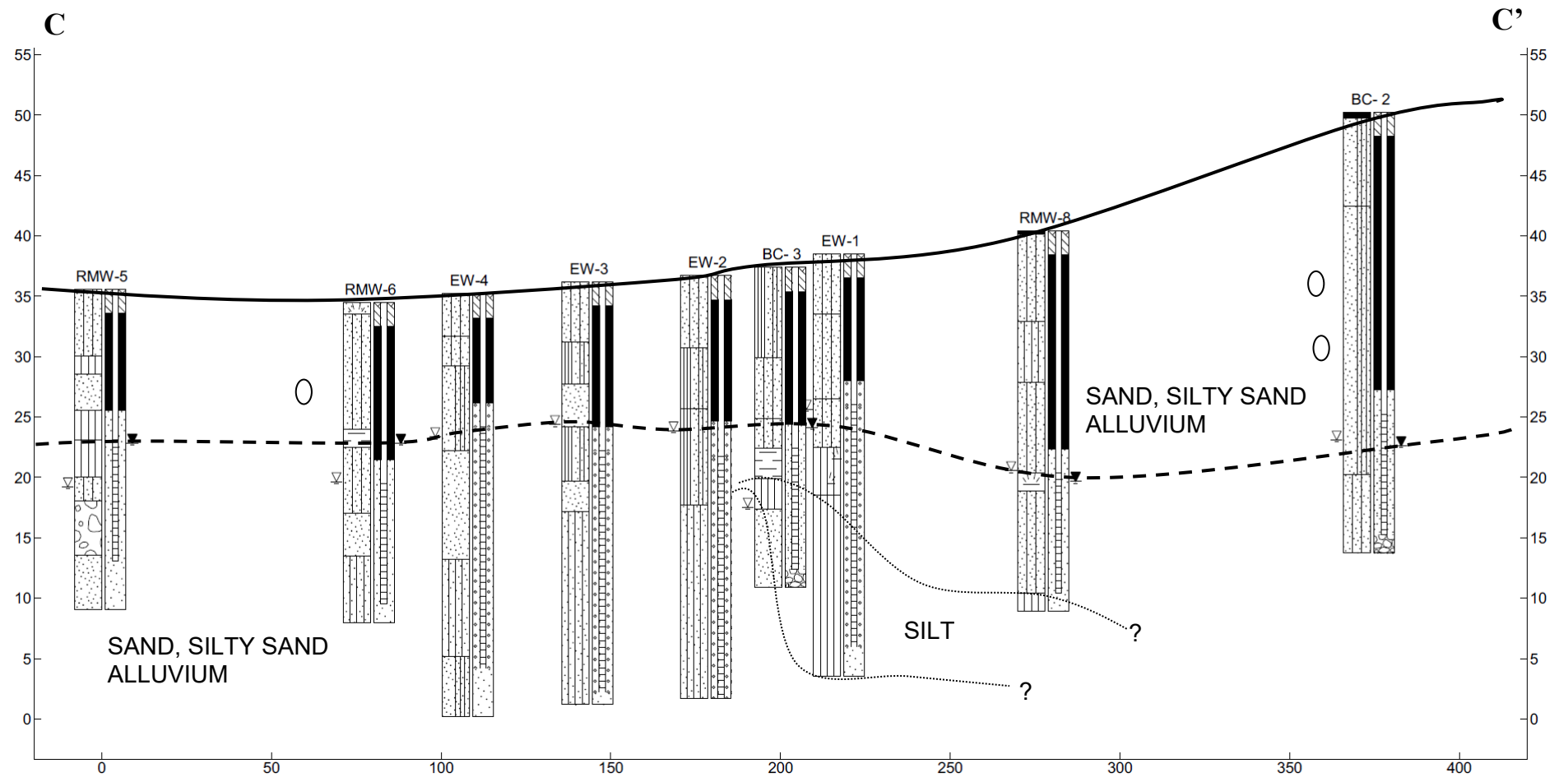
HWA GeoSciences Inc.

CROSS SECTION B-B"

BOTHELL RIVERSIDE RI REPORT
BOTHELL, WASHINGTON

FIGURE NO.
5

PROJECT NO.
2007-098



Lithology Graphics

- Asphalt
- USCS Poorly-graded Gravel
- USCS High Plasticity Clay
- USCS Well-graded Gravel
- USCS Silty Sand
- USCS Poorly-graded Gravelly Sand
- USCS Silt
- USCS Low Plasticity Silty Clay
- USCS Elastic Silt
- SILT to silty SAND
- USCS Poorly-graded Sand
- USCS Low to High Plasticity Clay
- USCS Poorly-graded Sand with Silt
- Utilities

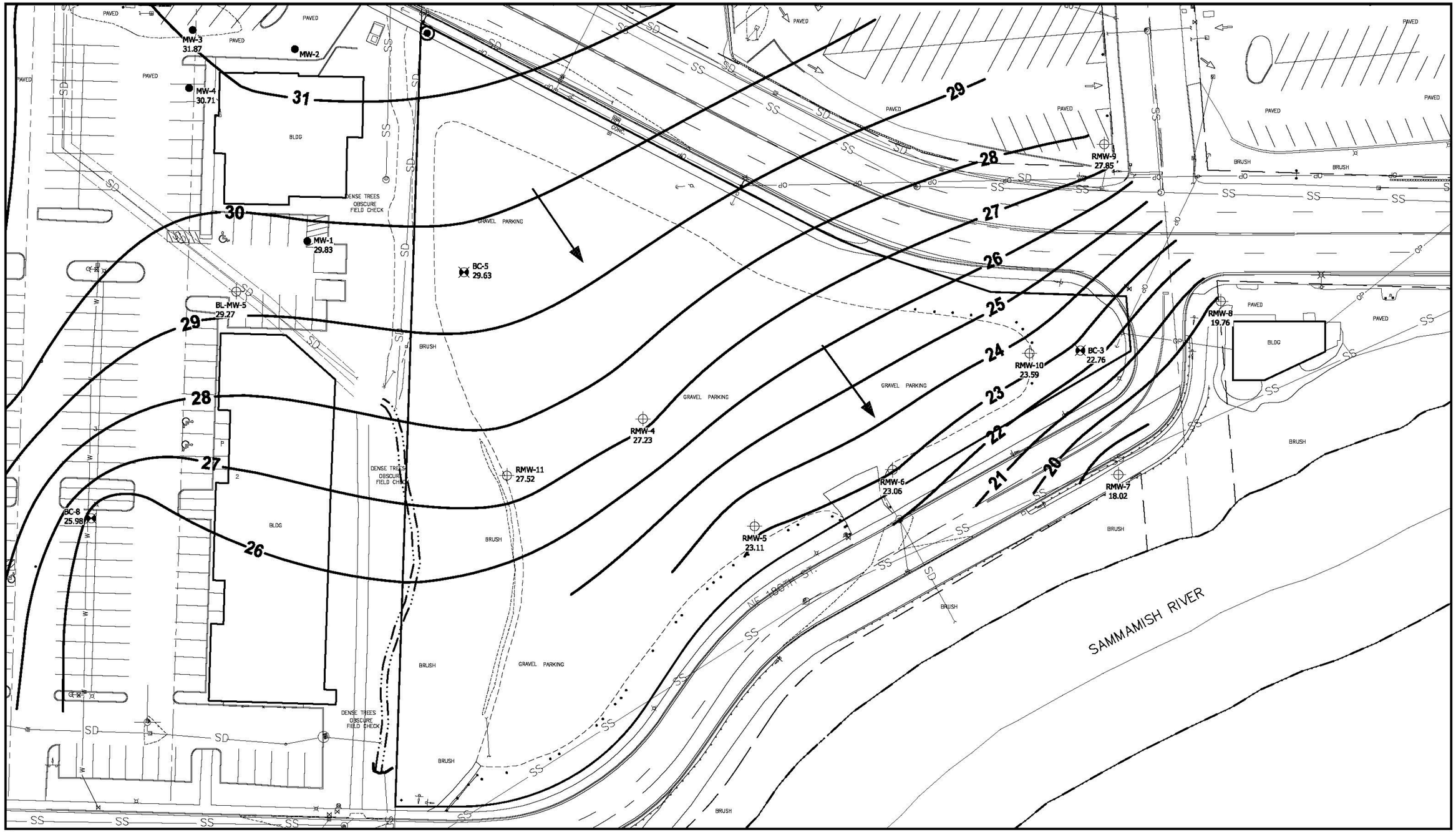
HWA GeoSciences Inc.

CROSS SECTION C-C'

BOTHELL RIVERSIDE RI REPORT
BOTHELL, WASHINGTON

FIGURE NO.
6

PROJECT NO.
2007-098



LEGEND

- HWA 2007 PHASE II ESA WELL LOCATIONS
- KLEINFELDER 1999 BORING LOCATIONS
- PMX 2009 RI/FS WELL LOCATIONS
- SITE BOUNDARY
- 27.06 GROUNDWATER TABLE ELEVATION MEASURED AT WELL ON 11/06/09
- 29 INFERRED POTENTIOMETRIC SURFACE ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION

N

0 50

SCALE IN FEET

Figure Source: Parametrix, 2009

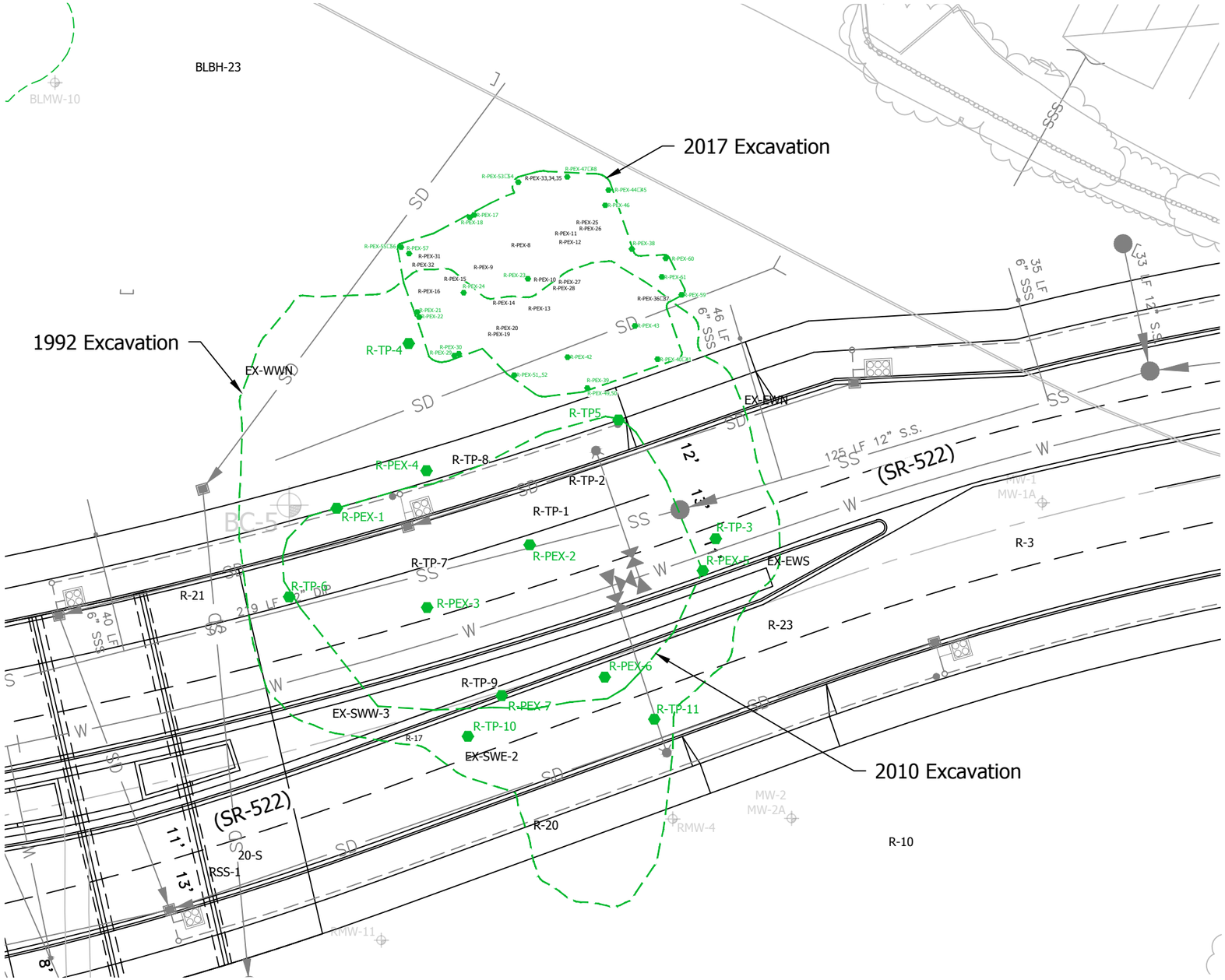
HWA GEOSCIENCES INC.

NOVEMBER 2009 POTENTIOMETRIC SURFACE

BOTHELL RIVERSIDE RI REPORT
BOTHELL, WASHINGTON

PROJECT NO.
2007-098

FIGURE NO.
7



0' 15' 30' 60'

N

EXPLANATION OF SYMBOL

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF CONTAMINATED SOIL EXCAVATION

R-PEX-9 — APPROXIMATE LOCATION OF CONFIRMATION SOIL SAMPLE LEFT IN PLACE WITH CONCENTRATIONS □MTCA

R-PEX-8 — APPROXIMATE LOCATION OF SOIL SAMPLE IN AREA THAT WAS SUBSE□UENTLY EXCAVATED

PRE-INTERIM ACTION SOIL SAMPLE MEETING MTCA CLEANUP LEVELS

R-TP-4 — TEST PIT LOCATION WITH CONCENTRATIONS □MTCA

BASE MAP PROVIDED BY PARAMETRIX

HWA GEOSCIENCES INC.

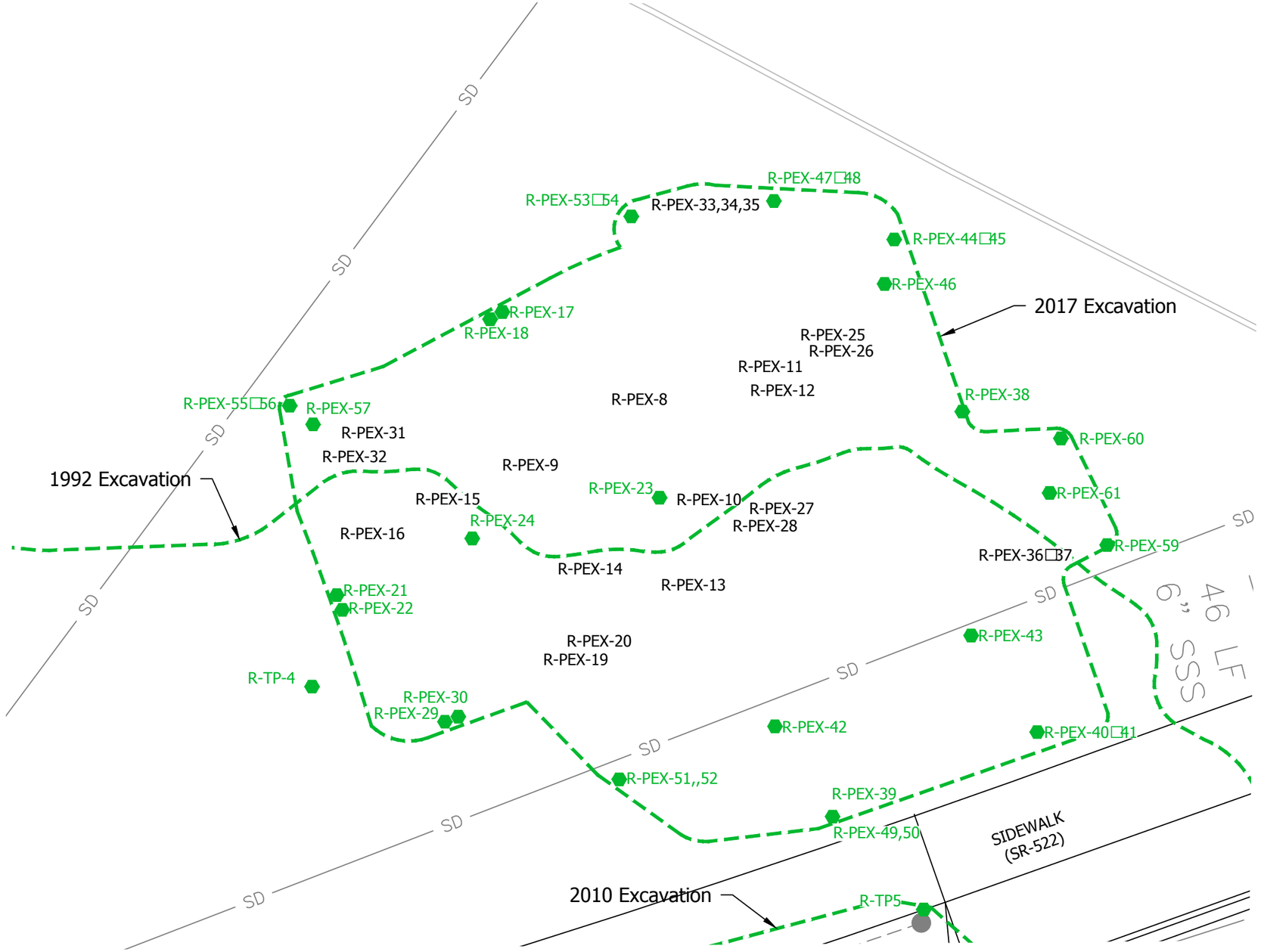
BOTHELL RIVERSIDE SITE
RI/FS
BOTHELL, WASHINGTON

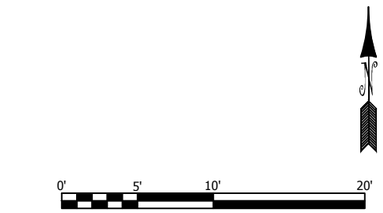
EXTENT OF INTERIM ACTION CLEANUP

DRAWN BY EFK
CHECK BY AS NK, AY
DATE 04.12.17

FIGURE NO. 8
PROJECT NO. 2007-098 T919

S:\2007 PROJECTS\2007-098-22 BOTHELL CROSSROADS\CAD 2007-098\HWA 2007-098-21 T20□□DWG <□ig 8 □it□□B □□> Plotted: □/28/2017 5:09 AM





EXPLANATION OF SYMBOL

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF CONTAMINATED SOIL EXCAVATION
- R-PEX-9 — APPROXIMATE LOCATION OF CONFIRMATION SOIL SAMPLE LEFT IN PLACE WITH CONCENTRATIONS □MTCA
- R-PEX-8 — APPROXIMATE LOCATION OF SOIL SAMPLE IN AREA THAT WAS SUBSE□UENTLY EXCAVATED
- PRE-INTERIM ACTION SOIL SAMPLE MEETING MTCA CLEANUP LEVELS
- R-TP-4 — TEST PIT LOCATION WITH CONCENTRATIONS □MTCA

BASE MAP PROVIDED BY PARAMETRIX

S:\2007 PROJECTS\2007-098-22 BOTHELL CROSSROADS\CAD 2007-098\HWA 2007-098-21 T20□□DWG <20□□ fig 2> Plotted: □/28/2017 5:09 AM

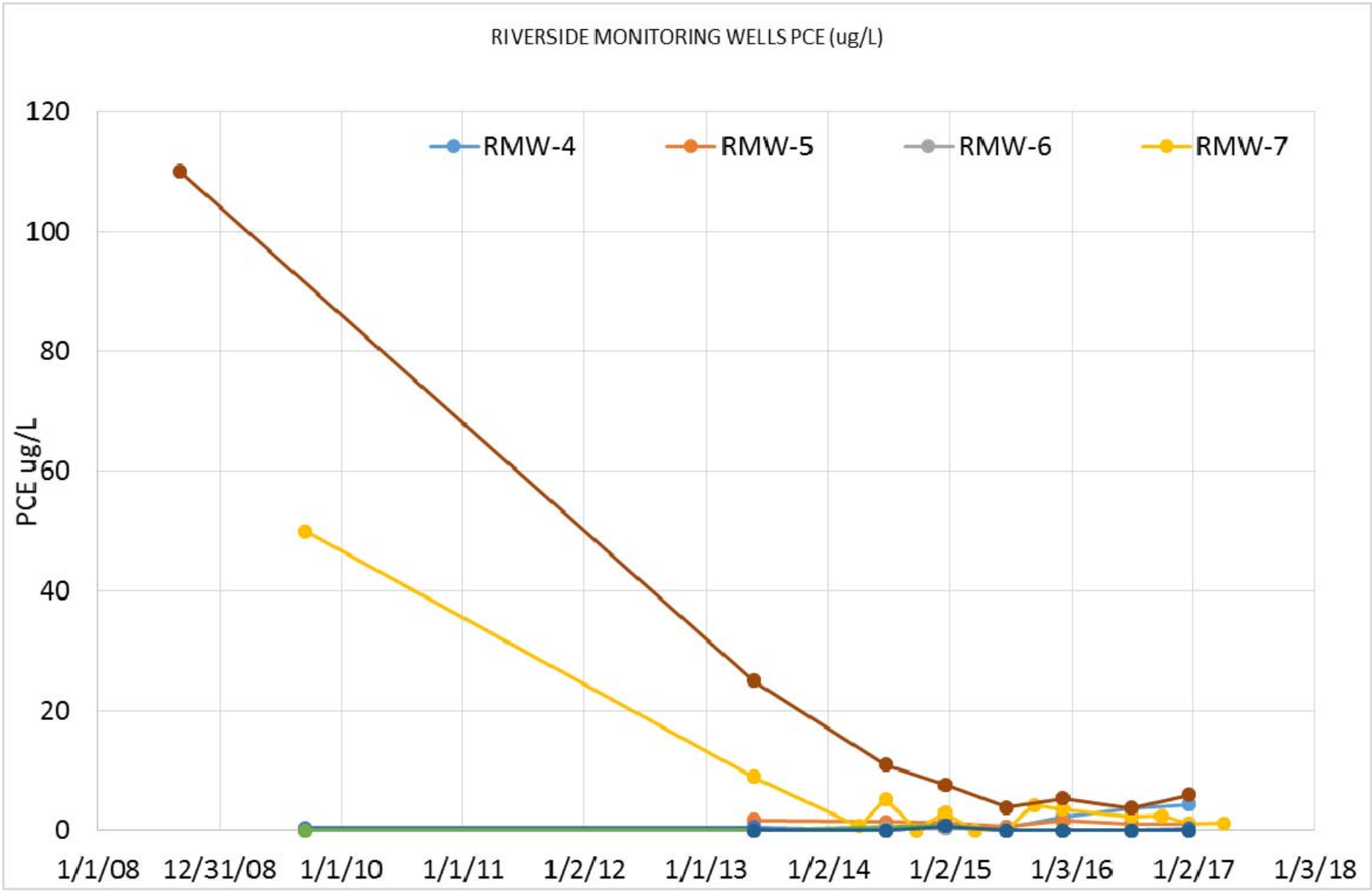
HWA GEOSCIENCES INC.

RIVERSIDE SITE
BOTHELL, WASHINGTON

EXTENT OF 2017 INTERIM ACTION CLEANUP

DRAWN BY EFK
CHECK BY AS/NK/AY
DATE 04.12.17

FIGURE NO. 8a
PROJECT NO. 2007-098 T2044



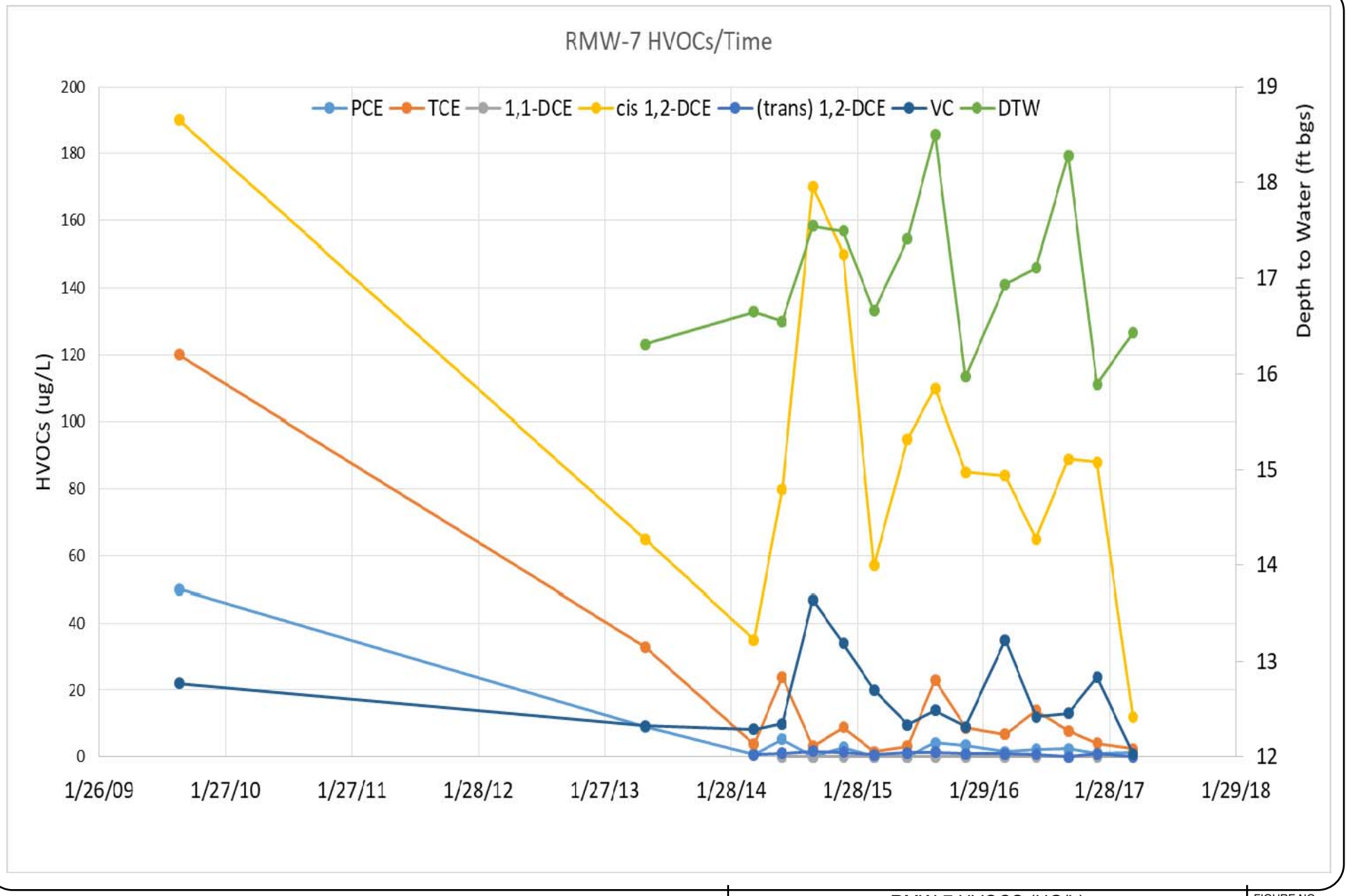
HWA GeoSciences Inc.

MONITORING WELLS PCE (UG/L)

BOTHELL RIVERSIDE HVOC SITE
BOTHELL, WASHINGTON

FIGURE NO.
9

POJECT NO
2007-098



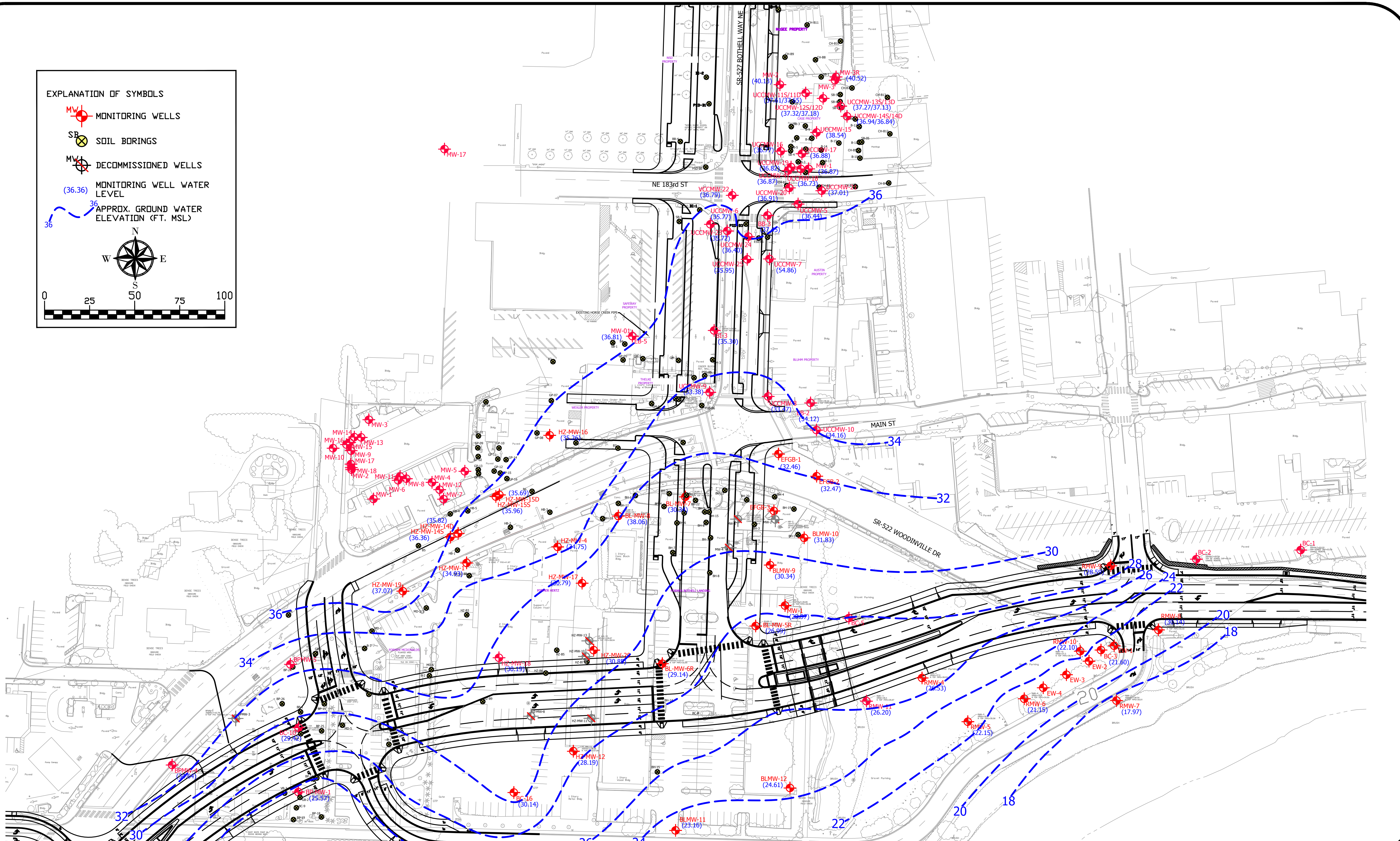
HWA GeoSciences Inc.

RMW-7 HVOCS (UG/L)

BOTHELL RIVERSIDE HVOC SITE
BOTHELL, WASHINGTON

FIGURE NO.
10

PROJECT NO.
2007-098



HWA GEOSCIENCES INC.

BOTHELL RIVERSIDE RI REPORT
BOTHELL, WASHINGTON

WATER TABLE ELEVATIONS
MARCH 2015

DRAWN BY EFK

CHECK BY AS

DATE

FIGURE NO.
11

PROJECT NO.
2007-098 T998

S:\2007 PROJECTS\2007-098-22 BOTHELL CROSSROADS\CAD 2007-098\HWA 2007-098-21 T998 GW.DWG <H2O table elevations march 2015 (2)> Plotted: 7/24/2015 9:03 AM

APPENDIX A

BORING LOGS

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	N (blows/ft)	Approximate Relative Density(%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	over 30	>4000

USCS SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP DESCRIPTIONS	
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravel (little or no fines)	GW	Well-graded GRAVEL
			GP	Poorly-graded GRAVEL
	More than 50% of Coarse Fraction Retained on No. 4 Sieve	Gravel with Fines (appreciable amount of fines)	GM	Silty GRAVEL
			GC	Clayey GRAVEL
More than 50% Retained on No. 200 Sieve Size	Sand and Sandy Soils	Clean Sand (little or no fines)	SW	Well-graded SAND
			SP	Poorly-graded SAND
	50% or More of Coarse Fraction Passing No. 4 Sieve	Sand with Fines (appreciable amount of fines)	SM	Silty SAND
			SC	Clayey SAND
Fine Grained Soils	Silt and Clay	Liquid Limit Less than 50%	ML	SILT
			CL	Lean CLAY
			OL	Organic SILT/Organic CLAY
50% or More Passing No. 200 Sieve Size	Silt and Clay	Liquid Limit 50% or More	MH	Elastic SILT
			CH	Fat CLAY
			OH	Organic SILT/Organic CLAY
Highly Organic Soils			PT	PEAT

TEST SYMBOLS

%F	Percent Fines
AL	Atterberg Limits: PL = Plastic Limit, LL = Liquid Limit
CBR	California Bearing Ratio
CN	Consolidation
DD	Dry Density (pcf)
DS	Direct Shear
GS	Grain Size Distribution
K	Permeability
MD	Moisture/Density Relationship (Proctor)
MR	Resilient Modulus
PID	Photoionization Device Reading
PP	Pocket Penetrometer Approx. Compressive Strength (tsf)
SG	Specific Gravity
TC	Triaxial Compression
TV	Torvane Approx. Shear Strength (tsf)
UC	Unconfined Compression

SAMPLE TYPE SYMBOLS

- 2.0" OD Split Spoon (SPT) (140 lb. hammer with 30 in. drop)
- Shelby Tube
- 3-1/4" OD Split Spoon with Brass Rings
- Small Bag Sample
- Large Bag (Bulk) Sample
- Core Run
- Non-standard Penetration Test (3.0" OD split spoon)

GROUNDWATER SYMBOLS

- Groundwater Level (measured at time of drilling)
- Groundwater Level (measured in well or open hole after water level stabilized)

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074mm)

COMPONENT PROPORTIONS

PROPORTION RANGE	DESCRIPTIVE TERMS
< 5%	Clean
5 - 12%	Slightly (Clayey, Silty, Sandy)
12 - 30%	Clayey, Silty, Sandy, Gravelly
30 - 50%	Very (Clayey, Silty, Sandy, Gravelly)
Components are arranged in order of increasing quantities.	

NOTES: Soil classifications presented on exploration logs are based on visual and laboratory observation.
Soil descriptions are presented in the following general order:

Density/consistency, color, modifier (if any) GROUP NAME, additions to group name (if any), moisture content. Proportion, gradation, and angularity of constituents, additional comments. (GEOLOGIC INTERPRETATION)

Please refer to the discussion in the report text as well as the exploration logs for a more complete description of subsurface conditions.

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
MOIST	Damp but no visible water.
WET	Visible free water, usually soil is below water table.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

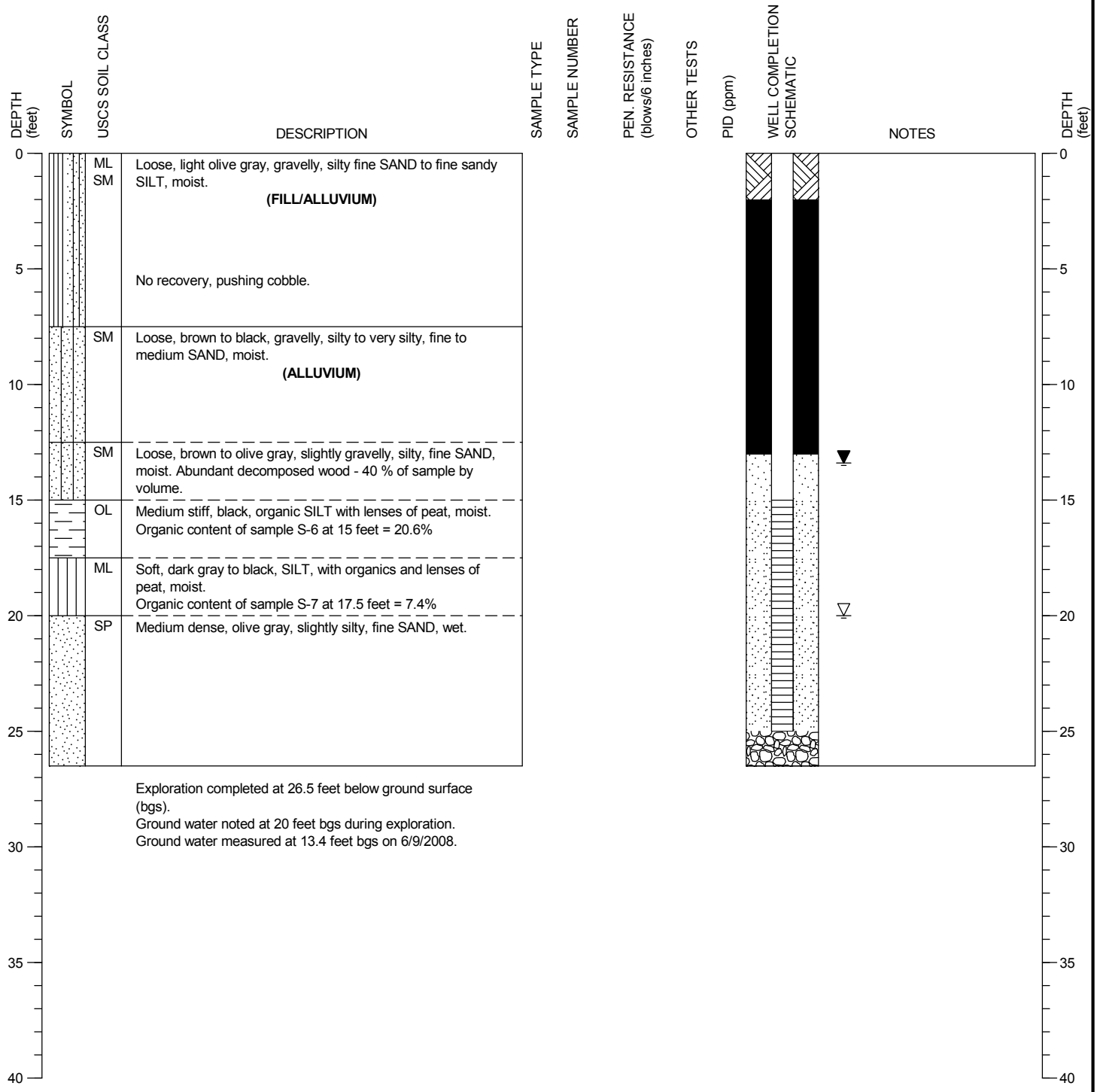
LEGEND OF TERMS AND SYMBOLS USED ON EXPLORATION LOGS

PROJECT NO.: 2007-098-800 FIGURE: A-1

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Hollow-Stem Auger, Mobile B-61 truck rig
SAMPLING METHOD: SPT with Autohammer
LOCATION:

SURFACE ELEVATION: 37.39 ± feet
CASING ELEVATION ± feet

DATE STARTED: 6/5/2008
DATE COMPLETED: 6/5/2008
LOGGED BY: J. Speck



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

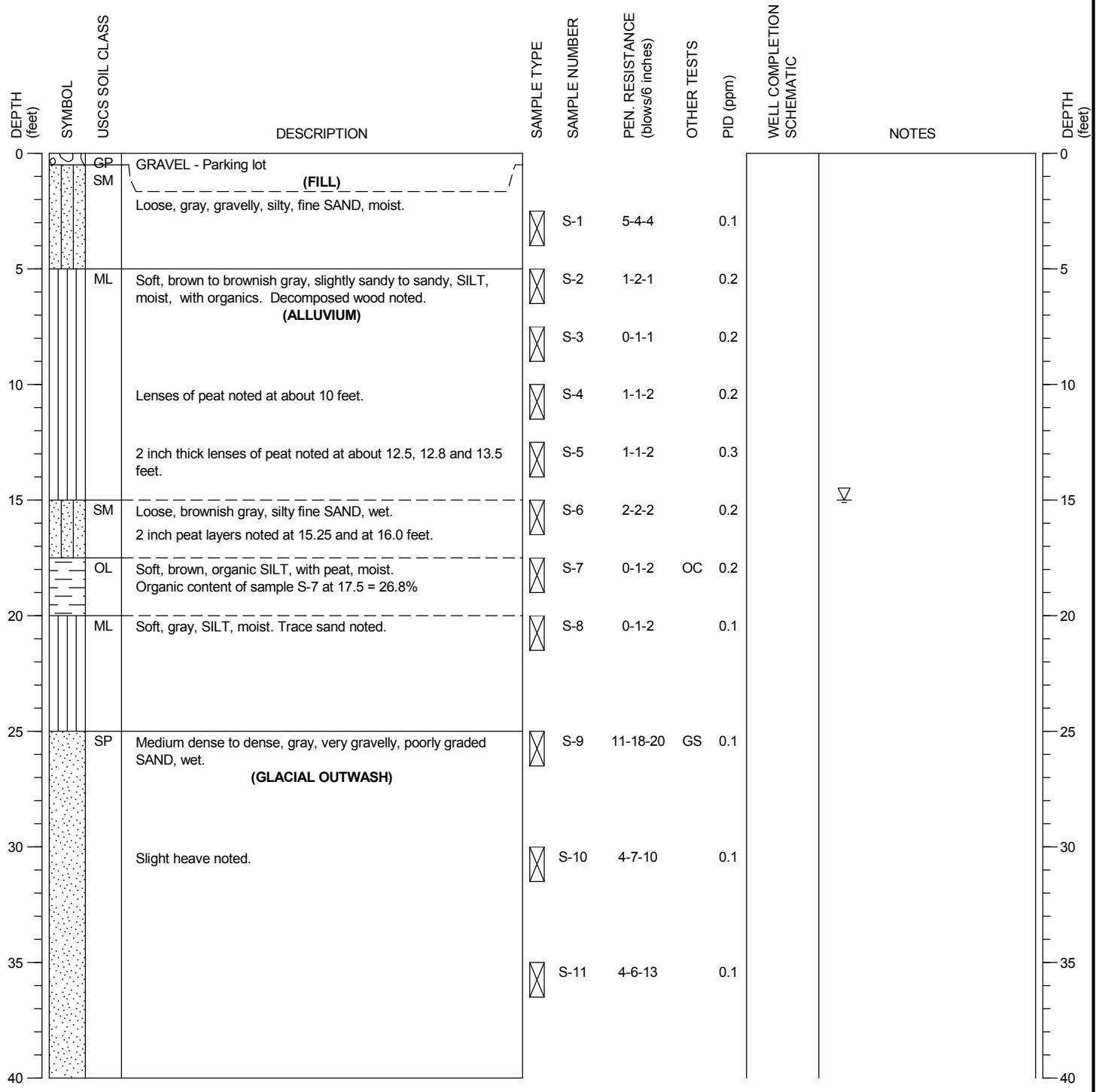
MONITORING WELL:
BC- 3

PROJECT NO.: 2007-098-800 FIGURE: A-2

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Hollow-Stem Auger, Mobile B-61 truck rig
SAMPLING METHOD: SPT with Autohammer
LOCATION: See Figure 2

SURFACE ELEVATION: 37.50 ± feet
CASING ELEVATION ± feet

DATE STARTED: 6/3/2008
DATE COMPLETED: 6/3/2008
LOGGED BY: J. Speck



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HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
BC- 4

PROJECT NO.: 2007-098-800 FIGURE: A-3

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Hollow-Stem Auger, Mobile B-61 truck rig
SAMPLING METHOD: SPT with Autohammer
LOCATION: See Figure 2

SURFACE ELEVATION: 37.50 ± feet
CASING ELEVATION ± feet

DATE STARTED: 6/3/2008
DATE COMPLETED: 6/3/2008
LOGGED BY: J. Speck

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	PID (ppm)	WELL COMPLETION SCHEMATIC	NOTES
40		CL	Very stiff to hard, gray, lean CLAY, moist. **(GLACIAL DRIFT)** 1.5 feet of heave noted during drilling below 40 feet.	⊠	S-12	50/5"		0.1		
45				⊠	S-13	3-3-19	AL	0.1		
50				⊠	S-14	17-29-39		0.1		
55			Exploration completed at 51.5 feet below ground surface (bgs). Ground water noted at 15 feet bgs during drilling.							
60										
65										
70										
75										
80										

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
BC- 4

PROJECT NO.: 2007-098-800 FIGURE: A-3

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: Hollow Stem Auger, track-mounted, Modified CME-55
SAMPLING METHOD: SPT w/wire-line and down-hole hammer
LOCATION: See Figure 2

SURFACE ELEVATION: 27.00 ± feet
CASING ELEVATION ± feet

DATE STARTED: 6/23/2008
DATE COMPLETED: 6/23/2008
LOGGED BY: J. Speck

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	PID (ppm)	WELL COMPLETION SCHEMATIC	NOTES
0		ML SM	Loose, dark brown, sandy SILT, moist, with leaves, roots, and wood chips. **(FILL)**							
			Medium dense, yellow brown, silty fine SAND, moist 4-inch lense of gray sandy SILT in sample at 2.5 feet.		S-1	7-8-8		1.7		▽
		ML	Loose, gray to olive gray, sandy SILT, moist. **(ALLUVIUM)**		S-2	5-3-4	GS	1.3		
5		OL	Soft, olive gray, organic SILT, moist to wet.		S-3	0-0-1		0.8		
10		MH	Soft, dark olive gray, elastic SILT, with organics, wet.		S-4	0-1-1	AL	0.3		
		CL	Very soft to soft, dark olive gray, lean CLAY, wet, interbedded with dark red-brown to olive gray, fine sandy silt with trace organics. 0.25-inch fine sand lense noted at 12.7 feet.		S-5		AL	0.5		
15		SP	Very dense, gray, gravelly medium to coarse SAND, wet. **(GLACIAL OUTWASH)**		S-6	36-50/5"		0.5		
			Possible 6 inches of heave noted.		S-7	50/3"		0.3		
20		ML	Very dense, gray, slightly gravelly, slightly sandy SILT, moist.		S-8	50/3"		0.3		
25		SP	Very dense, gray, gravelly, medium to coarse SAND, wet. Possible 1.5 feet of heave noted.		S-9	50/3"		0.3		
30			Possible 1 foot of heave noted.		S-10	50/5"		0.3		
35		SP	Very dense, gray, poorly graded coarse to medium SAND, wet. Trace gravel noted. Possible 3.5 feet of heave noted.		S-11	50/5"	GS	0.3		
40										

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
BC- 6

PROJECT NO.: 2007-098-800 FIGURE: A-4

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: Hollow Stem Auger, track-mounted, Modified CME-55
SAMPLING METHOD: SPT w/wire-line and down-hole hammer
LOCATION: See Figure 2

SURFACE ELEVATION: 27.00 ± feet
CASING ELEVATION ± feet

DATE STARTED: 6/23/2008
DATE COMPLETED: 6/23/2008
LOGGED BY: J. Speck

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	PID (ppm)	WELL COMPLETION SCHEMATIC	NOTES	DEPTH (feet)
40			Possible 3.0 feet of heave noted.	⊠	S-12	50/5"		0.3			40
45			Possible 5 feet of heave noted.	⊠	S-13	50/4"		0.3			45
50		ML	Hard, dark gray, SILT, moist, massive. **(GLACIAL DRIFT)**	⊠	S-14	50/4"		0.3			50
				⊠	S-15	50/4"		0.2			
55			Exploration completed at 54.0 feet below ground surface (bgs). Ground water noted at 4 feet bgs during exploration.								55
60											60
65											65
70											70
75											75
80											80

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

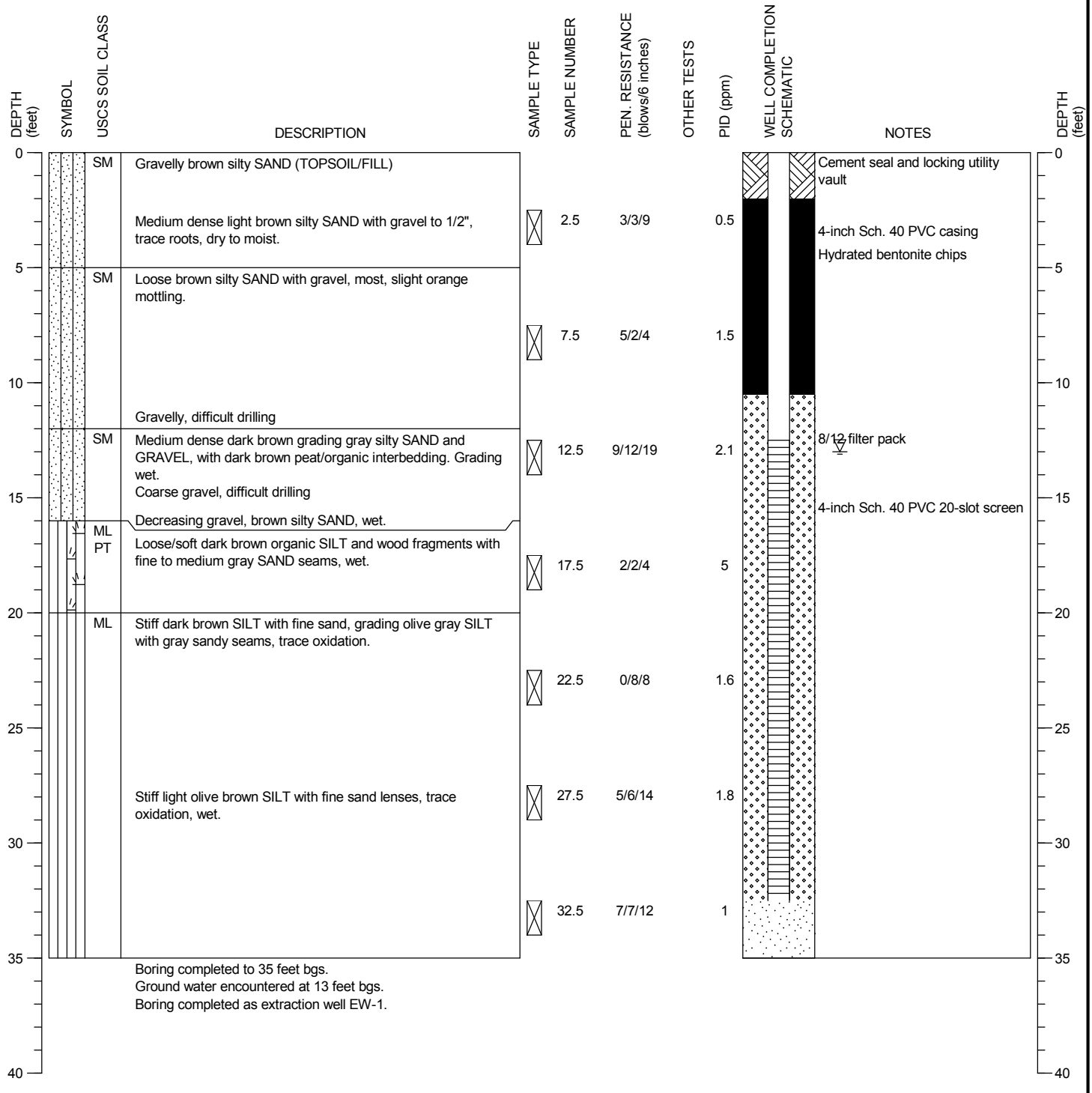
MONITORING WELL:
BC- 6

PROJECT NO.: 2007-098-800 FIGURE: A-4

DRILLING COMPANY: Environmental Drilling, Inc.
DRILLING METHOD: Mobile B-61 HSA
SAMPLING METHOD: SPT
LOCATION:

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 7/16/2013
DATE COMPLETED: 7/16/2013
LOGGED BY: V. Atkins



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HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
EW-1

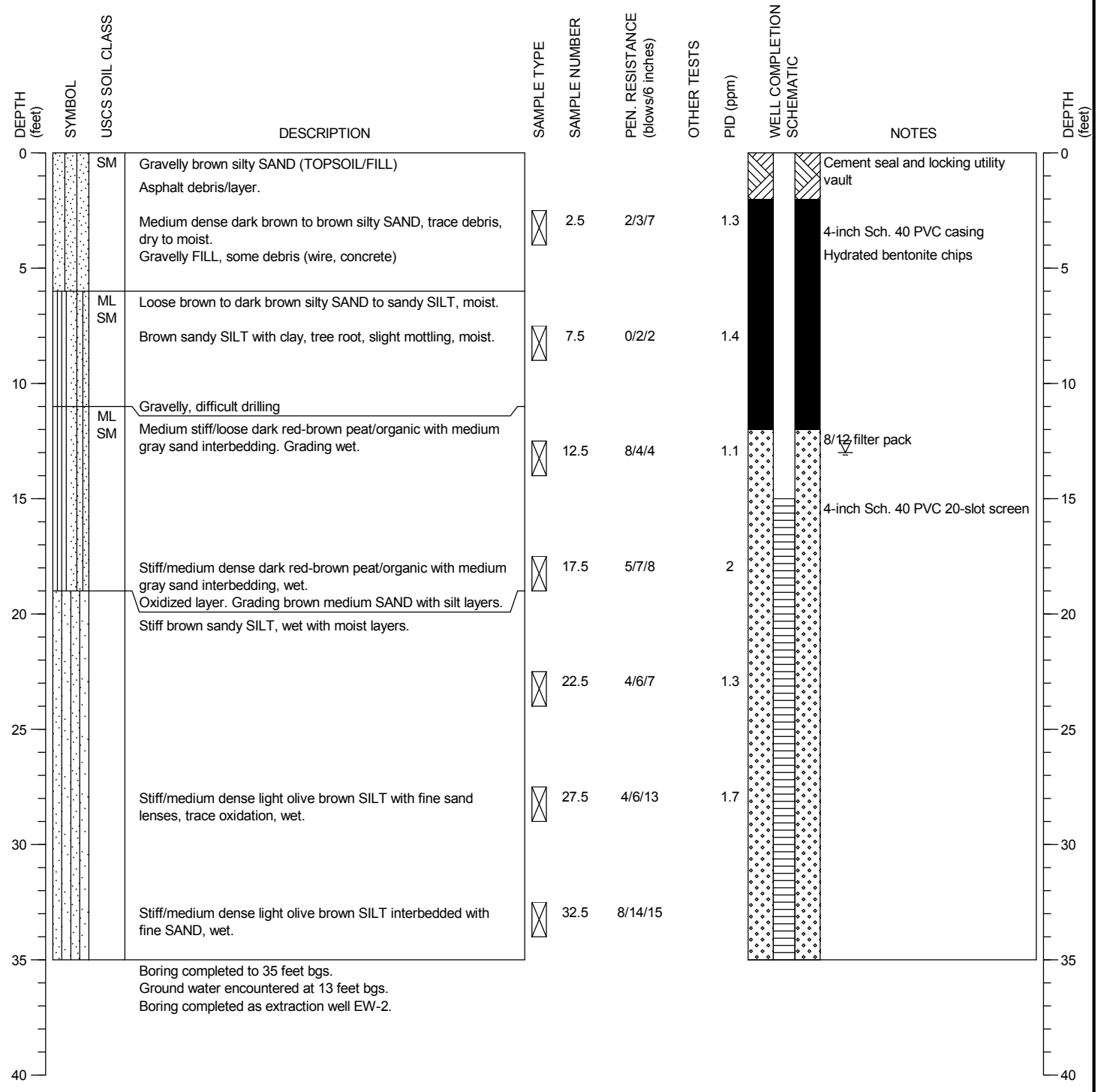
PROJECT NO.: 2007-098-800 FIGURE: A-5

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: Environmental Drilling, Inc.
DRILLING METHOD: Mobile B-61 HSA
SAMPLING METHOD: SPT
LOCATION:

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 7/16/2013
DATE COMPLETED: 7/16/2013
LOGGED BY: V. Atkins



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HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
EW-2

PAGE: 1 of 1

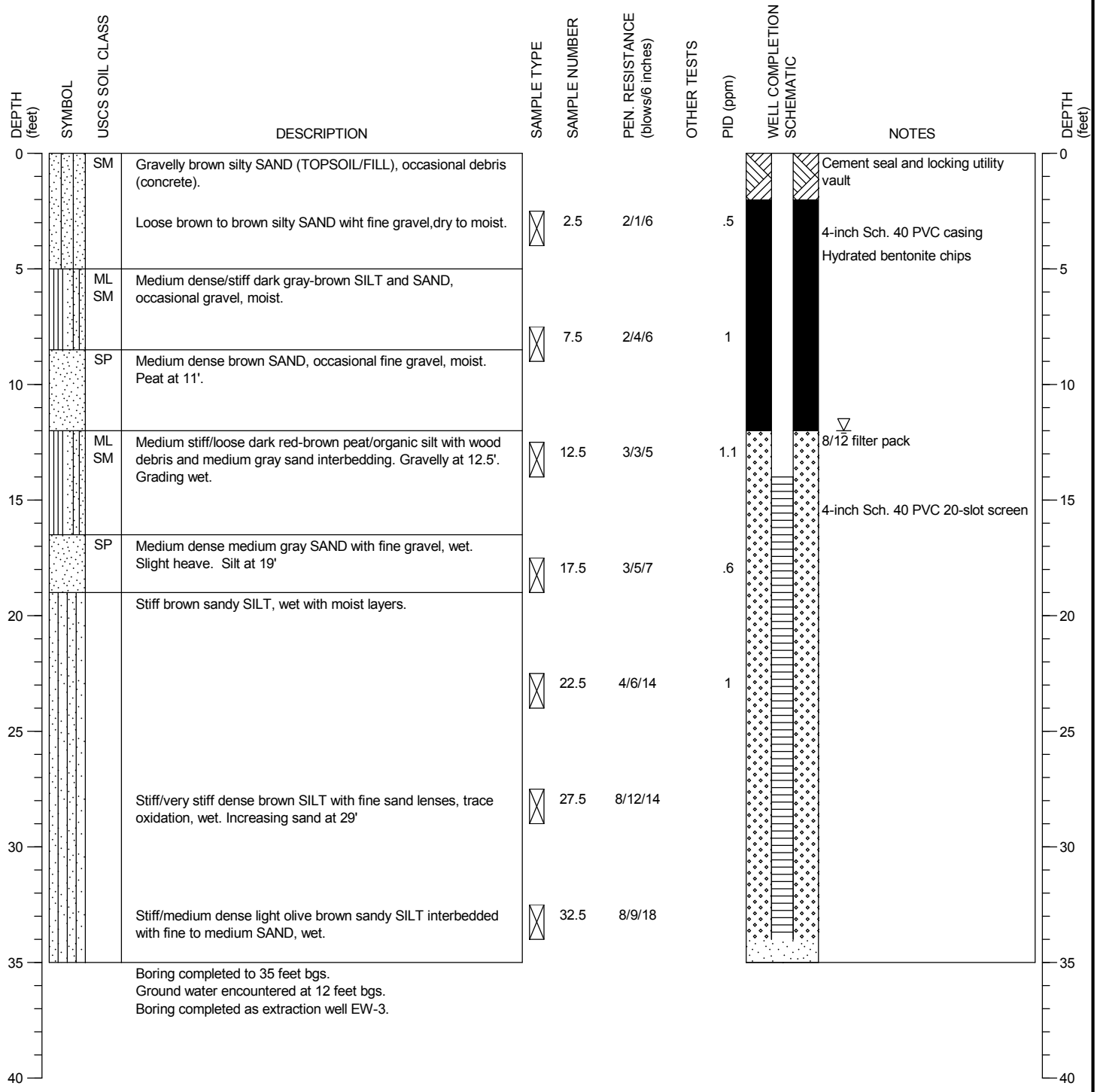
PROJECT NO.: 2007-098-800 FIGURE: A-6

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: Environmental Drilling, Inc.
DRILLING METHOD: Mobile B-61 HSA
SAMPLING METHOD: SPT
LOCATION:

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 7/15/2013
DATE COMPLETED: 7/15/2013
LOGGED BY: V. Atkins



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HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
EW-3

PAGE: 1 of 1

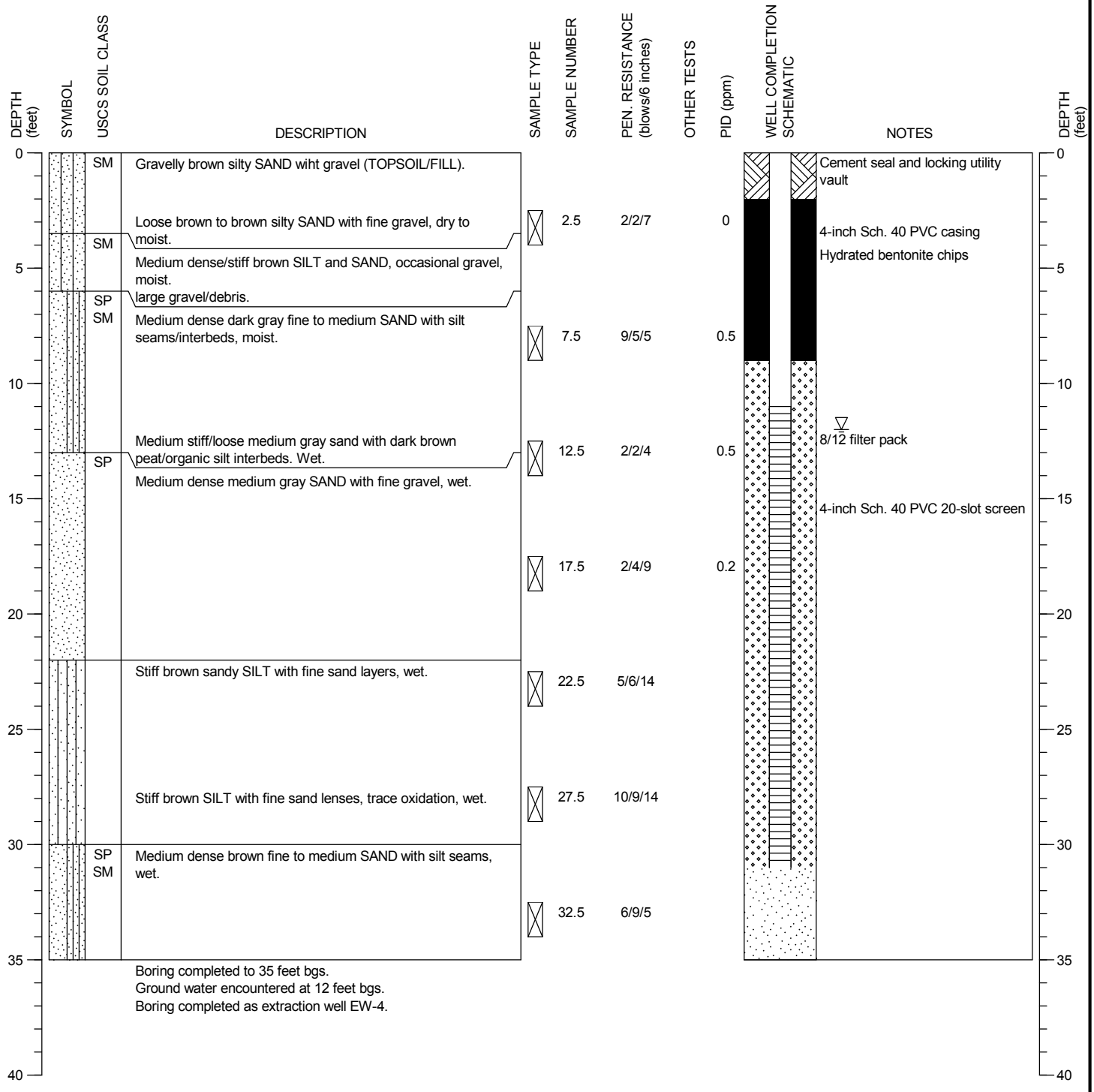
PROJECT NO.: 2007-098-800 FIGURE: A-7

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: Environmental Drilling, Inc.
DRILLING METHOD: Mobile B-61 HSA
SAMPLING METHOD: SPT
LOCATION:

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 7/15/2013
DATE COMPLETED: 7/15/2013
LOGGED BY: V. Atkins



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
EW-4

PAGE: 1 of 1

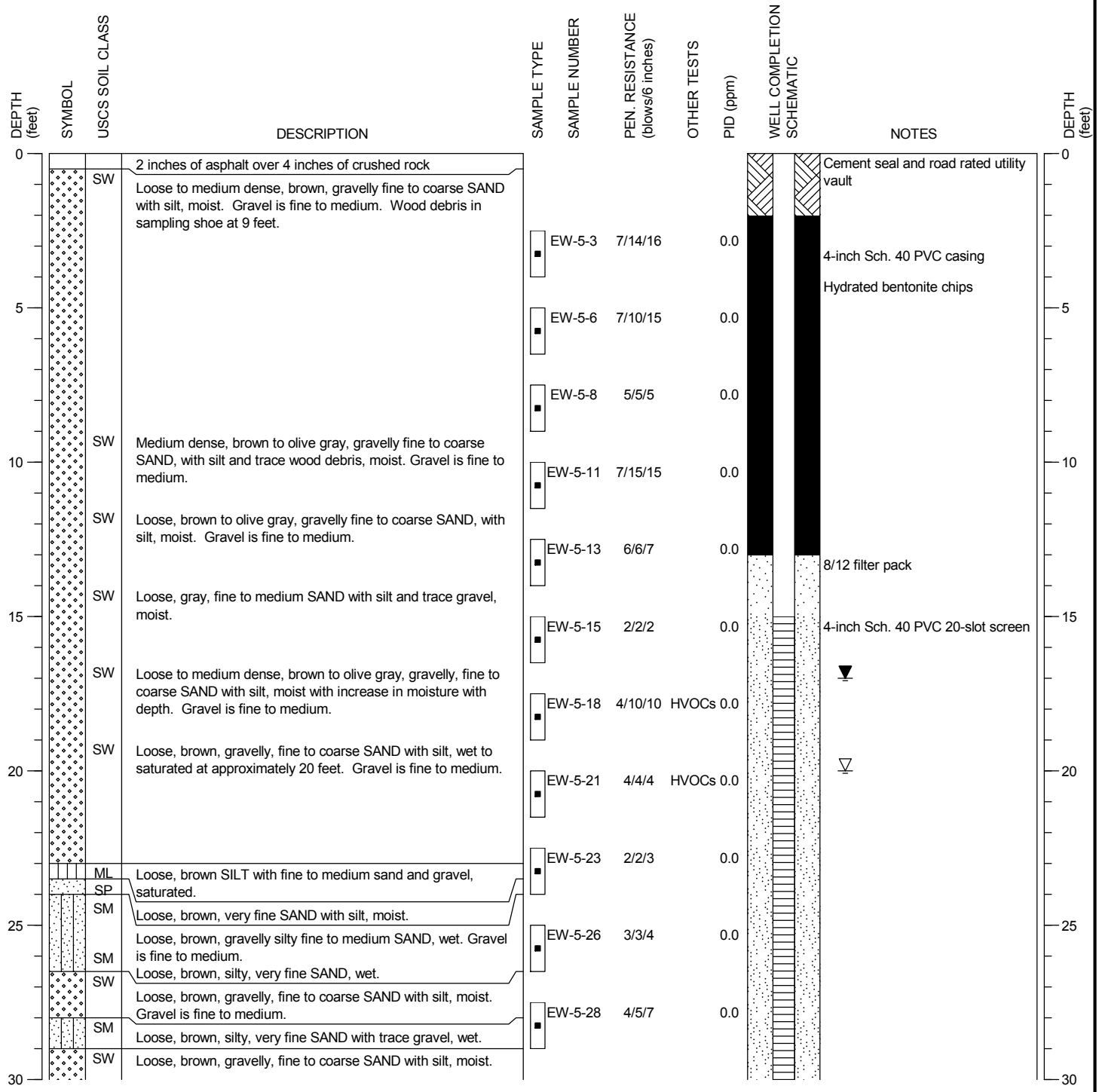
PROJECT NO.: 2007-098-800 FIGURE: A-8

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: South Lane of 180th

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 10/11/2016
DATE COMPLETED: 10/11/2016
LOGGED BY: N. Kapise



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside HVOC Site
Bothell, Washington

MONITORING WELL:
EW-5

PROJECT NO.: 2007-098-800 FIGURE: 1

MWELL 2007-098-RIVERSIDE.GPJ 11/10/16

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: South Lane of 180th

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 10/11/2016
DATE COMPLETED: 10/11/2016
LOGGED BY: N. Kapise

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	PID (ppm)	WELL COMPLETION SCHEMATIC	NOTES	DEPTH (feet)
30			Gravel is fine to medium.								30
		SM	Loose, brown, silty, very fine SAND with trace gravel, wet.		EW-5-31	3/4/6		0.0			
		SW	Loose, brown, gravelly, fine to coarse SAND with trace silt, moist.								
		SP	Loose, brown, very fine SAND with silt, moist.		EW-5-33	7/9/10		0.0			
		SM	Loose, brown, silty, very fine to fine SAND, wet.								
35					EW-5-36	5/6/7		0.0			35
		ML	Loose, gray SILT, moist.								
			Exploration terminated at 37 feet. Groundwater encountered at 20 feet. No visual or olfactory signs of contamination in soil. Well installed with screen from 15 to 35 feet.								
40											40
45											45
50											50
55											55
60											60

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside HVOC Site
Bothell, Washington

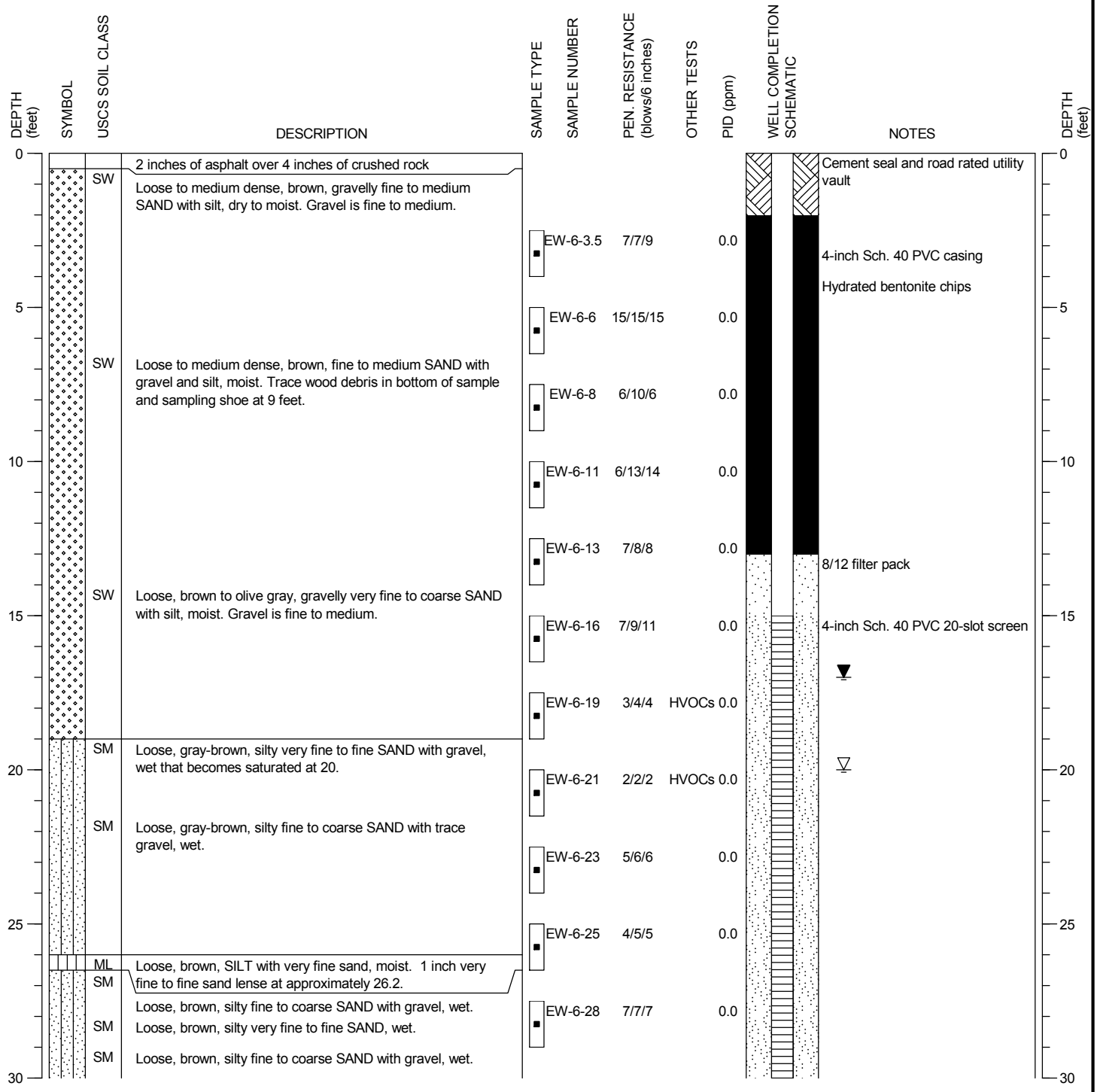
MONITORING WELL:
EW-5

PROJECT NO.: 2007-098-800 FIGURE: 1

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: South Lane of 180th

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 10/12/2016
DATE COMPLETED: 10/12/2016
LOGGED BY: N. Kapise



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HWA GEOSCIENCES INC.

Bothell Riverside HVOC Site
Bothell, Washington

MONITORING WELL:
EW-6

PROJECT NO.: 2007-098-800 FIGURE: 2

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: South Lane of 180th

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 10/12/2016
DATE COMPLETED: 10/12/2016
LOGGED BY: N. Kapise

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	PID (ppm)	WELL COMPLETION SCHEMATIC	NOTES	DEPTH (feet)
30		SM	Loose, brown, silty very fine to fine SAND, wet.		EW-6-31	3/9/10		0.0			30
		SM	Medium dense, brown, silty very fine to fine SAND with trace medium gravel, wet.		EW-6-33	3/18/20		0.0			
35		SM	Medium dense, brown, silty very fine to fine SAND, wet. Iron oxide staining at approximately 36.		EW-6-36	4/13/21		0.0			35
			Exploration terminated at 37 feet. Groundwater encountered at 20 feet. No visual or olfactory signs of contamination in soil. Well installed with screen from 15 to 35 feet.								
40											40
45											45
50											50
55											55
60											60

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside HVOC Site
Bothell, Washington

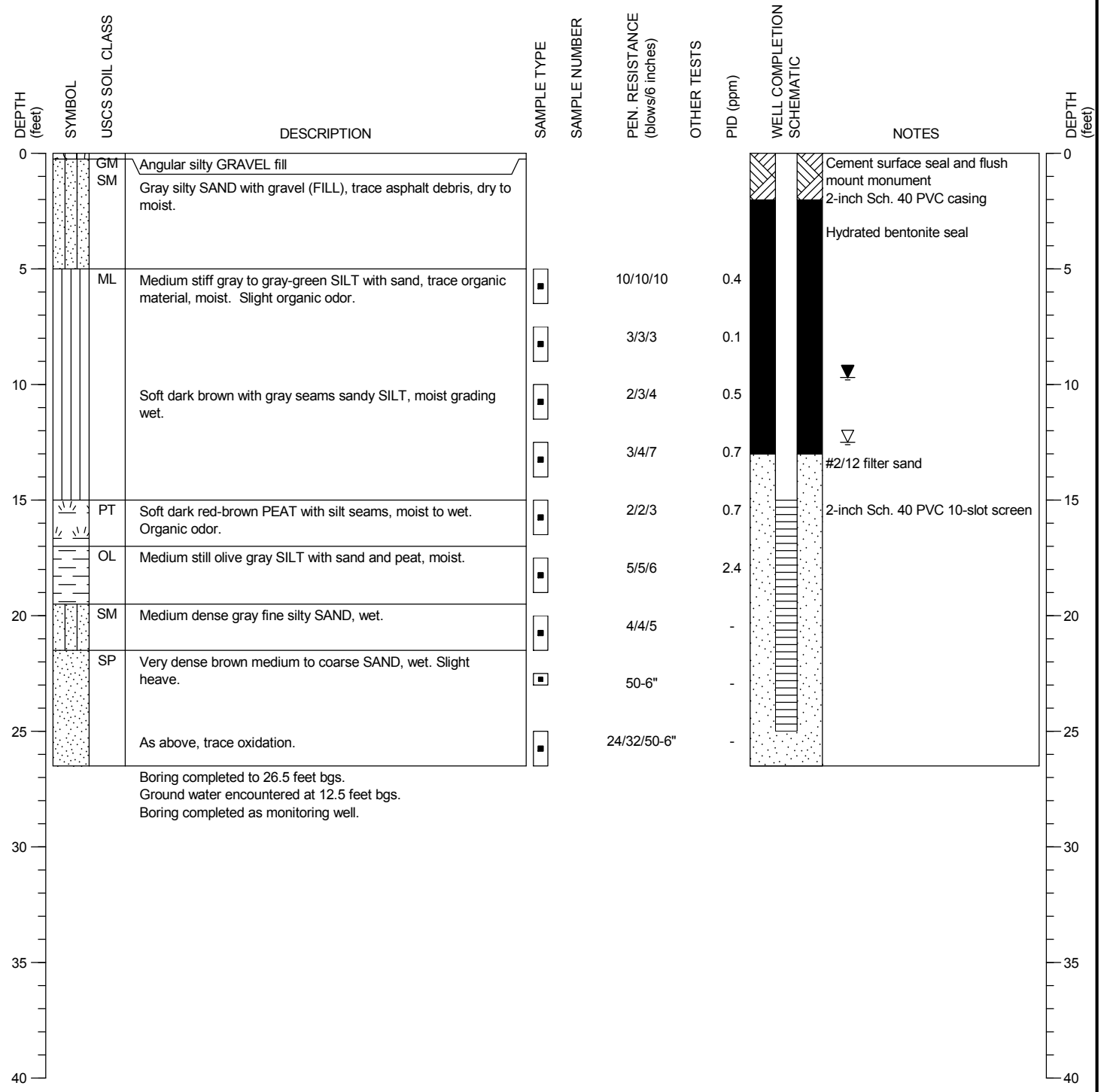
MONITORING WELL:
EW-6

PROJECT NO.: 2007-098-800 FIGURE: 2

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted 8-inch HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: Riverside property, center

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 8/31/2009
DATE COMPLETED: 8/31/2009
LOGGED BY: V. Atkins



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HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
RMW-4

PAGE: 1 of 1

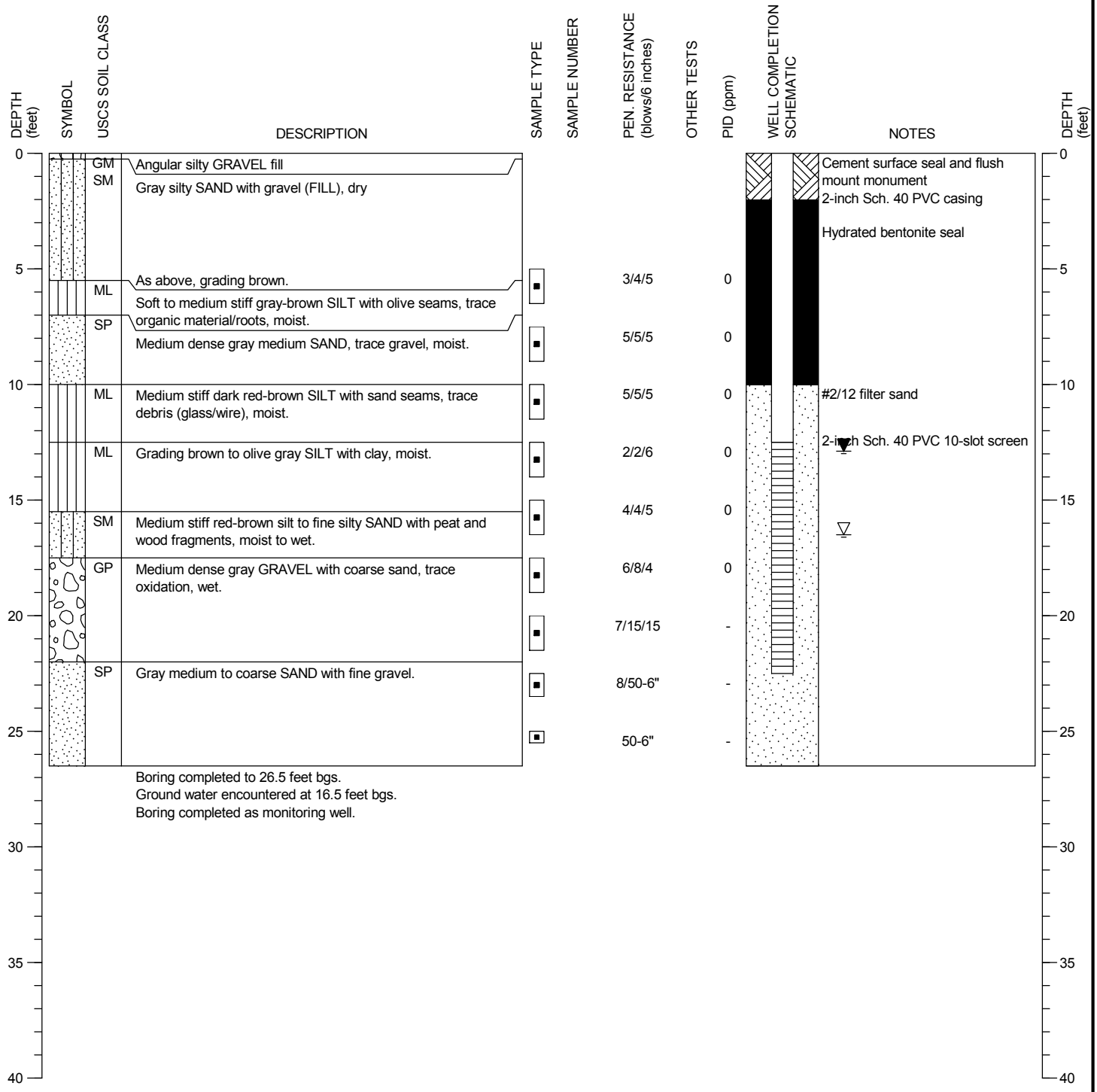
PROJECT NO.: 2007-098-800 FIGURE: A-9

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted 8-inch HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: Riverside property, south boundary

SURFACE ELEVATION: 35.56 ± feet
CASING ELEVATION ± feet

DATE STARTED: 8/31/2009
DATE COMPLETED: 8/31/2009
LOGGED BY: V. Atkins



Boring completed to 26.5 feet bgs.
Ground water encountered at 16.5 feet bgs.
Boring completed as monitoring well.

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
RMW-5

PROJECT NO.: 2007-098-800 FIGURE: A-10

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted 8-inch HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: Riverside property, south boundary

SURFACE ELEVATION: 34.50 ± feet
CASING ELEVATION ± feet

DATE STARTED: 8/31/2009
DATE COMPLETED: 8/31/2009
LOGGED BY: V. Atkins

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	PID (ppm)	WELL COMPLETION SCHEMATIC	NOTES
0			Brown silty sand TOPSOIL with organics, root material.							Cement surface seal and flush mount monument
		SM	Brown silty SAND with gravel (FILL), trace roots, dry.							2-inch Sch. 40 PVC casing
										Hydrated bentonite seal
5			Medium dense brown silty SAND with gravel, dry.	■		4/4/11		0		
				■		7/5/4		0		
10			Brown to red-brown silty SAND.	■		4/4/3		0		
		OL	Medium stiff olive green to red-brown organic SILT, moist.							
		SM	Medium dense olive gray silty SAND grading medium SAND with silt seams, moist.	■		4/6/4		0		#2/12 filter sand
15			Medium dense interbedded gray medium SAND with red-brown silt and wood fragments, moist.	■		4/5/4		0		2-inch Sch. 40 PVC 10-slot screen
		SP	Dense gray medium to coarse SAND with gravel, wet. Gravel to 2".	■		10/20/18		0		
20			Dense gray coarse SAND with silt, wet.	■		12/18/15		0		
			Stiff light brown silty SAND grading sandy SILT, wet.	■		12/15/16		-		
25				■		14/20/21		-		
			Boring completed to 26.5 feet bgs. Ground water encountered at 17.5 feet bgs. Boring completed as monitoring well.							
30										
35										
40										

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
RMW-6

PAGE: 1 of 1

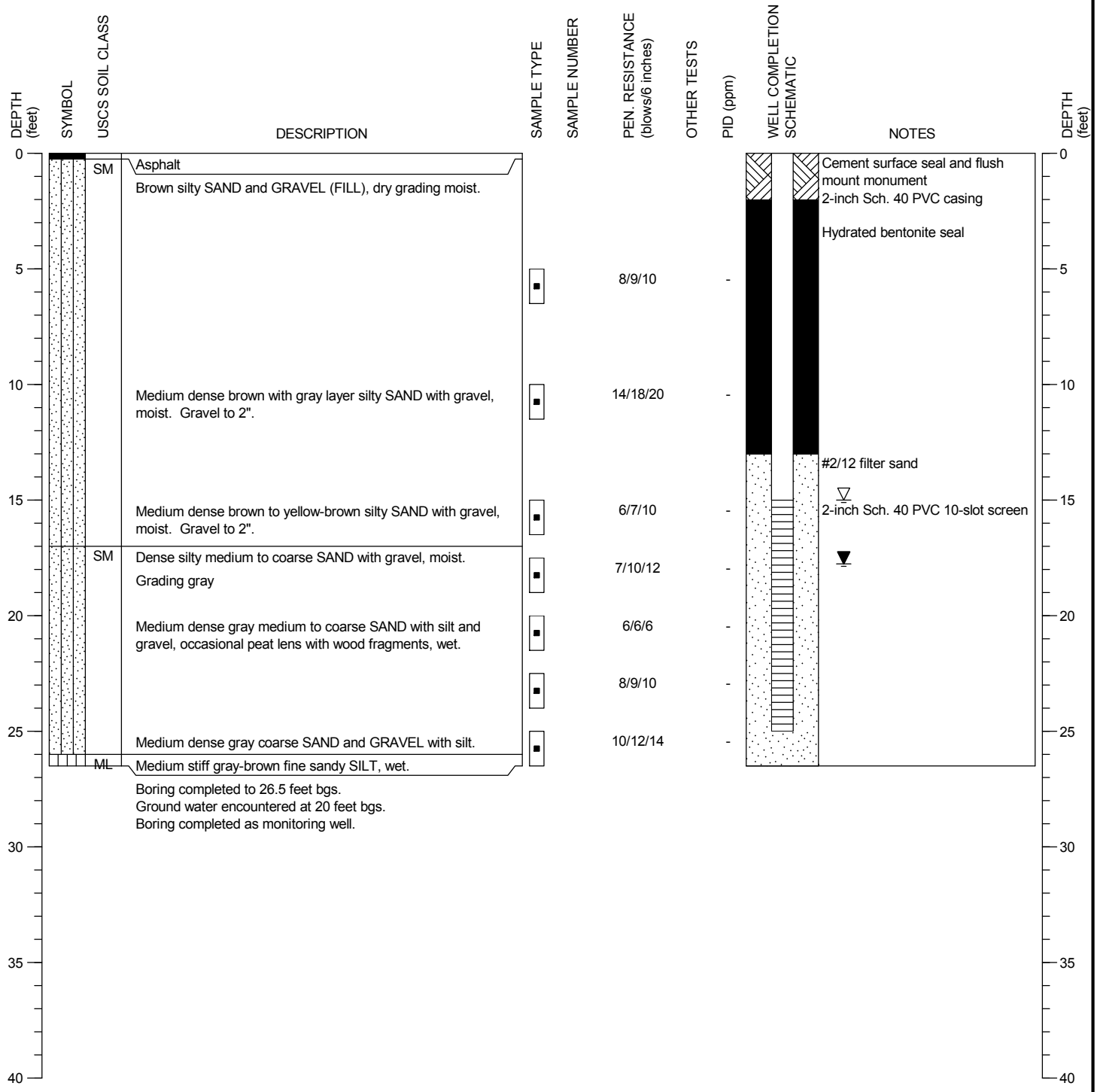
PROJECT NO.: 2007-098-800 FIGURE: A-11

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted 8-inch HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: Riverside property, south side of NE 180th Street

SURFACE ELEVATION: 35.51 ± feet
CASING ELEVATION ± feet

DATE STARTED: 9/1/2009
DATE COMPLETED: 9/1/2009
LOGGED BY: V. Atkins



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

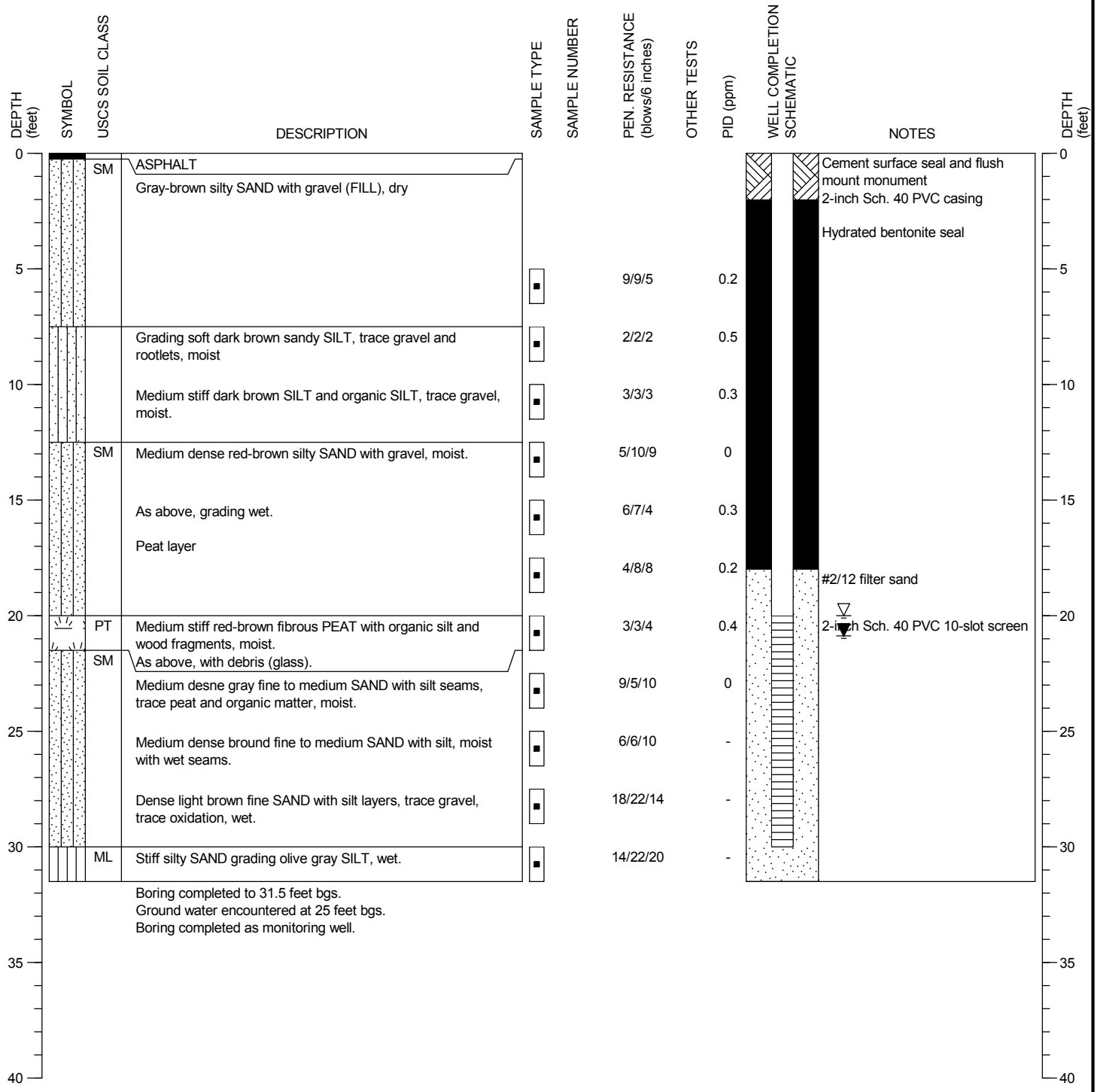
MONITORING WELL:
RMW-7

PROJECT NO.: 2007-098-800 FIGURE: A-12

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted 8-inch HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: East of Riverside property, intersection of SR 522 and NE 180th Street

SURFACE ELEVATION: 40.40 ± feet
CASING ELEVATION ± feet

DATE STARTED: 9/1/2009
DATE COMPLETED: 9/1/2009
LOGGED BY: V. Atkins



Boring completed to 31.5 feet bgs.
Ground water encountered at 25 feet bgs.
Boring completed as monitoring well.

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
RMW-8

PROJECT NO.: 2007-098-800 FIGURE: A-13

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted 8-inch HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: North of Riverside property, intersection of SR 522 and 101st Ave NE

SURFACE ELEVATION: 44.08 ± feet
CASING ELEVATION ± feet

DATE STARTED: 9/1/2009
DATE COMPLETED: 9/1/2009
LOGGED BY: V. Atkins

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	PID (ppm)	WELL COMPLETION SCHEMATIC	NOTES
0		SM	ASPHALT Brown to yellow-brown SAND with silt and gravel (FILL), dry grading moist.							Cement surface seal and flush mount monument 2-inch Sch. 40 PVC casing Hydrated bentonite seal
5			Loose yellow-brown medium SAND with silt and gravel, moist.	■		2/2/7		-		
10		SM	Medium dense yellow brown medium SAND to silty SAND with silt layers (ALLUVIUM), moist with wet seams.	■		7/10/12		-		
15				■		7/10/12		-		▼
20			Medium dense yellow brown fine to medium silty SAND, trace oxidation, wet.	■		7/16/12		-		#2/12 filter sand ▽ 2-inch Sch. 40 PVC 10-slot screen
			Still sandy SILT with silty SAND layers, moist to wet.	■		14/15/15		-		
25		SM	Medium dense dark brown fine silty SAND and sandy SILT with orange mottling, wet.	■		8/8/10		-		
			Medium dense brown to olive brown silty fine SAND, wet.	■		8/9/10		-		
30			Medium dense olive brown silty fine SAND, wet, slight heave.	■		5/5/7		-		
35			Boring completed to 31.5 feet bgs. Ground water encountered at 24 feet bgs. Boring completed as monitoring well.							
40										

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
RMW-9

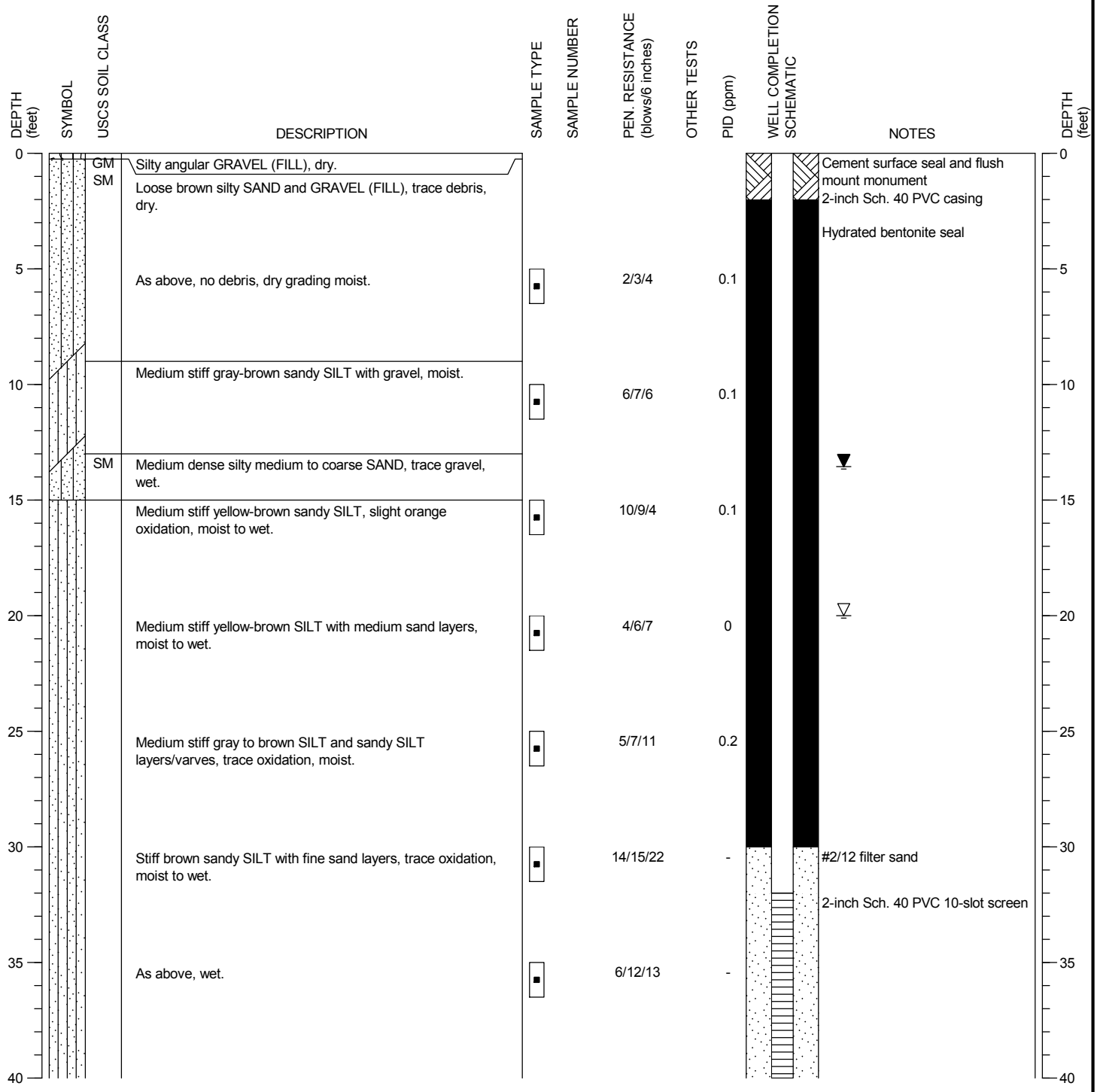
PROJECT NO.: 2007-098-800 FIGURE: A-14

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted 8-inch HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: Riverside property, east end

SURFACE ELEVATION: 36.79 ± feet
CASING ELEVATION ± feet

DATE STARTED: 9/3/2009
DATE COMPLETED: 9/3/2009
LOGGED BY: V. Atkins



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
RMW-10

PROJECT NO.: 2007-098-800 FIGURE: A-15

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: CME 75 Truck-mounted 8-inch HSA
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: Riverside property, east end

SURFACE ELEVATION: 36.79 ± feet
CASING ELEVATION ± feet

DATE STARTED: 9/3/2009
DATE COMPLETED: 9/3/2009
LOGGED BY: V. Atkins

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	PID (ppm)	WELL COMPLETION SCHEMATIC	NOTES
40		ML	Stiff gray SILT, wet.	■		6/12/20		-		
			Harder drilling.							Hydrated bentonite backfill
45			Stiff gray sandy SILT with fine sand layers, moist to wet.	■		12/18/16		-		
50			Stiff gray SILT with fine sand layers, moist to wet.	■		8/9/10		-		
			Boring completed to 51.5 feet bgs.							
			Ground water encountered at 20 and 30 feet bgs.							
			Boring completed as monitoring well.							
55										
60										
65										
70										
75										
80										

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

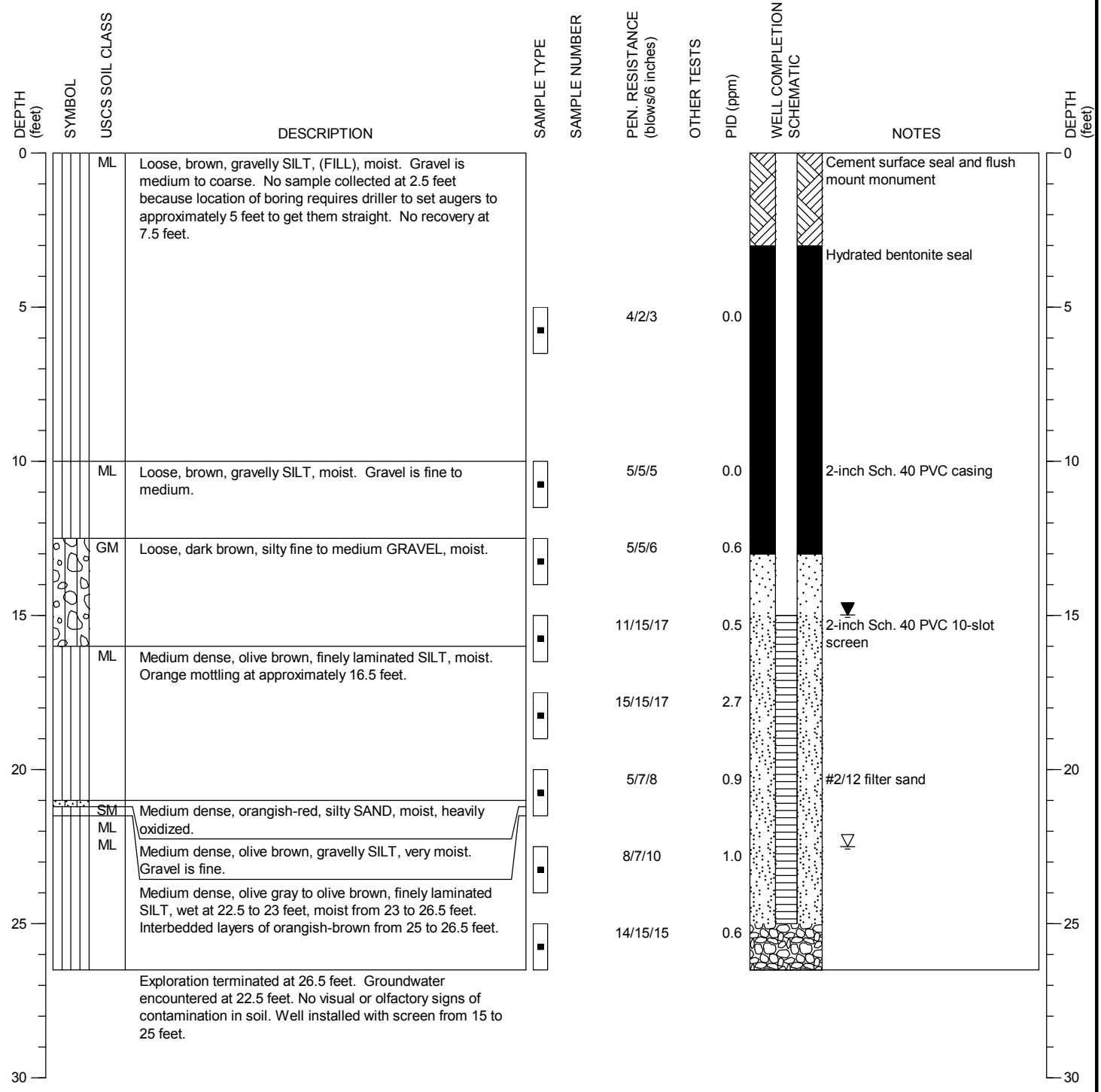
MONITORING WELL:
RMW-10

PROJECT NO.: 2007-098-800 FIGURE: A-15

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: Hollow Stem Auger, Modified CME-55
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: North of Gravel Parking Lot

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 7/22/2016
DATE COMPLETED: 7/22/2016
LOGGED BY: A. York



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Crossroads RI/FS
Bothell, Washington

MONITORING WELL:
RMW-12

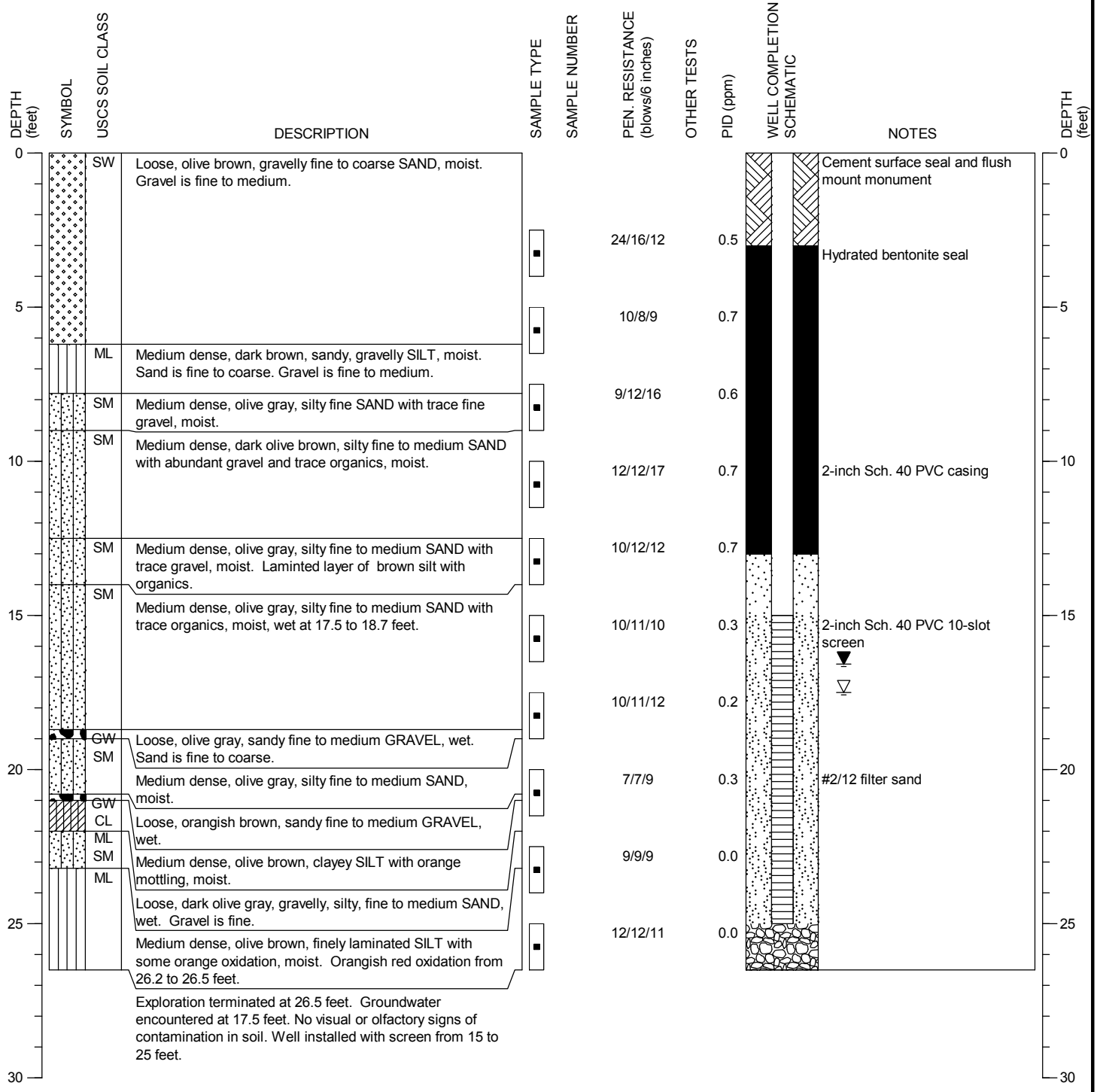
PAGE: 1 of 1

PROJECT NO.: 2007-098-800 FIGURE:

DRILLING COMPANY: Cascade Drilling, Inc.
DRILLING METHOD: Hollow Stem Auger, Modified CME-55
SAMPLING METHOD: D&M Split Spoon with 300 lb hammer
LOCATION: Paved Pathway South of 180th

SURFACE ELEVATION: ± feet
CASING ELEVATION ± feet

DATE STARTED: 7/22/2016
DATE COMPLETED: 7/22/2016
LOGGED BY: A. York



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Crossroads RI/FS
Bothell, Washington

MONITORING WELL:
RMW-13

PAGE: 1 of 1

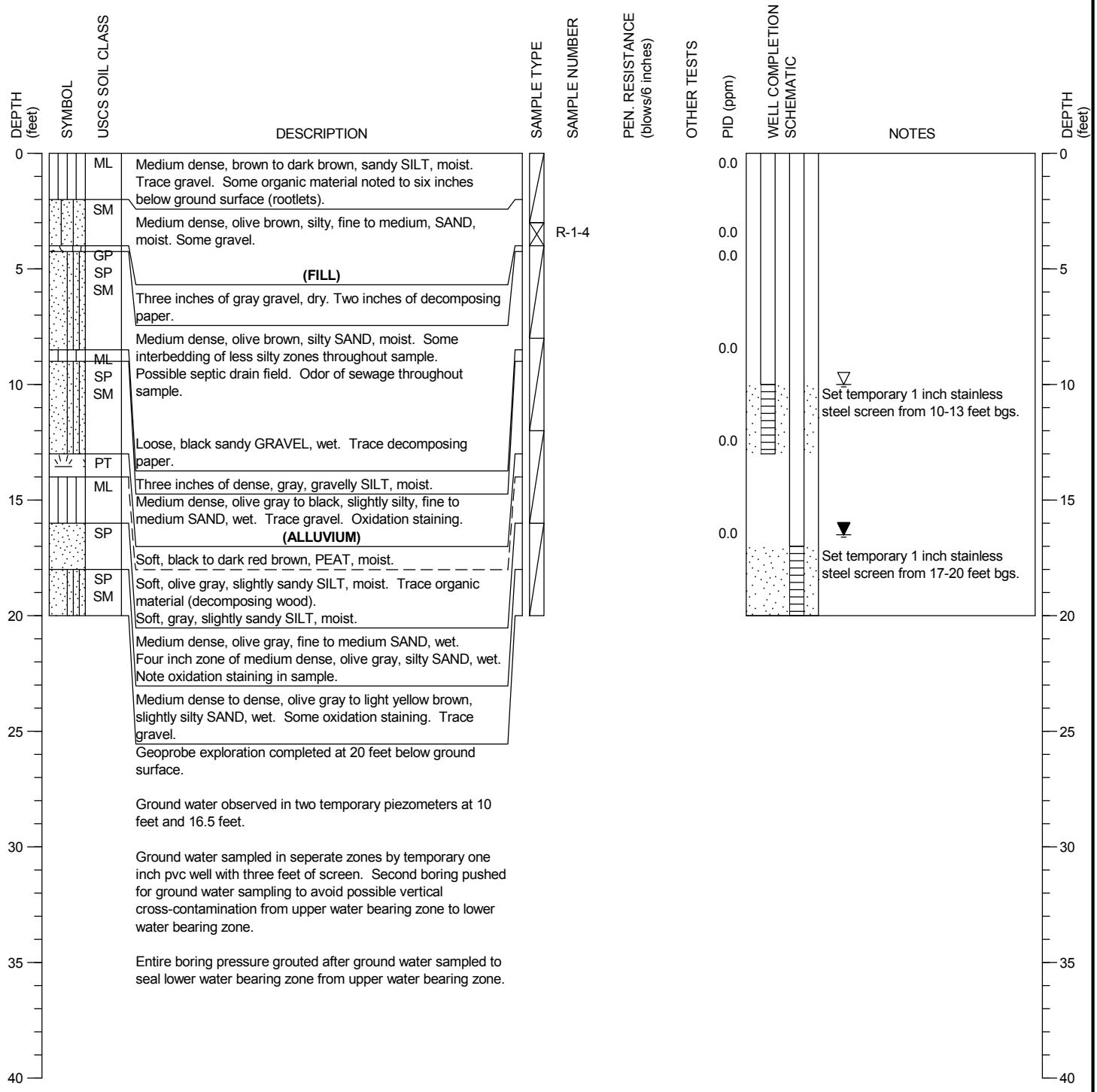
PROJECT NO.: 2007-098-800 FIGURE:

MWELL 2007-098-RIVERSIDE.GPJ 8/15/16

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 38.50 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/11/2008
DATE COMPLETED: 2/11/2008
LOGGED BY: J. Speck



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HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
R-1

PAGE: 1 of 1

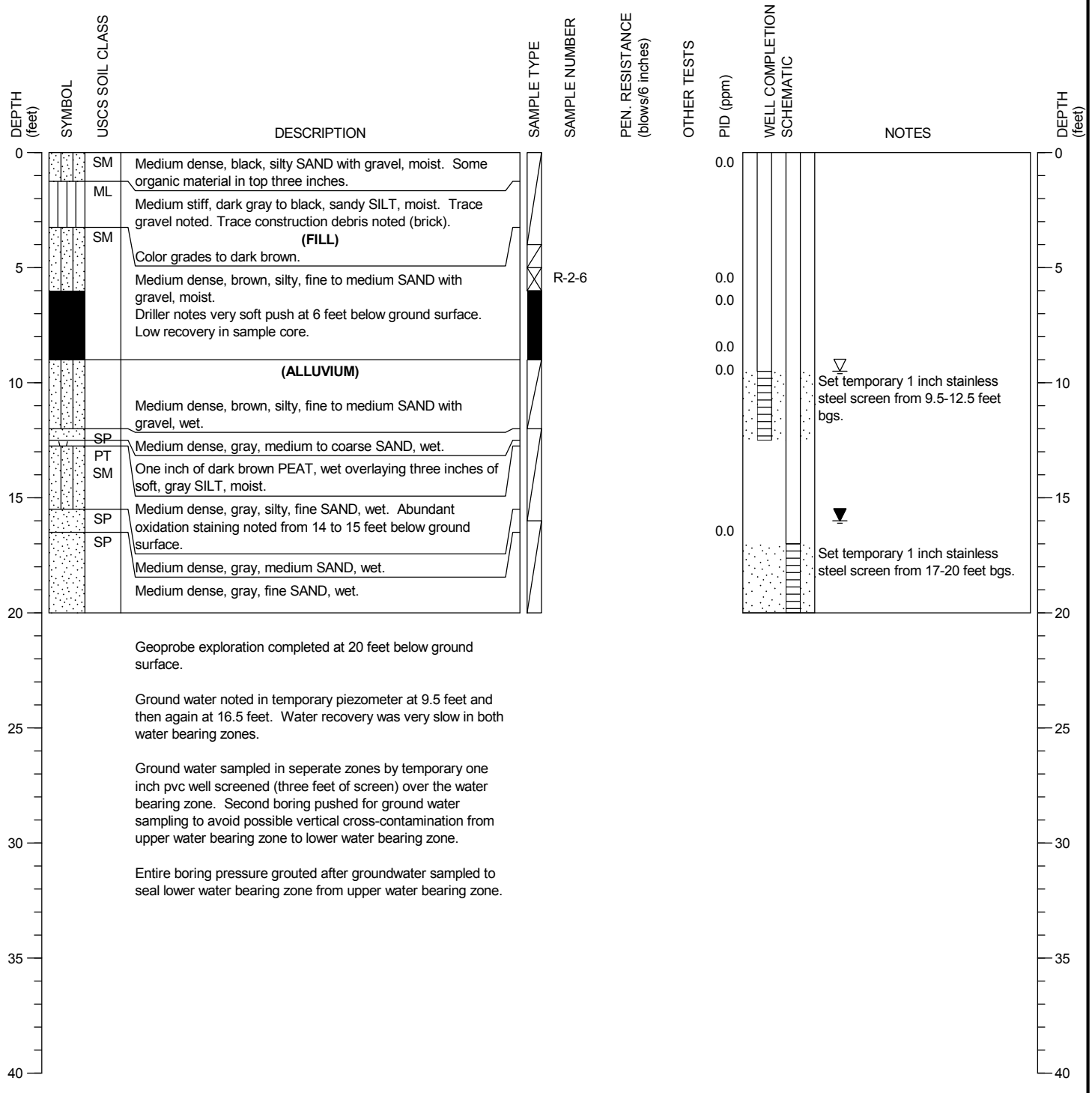
PROJECT NO.: 2007-098-800 FIGURE: A-16

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 38.50 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/11/2008
DATE COMPLETED: 2/11/2008
LOGGED BY: J. Speck



Geoprobe exploration completed at 20 feet below ground surface.

Ground water noted in temporary piezometer at 9.5 feet and then again at 16.5 feet. Water recovery was very slow in both water bearing zones.

Ground water sampled in seperate zones by temporary one inch pvc well screened (three feet of screen) over the water bearing zone. Second boring pushed for ground water sampling to avoid possible vertical cross-contamination from upper water bearing zone to lower water bearing zone.

Entire boring pressure grouted after groundwater sampled to seal lower water bearing zone from upper water bearing zone.

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
R-2

PAGE: 1 of 1

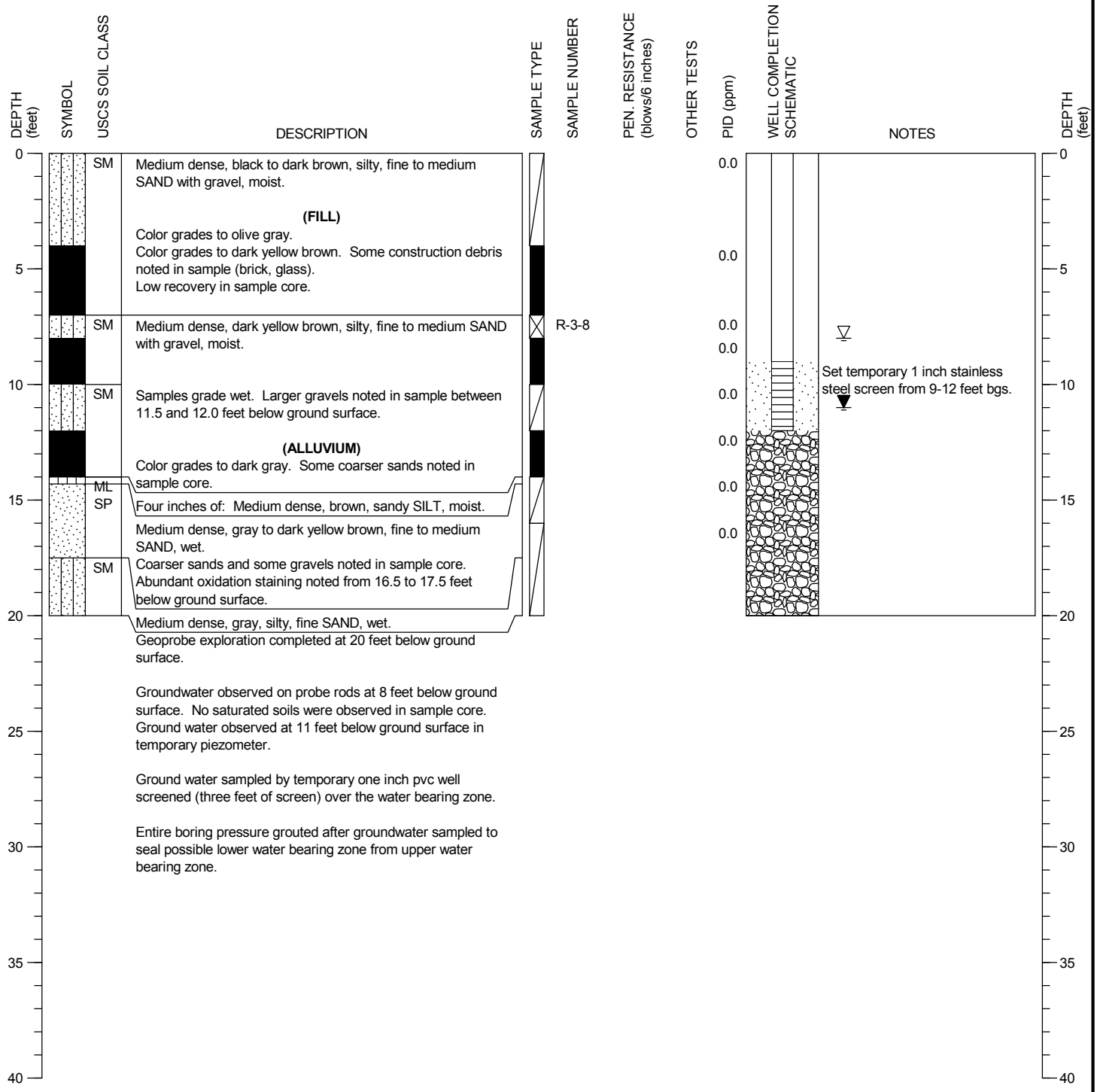
PROJECT NO.: 2007-098-800 FIGURE: A-17

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 37.50 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/12/2008
DATE COMPLETED: 2/12/2008
LOGGED BY: J. Speck



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
R-3

PAGE: 1 of 1

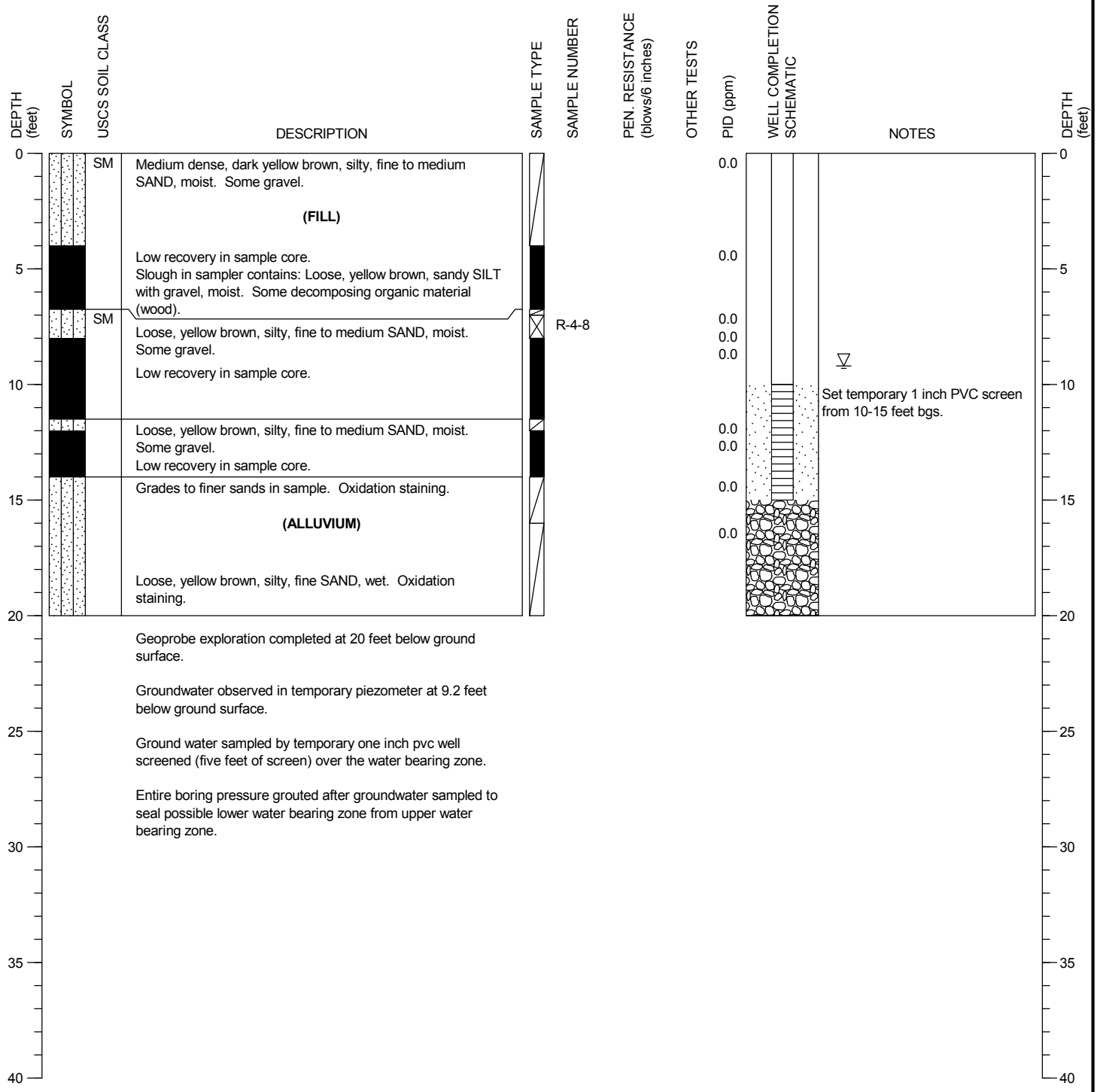
PROJECT NO.: 2007-098-800 FIGURE: A-18

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 36.50 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/12/2008
DATE COMPLETED: 2/12/2008
LOGGED BY: J. Speck



Geoprobe exploration completed at 20 feet below ground surface.

Groundwater observed in temporary piezometer at 9.2 feet below ground surface.

Ground water sampled by temporary one inch pvc well screened (five feet of screen) over the water bearing zone.

Entire boring pressure grouted after groundwater sampled to seal possible lower water bearing zone from upper water bearing zone.

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

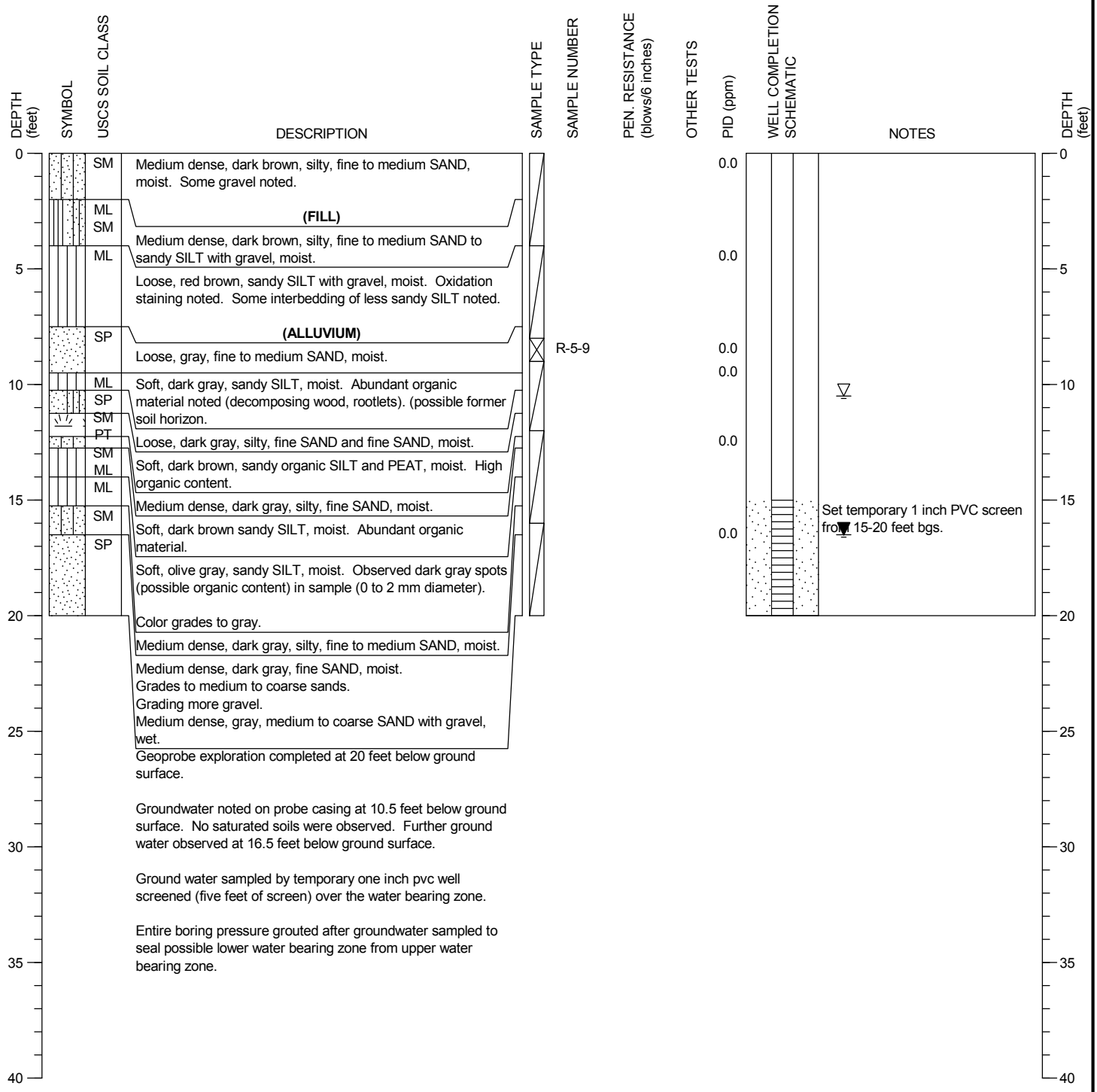
MONITORING WELL:
R-4

PROJECT NO.: 2007-098-800 FIGURE: A-19

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 35.50 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/12/2008
DATE COMPLETED: 2/12/2008
LOGGED BY: J. Speck



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HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
R-5

PAGE: 1 of 1

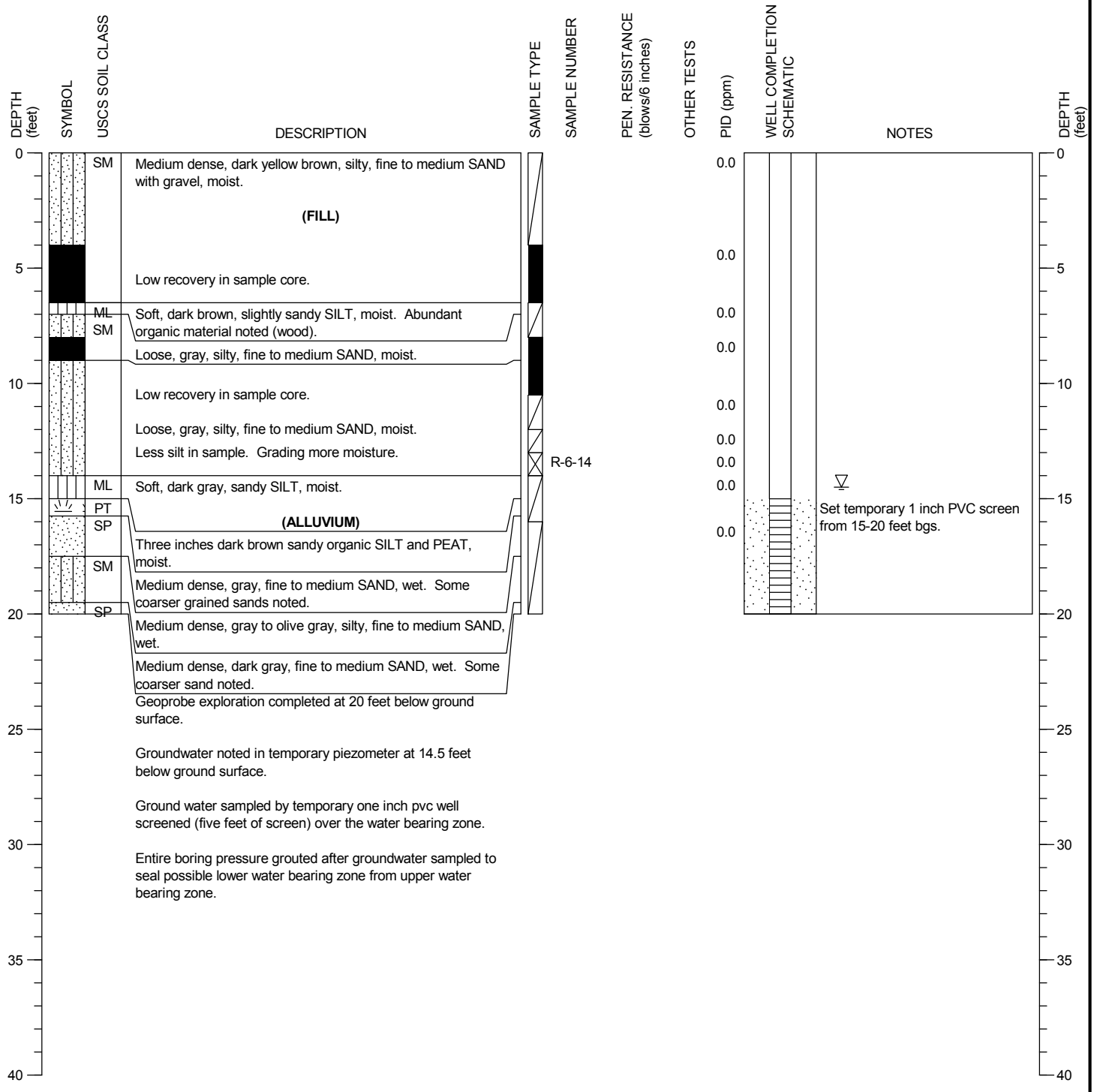
PROJECT NO.: 2007-098-800 FIGURE: A-20

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 36.30 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/12/2008
DATE COMPLETED: 2/12/2008
LOGGED BY: J. Speck



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
R-6

PAGE: 1 of 1

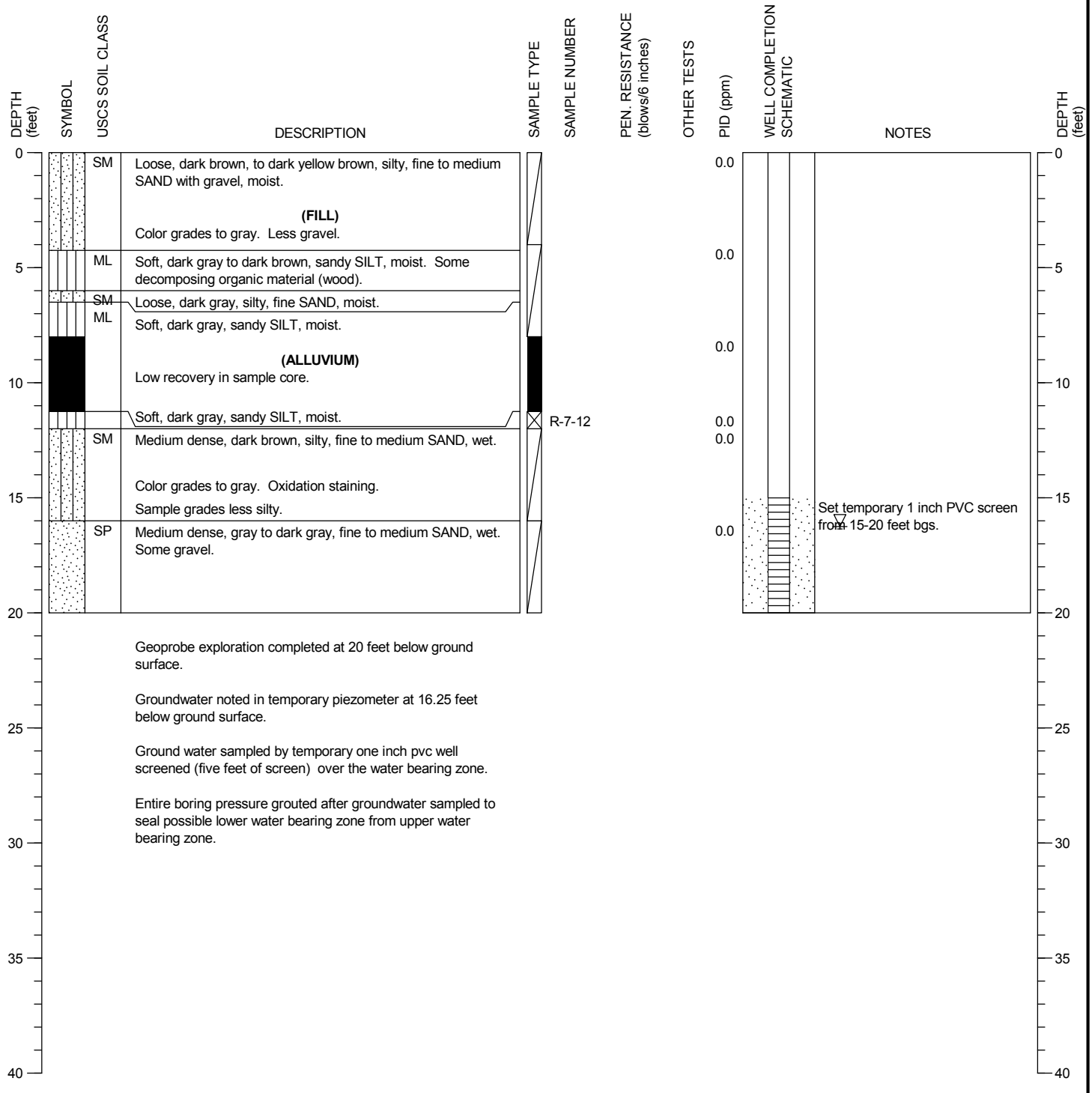
PROJECT NO.: 2007-098-800 FIGURE: A-21

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 36.40 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/12/2008
DATE COMPLETED: 2/12/2008
LOGGED BY: J. Speck



Geoprobe exploration completed at 20 feet below ground surface.

Groundwater noted in temporary piezometer at 16.25 feet below ground surface.

Ground water sampled by temporary one inch pvc well screened (five feet of screen) over the water bearing zone.

Entire boring pressure grouted after groundwater sampled to seal possible lower water bearing zone from upper water bearing zone.

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

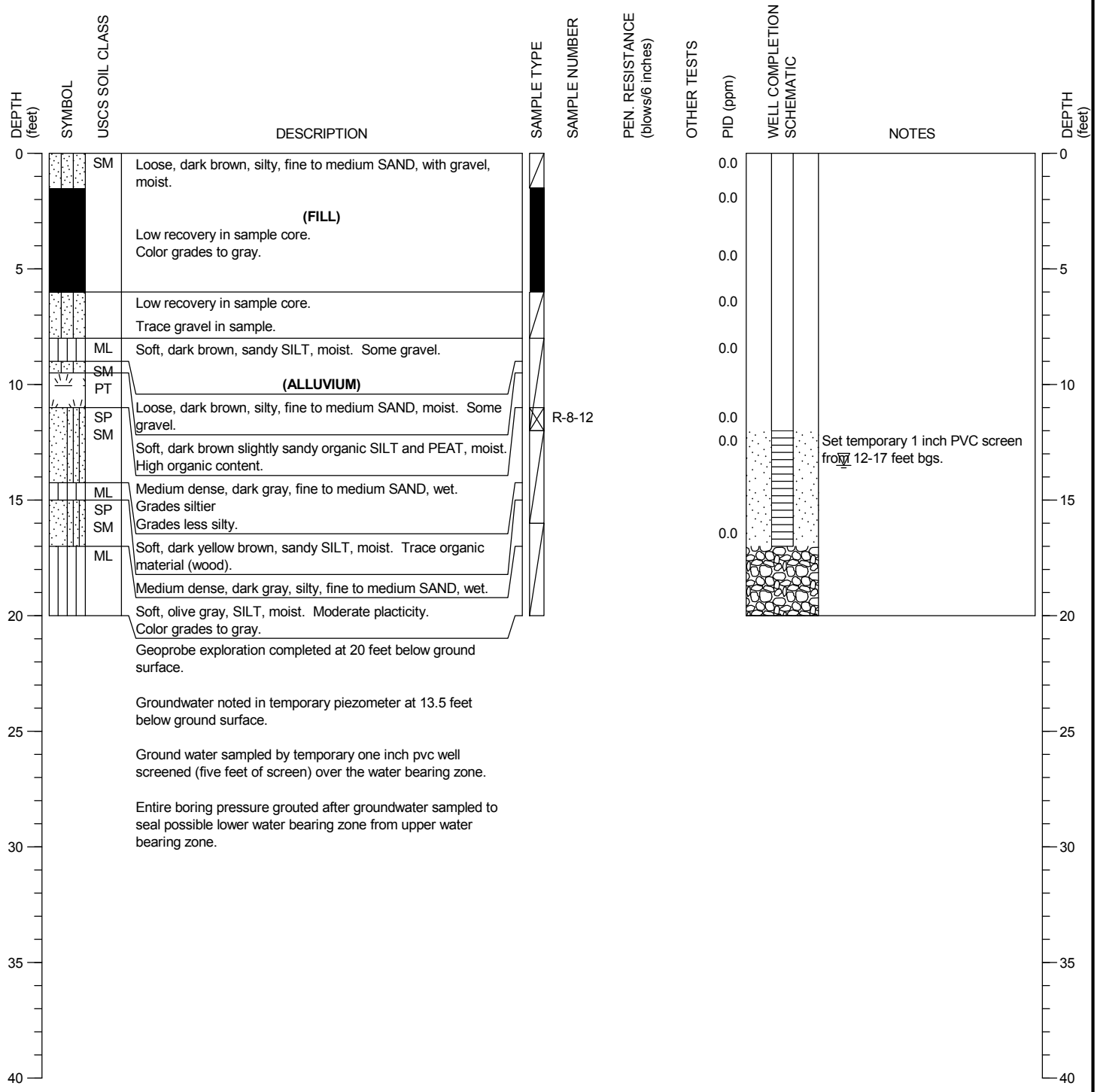
MONITORING WELL:
R-7

PROJECT NO.: 2007-098-800 FIGURE: A-22

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 36.80 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/12/2008
DATE COMPLETED: 2/12/2008
LOGGED BY: J. Speck



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
R-8

PAGE: 1 of 1

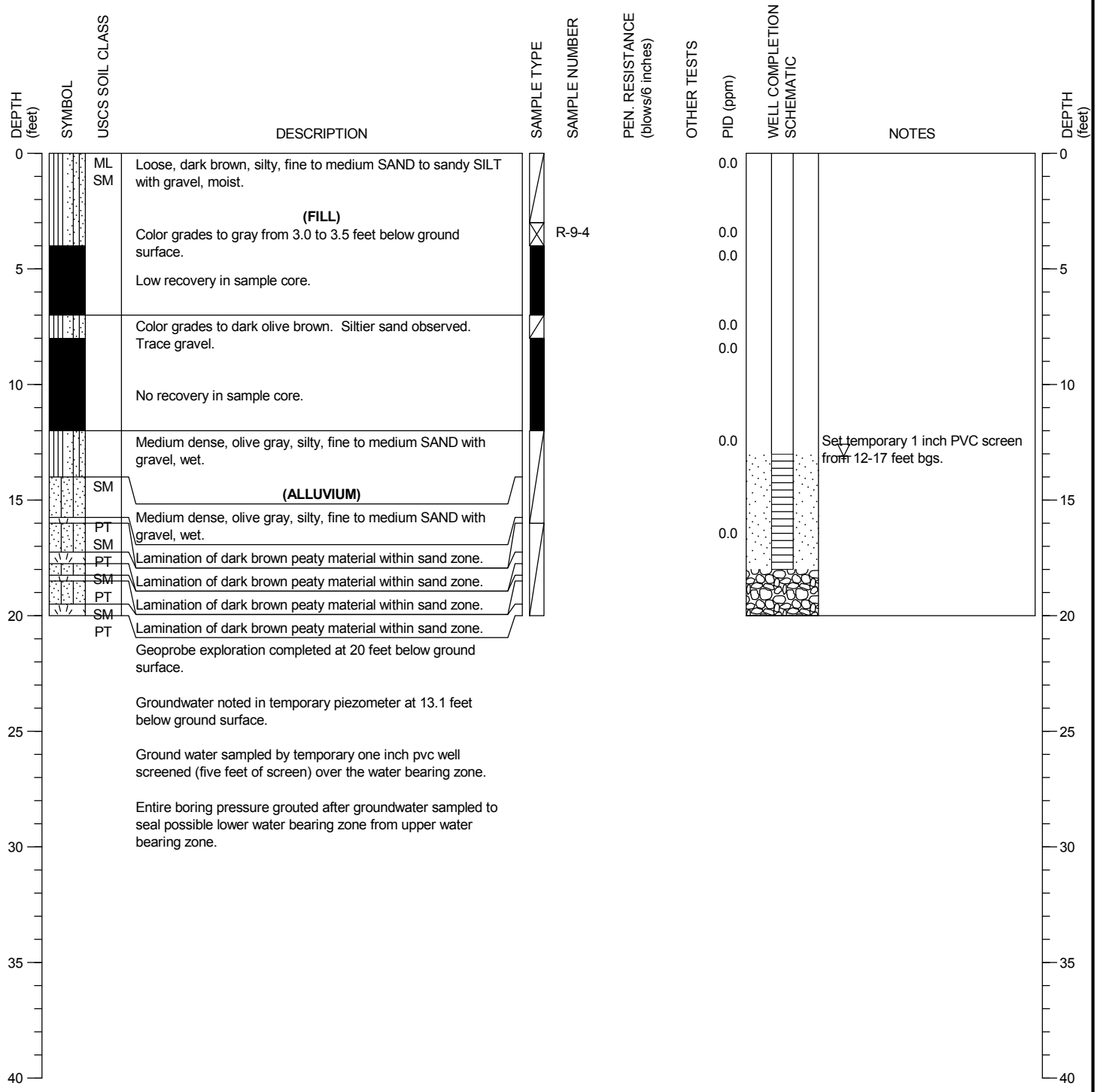
PROJECT NO.: 2007-098-800 FIGURE: A-23

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 37.70 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/13/2008
DATE COMPLETED: 2/13/2008
LOGGED BY: J. Speck



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
R-9

PAGE: 1 of 1

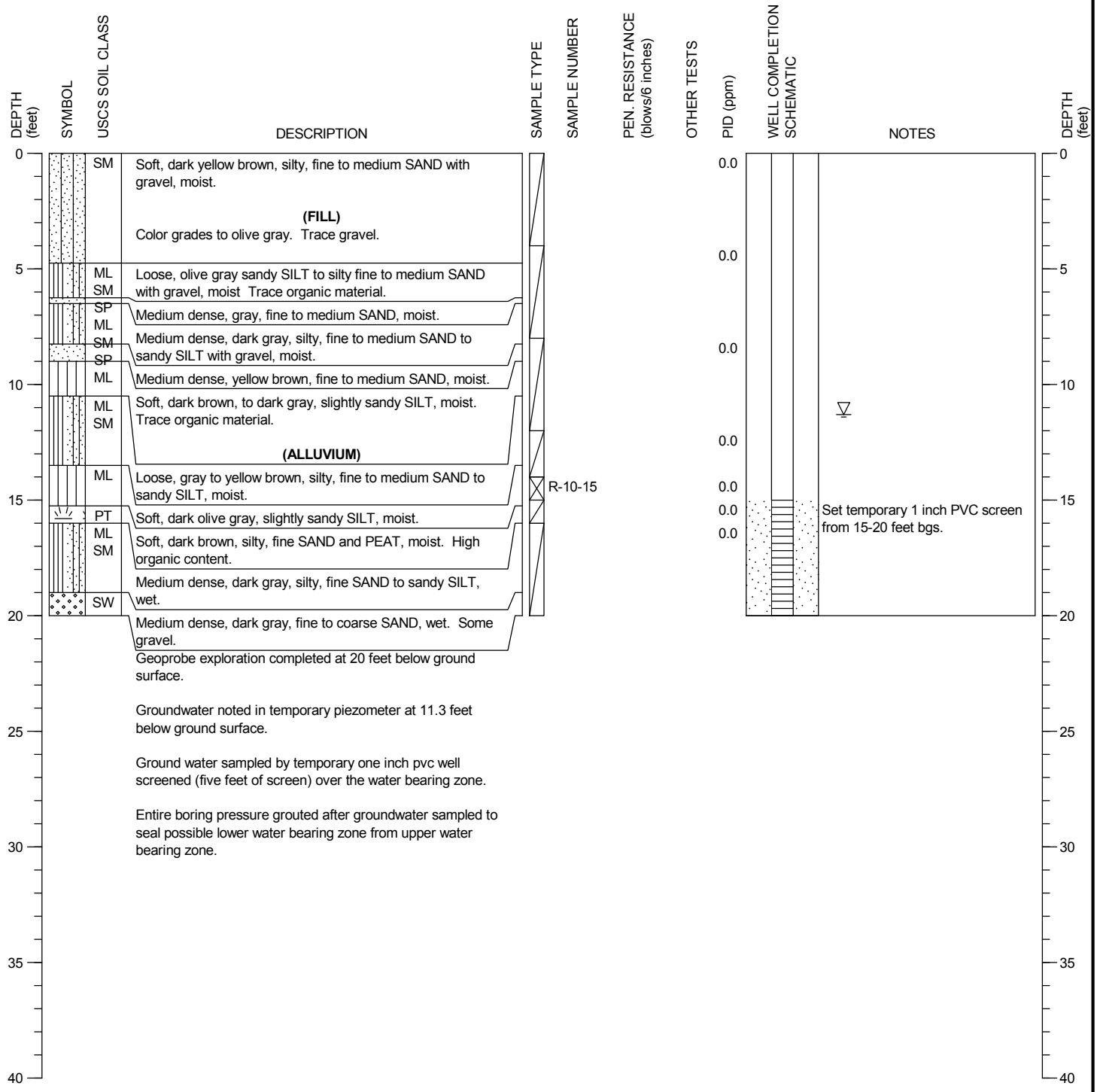
PROJECT NO.: 2007-098-800 FIGURE: A-24

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 36.70 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/13/2008
DATE COMPLETED: 2/13/2008
LOGGED BY: J. Speck



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
R-10

PAGE: 1 of 1

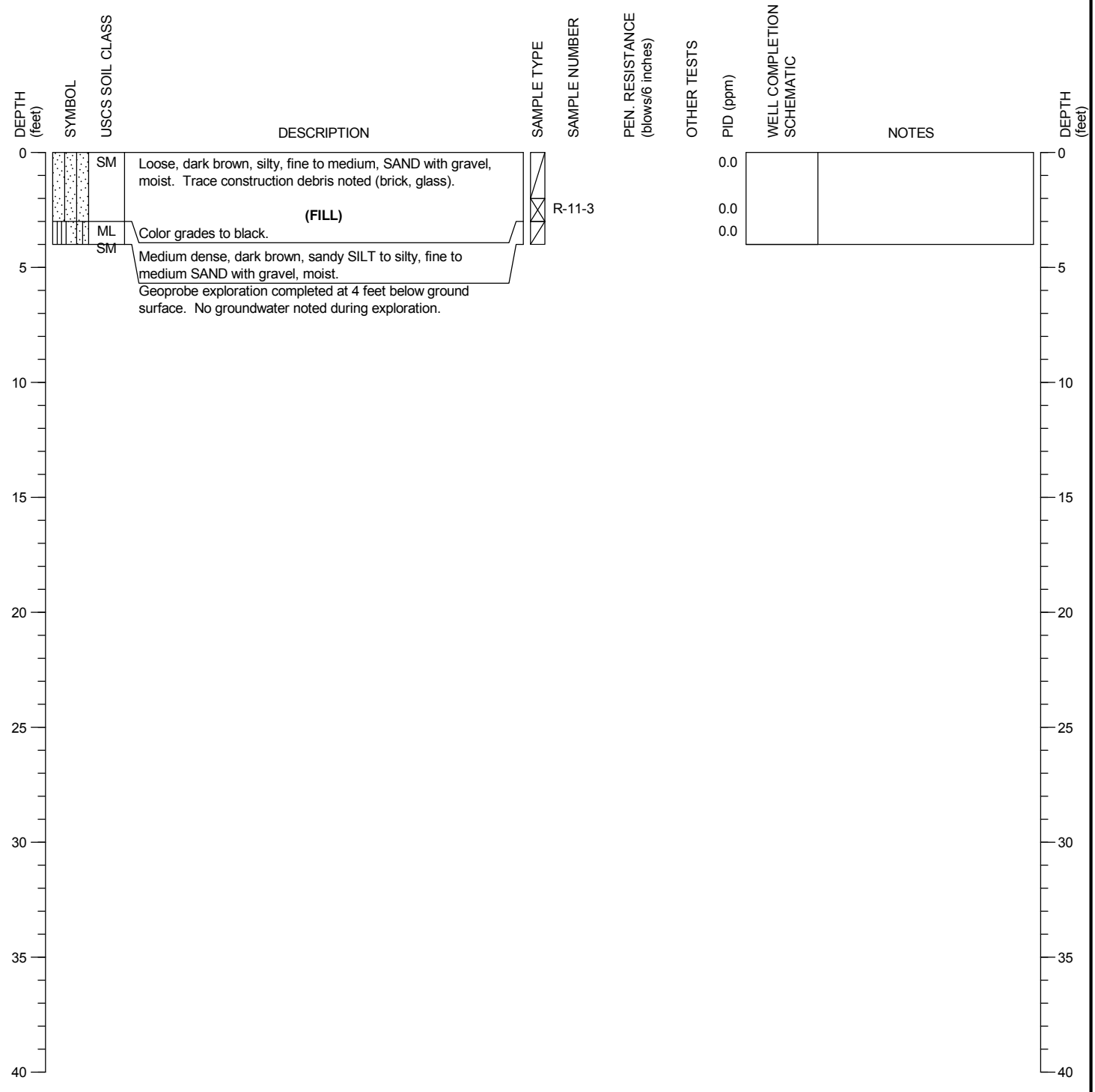
PROJECT NO.: 2007-098-800 FIGURE: A-25

MWELL 2007-098-RIVERSIDE.GPJ 4/7/15

DRILLING COMPANY: ESN Northwest
DRILLING METHOD: Geoprobe
SAMPLING METHOD: Continuous
LOCATION: See Figure 2

SURFACE ELEVATION: 38.10 ± feet
CASING ELEVATION ± feet

DATE STARTED: 2/13/2008
DATE COMPLETED: 2/13/2008
LOGGED BY: J. Speck



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Bothell Riverside
Bothell, Washington

MONITORING WELL:
R-11

PROJECT NO.: 2007-098-800 FIGURE: A-26

Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-12
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING 5'
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00		~50"			0 5 10 15 20 25			0-2 Brown/tan sand + gravel w/ asplalt debris 2-3 dark grey sand + gravel no odor. 3-3.5 light grey gravel 3.5-5 Dark grey brown silty sand + gravel. Head space 0.00 ppm	0 5 10 15 20 25	

Continued Next Page

Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-13
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING 5
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00		~55"			5			0-2' Brown sand + gravel with asphalt debris 2-3' grey brown sand + gravel. 3-5 grey brown silty sand + gravel. head space 0 ppm	5	
					10				10	
					15				15	
					20				20	
					25				25	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # B-14
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING 5
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
		50"			5			0-3' Brow sand & gravel w/ asphalt Debris. 3'-5' Dark grey silty sand & gravel head space: 0.00ppm	5	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 0210303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-15
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING 5
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
1.0		55"			5			0-4" asphalt debris 4"-2.5' brown sand & gravel w/ asphalt debris 2.5-2.75' yellow/tan sand & gravel 2.75'-5 dark grey silty sand & gravel Head Space 1.00ppm Collected 2' Sample	5	
					10				10	
					15				15	
					20				20	
					25				25	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-16
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING 5'
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00 ppm			50"		5			0 - 2' Brown sand & gravel. Chunks of asphalt. 2'-3 Dark grey sand and gravel. asphalt debris 3'-4' grey brow silty sand and gravel. Broken up concrete pieces. Head Space 0 ppm	5	
					10				10	
					15				15	
					20				20	
					25				25	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555.1647.019.02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-17
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING 5'
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vangelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00 ppm		55"			5			0-2.5 brown/grey sand & gravel 2.5-3 dark grey silty sand & gravel no odor 3'-5 ligh grey silty sand & gravel Head space 0.00ppm	5	
					10				10	
					15				15	
					20				20	
					25				25	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Pus
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-14
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING 5'
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00 ppm		55"			5			0-2.5 ligh grey brown Sand & gravel w/ asphalt. debris 2.5 -5 dark grey silty Sand & gravel no odor Head space 0.00ppm	5	
					10				10	
					15				15	
					20				20	
					25				25	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-19
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING 5'
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00 ppm					5 10 15 20 25			0-2.5 grey brown sand & gravel w/ asphalt debris 2.5-5 dark grey silty sand & gravel some wood debris at 4'. Petrol odor Head space 0.00 ppm However, due to strong odor of 2.5-4 interval grabbed 0-2' sample,	5 10 15 20 25	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-20
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING ~5'
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00 ppm		50"			5			0-2.5 Brown/tan sand & gravel with asphalt debris.. 2.5-3. Dark brown grey silty sand & gravel 3-5 light grey silty sand & gravel	5	
					10				10	
					15				15	
					20				20	
					25			Duplicate Dup 0903	25	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # B-21
DATE COMPLETED 9/3/2009
TOTAL DEPTH OF BORING 5'
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vougelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00 ppm		~75%			5 10 15 20 25			0 - 4" Bark & woody debris 4" - 3 Light brown tan silty sand. Very dry, loamy 3-5 light grey tan silty sand & gravel loamy Head space 0.00 ppm	5 10 15 20 25	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-22
DATE COMPLETED 9/3/09
TOTAL DEPTH OF BORING 5'
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00 ppm			40"		5			0-2" grass 2" - 3' orange tan loamy silty ~~sand~~ topsoil 3'-5' dark grey loamy silty soil. Head space = 0.0 ppm	5	
					10				10	
					15				15	
					20				20	
					25				25	

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Parametrix, Inc.

Riverside

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER #R-23
DATE COMPLETED 9/3/2003
TOTAL DEPTH OF BORING 4'
INITIAL WATER LEVEL ▽
STATIC WATER LEVEL ▼
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
0.00 ppm		40"			5			0-2.5 tanish brow sand + gravel 2.5-4 Brown/grey Silty sand + gravel, 3' piece of abandoned wire isulation head space 0.0ppm	5	
					10				10	
					15				15	
					20				20	
					25				25	

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 555 1647 019 02/0303
PROJECT NAME Bothell Crossing
LOCATION Riverside
COORDINATES
DRILLING METHOD Direct Push
SAMPLING METHOD
GROUND ELEVATION

BORING/WELL NUMBER # R-24
DATE COMPLETED 9/4/2009
TOTAL DEPTH OF BORING 30'
INITIAL WATER LEVEL ▽ 10'
STATIC WATER LEVEL ▼ 13'
LOGGED BY Lily Vagelatos
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	DESCRIPTION SOIL: Group Name, Group Symbol, Color, Plasticity, Grain Size, Moisture Content, Density/Compaction, Miscellaneous	DEPTH (ft.)	WELL DIAGRAM
		50"			5			0-6" Dark brown silty sand & gravel 6"-1' medium brown silty sand & gravel 1'-5' grey silty clay & gravel	5	
		15" Hit Rock			10			5'-6' grey silty clay & gravel 6'-9' Brown/grey silty sand & gravel 9'-10' Damp, Dark brown silty sand & gravel 10-13' Saturated grey brown silty sand.	10	1" H_2O ▽
		50"			15			13-13.25 wood debris. 13.25-15 Grey/brown silty clay 15-16' Grey/brown silty clay 16-16.25 wood debris.	15	
		55"			20			16.25-17 grey silty sand 17'-20 grey silty clay 20-25' grey silty clay	20	
		55"			25			25'-30 grey brown sand & gravel	25	

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50" -30'

-30'

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APPENDIX B

HISTORICAL GROUND WATER DATA AND GRADIENT MAPS

Table 3-1. Summary of Soil Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	MTCA B soil to gw	Ecological Indicator Conc.	Sample No.: Depth (ft): Background	R-12-4 4 9/3/2009	R-13-4 4 9/3/2009	R-14-4 4 9/3/2009	R-15-2 2 9/3/2009	R-15-4 4 9/3/2009	R-16-4 4 9/3/2009	R-17-4 4 9/3/2009	R-18-4 4 9/3/2009	R-19-2 2 9/3/2009
PETROLEUM HYDROCARBONS															
Diesel	mg/kg	NWTPH-Dx	2,000		200		95 U	85 U	73 J	480 U	100 U	29 J	27 U	100 J	200 U
Motor Oil	mg/kg	NWTPH-Dx	2,000				870	760	750	6,300	850	300	82	1,200	3,500
METALS															
Chromium	mg/kg	SW6010B-Total	2,000*CR		42	48.15	32	- -	- -	- -	- -	39	24	- -	15
Lead	mg/kg	SW6010B-Total	250	250	50	16.83	**54**	- -	- -	- -	- -	37	15	- -	5.4 U
Mercury	mg/kg	SW7471A-Total	2	2.088	0.1	0.07	0.047	- -	- -	- -	- -	0.036	0.022	- -	0.022 U
VOLATILE ORGANICS															
cis-1,2-Dichloroethene	µg/kg	SW8260B					- -	- -	- -	- -	- -	- -	- -	- -	- -
Methylene Chloride	µg/kg	SW8260B	20				- -	- -	- -	- -	- -	- -	- -	- -	- -
SEMIVOLATILE ORGANICS															
1-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				7.6 U	- -	- -	- -	- -	7.4 U	7.2 U	- -	7.2 U
2-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				7.6 U	- -	- -	- -	- -	7.4 U	7.2 U	- -	7.2 U
Benzo(a)anthracene	µg/kg	SW8270D SIM					7.6 U	- -	- -	- -	- -	7.4 U	7.2 U	- -	14
Benzo(a)pyrene	µg/kg	SW8270D SIM			12,000		16	- -	- -	- -	- -	24	8	- -	44
Benzo(b)fluoranthene	µg/kg	SW8270D SIM					17	- -	- -	- -	- -	23	9.4	- -	22
Benzo(g,h,i)perylene	µg/kg	SW8270D SIM					17	- -	- -	- -	- -	26	11	- -	71
Benzo(k)fluoranthene	µg/kg	SW8270D SIM					7.6 U	- -	- -	- -	- -	7.4 U	7.2 U	- -	59
Chrysene	µg/kg	SW8270D SIM					9.6	- -	- -	- -	- -	9.8	8.6	- -	75
Dibenz(a,h)anthracene	µg/kg	SW8270D SIM					7.6 U	- -	- -	- -	- -	7.4 U	7.2 U	- -	22
Fluoranthene	µg/kg	SW8270D SIM					7.6 U	- -	- -	- -	- -	8.6	7.2 U	- -	8.4
Indeno(1,2,3-cd)pyrene	µg/kg	SW8270D SIM					8.2	- -	- -	- -	- -	18	7.2 U	- -	11
Naphthalene	µg/kg	SW8270D SIM	5,000*NA				7.6 U	- -	- -	- -	- -	7.4 U	7.2 U	- -	7.2 U
Phenanthrene	µg/kg	SW8270D SIM					7.6 U	- -	- -	- -	- -	7.4 U	7.2 U	- -	7.2 U
Pyrene	µg/kg	SW8270D SIM					15	- -	- -	- -	- -	14	7.2 U	- -	29
Total cPAHs Using Tox. Equiv.	µg/kg	Calculated	100				20	- -	- -	- -	- -	29	10	- -	58

(Table continues)

Table 3-1. Summary of Soil Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	MTCA B soil to gw	Ecological Indicator Conc.	Sample No.: Depth (ft): Background	R-19-4 4 9/3/2009	R-20-4 4 9/3/2009	DUP-0903 (R-20-4) 4 9/3/2009	R-21-4 4 9/3/2009	R-22-4 4 9/3/2009	R-23-4 4 9/3/2009	RMW-4-5 5 8/31/2009	RMW-4-10 10 8/31/2009	RMW-4-15 15 8/31/2009
PETROLEUM HYDROCARBONS															
Diesel	mg/kg	NWTPH-Dx	2,000		200		150 J	27 U	27 U	27 U	28 U	28 U	- -	- -	- -
Motor Oil	mg/kg	NWTPH-Dx	2,000				1,400	54 U	54 U	88	270	57 U	- -	- -	- -
METALS															
Chromium	mg/kg	SW6010B-Total	2,000*CR		42	48.15	22	21	25	27	- -	40	- -	- -	- -
Lead	mg/kg	SW6010B-Total	250	250	50	16.83	**55**	5.4 U	5.4 U	13	- -	12	- -	- -	- -
Mercury	mg/kg	SW7471A-Total	2	2.088	0.1	0.07	0.061	0.022 U	0.022 U	0.036	- -	0.032	- -	- -	- -
VOLATILE ORGANICS															
cis-1,2-Dichloroethene	µg/kg	SW8260B					- -	- -	- -	- -	- -	- -	- -	- -	- -
Methylene Chloride	µg/kg	SW8260B	20				- -	- -	- -	- -	- -	- -	- -	- -	- -
SEMIVOLATILE ORGANICS															
1-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				20	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
2-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				32	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Benzo(a)anthracene	µg/kg	SW8270D SIM					8.6	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Benzo(a)pyrene	µg/kg	SW8270D SIM			12,000		13	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Benzo(b)fluoranthene	µg/kg	SW8270D SIM					24	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Benzo(g,h,i)perylene	µg/kg	SW8270D SIM					17	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Benzo(k)fluoranthene	µg/kg	SW8270D SIM					7.6 U	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Chrysene	µg/kg	SW8270D SIM					18	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Dibenz(a,h)anthracene	µg/kg	SW8270D SIM					7.6 U	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Fluoranthene	µg/kg	SW8270D SIM					17	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Indeno(1,2,3-cd)pyrene	µg/kg	SW8270D SIM					8.2	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Naphthalene	µg/kg	SW8270D SIM	5,000*NA				15	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Phenanthrene	µg/kg	SW8270D SIM					13	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Pyrene	µg/kg	SW8270D SIM					22	7.2 U	7.2 U	7.2 U	- -	7.6 U	7.8 U	7.9 U	9.3 U
Total cPAHs Using Tox. Equiv.	µg/kg	Calculated	100				18	5.4	5.4	5.4	- -	5.7	5.9	6.0	7.0

(Table continues)

Table 3-1. Summary of Soil Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	MTCA B soil to gw	Ecological Indicator Conc.	Sample No.: Depth (ft): Background	RMW-4-17 1/2 17.5 8/31/2009	RMW-5-10 10 8/31/2009	RMW-5-15 15 8/31/2009	RMW-6-5 5 8/31/2009	RMW-6-10 10 8/31/2009	RMW-6-15 15 8/31/2009	RMW-7-5 5 9/1/2009	RMW-7-10 10 9/1/2009
PETROLEUM HYDROCARBONS														
Diesel	mg/kg	NWTPH-Dx	2,000		200		35 U	35 U	33 U	- -	- -	- -	- -	- -
Motor Oil	mg/kg	NWTPH-Dx	2,000				69 U	69 U	65 U	- -	- -	- -	- -	- -
METALS														
Chromium	mg/kg	SW6010B-Total	2,000*CR		42	48.15	- -	- -	- -	- -	- -	- -	- -	- -
Lead	mg/kg	SW6010B-Total	250	250	50	16.83	- -	- -	- -	- -	- -	- -	- -	- -
Mercury	mg/kg	SW7471A-Total	2	2.088	0.1	0.07	- -	- -	- -	- -	- -	- -	- -	- -
VOLATILE ORGANICS														
cis-1,2-Dichloroethene	µg/kg	SW8260B					- -	- -	- -	1.1 U	1.4 U	4.5	0.5 U	0.55 U
Methylene Chloride	µg/kg	SW8260B	20				- -	- -	- -	9.9 J	9.2 J	17 J	2.5 U	2.8 U
SEMIVOLATILE ORGANICS														
1-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				- -	- -	- -	- -	- -	- -	- -	- -
2-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				- -	- -	- -	- -	- -	- -	- -	- -
Benzo(a)anthracene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Benzo(a)pyrene	µg/kg	SW8270D SIM			12,000		- -	- -	- -	- -	- -	- -	- -	- -
Benzo(b)fluoranthene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Benzo(g,h,i)perylene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Benzo(k)fluoranthene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Chrysene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Dibenz(a,h)anthracene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Fluoranthene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Indeno(1,2,3-cd)pyrene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Naphthalene	µg/kg	SW8270D SIM	5,000*NA				- -	- -	- -	- -	- -	- -	- -	- -
Phenanthrene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Pyrene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Total cPAHs Using Tox. Equiv.	µg/kg	Calculated	100				- -	- -	- -	- -	- -	- -	- -	- -

(Table continues)

Table 3-1. Summary of Soil Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	MTCA B soil to gw	Ecological Indicator Conc.	Sample No.: Depth (ft): Background	RMW-7-15 15 9/1/2009	RMW-7-17 1/2 17.5 9/1/2009	RMW-8-10 10 9/1/2009	RMW-8-15 15 9/1/2009	RMW-8-20 20 9/1/2009	RMW-8-22 1/2 22.5 9/1/2009	RMW-9-20 20 9/1/2009	Dup-090109 (RMW-9-20) 20 9/1/2009
PETROLEUM HYDROCARBONS														
Diesel	mg/kg	NWTPH-Dx	2,000		200		- -	28 U	- -	- -	- -	32 U	31 U	31 U
Motor Oil	mg/kg	NWTPH-Dx	2,000				- -	56 U	- -	- -	- -	63 U	62 U	62 U
METALS														
Chromium	mg/kg	SW6010B-Total	2,000*CR		42	48.15	- -	- -	- -	- -	- -	- -	- -	- -
Lead	mg/kg	SW6010B-Total	250	250	50	16.83	- -	- -	- -	- -	- -	- -	- -	- -
Mercury	mg/kg	SW7471A-Total	2	2.088	0.1	0.07	- -	- -	- -	- -	- -	- -	- -	- -
VOLATILE ORGANICS														
cis-1,2-Dichloroethene	µg/kg	SW8260B					0.55 U	- -	0.66 U	0.81 U	2.9 U	- -	- -	- -
Methylene Chloride	µg/kg	SW8260B	20				2.7 U	- -	3.3 U	4.1 U	15 U	- -	- -	- -
SEMIVOLATILE ORGANICS														
1-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				- -	- -	- -	- -	- -	- -	- -	- -
2-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				- -	- -	- -	- -	- -	- -	- -	- -
Benzo(a)anthracene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Benzo(a)pyrene	µg/kg	SW8270D SIM			12,000		- -	- -	- -	- -	- -	- -	- -	- -
Benzo(b)fluoranthene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Benzo(g,h,i)perylene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Benzo(k)fluoranthene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Chrysene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Dibenz(a,h)anthracene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Fluoranthene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Indeno(1,2,3-cd)pyrene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Naphthalene	µg/kg	SW8270D SIM	5,000*NA				- -	- -	- -	- -	- -	- -	- -	- -
Phenanthrene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Pyrene	µg/kg	SW8270D SIM					- -	- -	- -	- -	- -	- -	- -	- -
Total cPAHs Using Tox. Equiv.	µg/kg	Calculated	100				- -	- -	- -	- -	- -	- -	- -	- -

(Table continues)

Table 3-1. Summary of Soil Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	MTCA B soil to gw	Ecological Indicator Conc.	Sample No.: Depth (ft): Background	RSS-1 0-6" 0-0.5 9/9/2009	RSS-2 0-6" 0-0.5 9/9/2009
PETROLEUM HYDROCARBONS								
Diesel	mg/kg	NWTPH-Dx	2,000		200		37 U	34 U
Motor Oil	mg/kg	NWTPH-Dx	2,000				410	540
METALS								
Chromium	mg/kg	SW6010B-Total	2,000*CR		42	48.15	- -	- -
Lead	mg/kg	SW6010B-Total	250	250	50	16.83	- -	- -
Mercury	mg/kg	SW7471A-Total	2	2.088	0.1	0.07	- -	- -
VOLATILE ORGANICS								
cis-1,2-Dichloroethene	µg/kg	SW8260B					1.2 U	1.2 U
Methylene Chloride	µg/kg	SW8260B	20				6.2 U	5.9 U
SEMIVOLATILE ORGANICS								
1-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				- -	- -
2-Methylnaphthalene	µg/kg	SW8270D SIM	5,000*NA				- -	- -
Benzo(a)anthracene	µg/kg	SW8270D SIM					- -	- -
Benzo(a)pyrene	µg/kg	SW8270D SIM			12,000		- -	- -
Benzo(b)fluoranthene	µg/kg	SW8270D SIM					- -	- -
Benzo(g,h,i)perylene	µg/kg	SW8270D SIM					- -	- -
Benzo(k)fluoranthene	µg/kg	SW8270D SIM					- -	- -
Chrysene	µg/kg	SW8270D SIM					- -	- -
Dibenz(a,h)anthracene	µg/kg	SW8270D SIM					- -	- -
Fluoranthene	µg/kg	SW8270D SIM					- -	- -
Indeno(1,2,3-cd)pyrene	µg/kg	SW8270D SIM					- -	- -
Naphthalene	µg/kg	SW8270D SIM	5,000*NA				- -	- -
Phenanthrene	µg/kg	SW8270D SIM					- -	- -
Pyrene	µg/kg	SW8270D SIM					- -	- -
Total cPAHs Using Tox. Equiv.	µg/kg	Calculated	100				- -	- -

NOTES:
- - = Not analyzed or not collected
*CR = Chromium Standards based on Chromium III
*NA = Includes Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene
U = Not detected above the given practical quantitation limit
J = Estimated value
Shaded values exceed MTCA
Bold Bold values exceed Ecological Indicator Concentration

SOURCES: Background: 90th percentile Puget Sound (Ecology's Publication #94-115; 10/1994)
Model Toxics Control Act (MTCA) from WA Administrative Code 173-340-900
MTCA Method A Soil Cleanup Levels for Unrestricted Land Use: Table 740-1
MTCA Method B soil to groundwater: site-specific calculated
Ecological Indicator Concentrations: Table 749-3

UNITS:
ft = feet
mg/kg = milligram/kilogram
µg/kg = microgram/kilogram

Table 3-2. Summary of Groundwater Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	Sample No.: / Depth (ft): / Date:	BC-3-18 18 9/15/2009	BC-5-14 14 9/14/2009	R-24-30 30 9/4/2009	RMW-10-32 32 9/15/2009	RMW-11-22 22 9/14/2009	RMW-4-13 13 9/14/2009	RMW-5-15 15 9/14/2009	RMW-6-15 15 9/14/2009	RMW-7-21 21 9/15/2009	RMW-8-25 25 9/15/2009
FIELD DATA														
Conductivity	mmhos/cm				0.356	0.356	- -	0.331	0.368	0.000	0.00	0.00	0.435	0.411
pH	std units				6.60	7.42	- -	7.30	7.38	5.99	6.20	6.41	6.97	6.66
Temperature	Celsius				16.0	16.5	- -	15.7	14.2	15.9	16.3	16.1	18.2	15.8
Dissolved Oxygen	mg/L				4.68	2.62	- -	2.76	3.00	8.14	8.94	9.09	2.55	2.74
PETROLEUM HYDROCARBONS														
All Analytes	varies	varies			- -			- -	- -	ND	ND	- -	- -	- -
DISSOLVED METALS														
Arsenic	mg/L	200.8/6020	0.005		- -	0.0066	- -	0.0047	- -	- -	- -	0.0051	0.0040	- -
VOLATILE ORGANICS														
Chloroform	µg/L	SW8260			1 U	- -	0.2 U	0.2 U	0.2 U	- -	- -	0.2 U	1 U	0.2 U
cis-1,2-Dichloroethene	µg/L	SW8260			49	- -	0.2 U	0.2 U	0.2 U	- -	- -	3.6	190	1.3
Tetrachloroethene	µg/L	SW8260	5		130	- -	0.2 U	0.24	0.2 U	- -	- -	0.2 U	50	0.46
trans-1,2-Dichloroethene	µg/L	SW8260			1 U	- -	0.2 U	0.2 U	0.2 U	- -	- -	0.2 U	2	0.36
Trichloroethene	µg/L	SW8260	5		120	- -	0.2 U	0.2 U	0.2 U	- -	- -	0.27	120	2.6
Vinyl Chloride	µg/L	SW8260	0.2		1 U	- -	0.2 U	0.2 U	0.2 U	- -	- -	5.3	22	0.2 U
SEMIVOLATILE ORGANICS														
All Analytes	µg/L	SW8270D SIM			- -	- -	- -	- -	- -	ND	- -	- -	- -	- -

(Table continues)

Table 3-2. Summary of Groundwater Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	Sample No.: / Depth (ft): / Date:	RMW-8-25-2 / 2 / 9/15/2009	RMW-9-25 / 25 / 9/15/2009
FIELD DATA						
Conductivity	mmhos/cm				- -	0.231
pH	std units				- -	6.76
Temperature	Celsius				- -	17.5
Dissolved Oxygen	mg/L				- -	5.11
PETROLEUM HYDROCARBONS						
All Analytes	varies	varies			- -	- -
DISSOLVED METALS						
Arsenic	mg/L	200.8/6020	0.005		- -	- -
VOLATILE ORGANICS						
Chloroform	µg/L	SW8260			0.2 U	0.31
cis-1,2-Dichloroethene	µg/L	SW8260			1.3	0.2 U
Tetrachloroethene	µg/L	SW8260	5		0.48	0.2 U
trans-1,2-Dichloroethene	µg/L	SW8260			0.36	0.2 U
Trichloroethene	µg/L	SW8260	5		2.6	0.2 U
Vinyl Chloride	µg/L	SW8260	0.2		0.2 U	0.2 U
SEMIVOLATILE ORGANICS						
All Analytes	µg/L	SW8270D SIM			- -	- -

NOTES:
- - - = Not analyzed or not collected
ND = Non-detect
U = Not detected above the given practical quantitation limit
Shaded values exceed MTCA A

SOURCES:
Model Toxics Control Act (MTCA) from WA Administrative Code 173-340-900
MTCA Method A Soil Cleanup Levels for Ground Water: Table 720-1

UNITS:
ft = foot
mmhos/cm = millimhos/centimeter
mg/L = milligrams/liter
µg/L = micrograms/liter

Table 3-3. Summary of Historical Soil Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	Ecological Indicator Conc.	Sample No.: / Depth (ft): / Date:	3-S Unknown 8/16/1990	4-S Unknown 8/16/1990	6-S 4 8/16/1990	16-S 6 8/16/1990	20-S 6 8/16/1990	9/3-1 Unknown 9/3/1992	9/3-2 Unknown 9/3/1992	9/3-3 Unknown 9/3/1992	9/3-4 Unknown 9/3/1992	9/3-5 Unknown 9/3/1992	9/3-6 Unknown 9/3/1992	B15-10 10 4/3/2009	B16-13 13 4/3/2009
PETROLEUM HYDROCARBONS																		
Diesel	mg/kg	NWTPH-Dx*M1	2,000	200		- -	- -	- -	- -	- -	88	10 U	10 U	10 U	10 U	10 U	- -	- -
Gasoline	mg/kg	NWTPH-Gx*M1	30/100*G	100		- -	- -	- -	- -	- -	10 U	10 U	10 U	10 U	10 U	10 U	- -	- -
Total Petroleum Hydrocarbons	mg/kg	8015 or 418.1				10 U	10 U	10 U	10 U	420	350	88	42	10 U	10 U	118	- -	- -
POLYCHLORINATED BIPHENYLS																		
All Analytes	mg/kg	8082				- -	- -	- -	- -	ND	- -	- -	- -	- -	- -	- -	- -	- -
VOLATILE ORGANICS																		
Acetone	µg/kg	SW8260				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
cis-1,2-Dichloroethene	µg/kg	SW8260				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1.7 U	1.0 U
Tetrachloroethene	µg/kg	SW8260	50			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	27	4.1
Trichloroethene	µg/kg	SW8260	30			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1.7 U	1.0 U

(Table Continues)

Table 3-3. Summary of Historical Soil Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	Ecological Indicator Conc.	Sample No.: / Depth (ft): / Date:	B17-11 / 11 / 4/2/2009	BC-3-17.5 / 17.5 / 06/05/2008	BC-4-12.5 / 12.5 / 06/03/2008	BC-5-10 / 10 / 06/06/2008	BC-6-2.5 / 12.5 / 06/23/2008	BC-7-7.5 / 7.5 / 06/02/2008	BC-8-7.5 / 7.5 / 06/02/2008	BC-13-10 / 10 / 06/03/2008	BC-14-7.5 / 7.5 / 06/24/2008	EX-NWE/ EX-NWW / 6 - 8 / 8/23/1991
PETROLEUM HYDROCARBONS															
Diesel	mg/kg	NWTPH-Dx*M1	2,000	200		- -	36 U	32 U	31 U	31 U	29 U	36 U	29 U	28 U	25 U
Gasoline	mg/kg	NWTPH-Gx*M1	30/100*G	100		- -	9.7 U	9.7 U	6.7 U	6.7 U	6.3 U	8.5 U	5.7 U	5.0 U	1.0 U
Total Petroleum Hydrocarbons	mg/kg	8015 or 418.1				- -	- -	- -	- -	- -	- -	- -	- -	- -	58
POLYCHLORINATED BIPHENYLS															
All Analytes	mg/kg	8082				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
VOLATILE ORGANICS															
Acetone	µg/kg	SW8260				- -	48	- -	- -	- -	- -	- -	- -	- -	- -
cis-1,2-Dichloroethene	µg/kg	SW8260				1.1 U	5.9	- -	- -	- -	- -	- -	- -	- -	- -
Tetrachloroethene	µg/kg	SW8260	50			1.1 U	3.6	- -	- -	- -	- -	- -	- -	- -	- -
Trichloroethene	µg/kg	SW8260	30			1.1 U	5.5	- -	- -	- -	- -	- -	- -	- -	- -

(Table Continues)

Table 3-3. Summary of Historical Soil Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	Ecological Indicator Conc.	Sample No.: / Depth (ft): / Date:	EX-SWE/ EX-SWW 6 - 8 8/23/1991	EX-EWN/ EX-EWS 6 - 8 8/23/1991	EX-WWN/ EX-WWS 6 - 7 8/23/1991	EX-BNE/ EX-BNW 7 - 9 8/23/1991	EX-BSE/ EX-BSW 7 - 9 8/23/1991	EX-SWE-2 7 - 8 9/12/1991	EX-SWW-3 6 - 7 9/20/1991	EX-BSW-2 7 - 8 9/25/1991	EX-BSE-2 8 - 9 9/25/1991
PETROLEUM HYDROCARBONS														
Diesel	mg/kg	NWTPH-Dx*M1	2,000	200		25 U	25 U	25 U	65	66	- -	- -	- -	- -
Gasoline	mg/kg	NWTPH-Gx*M1	30/100*G	100		1.0 U	1.0 U	1.0 U	5.6	1.0 U	- -	- -	- -	- -
Total Petroleum Hydrocarbons	mg/kg	8015 or 418.1				160	96	65	87	170	110	43	10 U	10 U
POLYCHLORINATED BIPHENYLS														
All Analytes	mg/kg	8082				- -	- -	- -	- -	- -	- -	- -	- -	- -
VOLATILE ORGANICS														
Acetone	µg/kg	SW8260				- -	- -	- -	- -	- -	- -	- -	- -	- -
cis-1,2-Dichloroethene	µg/kg	SW8260				- -	- -	- -	- -	- -	- -	- -	- -	- -
Tetrachloroethene	µg/kg	SW8260	50			- -	- -	- -	- -	- -	- -	- -	- -	- -
Trichloroethene	µg/kg	SW8260	30			- -	- -	- -	- -	- -	- -	- -	- -	- -

NOTES:

- - = Not analyzed or not collected
*G = 100 if no benzene and TEX < 1% gas; 30 for other mixtures
M1 = Method varies for 1991/1992 data
ND = Non-detect
U = Not detected above the given practical quantitation limit
Shaded values exceed MTCA
Bold Bold values exceed Ecological Indicator Concentration

SOURCES:

Model Toxics Control Act (MTCA) from WA Administrative Code 173-340-900
MTCA Method A Soil Cleanup Levels for Unrestricted Land Use: Table 740-1

UNITS:

ft = feet
mg/kg = milligram/kilogram
µg/kg = microgram/kilogram

Table 3-4. Summary of Historical Groundwater Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	Sample No.: / Date:	B14-W 4/3/2009	B15-W 4/3/2009	B16-W 4/3/2009	B17-W 4/2/2009	BC-3-W 9/5/2008	BC-5-W 9/5/2008	R-1-13 2/11/2008	R-1-20 2/11/2008	R-2-13 2/11/2008	R-2-20 2/11/2008	R-3-12 2/12/2008	R-4-15 2/12/2008
PETROLEUM HYDROCARBONS																
Motor Oil	mg/L	NWTPH-Dx	0.5		- -	- -	- -	- -	- -	0.72	0.4 U	0.4 U	0.46 U	0.41 U	- -	- -
Gasoline Range Hydrocarbons	mg/L	NWTPH-Gx	0.8/1*G		- -	- -	- -	- -	- -	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	- -	- -
TOTAL METALS																
Barium	µg/L	200.8/6020-Total			- -	- -	- -	- -	- -		0.069	0.028 U	0.028 U	0.028 U	- -	- -
VOLATILE ORGANICS																
Carbon Disulfide	µg/L	SW8260			- -	- -	- -	- -	1 U	0.24	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2 U
Chloroform	µg/L	SW8260			0.72	0.20 U	0.20 U	0.20 U	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2 U
cis-1,2-Dichloroethene	µg/L	SW8260			0.33	1.4	0.20 U	0.20 U	46	0.2 U	0.2 U	0.2 U	0.25	0.2 U	1.6	43
Tetrachloroethene	µg/L	SW8260	5		5.9	3.9	0.21	0.20 U	110	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.56	320
trans-1,2-Dichloroethene	µg/L	SW8260			0.20 U	0.20 U	0.20 U	0.20 U	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2 U
Trichloroethene	µg/L	SW8260	5		0.54	1.8	0.20 U	0.20 U	120	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.39	140
Vinyl Chloride	µg/L	SW8260	0.2		0.20 U	0.20 U	0.20 U	0.20 U	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2 U
SEMIVOLATILE ORGANICS																
1-Methylnaphthalene	µg/L	SW8270D SIM			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
2-Methylnaphthalene	µg/L	SW8270D SIM			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Benzo(a)anthracene	µg/L	SW8270D SIM			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Naphthalene	µg/L	SW8270D SIM	160		- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total cPAHs Using Tox. Equiv.	µg/L	Calculated	0.1		- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

(Table Continues)

Table 3-4. Summary of Historical Groundwater Analytical Results

PARAMETERS	Units	Analytical Method	MTCA A	Sample No.: / Date:	R-5-20 2/12/2008	R-6-20 2/12/2008	R-7-20 2/12/2008	R-8-20 2/12/2008	R-9-18 2/13/2008	R-10-20 2/12/2008
PETROLEUM HYDROCARBONS										
Motor Oil	mg/L	NWTPH-Dx	0.5		- -	- -	- -	0.4 U	0.49 U	- -
Gasoline Range Hydrocarbons	mg/L	NWTPH-Gx	0.8/1*G		- -	- -	- -	0.100 U	0.310	- -
TOTAL METALS										
Barium	µg/L	200.8/6020-Total			- -	- -	- -	- -	- -	- -
VOLATILE ORGANICS										
Carbon Disulfide	µg/L	SW8260			- -	- -	- -	- -	- -	- -
Chloroform	µg/L	SW8260			0.2 U	0.2 U	0.2 U	- -	- -	0.2 U
cis-1,2-Dichloroethene	µg/L	SW8260			14	0.2 U	0.2 U	- -	- -	0.2 U
Tetrachloroethene	µg/L	SW8260	5		0.2 U	0.2 U	0.2 U	- -	- -	3.9
trans-1,2-Dichloroethene	µg/L	SW8260			0.65	0.2 U	0.2 U	- -	- -	0.2 U
Trichloroethene	µg/L	SW8260	5		1.5	0.2 U	0.2 U	- -	- -	0.59
Vinyl Chloride	µg/L	SW8260	0.2		2.7	0.2 U	0.2 U	- -	- -	0.2 U
SEMIVOLATILE ORGANICS										
1-Methylnaphthalene	µg/L	SW8270D SIM			0.095 U	0.095 U	0.096 U	0.095 U	0.34	- -
2-Methylnaphthalene	µg/L	SW8270D SIM			0.095 U	0.095 U	0.096 U	0.095 U	0.59	- -
Benzo(a)anthracene	µg/L	SW8270D SIM			0.0095 U	0.0095 U	0.0096 U	0.0095 U	0.014	- -
Naphthalene	µg/L	SW8270D SIM	160		0.095 U	0.095 U	0.096 U	0.095 U	2.2	- -
Total cPAHs Using Tox. Equiv.	µg/L	Calculated	0.1		0.0072	0.0072	0.0072	0.0072	0.0082	- -

NOTES:

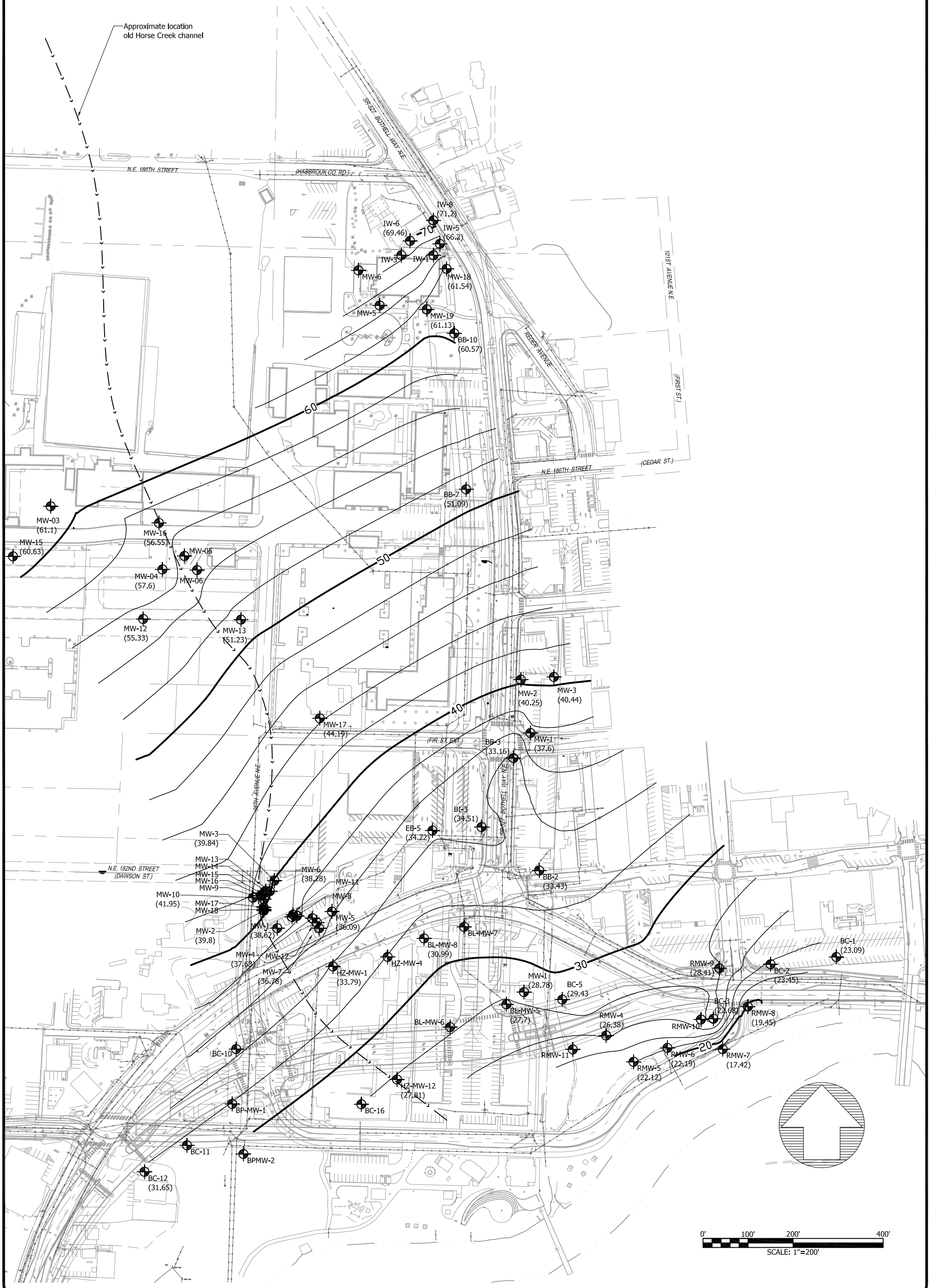
- - - = Not analyzed or not collected
U = Not detected above the given practical quantitation limit
*G = 1 if no benzene ; 0.8 if benzene
Shaded values exceed MTCA A

SOURCES:

Model Toxics Control Act (MTCA) from WA Administrative Code 173-340-900
MTCA Method A Soil Cleanup Levels for Ground Water: Table 720-1

UNITS:

mg/L = milligrams/liter
µg/L = micrograms/liter



BASE MAP PROVIDED BY:

HWA GeoSciences Inc.

Area-Wide Gradient Study
Bothell, Washington

Ground Water Gradient
August 29-31, 2012

DRAWN BY	EFK
CHECK BY	VA
DATE:	09.07.12
FIGURE #	1
PROJECT #	2012-098 950

S:\2007 PROJECTS\2007-098-22 BOTHELL CROSSROADS\CAD\HWA 2007-098-21 T950.DWG <GW AUGUST 29-31-12> Plotted: 9/26/2012 3:12 PM

EXPLANATION OF SYMBOLS

MW — MONITORING WELLS

SB — SOIL BORINGS

MW — DECOMMISSIONED WELLS

N

W E

S

0 25 50 75 100

40 — 40 APPROX. GROUND WATER ELEVATION (FT. MSL)

BOTHELL LANDING SITE

SR-527 BOTHELL WAY NE

NE 183rd ST

MAIN ST

SR-522 WOODINVILLE DR

HWA GEOSCIENCES INC.

AREA WIDE GROUND WATER MONITORING NETWORK
BOTHELL, WASHINGTON

WATER TABLE ELEVATIONS SEPTEMBER 2014

DRAWN BY EFK

CHECK BY NN

DATE

FIGURE NO. 3

PROJECT NO. 2007-098 T998

S:\2007 PROJECTS\2007-098-22 BOTHELL CROSSROADS\CAD\HWA 2007-098-21 T998.DWG <11x17 all wells> Plotted: 10/16/2014 11:59 AM

APPENDIX C

DETERMINATION OF RISK-BASED CLEANUP LEVELS FOR THE SITE

HWA GEOSCIENCES INC.
Geotechnical & Pavement Engineering • Hydrogeology • Geoenvironmental • Planning & Permitting • Inspection & Testing

November 4, 2010
HWA Project No. 2007 098-919

City of Bothell
9654 NE 182nd St.
Bothell, Washington 98021

Attention:Nduta Mbuthia, Project Engineer, Public Works Capital Projects

Subject: **CLEANUP LEVEL DETERMINATION**
Bothell Riverside Site
Interim Action Cleanup
Bothell, Washington

Dear Ms. Mbuthia:

This letter describes HWA GeoSciences Inc. (HWA's) determination of risk-based soil cleanup levels at the Bothell Riverside site, per the Interim Action Work Plan dated April 2010.

1.0 Introduction

The City of Bothell conducted an interim action cleanup at the Bothell Riverside site in October 2010, consisting of excavation and off site treatment/disposal of heavy oil-range petroleum contaminated soils.

In order to establish soil cleanup levels, selected soil samples were collected and analyzed for petroleum hydrocarbon fractionation (VPH/EPH) and other target compounds (BTEX, cPAHs, EDB, EDC, MTBE). The results of the VPH/EPH analyses were then input into Ecology's MTCATPH11.1 spreadsheet model to determine TPH cleanup levels that are protective of direct contact and ground water, per the Ecology approved Interim Action Work Plan. Information regarding the use of petroleum hydrocarbon fractionation data and Ecology's MTCAPH11.1 model to calculate the risk at a petroleum contaminated site is presented in *Workbook Tools for Calculating Soil and Ground Water Cleanup Levels under the Model Toxics Control Act Cleanup Regulation User's Guide* (Ecology Publication No. 01-09-073).

2.0 Method B Soil Cleanup Levels

MTCA Method B cleanup levels are the universal cleanup levels that typically employ a risk-based approach as outlined in WAC 173-340-708. Cleanup levels for a particular

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www.hwageo.com

site are determined after evaluating appropriate exposure pathway endpoints (e.g., direct contact, drinking water, nonpotable ground water, surface water, soil, wildlife, etc.) based on site use, contaminant distribution, etc. The actual clean up *standard* is then based on the calculated cleanup levels, measured at the point of compliance.

HWA evaluated Bothell Riverside site soils with respect to Method B cleanup levels for TPH. Under MTCA, once the source of contamination is removed, risk-based Method B (residential exposure scenario) TPH cleanup levels can be established. Method B cleanup levels must be protective for all exposure pathways, including direct contact with soil, leaching to ground water, and volatilization to air. Per the approved work plan, exposure pathways evaluated include:

- Direct human contact
- Protection of ground water

The vapor/odor pathway was not evaluated at this site, per the Ecology approved Interim Action Work Plan due to the non-volatile nature of the heavy hydrocarbons encountered and the absence of buildings over affected areas. The ground water to surface water pathway was also not evaluated, as the site remedial investigation indicated TPH-contaminated ground water was not migrating off site towards the Sammamish River.

Soil and ground water pathways (listed above) are discussed in the following sections.

Calculation of Method B cleanup levels is based on petroleum hydrocarbon fractionation analytical methods, collectively referred to as method E-TPH, that include Ecology methods VPH/EPH for volatile and extractable petroleum hydrocarbon fractions, BTEX, gasoline additives (MTBE, EDB, and EDC), and polynuclear aromatic hydrocarbons (PAHs).

Compounds composed of carbon and hydrogen are divided into two classes: aromatic compounds, which contain benzene rings or similar rings of atoms, and aliphatic compounds, which do not contain aromatic rings. The VPH/EPH method uses a fractionation approach to evaluate complex petroleum mixtures typically found in petroleum fuels and lubricants. The VPH/EPH approach divides petroleum into 12 compound groups (7 aliphatic and 5 aromatic) based on equivalent carbon (EC) number, which relates to the boiling point of a hydrocarbon compound. Hydrocarbons in the same EC group are assumed to have similar chemical, physical, and toxicological properties for the purposes of establishing cleanup levels. Each compound group is treated as if it was an individual chemical. Risks posed by site soils are calculated for each compound group and then summed across compound groups. Predicted ground water concentrations caused by leaching from the current soil concentrations are also estimated for each compound group and then summed across compound groups to produce a total ground water concentration.

2.1 Direct Contact Pathway

In the MTCA Method B risk analysis, the human health risk level for individual carcinogens may not exceed one-in-a-million ($1x10^{-6}$). If more than one type of hazardous substance is present, the total excess carcinogenic risk level at the site may not exceed 1 in 100,000 ($1x10^{-5}$). Cleanup levels protective of direct contact with soil for individual noncarcinogenic compounds are calculated in terms of hazard quotient (HQ), and for two or more compounds having similar toxic response by a hazard index (HI) that is the sum of individual hazard quotients. A HQ or HI less than 1.0 indicates an acceptable noncarcinogenic risk under MTCA Method B. Adverse effects resulting from exposure to two or more hazardous or carcinogenic compounds are assumed to be additive.

HWA used Ecology's MTCATPH11.1 electronic spreadsheet model (available at http://www.ecy.wa.gov/programs/tcp/tools/toolmain.html) to calculate the Method B cleanup levels protective of direct contact with soil. Table 1 summarizes the calculated Method B cleanup levels protective of the direct contact pathway; Appendix A contains the MTCATPH11.1 spreadsheet summary printouts. Per Ecology guidance (Publication No. 01-09-073 cited above), concentrations of TPH compounds not detected at the laboratory's practical quantitation limit (PQL) were entered into MTCATPH11.1 as the laboratory's method detection limit (MDL) – a value typically 5 or more times less than the practical quantitation limit.

2.2 Protection of Ground Water

Protection of ground water was evaluated for two pathways:

- Leaching from soil to ground water
- Residual soil saturation (the TPH concentration in soil at which a non aqueous phase liquid (NAPL) will form)

2.2.1 Leaching from soil to ground water

Soil cleanup levels protective of ground water may be calculated by several methods:

- Partitioning models
- Leaching tests
- Alternative fate & transport models
- Empirical demonstration

The Method B analyses used to calculate risk-based soil cleanup levels at the Bothell Riverside site included evaluation of the soil-to-ground water pathway using Ecology's partitioning models (WAC 173-340-747) for two scenarios: potable ground water and the default MTCA Method A ground water cleanup level as the protective concentrations.

Table 1 summarizes the calculated Method B soil cleanup levels protective of direct contact and ground water; Appendix A contains the MTCATPH11.1 spreadsheet summary printouts.

Table 1
Summary of Method B Soil TPH Risk Calculations
Bothell Riverside Site

Release area	Former service station(s)				
TPH Type	Lubricating oil				
Sample	R-TP-1-3	R-TP-2-3	R-TP-7-3	R-TP-8-3	R-TP-9-2
Calculated Method B TPH cleanup level for direct skin contact (mg/Kg)	4,977	5,013	6,403	6,666	1,824
Most stringent soil risk criterion for direct skin contact	cPAHs mixture	Hazard Index	Hazard Index	cPAHs mixture	cPAHs mixture
Method B soil TPH concentration protective of ground water (mg/Kg)	100% NAPL[1]	100% NAPL	100% NAPL	100% NAPL	100% NAPL
Most stringent soil risk criterion for protection of ground water	Hazard Index Total risk 1E-5 cPAHs mixture	Hazard Index Total risk 1E-5 cPAHs mixture	Hazard Index Total risk 1E-5 cPAHs mixture	Hazard Index Total risk 1E-5 cPAHs mixture	Hazard Index Total risk 1E-5 cPAHs mixture
Method A soil cleanup levels (mg/Kg)	2000 (D) 2000 (O) 5 (Naphthalenes)[2] 0.10 (cPAHs TEC)[3]				
Maximum value detected on site after cleanup	130 (D) 1800 (O) 0.14 (Naphthalenes) 0.02 (cPAHs TEC)				
Cleanup levels met?	Method A Yes Method B Yes TCs Yes[4]	Method A Yes Method B Yes TCs Yes	Method A Yes Method B Yes TCs Yes	Method A Yes Method B Yes TCs Yes	Method A Yes Method B Yes TCs Yes

Notes:
1 - 100% NAPL means soil containing free product would not produce a TPH concentration ≥800 µg/L in ground water
2 - Sum of Napthalene + 1-Methylnaphthalene + 2-Methylnaphthalene
3 - Toxic Equivalent Concentration of carcinogenic polynuclear aromatic hydrocarbons (cPAHs) per WAC 173-340-708(e)
4 - TCs: Cleanup levels for all target compounds (PAHs, EDB, EDC, MTBE, benzene, naphthalenes) were met as indicated by laboratory analysis for the individual compounds

2.2.2. Residual soil saturation

Evaluation of residual saturation concentrations is also required. Residual saturation refers to the soil concentration at which a nonaqueous phase liquid (a.k.a., NAPL or "free product") may form on or in soil or ground water. Residual saturation may be evaluated

under MTCA using default screening values or an empirical demonstration. Criteria for an empirical demonstration include:

- NAPL has not formed in soil or ground water at the site
- NAPL will not form in the future, i.e., sufficient time has elapsed for migration of hazardous substances from soil into ground water to occur and that the characteristics of the site (e.g., depth to ground water and infiltration) are representative of future site conditions.

Both of these criteria are met at the site, as no NAPL has been observed in soil or ground water, and the impacted soils have likely been in place for at least 10 years prior to removal from the site.

3.0 Discussion

It is possible to extrapolate the results of the risk calculation to estimate a Method B soil "cleanup level" for total TPH concentrations at the site based on the most stringent pathway. This requires the assumption that the hydrocarbon fractions in the soil sample represents the distribution of hydrocarbon fractions in all residual petroleum hydrocarbons at the site. In general, this assumption is valid for sites where the residual hydrocarbons derive from a single source, or single type of fuel, which appears to be the case at each of the three source areas at this site, based on analytical results. Using this assumption, HWA extrapolated the risk results to indicate an appropriate Method B soil cleanup level for the site, as summarized in Table 1.

HWA evaluated the potential risk to human health and the environment based on TPH concentrations in soil. Based on the Method B evaluation, site confirmation soil samples met the Method B, residential exposure scenario TPH cleanup levels for direct contact (i.e., HI less than 1, individual compound carcinogen risk less than 1E-6, and total carcinogen risk less than 1E-5), and protection of ground water (leaching as predicted by partitioning models and empirical demonstration of residual saturation).

4.0 Summary

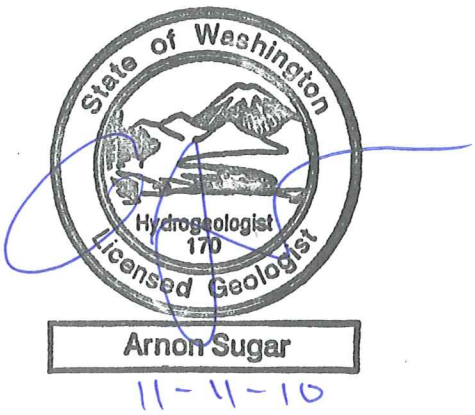
Confirmation soil samples met all applicable cleanup levels, including:

- Method A soil cleanup levels for TPH and all individual target compounds
- Method B soil cleanup levels for all individual target compounds
- Method B TPH soil cleanup levels protective of 1) direct contact, and 2) protection of ground water, calculated per Ecology's MTCATPH11.1.1 spreadsheet model based on the most stringent pathways

Residual soil at the site has been remediated to MTCA Method A or B cleanup levels, and therefore poses no risk to direct-contact exposure under a residential scenario, or to ground water by leaching.

We appreciate the opportunity to provide our services on this project. Please feel free to call us if you have any questions or need more information.

Sincerely,
HWA GeoSciences Inc.



Arnie Sugar, LG, LHG
President

Norm Nielsen, LG, LHG, PMP
Senior Hydrogeologist

A1 Soil Cleanup Levels: Worksheet for Soil Data Entry: Refer to WAC 173-340-720, 740,745, 747, 750

1. Enter Site Information

Date: 10/13/10
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-9-2

2. Enter Soil Concentration Measured

Chemical of Concern or Equivalent Carbon Group	Measured Soil Conc dry basis mg/kg	Composition Ratio %
Petroleum EC Fraction		
AL_EC >5-6	0.0480	0.02%
AL_EC >6-8	0.0404	0.01%
AL_EC >8-10	0.0512	0.02%
AL_EC >10-12	0.491	0.16%
AL_EC >12-16	0.3525	0.12%
AL_EC >16-21	10	3.28%
AL_EC >21-34	220	72.17%
AR_EC >8-10	0.0320	0.01%
AR_EC >10-12	0.6264	0.21%
AR_EC >12-16	0.6281	0.21%
AR_EC >16-21	0.4485	0.15%
AR_EC >21-34	71.9906	23.61%
Benzene	0.000159	0.00%
Toluene	0.00011	0.00%
Ethylbenzene	0.000096	0.00%
Total Xylenes	0.000297	0.00%
Naphthalene	0.0000256	0.00%
1-Methyl Naphthalene	0.0000151	0.00%
2-Methyl Naphthalene	0.0089	0.00%
n-Hexane	0.0603	0.02%
MTBE	0.00017	0.00%
Ethylene Dibromide (EDB)	0	0.00%
1,2 Dichloroethane (EDC)	0	0.00%
Benzo(a)anthracene	0.01	0.00%
Benzo(b)fluoranthene	0.011	0.00%
Benzo(k)fluoranthene	0.0000308	0.00%
Benzo(a)pyrene	0.014	0.00%
Chrysene	0.028	0.01%
Dibenz(a,h)anthracene	0.0000342	0.00%
Indeno(1,2,3-cd)pyrene	0.0094	0.00%
Sum	304.8511797	100.00%

Notes for Data Entry | Set Default Hydrogeology

Clear All Soil Concentration Data Entry Cells

Restore All Soil Concentration Data cleared previously

REMARK:
Bothell Riverside site pot hole sample
MTCA Method A cleanup level = 800 mg/Kg because benzene was detected in ground water in onsite monitoring wells

3. Enter Site-Specific Hydrogeological Data

Total soil porosity:	0.43	Unitless
Volumetric water content:	0.3	Unitless
Volumetric air content:	0.13	Unitless
Soil bulk density measured:	1.5	kg/L
Fraction Organic Carbon:	0.001	Unitless
Dilution Factor:	20	Unitless

4. Target TPH Ground Water Concentation (if adjusted)

If you adjusted the target TPH ground water concentration, enter adjusted value here: 800 ug/L

A2 Soil Cleanup Levels: Calculation and Summary of Results. Refer to WAC 173-340-720, 740, 745, 747, 750

Site Information

Date: 10/13/2010
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-9-2
Measured Soil TPH Concentration, mg/kg: **304.851**

1. Summary of Calculation Results

Exposure Pathway	Method/Goal	Protective Soil TPH Conc, mg/kg	With Measured Soil Conc		Does Measured Soil Conc Pass or Fail?
			RISK @	HI @	
Protection of Soil Direct Contact: Human Health	Method B	1,824	1.67E-07	3.59E-02	Pass
	Method C	73,460	4.15E-08	2.97E-03	Pass
Protection of Method B Ground Water Quality (Leaching)	Potable GW: Human Health Protectior	100% NAPL	3.17E-08	3.16E-02	Pass
	Target TPH GW Conc. @ 800 ug/L	100% NAPL	NA	NA	Pass

Warning! Check to determine if a simplified or site-specific Terrestrial Ecological Evaluation may be required (Refer to WAC 173-340-7490 through ~7494).

2. Results for Protection of Soil Direct Contact Pathway: Human Health

	Method B: Unrestricted Land Use	Method C: Industrial Land Use
Protective Soil Concentration, TPH mg/kg	**1,824.05**	**73,459.69**
Most Stringent Criterion	**Risk of cPAHs mixture= 1E-6**	**Total Risk=1E-5**

Soil Criteria	Protective Soil Concentration @Method B				Protective Soil Concentration @Method C			
	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @
HI =1	*NO*	8.49E+03	4.66E-06	1.00E+00	*NO*	1.03E+05	1.40E-05	1.00E+00
Total Risk=1E-5	*NO*	1.82E+04	1.00E-05	2.15E+00	YES	7.35E+04	1.00E-05	7.15E-01
Risk of Benzene= 1E-6	*NO*	3.48E+07	1.91E-02	4.10E+03	NA			
Risk of cPAHs mixture= 1E-6	YES	1.82E+03	1.00E-06	2.15E-01				
EDB	NA	NA	NA	NA				
EDC	NA	NA	NA	NA				

3. Results for Protection of Ground Water Quality (Leaching Pathway)

3.1. Protection of Potable Ground Water Quality (Method B): Human Health Protection

Most Stringent Criterion	**NA**
Protective Ground Water Concentration, ug/L	**NA**
Protective Soil Concentration, mg/kg	**Soil-to-Ground Water is not a critical pathway!**

Ground Water Criteria	Protective Potable Ground Water Concentration @Method B				Protective Soil Conc, mg/kg
	Most Stringent?	TPH Conc, ug/L	RISK @	HI @	
HI=1	YES	1.46E+01	2.42E-07	5.43E-02	100% NAPL
Total Risk = 1E-5	YES	1.46E+01	2.42E-07	5.43E-02	100% NAPL
Total Risk = 1E-6	YES	1.46E+01	2.42E-07	5.43E-02	100% NAPL
Risk of cPAHs mixture= 1E-5	YES	1.46E+01	2.42E-07	5.43E-02	100% NAPL
Benzene MCL = 5 ug/L	YES	1.46E+01	2.42E-07	5.43E-02	100% NAPL
MTBE = 20 ug/L	YES	1.46E+01	2.42E-07	5.43E-02	100% NAPL

Note: 100% NAPL is 75000 mg/kg TPH.

3.2 Protection of Ground Water Quality for TPH Ground Water Concentration previously adjusted and entered

Ground Water Criteria	Protective Ground Water Concentration			Protective Soil Conc, mg/kg
	TPH Conc, ug/L	Risk @	HI @	
Target TPH GW Conc = 800 ug/L	1.46E+01	2.42E-07	5.43E-02	**100% NAPL**

A1 Soil Cleanup Levels: Worksheet for Soil Data Entry: Refer to WAC 173-340-720, 740,745, 747, 750

1. Enter Site Information

Date: 10/20/10
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-1-3

2. Enter Soil Concentration Measured

Chemical of Concern or Equivalent Carbon Group	Measured Soil Conc dry basis mg/kg	Composition Ratio %
Petroleum EC Fraction		
AL_EC >5-6	5.0	0.67%
AL_EC >6-8	5.0	0.67%
AL_EC >8-10	5.0	0.67%
AL_EC >10-12	7.0	0.94%
AL_EC >12-16	7.5	1.00%
AL_EC >16-21	23.0	3.08%
AL_EC >21-34	400.0	53.49%
AR_EC >8-10	5.0	0.67%
AR_EC >10-12	11.0	1.47%
AR_EC >12-16	6.0	0.80%
AR_EC >16-21	13.0	1.74%
AR_EC >21-34	260.0	34.77%
Benzene	0	0.00%
Toluene	0	0.00%
Ethylbenzene	0	0.00%
Total Xylenes	0	0.00%
Naphthalene	0.0000256	0.00%
1-Methyl Naphthalene	0.01	0.00%
2-Methyl Naphthalene	0.017	0.00%
n-Hexane	0.2	0.03%
MTBE	0.00017	0.00%
Ethylene Dibromide (EDB)	0	0.00%
1,2 Dichloroethane (EDC)	0	0.00%
Benzo(a)anthracene	0.011	0.00%
Benzo(b)fluoranthene	0.013	0.00%
Benzo(k)fluoranthene	0.0000308	0.00%
Benzo(a)pyrene	0.012	0.00%
Chrysene	0.029	0.00%
Dibenz(a,h)anthracene	0.0000342	0.00%
Indeno(1,2,3-cd)pyrene	0.0088	0.00%
Sum	747.8010606	100.00%

Notes for Data Entry | Set Default Hydrogeology
Clear All Soil Concentration Data Entry Cells
Restore All Soil Concentration Data cleared previously

REMARK:
Bothell Riverside site pot hole sample
MTCA Method A cleanup level = 800 mg/Kg because benzene was detected in ground water in onsite monitoring wells

3. Enter Site-Specific Hydrogeological Data

Total soil porosity:	0.43	Unitless
Volumetric water content:	0.3	Unitless
Volumetric air content:	0.13	Unitless
Soil bulk density measured:	1.5	kg/L
Fraction Organic Carbon:	0.001	Unitless
Dilution Factor:	20	Unitless

4. Target TPH Ground Water Concentation (if adjusted)

If you adjusted the target TPH ground water concentration, enter adjusted value here: 800 ug/L

A2 Soil Cleanup Levels: Calculation and Summary of Results. Refer to WAC 173-340-720, 740, 745, 747, 750

Site Information

Date: 10/20/2010
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-1-3
Measured Soil TPH Concentration, mg/kg: **747.801**

1. Summary of Calculation Results

Exposure Pathway	Method/Goal	Protective Soil TPH Conc, mg/kg	With Measured Soil Conc		Does Measured Soil Conc Pass or Fail?
			RISK @	HI @	
Protection of Soil Direct Contact: Human Health	Method B	4,977	1.50E-07	1.49E-01	Pass
	Method C	62,480	3.73E-08	1.20E-02	Pass
Protection of Method B Ground Water Quality (Leaching)	Potable GW: Human Health Protection	100% NAPL	2.14E-10	2.74E-01	Pass
	Target TPH GW Conc. @ 800 ug/L	100% NAPL	NA	NA	Pass

Warning! Check to determine if a simplified or site-specific Terrestrial Ecological Evaluation may be required (Refer to WAC 173-340-7490 through ~7494).

2. Results for Protection of Soil Direct Contact Pathway: Human Health

	Method B: Unrestricted Land Use	Method C: Industrial Land Use
Protective Soil Concentration, TPH mg/kg	**4,977.10**	**62,480.29**
Most Stringent Criterion	**Risk of cPAHs mixture= 1E-6**	**HI =1**

Soil Criteria	Protective Soil Concentration @Method B				Protective Soil Concentration @Method C			
	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @
HI =1	*NO*	5.02E+03	1.01E-06	1.00E+00	YES	6.25E+04	3.12E-06	1.00E+00
Total Risk=1E-5	*NO*	4.98E+04	1.00E-05	9.92E+00	*NO*	2.00E+05	1.00E-05	3.21E+00
Risk of Benzene= 1E-6	NA	NA	NA	NA	NA			
Risk of cPAHs mixture= 1E-6	YES	4.98E+03	1.00E-06	9.92E-01				
EDB	NA	NA	NA	NA				
EDC	NA	NA	NA	NA				

3. Results for Protection of Ground Water Quality (Leaching Pathway)

3.1. Protection of Potable Ground Water Quality (Method B): Human Health Protection

Most Stringent Criterion	**NA**
Protective Ground Water Concentration, ug/L	**NA**
Protective Soil Concentration, mg/kg	**Soil-to-Ground Water is not a critical pathway!**

Ground Water Criteria	Protective Potable Ground Water Concentration @Method B				Protective Soil Conc, mg/kg
	Most Stringent?	TPH Conc, ug/L	RISK @	HI @	
HI=1	YES	1.46E+02	2.09E-10	3.29E-01	100% NAPL
Total Risk = 1E-5	YES	1.46E+02	2.09E-10	3.29E-01	100% NAPL
Total Risk = 1E-6	YES	1.46E+02	2.09E-10	3.29E-01	100% NAPL
Risk of cPAHs mixture= 1E-5	YES	1.46E+02	2.09E-10	3.29E-01	100% NAPL
Benzene MCL = 5 ug/L	NA	NA	NA	NA	NA
MTBE = 20 ug/L	YES	1.46E+02	2.09E-10	3.29E-01	100% NAPL

Note: 100% NAPL is 79000 mg/kg TPH.

3.2 Protection of Ground Water Quality for TPH Ground Water Concentration previously adjusted and entered

Ground Water Criteria	Protective Ground Water Concentration			Protective Soil Conc, mg/kg
	TPH Conc, ug/L	Risk @	HI @	
Target TPH GW Conc = 800 ug/L	1.46E+02	2.09E-10	3.29E-01	**100% NAPL**

A1 Soil Cleanup Levels: Worksheet for Soil Data Entry: Refer to WAC 173-340-720, 740,745, 747, 750

1. Enter Site Information

Date: 10/20/10
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-2-3

2. Enter Soil Concentration Measured

Chemical of Concern or Equivalent Carbon Group	Measured Soil Conc dry basis mg/kg	Composition Ratio %
Petroleum EC Fraction		
AL_EC >5-6	5.0	0.57%
AL_EC >6-8	5.0	0.57%
AL_EC >8-10	5.0	0.57%
AL_EC >10-12	9.8	1.11%
AL_EC >12-16	31.0	3.51%
AL_EC >16-21	35.0	3.97%
AL_EC >21-34	470.0	53.28%
AR_EC >8-10	5.0	0.57%
AR_EC >10-12	11.0	1.25%
AR_EC >12-16	26.0	2.95%
AR_EC >16-21	19.0	2.15%
AR_EC >21-34	260.0	29.47%
Benzene	0	0.00%
Toluene	0	0.00%
Ethylbenzene	0	0.00%
Total Xylenes	0	0.00%
Naphthalene	0.017	0.00%
1-Methyl Naphthalene	0.025	0.00%
2-Methyl Naphthalene	0.039	0.00%
n-Hexane	0.2	0.02%
MTBE	0.00017	0.00%
Ethylene Dibromide (EDB)	0	0.00%
1,2 Dichloroethane (EDC)	0	0.00%
Benzo(a)anthracene	0.0000338	0.00%
Benzo(b)fluoranthene	0.000039	0.00%
Benzo(k)fluoranthene	0.0000308	0.00%
Benzo(a)pyrene	0.0087	0.00%
Chrysene	0.014	0.00%
Dibenz(a,h)anthracene	0.0000342	0.00%
Indeno(1,2,3-cd)pyrene	0.0000373	0.00%
Sum	882.1040451	100.00%

Notes for Data Entry | Set Default Hydrogeology
Clear All Soil Concentration Data Entry Cells
Restore All Soil Concentration Data cleared previously

REMARK:
Bothell Riverside site pot hole sample
MTCA Method A cleanup level = 800 mg/Kg because benzene was detected in ground water in onsite monitoring wells

3. Enter Site-Specific Hydrogeological Data

Total soil porosity:	0.43	Unitless
Volumetric water content:	0.3	Unitless
Volumetric air content:	0.13	Unitless
Soil bulk density measured:	1.5	kg/L
Fraction Organic Carbon:	0.001	Unitless
Dilution Factor:	20	Unitless

4. Target TPH Ground Water Concentation (if adjusted)

If you adjusted the target TPH ground water concentration, enter adjusted value here:	800	ug/L

A2 Soil Cleanup Levels: Calculation and Summary of Results. Refer to WAC 173-340-720, 740, 745, 747, 750

Site Information

Date: 10/20/2010
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-2-3
Measured Soil TPH Concentration, mg/kg: **882.104**

1. Summary of Calculation Results

Exposure Pathway	Method/Goal	Protective Soil TPH Conc, mg/kg	With Measured Soil Conc		Does Measured Soil Conc Pass or Fail?
			RISK @	HI @	
Protection of Soil Direct Contact: Human Health	Method B	5,013	8.54E-08	1.76E-01	Pass
	Method C	62,236	2.12E-08	1.42E-02	Pass
Protection of Method B Ground Water Quality (Leaching)	Potable GW: Human Health Protectior	100% NAPL	7.69E-11	2.53E-01	Pass
	Target TPH GW Conc. @ 800 ug/L	100% NAPL	NA	NA	Pass

Warning! Check to determine if a simplified or site-specific Terrestrial Ecological Evaluation may be required (Refer to WAC 173-340-7490 through ~7494).

2. Results for Protection of Soil Direct Contact Pathway: Human Health

	Method B: Unrestricted Land Use	Method C: Industrial Land Use
Protective Soil Concentration, TPH mg/kg	**5,012.82**	**62,235.87**
Most Stringent Criterion	**HI =1**	**HI =1**

Soil Criteria	Protective Soil Concentration @Method B				Protective Soil Concentration @Method C			
	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @
HI =1	YES	5.01E+03	4.86E-07	1.00E+00	YES	6.22E+04	1.50E-06	1.00E+00
Total Risk=1E-5	*NO*	1.03E+05	1.00E-05	2.06E+01	*NO*	4.16E+05	1.00E-05	6.68E+00
Risk of Benzene= 1E-6	NA	NA	NA	NA	NA			
Risk of cPAHs mixture= 1E-6	*NO*	1.03E+04	1.00E-06	2.06E+00				
EDB	NA	NA	NA	NA				
EDC	NA	NA	NA	NA				

3. Results for Protection of Ground Water Quality (Leaching Pathway)

3.1. Protection of Potable Ground Water Quality (Method B): Human Health Protection

Most Stringent Criterion	**NA**
Protective Ground Water Concentration, ug/L	**NA**
Protective Soil Concentration, mg/kg	**Soil-to-Ground Water is not a critical pathway!**

Ground Water Criteria	Protective Potable Ground Water Concentration @Method B				Protective Soil Conc, mg/kg
	Most Stringent?	TPH Conc, ug/L	RISK @	HI @	
HI=1	YES	1.34E+02	7.54E-11	2.93E-01	100% NAPL
Total Risk = 1E-5	YES	1.34E+02	7.54E-11	2.93E-01	100% NAPL
Total Risk = 1E-6	YES	1.34E+02	7.54E-11	2.93E-01	100% NAPL
Risk of cPAHs mixture= 1E-5	YES	1.34E+02	7.54E-11	2.93E-01	100% NAPL
Benzene MCL = 5 ug/L	NA	NA	NA	NA	NA
MTBE = 20 ug/L	YES	1.34E+02	7.54E-11	2.93E-01	100% NAPL

Note: 100% NAPL is 78000 mg/kg TPH.

3.2 Protection of Ground Water Quality for TPH Ground Water Concentration previously adjusted and entered

Ground Water Criteria	Protective Ground Water Concentration			Protective Soil Conc, mg/kg
	TPH Conc, ug/L	Risk @	HI @	
Target TPH GW Conc = 800 ug/L	1.34E+02	7.54E-11	2.93E-01	**100% NAPL**

A1 Soil Cleanup Levels: Worksheet for Soil Data Entry: Refer to WAC 173-340-720, 740,745, 747, 750

1. Enter Site Information

Date: 10/20/10
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-7-3

2. Enter Soil Concentration Measured

Chemical of Concern or Equivalent Carbon Group	Measured Soil Conc dry basis mg/kg	Composition Ratio %
Petroleum EC Fraction		
AL_EC >5-6	5.0	1.06%
AL_EC >6-8	5.0	1.06%
AL_EC >8-10	5.0	1.06%
AL_EC >10-12	5.0	1.06%
AL_EC >12-16	7.5	1.58%
AL_EC >16-21	19.0	4.01%
AL_EC >21-34	290.0	61.28%
AR_EC >8-10	5.0	1.06%
AR_EC >10-12	5.0	1.06%
AR_EC >12-16	6.5	1.37%
AR_EC >16-21	10.0	2.11%
AR_EC >21-34	110.0	23.24%
Benzene	0	0.00%
Toluene	0	0.00%
Ethylbenzene	0	0.00%
Total Xylenes	0	0.00%
Naphthalene	0.015	0.00%
1-Methyl Naphthalene	0.013	0.00%
2-Methyl Naphthalene	0.025	0.01%
n-Hexane	0.2	0.04%
MTBE	0.00017	0.00%
Ethylene Dibromide (EDB)	0	0.00%
1,2 Dichloroethane (EDC)	0	0.00%
Benzo(a)anthracene	0.0000338	0.00%
Benzo(b)fluoranthene	0.000039	0.00%
Benzo(k)fluoranthene	0.0000308	0.00%
Benzo(a)pyrene	0.0000261	0.00%
Chrysene	0.0087	0.00%
Dibenz(a,h)anthracene	0.0000342	0.00%
Indeno(1,2,3-cd)pyrene	0.0000373	0.00%
Sum	473.2620712	100.00%

Notes for Data Entry | Set Default Hydrogeology
Clear All Soil Concentration Data Entry Cells
Restore All Soil Concentration Data cleared previously

REMARK:
Bothell Riverside site pot hole sample
MTCA Method A cleanup level = 800 mg/Kg because benzene was detected in ground water in onsite monitoring wells

3. Enter Site-Specific Hydrogeological Data

Total soil porosity:	0.43	Unitless
Volumetric water content:	0.3	Unitless
Volumetric air content:	0.13	Unitless
Soil bulk density measured:	1.5	kg/L
Fraction Organic Carbon:	0.001	Unitless
Dilution Factor:	20	Unitless

4. Target TPH Ground Water Concentation (if adjusted)

If you adjusted the target TPH ground water concentration, enter adjusted value here: 800 ug/L

A2 Soil Cleanup Levels: Calculation and Summary of Results. Refer to WAC 173-340-720, 740, 745, 747, 750

Site Information

Date: 10/20/2010
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-7-3
Measured Soil TPH Concentration, mg/kg: **473.262**

1. Summary of Calculation Results

Exposure Pathway	Method/Goal	Protective Soil TPH Conc, mg/kg	With Measured Soil Conc		Does Measured Soil Conc Pass or Fail?
			RISK @	HI @	
Protection of Soil Direct Contact: Human Health	Method B	6,403	1.26E-09	7.39E-02	Pass
	Method C	80,581	3.13E-10	5.87E-03	Pass
Protection of Method B Ground Water Quality (Leaching)	Potable GW: Human Health Protectior	100% NAPL	2.60E-12	2.31E-01	Pass
	Target TPH GW Conc. @ 800 ug/L	100% NAPL	NA	NA	Pass

Warning! Check to determine if a simplified or site-specific Terrestrial Ecological Evaluation may be required (Refer to WAC 173-340-7490 through ~7494).

2. Results for Protection of Soil Direct Contact Pathway: Human Health

	Method B: Unrestricted Land Use	Method C: Industrial Land Use
Protective Soil Concentration, TPH mg/kg	**6,403.09**	**80,581.48**
Most Stringent Criterion	**HI =1**	**HI =1**

Soil Criteria	Protective Soil Concentration @Method B				Protective Soil Concentration @Method C			
	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @
HI =1	YES	6.40E+03	1.70E-08	1.00E+00	YES	8.06E+04	5.33E-08	1.00E+00
Total Risk=1E-5	*NO*	3.76E+06	1.00E-05	5.87E+02	*NO*	1.51E+07	1.00E-05	1.88E+02
Risk of Benzene= 1E-6	NA	NA	NA	NA	NA			
Risk of cPAHs mixture= 1E-6	*NO*	3.76E+05	1.00E-06	5.87E+01				
EDB	NA	NA	NA	NA				
EDC	NA	NA	NA	NA				

3. Results for Protection of Ground Water Quality (Leaching Pathway)

3.1. Protection of Potable Ground Water Quality (Method B): Human Health Protection

Most Stringent Criterion	**NA**
Protective Ground Water Concentration, ug/L	**NA**
Protective Soil Concentration, mg/kg	**Soil-to-Ground Water is not a critical pathway!**

Ground Water Criteria	Protective Potable Ground Water Concentration @Method B				Protective Soil Conc, mg/kg
	Most Stringent?	TPH Conc, ug/L	RISK @	HI @	
HI=1	YES	1.98E+02	2.48E-12	3.09E-01	100% NAPL
Total Risk = 1E-5	YES	1.98E+02	2.48E-12	3.09E-01	100% NAPL
Total Risk = 1E-6	YES	1.98E+02	2.48E-12	3.09E-01	100% NAPL
Risk of cPAHs mixture= 1E-5	YES	1.98E+02	2.48E-12	3.09E-01	100% NAPL
Benzene MCL = 5 ug/L	NA	NA	NA	NA	NA
MTBE = 20 ug/L	YES	1.98E+02	2.48E-12	3.09E-01	100% NAPL

Note: 100% NAPL is 75000 mg/kg TPH.

3.2 Protection of Ground Water Quality for TPH Ground Water Concentration previously adjusted and entered

Ground Water Criteria	Protective Ground Water Concentration			Protective Soil Conc, mg/kg
	TPH Conc, ug/L	Risk @	HI @	
Target TPH GW Conc = 800 ug/L	1.98E+02	2.48E-12	3.09E-01	**100% NAPL**

A1 Soil Cleanup Levels: Worksheet for Soil Data Entry: Refer to WAC 173-340-720, 740,745, 747, 750

1. Enter Site Information

Date: 10/20/10
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-8-3

2. Enter Soil Concentration Measured

Chemical of Concern or Equivalent Carbon Group	Measured Soil Conc dry basis mg/kg	Composition Ratio %
Petroleum EC Fraction		
AL_EC >5-6	5.0	0.71%
AL_EC >6-8	5.0	0.71%
AL_EC >8-10	5.0	0.71%
AL_EC >10-12	5.0	0.71%
AL_EC >12-16	12.0	1.69%
AL_EC >16-21	32.0	4.52%
AL_EC >21-34	450.0	63.53%
AR_EC >8-10	5.0	0.71%
AR_EC >10-12	5.0	0.71%
AR_EC >12-16	10.0	1.41%
AR_EC >16-21	14.0	1.98%
AR_EC >21-34	160.0	22.59%
Benzene	0	0.00%
Toluene	0	0.00%
Ethylbenzene	0	0.00%
Total Xylenes	0	0.00%
Naphthalene	0.012	0.00%
1-Methyl Naphthalene	0.022	0.00%
2-Methyl Naphthalene	0.033	0.00%
n-Hexane	0.2	0.03%
MTBE	0.00017	0.00%
Ethylene Dibromide (EDB)	0	0.00%
1,2 Dichloroethane (EDC)	0	0.00%
Benzo(a)anthracene	0.0094	0.00%
Benzo(b)fluoranthene	0.0096	0.00%
Benzo(k)fluoranthene	0.0000308	0.00%
Benzo(a)pyrene	0.0079	0.00%
Chrysene	0.021	0.00%
Dibenz(a,h)anthracene	0.0000342	0.00%
Indeno(1,2,3-cd)pyrene	0.01	0.00%
Sum	708.325135	100.00%

Notes for Data Entry | Set Default Hydrogeology
Clear All Soil Concentration Data Entry Cells
Restore All Soil Concentration Data cleared previously

REMARK:
Bothell Riverside site pot hole sample
MTCA Method A cleanup level = 800 mg/Kg because benzene was detected in ground water in onsite monitoring wells

3. Enter Site-Specific Hydrogeological Data

Total soil porosity:	0.43	Unitless
Volumetric water content:	0.3	Unitless
Volumetric air content:	0.13	Unitless
Soil bulk density measured:	1.5	kg/L
Fraction Organic Carbon:	0.001	Unitless
Dilution Factor:	20	Unitless

4. Target TPH Ground Water Concentation (if adjusted)

If you adjusted the target TPH ground water concentration, enter adjusted value here:	800	ug/L

A2 Soil Cleanup Levels: Calculation and Summary of Results. Refer to WAC 173-340-720, 740, 745, 747, 750

Site Information

Date: 10/20/2010
Site Name: Bothell Crossroads, Rieverside Site
Sample Name: R-TP-8-3
Measured Soil TPH Concentration, mg/kg: **708.325**

1. Summary of Calculation Results

Exposure Pathway	Method/Goal	Protective Soil TPH Conc, mg/kg	With Measured Soil Conc		Does Measured Soil Conc Pass or Fail?
			RISK @	HI @	
Protection of Soil Direct Contact: Human Health	Method B	6,666	1.06E-07	1.04E-01	Pass
	Method C	84,235	2.64E-08	8.41E-03	Pass
Protection of Method B Ground Water Quality (Leaching)	Potable GW: Human Health Protection	100% NAPL	1.74E-10	1.77E-01	Pass
	Target TPH GW Conc. @ 800 ug/L	100% NAPL	NA	NA	Pass

Warning! Check to determine if a simplified or site-specific Terrestrial Ecological Evaluation may be required (Refer to WAC 173-340-7490 through ~7494).

2. Results for Protection of Soil Direct Contact Pathway: Human Health

	Method B: Unrestricted Land Use	Method C: Industrial Land Use
Protective Soil Concentration, TPH mg/kg	6,665.75	84,235.38
Most Stringent Criterion	Risk of cPAHs mixture= 1E-6	HI =1

Soil Criteria	Protective Soil Concentration @Method B				Protective Soil Concentration @Method C			
	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @
HI =1	*NO*	6.79E+03	1.02E-06	1.00E+00	YES	8.42E+04	3.14E-06	1.00E+00
Total Risk=1E-5	*NO*	6.67E+04	1.00E-05	9.82E+00	*NO*	2.68E+05	1.00E-05	3.19E+00
Risk of Benzene= 1E-6	NA	NA	NA	NA	NA			
Risk of cPAHs mixture= 1E-6	YES	6.67E+03	1.00E-06	9.82E-01				
EDB	NA	NA	NA	NA				
EDC	NA	NA	NA	NA				

3. Results for Protection of Ground Water Quality (Leaching Pathway)

3.1. Protection of Potable Ground Water Quality (Method B): Human Health Protection

Most Stringent Criterion	NA
Protective Ground Water Concentration, ug/L	NA
Protective Soil Concentration, mg/kg	Soil-to-Ground Water is not a critical pathway!

Ground Water Criteria	Protective Potable Ground Water Concentration @Method B				Protective Soil Conc, mg/kg
	Most Stringent?	TPH Conc, ug/L	RISK @	HI @	
HI=1	YES	1.41E+02	1.70E-10	2.20E-01	100% NAPL
Total Risk = 1E-5	YES	1.41E+02	1.70E-10	2.20E-01	100% NAPL
Total Risk = 1E-6	YES	1.41E+02	1.70E-10	2.20E-01	100% NAPL
Risk of cPAHs mixture= 1E-5	YES	1.41E+02	1.70E-10	2.20E-01	100% NAPL
Benzene MCL = 5 ug/L	NA	NA	NA	NA	NA
MTBE = 20 ug/L	YES	1.41E+02	1.70E-10	2.20E-01	100% NAPL

Note: 100% NAPL is 75000 mg/kg TPH.

3.2 Protection of Ground Water Quality for TPH Ground Water Concentration previously adjusted and entered

Ground Water Criteria	Protective Ground Water Concentration			Protective Soil Conc, mg/kg
	TPH Conc, ug/L	Risk @	HI @	
Target TPH GW Conc = 800 ug/L	1.41E+02	1.70E-10	2.20E-01	**100% NAPL**

APPENDIX D

COPIES OF QUARTERLY GROUND WATER MONITORING REPORTS

(with monitoring well locations and laboratory reports)

OnSite Environmental Inc.

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

January 5, 2015

Kim Stilson
HWA GeoSciences, Inc.
21312 30th Drive SE, Suite 110
Bothell, WA 98021

Re: Analytical Data for Project 2007-098-998
Laboratory Reference No. 1412-252

Dear Kim:

Enclosed are the analytical results and associated quality control data for samples submitted on December 20, 2014.

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: January 5, 2015
Samples Submitted: December 20, 2014
Laboratory Reference: 1412-252
Project: 2007-098-998

Case Narrative

Samples were collected on December 18 and 19, 2014 and received by the laboratory on December 20, 2014. 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: January 5, 2015
Samples Submitted: December 20, 2014
Laboratory Reference: 1412-252
Project: 2007-098-998

HALOGENATED VOLATILES EPA 8260C
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 4**					
Laboratory ID:	12-252-01					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloromethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Iodomethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroform	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Trichloroethene	0.33	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	

Date of Report: January 5, 2015
Samples Submitted: December 20, 2014
Laboratory Reference: 1412-252
Project: 2007-098-998

HALOGENATED VOLATILES EPA 8260C
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 4**					
Laboratory ID:	12-252-01					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Tetrachloroethene	0.79	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromoform	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Bromobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*107*	*79-122*				
Toluene-d8	*98*	*80-120*				
4-Bromofluorobenzene	*99*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 5**					
Laboratory ID:	12-252-02					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloromethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Iodomethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(cis) 1,2-Dichloroethene	0.22	0.20	EPA 8260C	12-30-14	12-30-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroform	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Trichloroethene	0.32	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 5**					
Laboratory ID:	12-252-02					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Tetrachloroethene	1.3	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromoform	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Bromobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*104*	*79-122*				
Toluene-d8	*101*	*80-120*				
4-Bromofluorobenzene	*101*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 8**					
Laboratory ID:	12-252-03					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloromethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Iodomethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroform	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Trichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 8**					
Laboratory ID:	12-252-03					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Tetrachloroethene	0.70	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromoform	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Bromobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*100*	*79-122*				
Toluene-d8	*104*	*80-120*				
4-Bromofluorobenzene	*105*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DUP**					
Laboratory ID:	12-252-04					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloromethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Iodomethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroform	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Trichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DUP**					
Laboratory ID:	12-252-04					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Tetrachloroethene	0.92	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromoform	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Bromobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*100*	*79-122*				
Toluene-d8	*103*	*80-120*				
4-Bromofluorobenzene	*100*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**BC 3**					
Laboratory ID:	12-252-05					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Chloromethane	ND	1.0	EPA 8260C	12-30-14	12-31-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Bromomethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Chloroethane	ND	1.0	EPA 8260C	12-30-14	12-31-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Iodomethane	ND	1.0	EPA 8260C	12-30-14	12-31-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-30-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
(cis) 1,2-Dichloroethene	0.44	0.20	EPA 8260C	12-30-14	12-31-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Chloroform	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Trichloroethene	2.1	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Dibromomethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-30-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**BC 3**					
Laboratory ID:	12-252-05					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Tetrachloroethene	7.7	0.20	EPA 8260C	12-30-14	12-31-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Bromoform	ND	1.0	EPA 8260C	12-30-14	12-31-14	
Bromobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-30-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*97*	*79-122*				
Toluene-d8	*103*	*80-120*				
4-Bromofluorobenzene	*107*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 10**					
Laboratory ID:	12-252-06					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Chloromethane	ND	1.0	EPA 8260C	12-30-14	12-31-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Bromomethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Chloroethane	ND	1.0	EPA 8260C	12-30-14	12-31-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Iodomethane	ND	1.0	EPA 8260C	12-30-14	12-31-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-30-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Chloroform	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Trichloroethene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Dibromomethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-30-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 10**					
Laboratory ID:	12-252-06					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Tetrachloroethene	0.69	0.20	EPA 8260C	12-30-14	12-31-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Bromoform	ND	1.0	EPA 8260C	12-30-14	12-31-14	
Bromobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-30-14	12-31-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-30-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*102*	*79-122*				
Toluene-d8	*101*	*80-120*				
4-Bromofluorobenzene	*104*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EW 1**					
Laboratory ID:	12-252-07					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Iodomethane	ND	2.2	EPA 8260C	12-31-14	12-31-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(cis) 1,2-Dichloroethene	0.82	0.20	EPA 8260C	12-31-14	12-31-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroform	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Trichloroethene	2.6	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EW 1**					
Laboratory ID:	12-252-07					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Tetrachloroethene	21	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromoform	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Bromobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*103*	*79-122*				
Toluene-d8	*100*	*80-120*				
4-Bromofluorobenzene	*98*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EW 2**					
Laboratory ID:	12-252-08					
Dichlorodifluoromethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Chloromethane	ND	2.0	EPA 8260C	12-31-14	12-31-14	
Vinyl Chloride	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Bromomethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Chloroethane	ND	2.0	EPA 8260C	12-31-14	12-31-14	
Trichlorofluoromethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Iodomethane	ND	4.4	EPA 8260C	12-31-14	12-31-14	
Methylene Chloride	ND	2.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
2,2-Dichloropropane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
(cis) 1,2-Dichloroethene	12	0.40	EPA 8260C	12-31-14	12-31-14	
Bromochloromethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Chloroform	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,1,1-Trichloroethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Carbon Tetrachloride	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloropropene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloroethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Trichloroethene	12	0.40	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloropropane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Dibromomethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Bromodichloromethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	2.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.40	EPA 8260C	12-31-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EW 2**					
Laboratory ID:	12-252-08					
1,1,2-Trichloroethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Tetrachloroethene	44	0.40	EPA 8260C	12-31-14	12-31-14	
1,3-Dichloropropane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Dibromochloromethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromoethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Chlorobenzene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Bromoform	ND	2.0	EPA 8260C	12-31-14	12-31-14	
Bromobenzene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichloropropane	ND	0.40	EPA 8260C	12-31-14	12-31-14	
2-Chlorotoluene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
4-Chlorotoluene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,3-Dichlorobenzene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,4-Dichlorobenzene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,2-Dichlorobenzene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	2.0	EPA 8260C	12-31-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Hexachlorobutadiene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.40	EPA 8260C	12-31-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*100*	*79-122*				
Toluene-d8	*103*	*80-120*				
4-Bromofluorobenzene	*104*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EW 3**					
Laboratory ID:	12-252-09					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Iodomethane	ND	2.2	EPA 8260C	12-31-14	12-31-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(cis) 1,2-Dichloroethene	6.0	0.20	EPA 8260C	12-31-14	12-31-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroform	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Trichloroethene	6.4	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EW 3**					
Laboratory ID:	12-252-09					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Tetrachloroethene	21	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromoform	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Bromobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*107*	*79-122*				
Toluene-d8	*102*	*80-120*				
4-Bromofluorobenzene	*102*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EW 4**					
Laboratory ID:	12-252-10					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Vinyl Chloride	0.27	0.20	EPA 8260C	12-31-14	12-31-14	
Bromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Iodomethane	ND	2.2	EPA 8260C	12-31-14	12-31-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(cis) 1,2-Dichloroethene	1.1	0.20	EPA 8260C	12-31-14	12-31-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroform	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Trichloroethene	1.6	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EW 4**					
Laboratory ID:	12-252-10					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Tetrachloroethene	1.2	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromoform	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Bromobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*104*	*79-122*				
Toluene-d8	*101*	*80-120*				
4-Bromofluorobenzene	*101*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 6**					
Laboratory ID:	12-252-11					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Iodomethane	ND	2.2	EPA 8260C	12-31-14	12-31-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroform	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Trichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 6**					
Laboratory ID:	12-252-11					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Tetrachloroethene	0.47	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromoform	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Bromobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*107*	*79-122*				
Toluene-d8	*106*	*80-120*				
4-Bromofluorobenzene	*104*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 7**					
Laboratory ID:	12-252-12					
Dichlorodifluoromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Chloromethane	ND	5.0	EPA 8260C	12-31-14	12-31-14	
Vinyl Chloride	34	1.0	EPA 8260C	12-31-14	12-31-14	
Bromomethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Chloroethane	ND	5.0	EPA 8260C	12-31-14	12-31-14	
Trichlorofluoromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Iodomethane	ND	11	EPA 8260C	12-31-14	12-31-14	
Methylene Chloride	ND	5.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,2-Dichloroethene	1.4	1.0	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
2,2-Dichloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,2-Dichloroethene	150	1.0	EPA 8260C	12-31-14	12-31-14	
Bromochloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Chloroform	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,1,1-Trichloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Carbon Tetrachloride	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloropropene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Trichloroethene	8.9	1.0	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Dibromomethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Bromodichloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	5.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	1.0	EPA 8260C	12-31-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 7**					
Laboratory ID:	12-252-12					
1,1,2-Trichloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Tetrachloroethene	2.9	1.0	EPA 8260C	12-31-14	12-31-14	
1,3-Dichloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Dibromochloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromoethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Chlorobenzene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Bromoform	ND	5.0	EPA 8260C	12-31-14	12-31-14	
Bromobenzene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
2-Chlorotoluene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
4-Chlorotoluene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,3-Dichlorobenzene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,4-Dichlorobenzene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2-Dichlorobenzene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	5.0	EPA 8260C	12-31-14	12-31-14	
1,2,4-Trichlorobenzene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Hexachlorobutadiene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichlorobenzene	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*102*	*79-122*				
Toluene-d8	*100*	*80-120*				
4-Bromofluorobenzene	*100*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 9R**					
Laboratory ID:	12-252-13					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Iodomethane	ND	2.2	EPA 8260C	12-31-14	12-31-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroform	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Trichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW 9R**					
Laboratory ID:	12-252-13					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Tetrachloroethene	0.79	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromoform	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Bromobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*108*	*79-122*				
Toluene-d8	*105*	*80-120*				
4-Bromofluorobenzene	*104*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Total Discharge**					
Laboratory ID:	12-252-14					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Iodomethane	ND	2.2	EPA 8260C	12-31-14	12-31-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(cis) 1,2-Dichloroethene	2.5	0.20	EPA 8260C	12-31-14	12-31-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroform	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Trichloroethene	2.7	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**Total Discharge**					
Laboratory ID:	12-252-14					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Tetrachloroethene	11	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromoform	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Bromobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*102*	*79-122*				
Toluene-d8	*101*	*80-120*				
4-Bromofluorobenzene	*103*	*80-120*				

Date of Report: January 5, 2015
Samples Submitted: December 20, 2014
Laboratory Reference: 1412-252
Project: 2007-098-998

HALOGENATED VOLATILES 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:	MB1230W1					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloromethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Iodomethane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chloroform	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Trichloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromomethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-30-14	12-30-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-30-14	12-30-14	

Date of Report: January 5, 2015
Samples Submitted: December 20, 2014
Laboratory Reference: 1412-252
Project: 2007-098-998

HALOGENATED VOLATILES EPA 8260C
METHOD BLANK QUALITY CONTROL
Page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB1230W1					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Tetrachloroethene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Bromoform	ND	1.0	EPA 8260C	12-30-14	12-30-14	
Bromobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-30-14	12-30-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-30-14	12-30-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-30-14	12-30-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*103*	*79-122*				
Toluene-d8	*101*	*80-120*				
4-Bromofluorobenzene	*97*	*80-120*				

Date of Report: January 5, 2015
Samples Submitted: December 20, 2014
Laboratory Reference: 1412-252
Project: 2007-098-998

HALOGENATED VOLATILES 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:	MB1231W1					
Dichlorodifluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloromethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Vinyl Chloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroethane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Trichlorofluoromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Iodomethane	ND	2.2	EPA 8260C	12-31-14	12-31-14	
Methylene Chloride	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chloroform	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Carbon Tetrachloride	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Trichloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromomethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromodichloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260C	12-31-14	12-31-14	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	12-31-14	12-31-14	

Date of Report: January 5, 2015
Samples Submitted: December 20, 2014
Laboratory Reference: 1412-252
Project: 2007-098-998

HALOGENATED VOLATILES EPA 8260C
METHOD BLANK QUALITY CONTROL
Page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB1231W1					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Tetrachloroethene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Dibromochloromethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromoethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Chlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Bromoform	ND	1.0	EPA 8260C	12-31-14	12-31-14	
Bromobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	12-31-14	12-31-14	
2-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
4-Chlorotoluene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	12-31-14	12-31-14	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Hexachlorobutadiene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	12-31-14	12-31-14	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*100*	*79-122*				
Toluene-d8	*100*	*80-120*				
4-Bromofluorobenzene	*99*	*80-120*				

Date of Report: January 5, 2015
Samples Submitted: December 20, 2014
Laboratory Reference: 1412-252
Project: 2007-098-998

HALOGENATED VOLATILES 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:	SB1230W1									
	SB	SBD	SB	SBD	SB	SBD				
1,1-Dichloroethene	**9.27**	**9.07**	10.0	10.0	93	91	64-138	2	16	
Benzene	**9.33**	**9.60**	10.0	10.0	93	96	76-125	3	14	
Trichloroethene	**7.83**	**8.12**	10.0	10.0	78	81	70-125	4	16	
Toluene	**9.64**	**9.38**	10.0	10.0	96	94	75-125	3	15	
Chlorobenzene	**9.33**	**9.19**	10.0	10.0	93	92	80-140	2	15	
Surrogate:										
Dibromofluoromethane					*101*	*98*	*79-122*			
Toluene-d8					*104*	*98*	*80-120*			
4-Bromofluorobenzene					*105*	*102*	*80-120*			

Date of Report: January 5, 2015
Samples Submitted: December 20, 2014
Laboratory Reference: 1412-252
Project: 2007-098-998

HALOGENATED VOLATILES 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:	SB1231W1									
	SB	SBD	SB	SBD	SB	SBD				
1,1-Dichloroethene	**8.36**	**9.14**	10.0	10.0	84	91	64-138	9	16	
Benzene	**8.75**	**9.57**	10.0	10.0	88	96	76-125	9	14	
Trichloroethene	**7.35**	**7.80**	10.0	10.0	74	78	70-125	6	16	
Toluene	**8.90**	**9.45**	10.0	10.0	89	95	75-125	6	15	
Chlorobenzene	**8.75**	**9.25**	10.0	10.0	88	93	80-140	6	15	
Surrogate:										
Dibromofluoromethane					*95*	*98*	*79-122*			
Toluene-d8					*95*	*94*	*80-120*			
4-Bromofluorobenzene					*93*	*98*	*80-120*			

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

~~393-31~~ ~~12-251~~ 12-252

HWA GeoSciences Inc.

21312 30th Drive SE, Suite 110, Bothell, Washington 98021-7010
Tel 425.774.0106 Fax 425.774.2714 www.hwageo.com

Chain of Custody and Laboratory Anaylsis Request

DATE: 12/19/14
PAGE: 1 of 1

PROJECT NAME: Bothell Riverside #: 2007-088-998
SAMPLERS NAME: KShilson PHONE:
SAMPLERS SIGNATURE: KShilson DATE: 12/19/14
HWA CONTACT: KShilson PHONE:

ANALYSIS REQUESTED

TURNAROUND TIME
☐ DAYS
☑ ~~STANDARD~~

HWA SAMPLE ID	DATE	TIME	MATRIX	LAB ID	# OF BOTTLE	HVOCs	EDD	REMARKS
RMW4	12/18/14	400	W	1	3	1		
RMW5	12/18/14	500		2		1		
RMW8	12/19/14	1100		3		1		
DUP		1115		4		1		
BC3		1130		5		1		
RMW10		200		6		1		
~~EX1~~ EW1		1200		7		1		
~~EX2~~ EW2		1230		8		1		
~~EX3~~ EW3		100		9		1		
~~EX4~~ EW4		130		10		1		
RMW6		230		11		1		
RMW7		300		12		1		
RMW9R		400		13		1		
Total Discharge	12/18/14	515		14		1		

PRINT NAME	SIGNATURE	COMPANY	DATE	TIME	REMARKS
Relinquished by: KShilson	KShilson	HWA Geo	~~12/18~~ 12/20/14	900	
Received by: B. Howard	B. Howard	OSE	12/20	920	
Relinquished by:					
Received by:					

DISTRIBUTION: WHITE - Return to HWA GeoSciences; YELLOW - Retain by Lab; PINK - Retain by Sampler

OnSite Environmental Inc.

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

March 25, 2015

Kim Stilson
HWA GeoSciences, Inc.
21312 30th Drive SE, Suite 110
Bothell, WA 98021

Re: Analytical Data for Project 2007-098-2012
Laboratory Reference No. 1503-213

Dear Kim:

Enclosed are the analytical results and associated quality control data for samples submitted on March 19, 2015.

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: March 25, 2015
Samples Submitted: March 19, 2015
Laboratory Reference: 1503-213
Project: 2007-098-2012

Case Narrative

Samples were collected on March 18, 2015 and received by the laboratory on March 19, 2015. 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: March 25, 2015
Samples Submitted: March 19, 2015
Laboratory Reference: 1503-213
Project: 2007-098-2012

HALOGENATED VOLATILES EPA 8260C
page 1 of 2

Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EX-1**					
Laboratory ID:	03-213-01					
Dichlorodifluoromethane	ND	0.26	EPA 8260C	3-23-15	3-23-15	
Chloromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Vinyl Chloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromomethane	ND	0.31	EPA 8260C	3-23-15	3-23-15	
Chloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Trichlorofluoromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Iodomethane	ND	1.4	EPA 8260C	3-23-15	3-23-15	
Methylene Chloride	ND	1.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chloroform	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Carbon Tetrachloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Trichloroethene	0.27	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromomethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromodichloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chloroethyl Vinyl Ether	ND	3.2	EPA 8260C	3-23-15	3-23-15	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	

Date of Report: March 25, 2015
Samples Submitted: March 19, 2015
Laboratory Reference: 1503-213
Project: 2007-098-2012

HALOGENATED VOLATILES EPA 8260C
page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EX-1**					
Laboratory ID:	03-213-01					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Tetrachloroethene	2.8	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromoethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromoform	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Bromobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
4-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Hexachlorobutadiene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*98*	*79-122*				
Toluene-d8	*99*	*80-120*				
4-Bromofluorobenzene	*96*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EX-2**					
Laboratory ID:	03-213-02					
Dichlorodifluoromethane	ND	0.26	EPA 8260C	3-23-15	3-23-15	
Chloromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Vinyl Chloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromomethane	ND	0.31	EPA 8260C	3-23-15	3-23-15	
Chloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Trichlorofluoromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Iodomethane	ND	1.4	EPA 8260C	3-23-15	3-23-15	
Methylene Chloride	ND	1.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(cis) 1,2-Dichloroethene	4.3	0.20	EPA 8260C	3-23-15	3-23-15	
Bromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chloroform	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Carbon Tetrachloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Trichloroethene	6.5	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromomethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromodichloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chloroethyl Vinyl Ether	ND	3.2	EPA 8260C	3-23-15	3-23-15	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EX-2**					
Laboratory ID:	03-213-02					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Tetrachloroethene	22	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromoethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromoform	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Bromobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
4-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Hexachlorobutadiene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*98*	*79-122*				
Toluene-d8	*97*	*80-120*				
4-Bromofluorobenzene	*90*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EX-3**					
Laboratory ID:	03-213-03					
Dichlorodifluoromethane	ND	1.3	EPA 8260C	3-23-15	3-23-15	
Chloromethane	ND	5.0	EPA 8260C	3-23-15	3-23-15	
Vinyl Chloride	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Bromomethane	ND	1.6	EPA 8260C	3-23-15	3-23-15	
Chloroethane	ND	5.0	EPA 8260C	3-23-15	3-23-15	
Trichlorofluoromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Iodomethane	ND	7.0	EPA 8260C	3-23-15	3-23-15	
Methylene Chloride	ND	5.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,2-Dichloroethene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
2,2-Dichloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
(cis) 1,2-Dichloroethene	29	1.0	EPA 8260C	3-23-15	3-23-15	
Bromochloromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Chloroform	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,1,1-Trichloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Carbon Tetrachloride	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloropropene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Trichloroethene	46	1.0	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Dibromomethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Bromodichloromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
2-Chloroethyl Vinyl Ether	ND	16	EPA 8260C	3-23-15	3-23-15	
(cis) 1,3-Dichloropropene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,3-Dichloropropene	ND	1.0	EPA 8260C	3-23-15	3-23-15	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EX-3**					
Laboratory ID:	03-213-03					
1,1,2-Trichloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Tetrachloroethene	140	1.0	EPA 8260C	3-23-15	3-23-15	
1,3-Dichloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Dibromochloromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromoethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Chlorobenzene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,1,1,2-Tetrachloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Bromoform	ND	5.0	EPA 8260C	3-23-15	3-23-15	
Bromobenzene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,1,2,2-Tetrachloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
2-Chlorotoluene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
4-Chlorotoluene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,3-Dichlorobenzene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,4-Dichlorobenzene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2-Dichlorobenzene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromo-3-chloropropane	ND	5.0	EPA 8260C	3-23-15	3-23-15	
1,2,4-Trichlorobenzene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Hexachlorobutadiene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichlorobenzene	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*92*	*79-122*				
Toluene-d8	*91*	*80-120*				
4-Bromofluorobenzene	*86*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EX-4**					
Laboratory ID:	03-213-04					
Dichlorodifluoromethane	ND	0.26	EPA 8260C	3-23-15	3-23-15	
Chloromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Vinyl Chloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromomethane	ND	0.31	EPA 8260C	3-23-15	3-23-15	
Chloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Trichlorofluoromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Iodomethane	ND	1.4	EPA 8260C	3-23-15	3-23-15	
Methylene Chloride	ND	1.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(cis) 1,2-Dichloroethene	3.2	0.20	EPA 8260C	3-23-15	3-23-15	
Bromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chloroform	0.21	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Carbon Tetrachloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Trichloroethene	4.8	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromomethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromodichloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chloroethyl Vinyl Ether	ND	3.2	EPA 8260C	3-23-15	3-23-15	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**EX-4**					
Laboratory ID:	03-213-04					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Tetrachloroethene	15	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromoethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromoform	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Bromobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
4-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Hexachlorobutadiene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*97*	*79-122*				
Toluene-d8	*98*	*80-120*				
4-Bromofluorobenzene	*94*	*80-120*				

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW-7**					
Laboratory ID:	03-213-05					
Dichlorodifluoromethane	ND	0.52	EPA 8260C	3-23-15	3-23-15	
Chloromethane	ND	2.0	EPA 8260C	3-23-15	3-23-15	
Vinyl Chloride	20	0.40	EPA 8260C	3-23-15	3-23-15	
Bromomethane	ND	0.62	EPA 8260C	3-23-15	3-23-15	
Chloroethane	ND	2.0	EPA 8260C	3-23-15	3-23-15	
Trichlorofluoromethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Iodomethane	ND	2.8	EPA 8260C	3-23-15	3-23-15	
Methylene Chloride	ND	2.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,2-Dichloroethene	0.64	0.40	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
2,2-Dichloropropane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
(cis) 1,2-Dichloroethene	57	0.40	EPA 8260C	3-23-15	3-23-15	
Bromochloromethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Chloroform	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1,1-Trichloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Carbon Tetrachloride	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloropropene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Trichloroethene	1.5	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloropropane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Dibromomethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Bromodichloromethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
2-Chloroethyl Vinyl Ether	ND	6.4	EPA 8260C	3-23-15	3-23-15	
(cis) 1,3-Dichloropropene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
(trans) 1,3-Dichloropropene	ND	0.40	EPA 8260C	3-23-15	3-23-15	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**RMW-7**					
Laboratory ID:	03-213-05					
1,1,2-Trichloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Tetrachloroethene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,3-Dichloropropane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Dibromochloromethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromoethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Chlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1,1,2-Tetrachloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Bromoform	ND	2.0	EPA 8260C	3-23-15	3-23-15	
Bromobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1,2,2-Tetrachloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichloropropane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
2-Chlorotoluene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
4-Chlorotoluene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,3-Dichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,4-Dichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromo-3-chloropropane	ND	2.0	EPA 8260C	3-23-15	3-23-15	
1,2,4-Trichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Hexachlorobutadiene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*91*	*79-122*				
Toluene-d8	*90*	*80-120*				
4-Bromofluorobenzene	*85*	*80-120*				

Date of Report: March 25, 2015
Samples Submitted: March 19, 2015
Laboratory Reference: 1503-213
Project: 2007-098-2012

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DUP**					
Laboratory ID:	03-213-06					
Dichlorodifluoromethane	ND	0.52	EPA 8260C	3-23-15	3-23-15	
Chloromethane	ND	2.0	EPA 8260C	3-23-15	3-23-15	
Vinyl Chloride	19	0.40	EPA 8260C	3-23-15	3-23-15	
Bromomethane	ND	0.62	EPA 8260C	3-23-15	3-23-15	
Chloroethane	ND	2.0	EPA 8260C	3-23-15	3-23-15	
Trichlorofluoromethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Iodomethane	ND	2.8	EPA 8260C	3-23-15	3-23-15	
Methylene Chloride	ND	2.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,2-Dichloroethene	0.65	0.40	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
2,2-Dichloropropane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
(cis) 1,2-Dichloroethene	54	0.40	EPA 8260C	3-23-15	3-23-15	
Bromochloromethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Chloroform	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1,1-Trichloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Carbon Tetrachloride	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloropropene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Trichloroethene	1.0	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloropropane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Dibromomethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Bromodichloromethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
2-Chloroethyl Vinyl Ether	ND	6.4	EPA 8260C	3-23-15	3-23-15	
(cis) 1,3-Dichloropropene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
(trans) 1,3-Dichloropropene	ND	0.40	EPA 8260C	3-23-15	3-23-15	

Date of Report: March 25, 2015
Samples Submitted: March 19, 2015
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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DUP**					
Laboratory ID:	03-213-06					
1,1,2-Trichloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Tetrachloroethene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,3-Dichloropropane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Dibromochloromethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromoethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Chlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1,1,2-Tetrachloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Bromoform	ND	2.0	EPA 8260C	3-23-15	3-23-15	
Bromobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,1,2,2-Tetrachloroethane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichloropropane	ND	0.40	EPA 8260C	3-23-15	3-23-15	
2-Chlorotoluene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
4-Chlorotoluene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,3-Dichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,4-Dichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromo-3-chloropropane	ND	2.0	EPA 8260C	3-23-15	3-23-15	
1,2,4-Trichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Hexachlorobutadiene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichlorobenzene	ND	0.40	EPA 8260C	3-23-15	3-23-15	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*92*	*79-122*				
Toluene-d8	*91*	*80-120*				
4-Bromofluorobenzene	*89*	*80-120*				

Date of Report: March 25, 2015
Samples Submitted: March 19, 2015
Laboratory Reference: 1503-213
Project: 2007-098-2012

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DISCH**					
Laboratory ID:	03-213-07					
Dichlorodifluoromethane	ND	0.26	EPA 8260C	3-23-15	3-23-15	
Chloromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Vinyl Chloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromomethane	ND	0.31	EPA 8260C	3-23-15	3-23-15	
Chloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Trichlorofluoromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Iodomethane	ND	1.4	EPA 8260C	3-23-15	3-23-15	
Methylene Chloride	ND	1.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(cis) 1,2-Dichloroethene	4.7	0.20	EPA 8260C	3-23-15	3-23-15	
Bromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chloroform	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Carbon Tetrachloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Trichloroethene	7.4	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromomethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromodichloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chloroethyl Vinyl Ether	ND	3.2	EPA 8260C	3-23-15	3-23-15	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DISCH**					
Laboratory ID:	03-213-07					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Tetrachloroethene	25	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromoethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromoform	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Bromobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
4-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Hexachlorobutadiene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*97*	*79-122*				
Toluene-d8	*98*	*80-120*				
4-Bromofluorobenzene	*92*	*80-120*				

Date of Report: March 25, 2015
Samples Submitted: March 19, 2015
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Project: 2007-098-2012

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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**TB**					
Laboratory ID:	03-213-08					
Dichlorodifluoromethane	ND	0.26	EPA 8260C	3-23-15	3-23-15	
Chloromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Vinyl Chloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromomethane	ND	0.31	EPA 8260C	3-23-15	3-23-15	
Chloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Trichlorofluoromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Iodomethane	ND	1.4	EPA 8260C	3-23-15	3-23-15	
Methylene Chloride	ND	1.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chloroform	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Carbon Tetrachloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Trichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromomethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromodichloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chloroethyl Vinyl Ether	ND	3.2	EPA 8260C	3-23-15	3-23-15	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	

Date of Report: March 25, 2015
Samples Submitted: March 19, 2015
Laboratory Reference: 1503-213
Project: 2007-098-2012

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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**TB**					
Laboratory ID:	03-213-08					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Tetrachloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromoethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromoform	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Bromobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
4-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Hexachlorobutadiene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*94*	*79-122*				
Toluene-d8	*97*	*80-120*				
4-Bromofluorobenzene	*90*	*80-120*				

Date of Report: March 25, 2015
Samples Submitted: March 19, 2015
Laboratory Reference: 1503-213
Project: 2007-098-2012

HALOGENATED VOLATILES EPA 8260C
METHOD BLANK QUALITY CONTROL
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Matrix: Water
Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0323W2					
Dichlorodifluoromethane	ND	0.26	EPA 8260C	3-23-15	3-23-15	
Chloromethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Vinyl Chloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromomethane	ND	0.31	EPA 8260C	3-23-15	3-23-15	
Chloroethane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Trichlorofluoromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Iodomethane	ND	1.4	EPA 8260C	3-23-15	3-23-15	
Methylene Chloride	ND	1.0	EPA 8260C	3-23-15	3-23-15	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chloroform	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Carbon Tetrachloride	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Trichloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromomethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromodichloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chloroethyl Vinyl Ether	ND	3.2	EPA 8260C	3-23-15	3-23-15	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260C	3-23-15	3-23-15	

Date of Report: March 25, 2015
Samples Submitted: March 19, 2015
Laboratory Reference: 1503-213
Project: 2007-098-2012

HALOGENATED VOLATILES EPA 8260C
METHOD BLANK QUALITY CONTROL
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Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0323W2					
1,1,2-Trichloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Tetrachloroethene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Dibromochloromethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromoethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Chlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Bromoform	ND	1.0	EPA 8260C	3-23-15	3-23-15	
Bromobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichloropropane	ND	0.20	EPA 8260C	3-23-15	3-23-15	
2-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
4-Chlorotoluene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,3-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,4-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260C	3-23-15	3-23-15	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Hexachlorobutadiene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260C	3-23-15	3-23-15	
Surrogate:	*Percent Recovery*	*Control Limits*				
Dibromofluoromethane	*95*	*79-122*				
Toluene-d8	*99*	*80-120*				
4-Bromofluorobenzene	*94*	*80-120*				

Date of Report: March 25, 2015
Samples Submitted: March 19, 2015
Laboratory Reference: 1503-213
Project: 2007-098-2012

HALOGENATED VOLATILES 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:	SB0323W2									
	SB	SBD	SB	SBD	SB	SBD				
1,1-Dichloroethene	**8.24**	**8.32**	10.0	10.0	82	83	64-138	1	16	
Benzene	**9.37**	**9.17**	10.0	10.0	94	92	76-125	2	14	
Trichloroethene	**9.29**	**8.74**	10.0	10.0	93	87	70-125	6	16	
Toluene	**9.70**	**9.34**	10.0	10.0	97	93	75-125	4	15	
Chlorobenzene	**9.71**	**9.31**	10.0	10.0	97	93	80-140	4	15	
Surrogate:										
Dibromofluoromethane					*92*	*95*	*79-122*			
Toluene-d8					*96*	*96*	*80-120*			
4-Bromofluorobenzene					*91*	*91*	*80-120*			

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

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03-213

Chain of Custody and Laboratory Anaylsis Request

DATE: 3/19/15
PAGE: 1 of 1

PROJECT NAME: Bothell Riverside #: 2007-048-2012
SAMPLERS NAME: KStilson PHONE:
SAMPLERS SIGNATURE: KStilson DATE: 3/19/15
HWA CONTACT: KStilson ASugar PHONE:

ANALYSIS REQUESTED

TURNAROUND TIME
☐ DAYS
☒ ~~STANDARD~~

HWA SAMPLE ID	DATE	TIME	MATRIX	LAB ID	# OF BOTTLE	HVOCs	EDD	REMARKS
EX-1	3/19/15	230	W	1	3	/		
EX-2	"	235	"	2	"	/		
EX-3	"	240	"	3	"	/		
EX-4	"	245	"	4	"	/		
RMW-7	"	120	"	5	"	/		
DUP	"	130	"	6	"	/		
DISCH	"	250	"	7	"	/		
TB	3/18/15	—	W	8	X2	/		

PRINT NAME	SIGNATURE	COMPANY	DATE	TIME	REMARKS
Relinquished by: KStilson	KA	HWA Geo	3/19/15	300	
Received by: Scott Williams		ALPHA	3/19/15	3:27	
Relinquished by: Scott Williams	" "		3/19/15	4:00	
Received by: M. VOWN		CORE	3/19/15	1600	

DISTRIBUTION: WHITE - Return to HWA GeoSciences; YELLOW - Retain by Lab; PINK - Retain by Sampler

APPENDIX E

DATA QUALITY ASSESSMENT

July 23, 2015
HWA Project No. 2007-098-2018

INTRODUCTION

This appendix presents a data quality assessment for the Bothell Riverside site remedial investigation ground water samples collected in January and March 2015.

Quality is the degree to which a set of inherent characteristics fulfills project requirements. Quality assurance (QA) is the processes of auditing the project's quality requirements and the results from quality control measurements to ensure appropriate quality standards are used. Quality control (QC) is the process of monitoring and recording results of executing the project quality activities to assess performance and to recommend necessary changes (PMI, 2008).

The principal ingredients that make up suitable data quality or "good data" are (Flory, 2000):

1. **Clearly stated measurement purposes:** Must include the chemical compounds to be analyzed; the sample matrices to be submitted; the intended use of the data, and the associated detection limits, accuracy, and precision required.
2. **Data management:** Refers to sample tracking (chain-of-custody) and associated activities that guarantee the laboratory results are associated with the correct sample.
3. **Sampling:** Includes a technically valid sampling plan that is correctly implemented to properly collect, identify, preserve, store and prepare samples for analysis.
4. **Analytical method:** Must have sufficient selectivity, detection limits, accuracy and precision to be technically valid.
5. **Quality control samples:** Must include sufficient quality control samples to support the necessary statements of accuracy, precision, and detection limits. These include blanks (field, trip, laboratory, reagent), duplicate measurements, matrix spikes, laboratory control samples, and performance evaluation samples.
6. **Quality control limits:** Includes clearly stated acceptable limits for quality control samples such as allowable blank contamination; precision of duplicate samples; and accuracy of matrix spikes, performance evaluation samples and laboratory control samples. Calibration frequency and linearity may also be included.
7. **Documentation:** Must be comprehensive enough to allow a third party evaluator to independently verify the suitability of the sample data.

The process of verifying the suitability of the data is termed data quality assessment. Data quality assessment is a determination of the suitability of the data for the intended use. It includes the four major tasks of (a) data management, (b) data validation, (c) data qualification/review (flagging), and (d) the determination of suitability. Data management includes determining the completeness of the data documentation. Environmental data validation primarily entails checking to see if the quality control requirements of the method have been met. Data qualification is the application of flags to the data that reflect the failures found during validation. The final determination of suitability must consider the technical validity of the data

as well as the data qualifiers and be consistent with the intended use of the analytical data (Flory, 2000).

There were two components to the data quality program for the Bothell Riverside site remedial investigation: field and laboratory. Both components followed Washington Department of Ecology guidance (Ecology, 2004). Also, the *Interim Action Work Plan* (HWA, 2013) specified the sample collection procedures and analysis, and defined the data quality objectives (DQOs) and criteria for the independent action cleanup.

FIELD QC METHODS

Assessment of field QC methods and data revealed no deviations from the *Interim Action Work Plan* (HWA, 2013). Field QC included proper documentation of field activities in a field log book and daily field reports that provided a daily record of significant events, observations, deviations from the sampling plan and measurements collected during the field activities. Field personnel followed standard QC procedures to collect and transport samples including collection of duplicate samples, decontamination of reusable sampling equipment between samples, labeling samples, and following chain of custody procedures to transport samples to the laboratory. Field personnel photographically documented significant events and observations during the independent action cleanup.

LABORATORY QC METHODS

OnSite Environmental Inc. of Redmond, Washington performed all sample analyses. OnSite Environmental is accredited by the Washington Department of Ecology (Accreditation #C591-14) for all analyses performed for the remedial investigation.

Specific laboratory QC consisted of the following (OnSite Environmental, 2012; Ecology, 2004):

- **Sample Batching.** A batch consisted of up to twenty samples in addition to any quality control samples that were required. Samples in a batch may have been collected at different sites by different clients of OnSite Environmental. The samples were extracted, digested, and prepared for analysis within a twelve-hour window. If more than twenty samples were to be extracted, a second batch of quality control samples was generated.
- **Method Blanks.** Method blanks were used to ensure that the extraction and analysis procedures did not contribute contamination to the analysis. Method blanks were prepared and analyzed in the laboratory to document the response of the measurement system to a sample containing effectively none of the analyte of interest. A positive blank response can be due to a variety of factors related to the procedure, equipment, or reagents. Unusually high blank responses indicate laboratory contamination. The method blank response becomes very important when the analyte concentration is near the detection limit.

- **Spike Blanks.** A spike blank is a laboratory QC sample prepared by adding a known amount of the target analyte(s) to a laboratory blank sample. This is a measure of the accuracy of the test procedure. If an analyte for any spike blank was outside of quality control criteria, then that particular analyte was evaluated and actions were taken to bring the analysis into control.
- **Duplicate Samples.** Duplicate samples were used to ensure that sample results could be reproduced in a precise manner.
- **Surrogates.** Surrogate compounds are compounds similar to the analytes of interest that were added to the sample at a known concentration in order to track the accuracy of the sample extraction and analysis. Some methods for organics analyses specify that all samples, including QC samples, be spiked with surrogate compounds at the start of the procedure. Because surrogate compounds are not expected to be present in the samples, they give analytical responses that can be distinguished from those of the analytes of interest. Surrogate percent recoveries (defined below) provided an estimate of accuracy for the entire analytical procedure. The standard deviations of surrogate results provided an estimate of analytical precision, while the mean percent recoveries indicated whether or not the sample results were biased.
- **Spiked Blank Duplicates.** These were a second laboratory spiked blank laboratory QC sample. The difference in the laboratory's recovery of the spiked blank and spiked blank duplicate was a measure of analytical precision, and was reported as relative percent difference (RPD) as defined below.
- **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples.** Matrix spike samples were used to ensure the analytes of interest could be accurately recovered from the sample matrix. The matrix spike duplicate was also used to ensure the analytes could be repeatedly recovered in an accurate and precise manner.

Analytical Accuracy and Precision

Routine laboratory QC analyses provided information about accuracy and precision. The types of quality control samples differed depending on the method specifications. Analytical accuracy was assessed through the surrogate, spike blank, and matrix spike analysis as specified by the analytical method. Accuracy was expressed as percent recovery:

$$\text{Percent Recovery (\%R)} = 100*(X_s/C_t)$$

Where X_s was the observed concentration of the analyte, and C_t was the true concentration of the analyte. The acceptable range for accuracy was determined by the method or by control charting of actual laboratory samples. A control chart is a graphical representation of the precision of QC results showing whether the measurement system is in statistical control. The laboratory analyst was responsible for verifying that the surrogate, spike blank and MS/MSD percent recoveries meet the quality control limits.

Analytical precision was assessed through analysis of the sample duplicates or matrix spike duplicates as specified by the analytical method. Precision was expressed as relative percent difference:

$$\text{Relative Percent Difference (RPD)} = 100*(X_1-X_2)/((X_1+X_2)/2)$$

Where: X_1 was the concentration in the first duplicate sample and X_2 was the concentration in the second duplicate sample. The acceptable range for precision was determined by the method or by control charting of actual laboratory samples. The analyst was responsible for verifying that the duplicate or MS/MSD recoveries meet the quality control limits.

Practical Quantitation Limits and Method Detection Limits

OnSite Environmental reported all analytical results for the remedial investigation as practical quantitation limits (PQLs). PQLs are the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. OnSite Environmental's routine PQLs for all independent action analyses were lower than regulatory ground water cleanup levels thus ensuring confirmation of successful cleanup. OnSite Environmental conducts studies annually for all accredited test methods to determine its PQLs.

Method detection limits (MDLs) are the lowest concentration that can be detected by an instrument with correction for the effects of sample matrix and method-specific parameters such as sample preparation. OnSite Environmental conducts studies annually for all accredited test methods to determine its method detection limits. MDLs are defined at 40 CFR Part 136 as three times the standard deviation of replicate spiked analyses. An analytical PQL is generally 5-10 times the MDL. MDLs are only a measure of the ability of the test procedure to generate a positive response and have nothing to do with the accuracy of that response (Quality Assurance Associates, 2010).

DATA VERIFICATION

The analyses performed for the remedial investigation included:

- Halogenated volatile organic compounds (HVOCs) by EPA Method 8260c.

For the remedial investigation 19 ground water analyses were analyzed. Ground water analytical data are presented in Table 3 of the main body of the RI/FS/DCAP. Verification of the data included checking holding times, checking that the laboratory performed the analyses requested on the chain of custody form, and that the laboratory's QC results were within established control limits. Holding times, surrogate percent recoveries, method blank analytical results, lab duplicate RPDs, matrix spike/matrix spike duplicate percent recoveries and RPDs, and spiked

blank/spiked blank duplicate percent recoveries and RPDs were all within control limits with no exceptions.

EVALUATION OF FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected at an approximate frequency of two duplicates per 19 ground water samples – a frequency significantly greater than the ratio of one duplicate per 20 samples specified in the *Interim Action Work Plan* (HWA, 2013). Inspection of Table 3 indicates good agreement between duplicate sample and primary sample results.

TRIP BLANK RESULTS

Trip blanks are VOA vials filled with deionized water that were transported, stored, and handled in the same manner as VOA vials for BTEX analyses. Volatile organic compounds being detected in the analysis of a trip blank indicates poor sample handling techniques in the field. Inspection of Table 3 indicates no volatile organic compounds were detected in any of the trip blank samples.

PROJECT DOCUMENTATION AND DATA MANAGEMENT

Field personnel used bound waterproof field notebooks to record significant events and observations during the remedial investigation. Entries were made in waterproof ink or pencil, signed, and dated. Field personnel also completed daily field reports and forwarded copies of the field report to City of Bothell representatives. All field logs, figures, and records are retained in project files at HWA's office.

Digital photographs taken of field activities and significant events are stored on HWA's computer system with the following information noted:

- Date, time, and location of photograph taken
- Description of photograph taken
- Reasons photograph was taken
- Viewing direction

Original laboratory certificates containing analytical results and laboratory QC data are documented in Appendix C of the RI/FS/DCAP. An electronic copy of each laboratory certificate is stored on HWA's computer network server as PDF files in the project folder. In addition, OnSite Environmental's Electronic Data Deliverables (EDD) packages for all analytical results are stored on HWA's computer network server as Microsoft Excel spreadsheets in the project folder. HWA routinely backs up its network servers.

SUMMARY

- Field QC procedures were followed.
- The voluminous field and laboratory data generated during the remedial investigation are technically complete, accessible, and efficiently handled.
- No quality control issues are noted above
- All reported data should be considered valid as qualified and acceptable for further use.

REFERENCES

Grant, C.G, T.F. Jenkins, and A.R. Mudambi, 1996, *Comparison Criteria for Environmental Chemical Analyses of Split Samples Sent to Different Laboratories-Corps of Engineers Archived Data*, U.S. Army Corps of Engineers Cold Regions & Environmental Research Laboratory, Hanover NH. CRREL Special Report No. 96-9, May 1996.

Flory, D., 2000, *What is "Good" Data*, Quality Assurance Associates (www.qaallc.com/gooddata.html)

OnSite Environmental, 2012, *Quality Assurance Manual, Revision No. 9.3*, August 3, 2012 (www.onsite-env.com/pdf/QA.pdf)

HWA GeoSciences, 2009, *Remedial Investigation And Feasibility Study Work Plan Riverside Property Bothell, Washington*, August 26, 2009.

HWA GeoSciences, 2011, *Documentation of Interim Action At Bothell Riverside Site Bothell, Washington*, February 2, 2011.

HWA GeoSciences, 2013, *Interim Action Work Plan Bothell Riverside Site Bothell, Washington*, January 7, 2013.

PMI, 2008, *A Guide to the Project Management Body of Knowledge – Fourth Edition* (ANSI/PMI 99-001-2008), Project Management Institute (www.pmi.org).

Quality Assurance Associates, 2010, *Understanding Laboratory Reporting Limits*. (www.qaallc.com/replimit.html)

Washington Department of Ecology, 2004, *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, Publication No. 04-03-030.