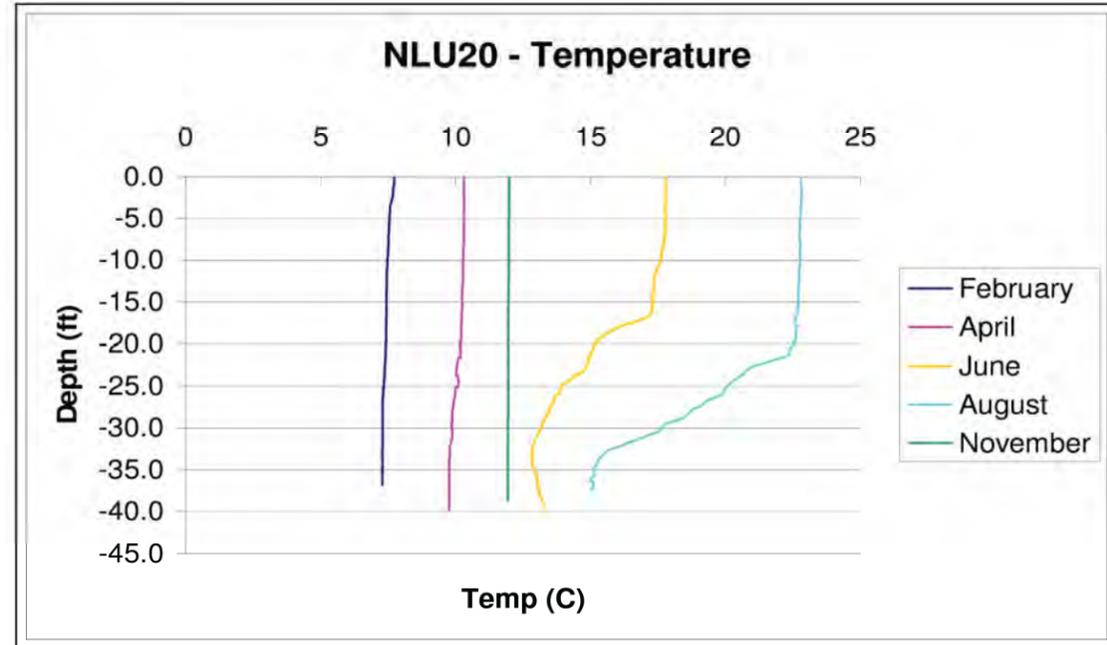
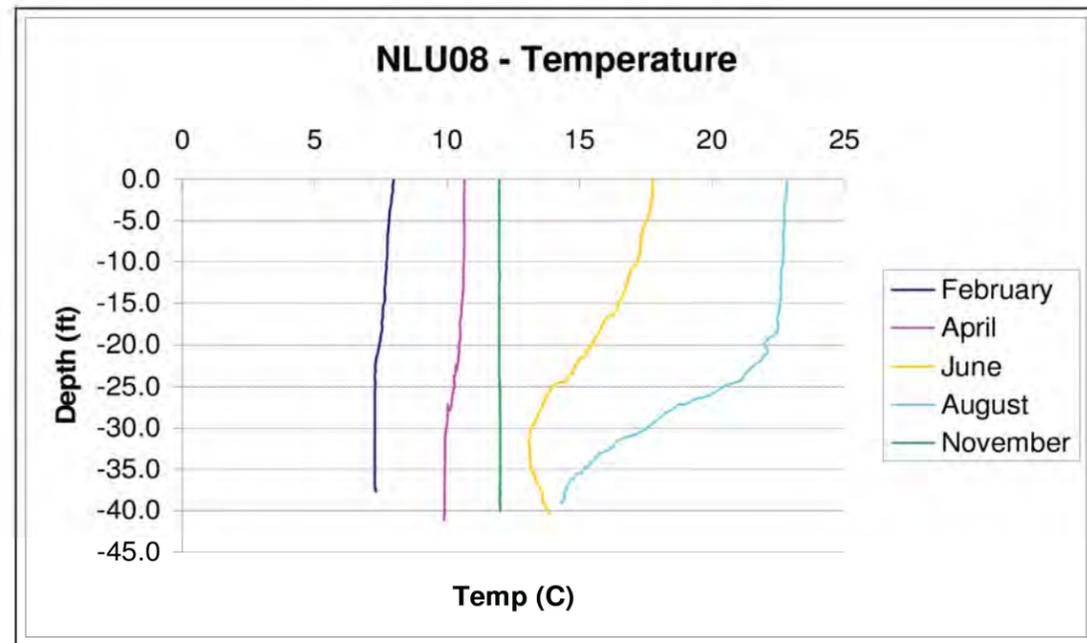
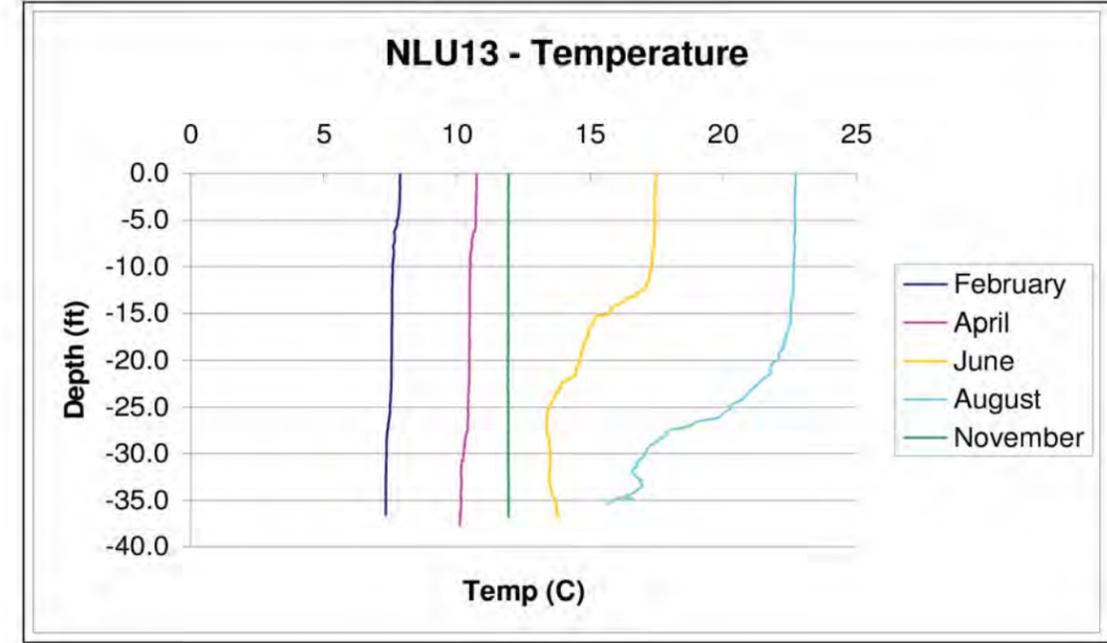
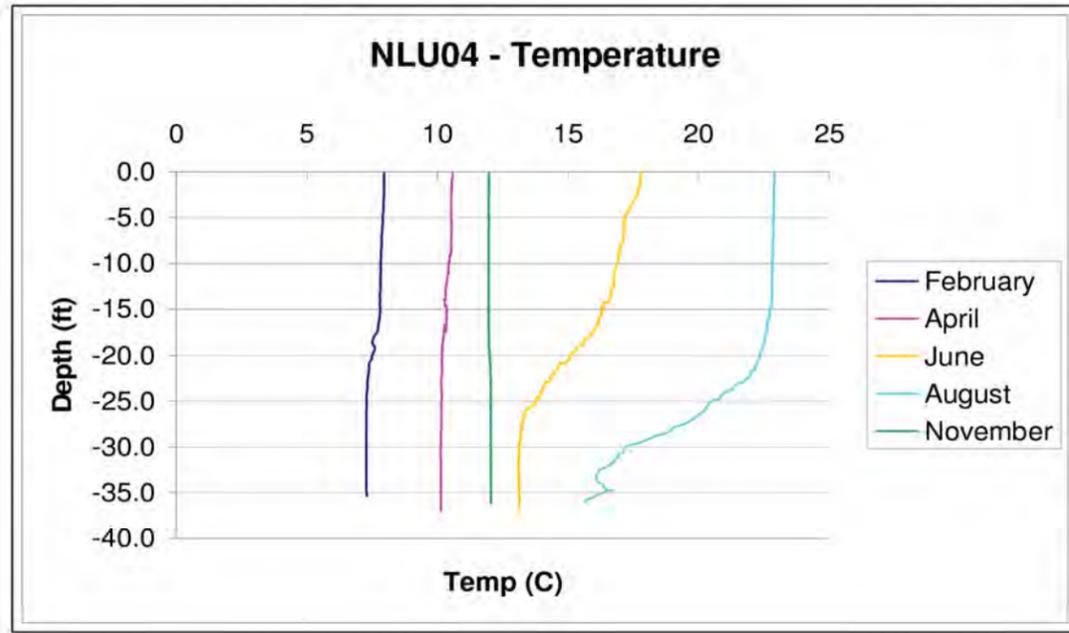


**APPENDIX 3A**  
**Water Column Profile Figures**



**Notes:**

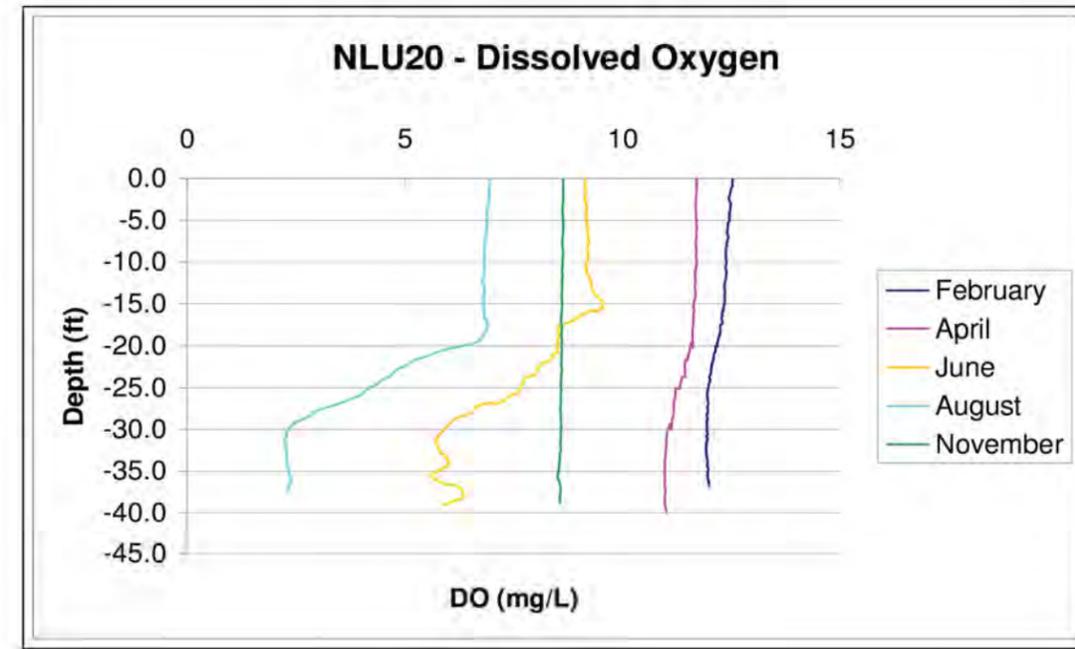
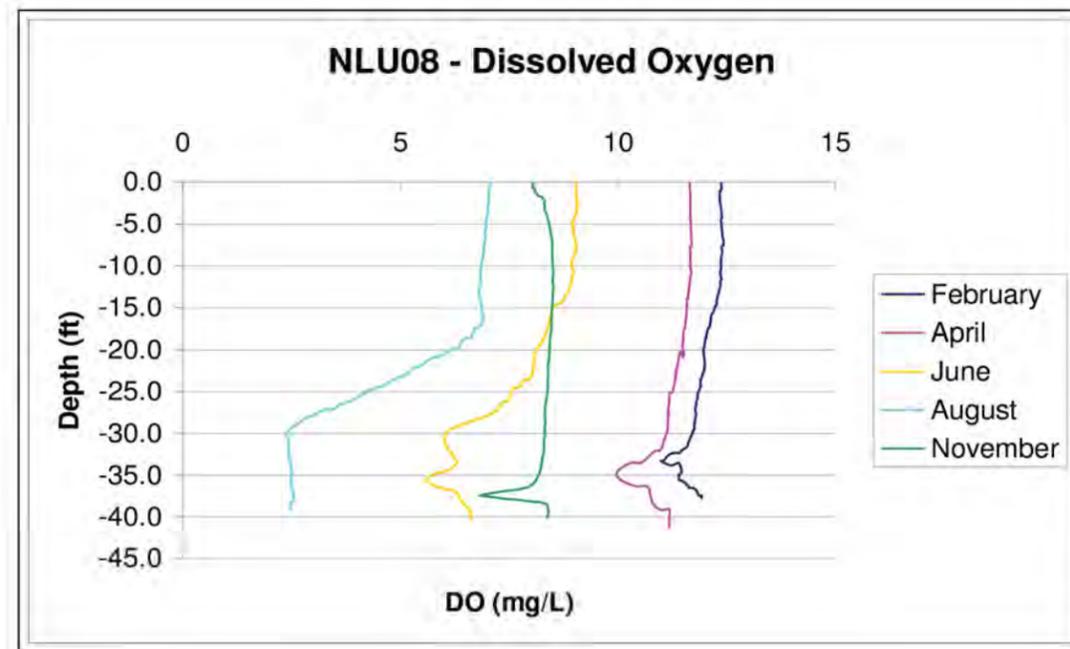
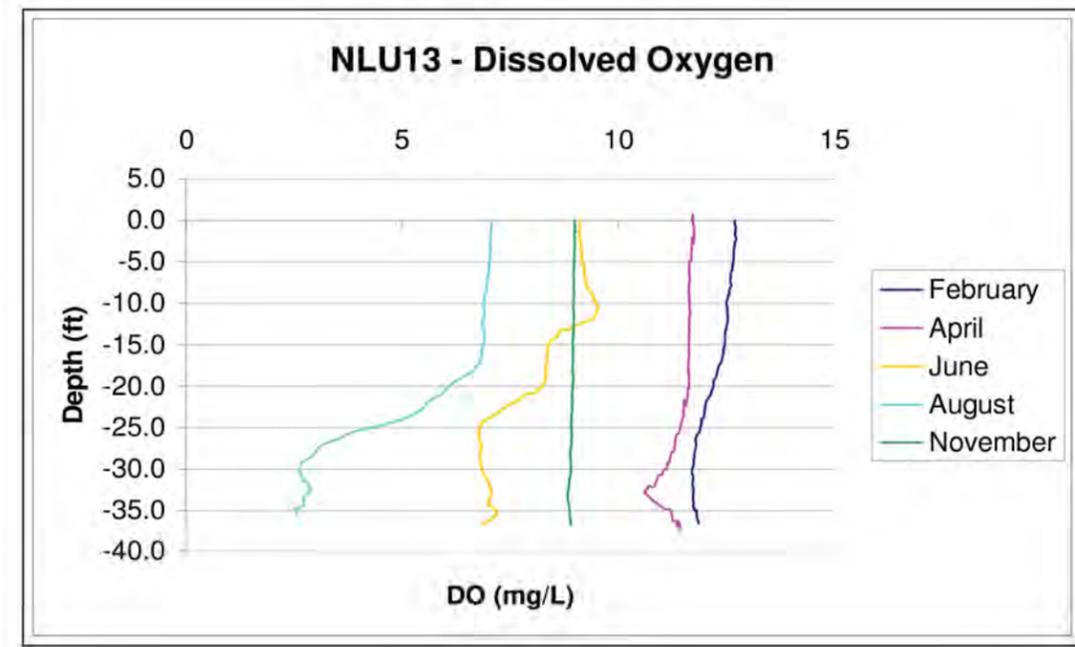
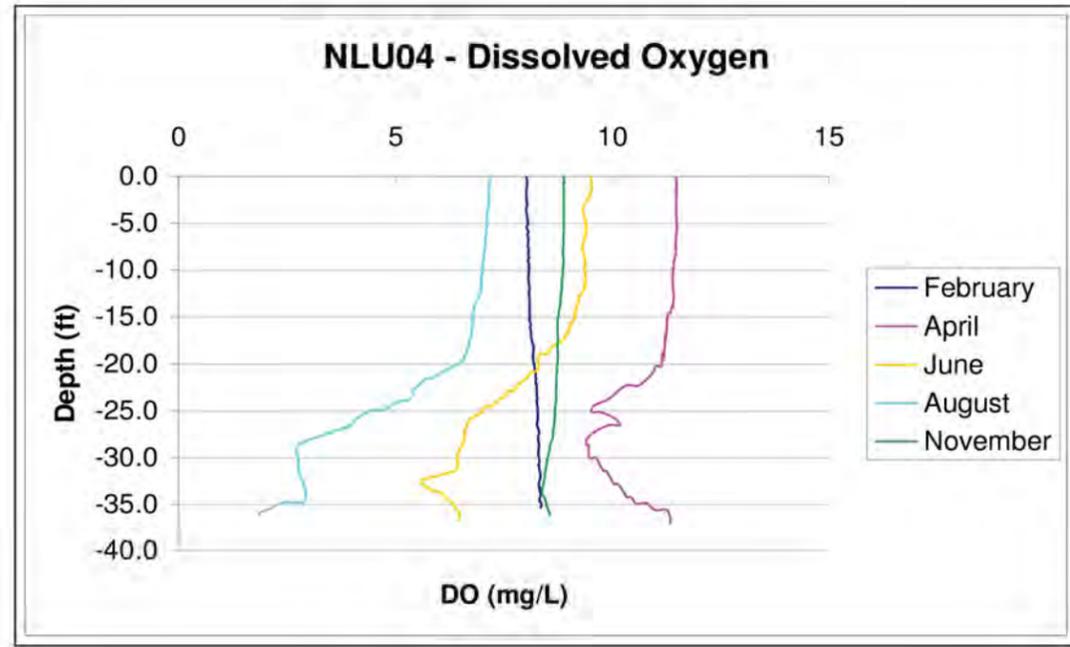
1. Temperature in degrees Celsius (C).
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

**Water Column Profiles: Temperature**

Gas Works Park Site  
Seattle, Washington



**Figure 3A-1**



**Notes:**

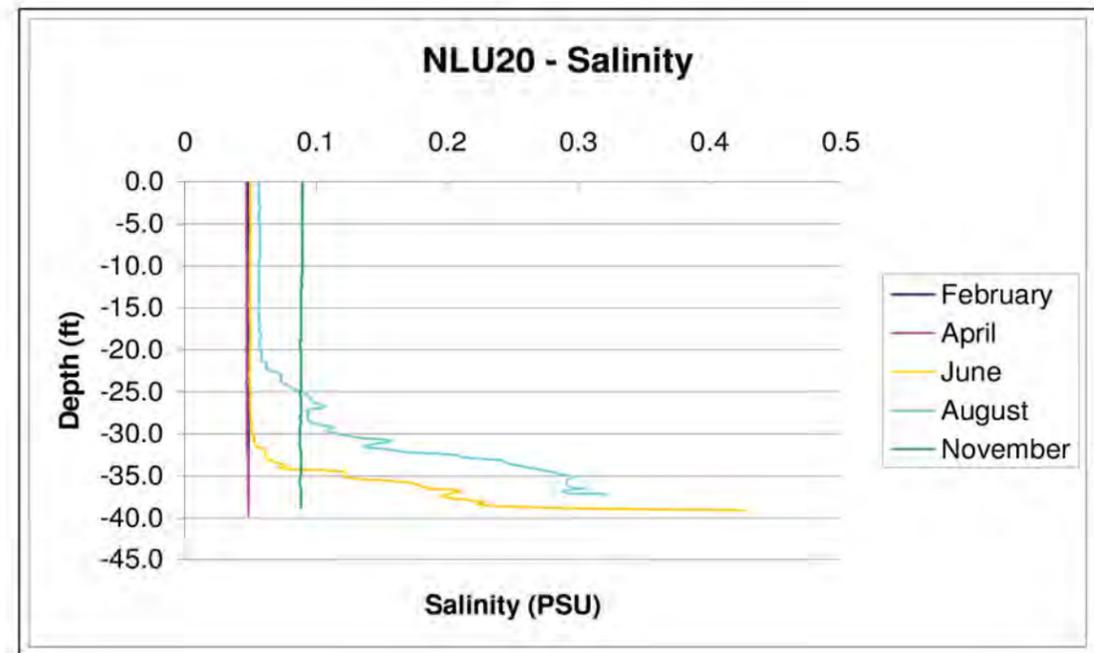
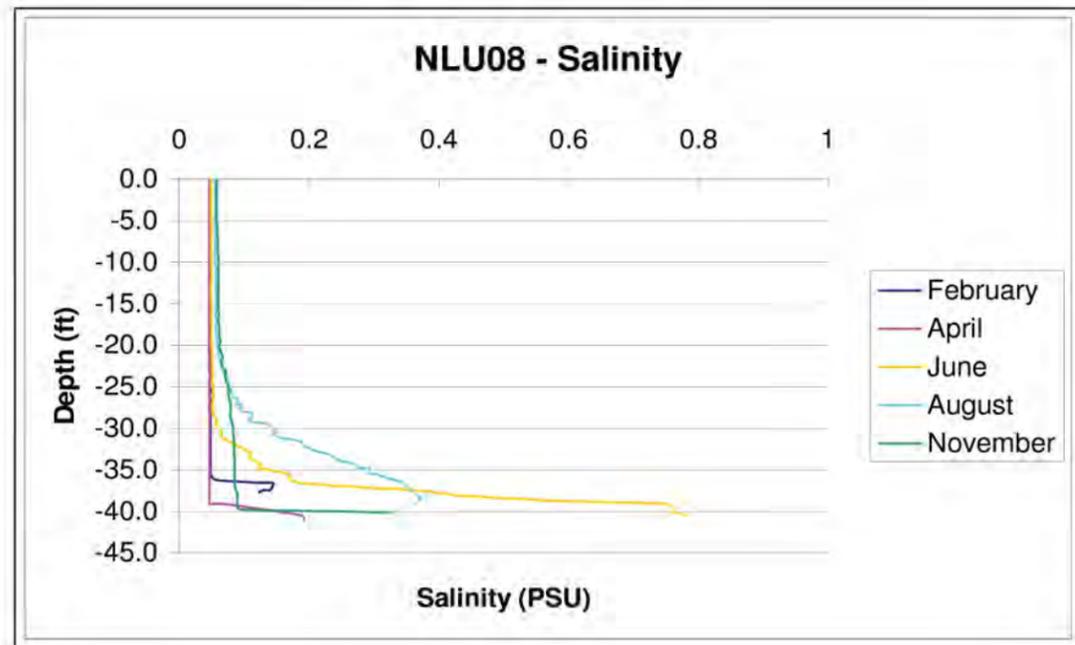
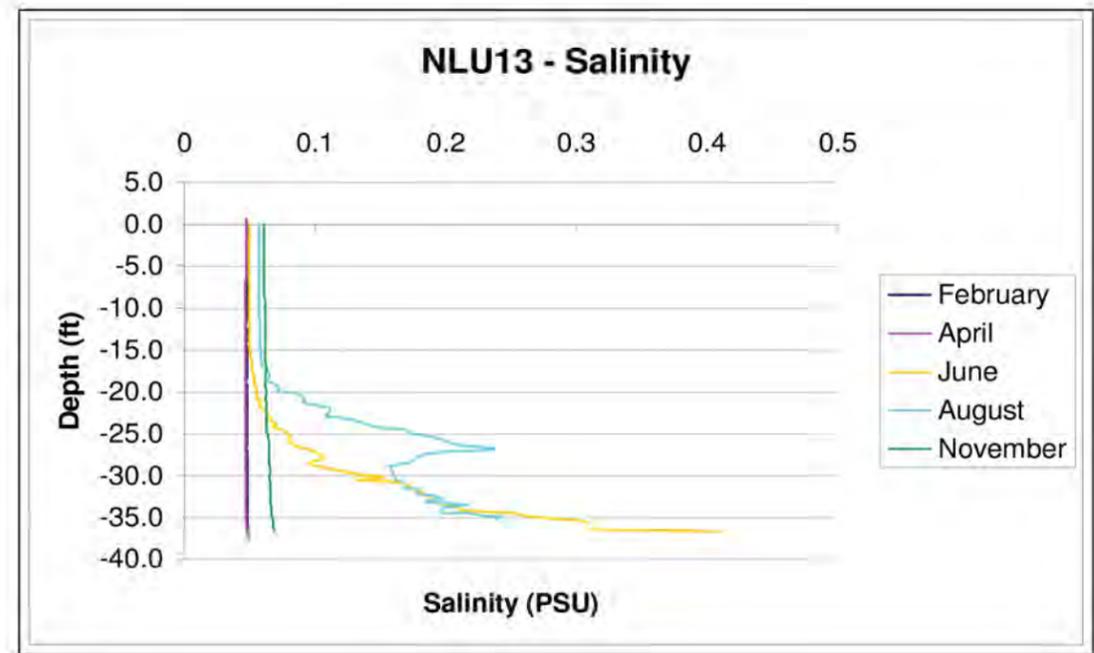
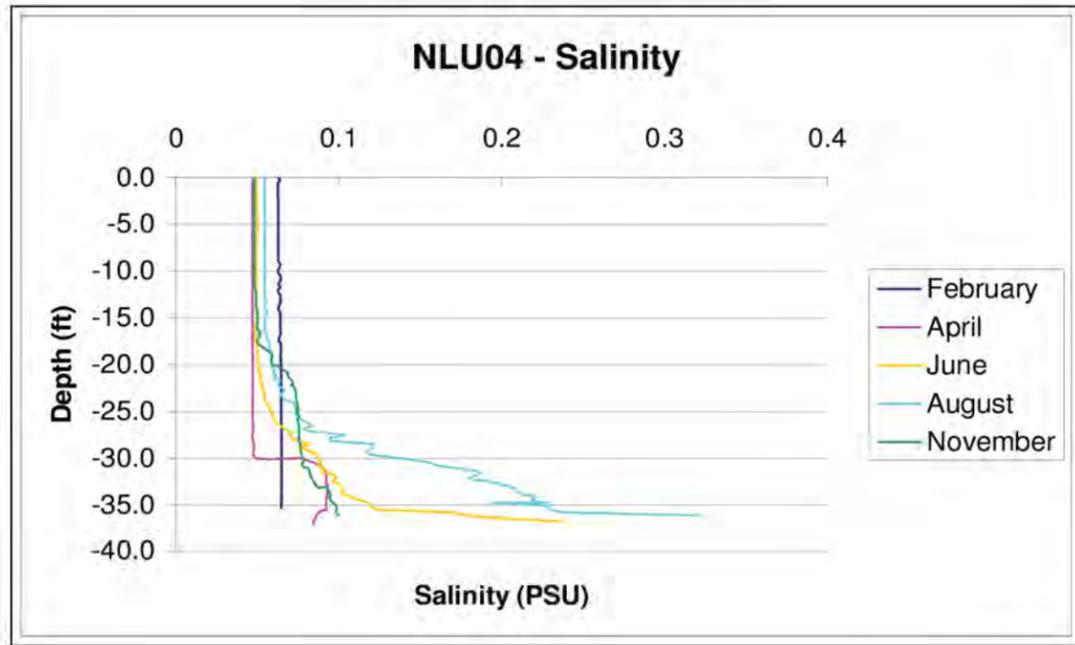
1. Dissolved oxygen (DO) in milligrams per liter (mg/L).
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

**Water Column Profiles: Dissolved Oxygen**

Gas Works Park Site  
Seattle, Washington



**Figure 3A-2**



**Notes:**

1. Salinity in practical salinity units (PSU).
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

**Water Column Profiles: Salinity**

Gas Works Park Site  
Seattle, Washington



**Figure 3A-3**

**APPENDIX 3B**  
**Geology Interpretation**

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Attachment 3B-1. Regional Geologic Setting Memorandum June 2, 2011

## **APPENDIX 3B GEOLOGY INTERPRETATION**

The purpose of this appendix is to provide supplemental information on and interpretation of Area of Investigation (AOI) geology. This appendix is intended to complement Section 3.2.4 (Geology) of the remedial investigation (RI), focusing on geologic conditions that may influence the distribution, fate, and transport of contaminants. Section 1.0 of this appendix presents additional site-specific geology information and interpretation, including isopach and structure contour maps of geologic units, and a detailed description of geologic unit characteristics, as well as an expanded discussion of regional geologic setting. Section 2.0 provides detail on fill history and shoreline changes. Section 3.0 describes geologic controls on fate and transport, and Section 4.0 expands on key geologic characteristics of the sediment area. It should be noted that this appendix is not a comprehensive presentation of all AOI geologic information—much of the AOI geologic information is provided in Section 3.2.4 of the RI. But rather, this appendix is intended to provide complementary information and detailed interpretation not presented in the main body of the RI report.

### **1.0 SUPPLEMENTAL GEOLOGIC INTERPRETATION**

#### **1.1. Site Specific Geology**

Geologic data for the AOI are summarized in Section 3.2.4.

Isopach thickness and/or structure contour maps for five of the six geologic units in the AOI are presented on Figures 3B-1 through 3B-5 (the remaining Qvr<sup>1</sup> unit is sparsely distributed and was not mapped). These figures integrate surface and subsurface investigation data for locations within the AOI and surrounding area. Because of additional data collection and refinement of the conceptual site model (CSM), there are significant differences between the initial United States Geological Survey (USGS) interpretation of the geology at Gas Works Park (i.e., pre-2010 drilling effort) and the current interpretation (Attachment 3B-1).

An overview of geologic units is given in Section 3.2.4.1. Details of each geologic unit, including defining characteristics, soil type, color, content, and vertical and lateral extent, are described in Table 3B-1.

As mentioned in Section 3.2.4, Figure 3-7 shows the alignment of four generalized cross-sections A-A' through D-D' (Figures 3B-9 through 3B-12; the same as Figures 3-8 to 3-11) that depict the vertical and lateral extent of the geologic units in cross sectional view. These cross sections are discussed below.

#### **1.2. Regional Geologic Setting**

As described in Section 3.1.3 (Regional Geologic Setting), the Wallingford Hill drumlin is a dominant geological feature in the AOI and bisects Gas Works Park along a northwest-southeast axis. The approximate shape of the drumlin apparently predated the Vashon glaciation as the eastern and western flanks of the pre-Fraser drumlin ridge are locally overlain with a thin and discontinuous veneer of very dense glacial outwash, interpreted to be Vashon advance outwash. Much of this advance outwash may have been deposited when the low areas of Lake Union were part of a subglacial meltwater channel.

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<sup>1</sup> Qvr<sup>1</sup> = Vashon recessional glaciolacustrine unit

Advance outwash deposits and the till units are both locally overlain by a discontinuous veneer of recessional glacial outwash and other younger soil units. Where recessional outwash lies above advance outwash, the contact between them is indicated by a significant and abrupt contrast in soil density. Recessional outwash deposits appear to extend from the lake into the upland. They thin and terminate on the upland, generally within several feet of lake level elevations where they were presumably removed by erosion at the predevelopment lake shoreline or were removed from the upland by excavation or grading.

Recent lacustrine deposits (QI) locally occur both above and below some fill deposits that were placed in the lake. This deposit has accumulated since the retreat of the last glacier, and deeper offshore borings suggest that recent lacustrine deposits are at least tens of feet thick in the center of the lake.

## 2.0 FILL HISTORY AND SHORELINE CHANGES

Fill history and shoreline changes are summarized in Section 3.2.4.2 (Key Upland Geologic Characteristics). This section provides more detailed discussion of fill history and shoreline changes. The fill history in the upland portion of the AOI (upland) and adjacent lake shore zone is complex but can be understood by reviewing historical documentation, historical aerial photographs, and topographic maps. The three general “eras” of fill from oldest (bottom) to most recent (top) are as follows (see Table 3B-1 for more detail):

- Fill placed during the industrial use of the upland (1900s to 1960s) (aka, the “Gas Works Deposit”) is thicker, deeper, and more widespread than that placed during other “eras.” This deposit includes cinders, brick, wood, concrete, raw materials such as coal, and products and byproducts from the manufactured gas plant (MGP), tar refinery and other historical sources. In general, this early industrial fill is present throughout the former MGP footprint and western area of the upland, and because it is the oldest fill, the elevation contours of the bottom of the fill unit on Figure 3B-1 generally represent the contact between this era of fill and underlying native soil in the eastern part of the upland.
- Fill placed during park development (1970s) is of variable thickness. This era of fill includes a substantial amount of imported material, such as soil stockpiled in the Kite Hill area (at the time, referred to as the Great Mound), locally mixed with fill from the industrial era (Gas Works Deposit). This fill deposit was the result of extensive regrading during MGP demolition and park development, as illustrated in the cut-and-fill figure (Figure 3B-6). Besides forming the thickest accumulation of fill at Kite Hill, this fill is present in substantial thicknesses along the berms south of the trail and south of the Cracking Towers (Figure 3B-6).
- Fill placed as soil caps (in 2001, 2005, 2012, and 2014) is generally less than 24 inches thick<sup>2</sup>. This fill was placed in the well-delineated areas depicted on Figure 3B-7 and is separated from underlying soil by a geotextile marker layer. This fill layer functions as a vegetated soil cover and is considered clean and generally free of debris.

The earliest era of filling was related to expanding the upland to support industrial development of North Lake Union and resulted in substantial shoreline changes. The original property and shoreline of 1899 were known as Brown’s Point. Since that time, the shoreline has been extended into the lake by filling the lake 100 to 250 feet waterward in most areas. The present shoreline is the result of fill placed primarily

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<sup>2</sup> Imported fill was placed in the northwest corner for potential use as cap material. This area was later recontoured and capped in 2005 with clean soil. Total thickness of post park development fill ranges up to 9 feet thick in the northwest corner.

between 1907 and 1929 (Washington State Board 1907; Sanborn Fire Insurance 1919; USACE 1927). Shoreline changes over time within the AOI are shown in Figure 3B-8. A summary of shoreline fluctuations as observed on historical aerial photographs<sup>3</sup>, follows:

- The bulk of shoreline alteration in what is now the park took place between 1907 and 1919 (with the exception of the Harbor Patrol/Waterway 20 and Waterway 19/Gas Works Park Marina areas, which were filled more recently). The bulkhead (Prow) along the southern shoreline has been in place since 1919.
- The bulk of shoreline alteration in what is the southwest area of the park (south and southwest of Kite Hill) took place between 1910 and 1919 during the period when this area was operated as a municipal landfill (Phelps 1975).
- From 1919 to 1929, the shoreline filling on the Harbor Patrol property occurred while Paramount Briquetting operated and owned the parcel (USACE 1929).
- The southeastern and eastern shorelines changed considerably from 1946 to 1977 during MGP operation and park redevelopment. The farthest offshore extent of filling appears to have occurred around 1969, before park development.
- The eastern shoreline, and the southeastern shoreline in particular, have fluctuated the most in the last 40 years. The shoreline appears to have reached its farthest east/southeastward extent circa 1973 (Figure 3B-8). By 1977, the shoreline appeared to have receded although there is some uncertainty due to the reliance on aerial photography<sup>4</sup>. Aerial photographs suggest additional recession of the southeastern shoreline between 1990 and present.

The following key shoreline development occurred at sites adjacent to the AOI:

- In 1924, the shoreline west of the AOI upland along the Standard Oil/Chevron (now Metro) South Yard was extended into Lake Union with placement of fill during construction of a bulkhead along part of Waterway 20 (USACE 1924).
- Based on analysis of aerial photography (Walker and Associates 1946, 1956), the head of Waterway 19 bordering the park to the northeast was filled sometime after 1946.

### **3.0 GEOLOGIC CONTROLS ON FATE AND TRANSPORT**

Key upland geologic characteristics are summarized in Section 3.2.4.2. Geology characteristics with significant influence on contaminant fate and transport are described in more detail below and depicted in Figures 3B-1 through 3B-5.

#### **3.1. Glacial Till Ridge and Trough Feature**

As shown in Figure 3B-5, the till is laterally continuous. Highest in elevation and closest to the ground surface at the north end of the AOI, the till forms a southeast trending “till ridge” (glacially-formed drumlin), the axis of which generally slopes down toward to the southeast. Cross section A-A’ (Figure 3B-9) provides a sectional view of the till ridge. The western and eastern flanks of the till ridge slope down to the southwest

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<sup>3</sup> Historical aerial photograph shoreline evaluation is approximate and does not take into account seasonal fluctuations of lake level.

<sup>4</sup> The shoreline will appear to extend farther into Lake Union when the lake level is low and not as far into the lake when the lake level is high.

and east, respectively. The till ridge is crossed by an east-trending “trough” or depression in the top of the till that is up to 200 feet wide and approximately 15 feet deep (Figure 3B-5). This depression is most noticeable in the east-central area of the upland, east and west of the Play Barn (see cross section D-D’, Figure 3B-12). The depression is a natural feature, as evidenced by the fact that the deposits overlying the till in this area are native (the trough feature is filled with outwash deposits).

### 3.2. Orientation of Till and Overlying Outwash Deposits

The till is the primary unit controlling the transport and distribution of contaminants in the AOI. The location and orientation of recessional and advance outwash or fill deposits influence groundwater flow and potential contaminant migration:

- Recessional outwash deposits and advance outwash deposits are “draped” on the flanks of the glacial till ridge, and dip downward to the southwest and east offshore, beneath the mudline. The orientation of outwash deposits and the underlying till have controlled the migration of dense nonaqueous phase liquid (DNAPL) at the Gas Works Park Site (GWPS). In general, DNAPL has migrated vertically downward through more permeable units (e.g., gravel layers) and laterally above less permeable layers (e.g., silt layers). The result is a “stair stepping” pattern of migration that has been observed in some areas of the AOI. In areas where DNAPL has penetrated down to the till, DNAPL follows the till surface downslope or into depressions in the till surface. The overlying outwash deposits may “confine” downslope DNAPL migration (i.e., prevent offshore seeps) in some areas. There is also evidence of preferential migration of DNAPL near the top of outwash deposits in sediment offshore. DNAPL migration is discussed further in Section 6 and Appendix 5F.
- The general distribution of outwash is discontinuous such that this unit does not transmit groundwater from farther upslope.

### 3.3. Weathering of Glacial Till

At the GWPS, the composition of the pre-Fraser glacial till group is vertically and laterally variable and it includes strata that vary in apparent density, degree of weathering and other properties. In the upland, the pre-Fraser glacial till is characterized by variable density. Groundwater is more easily transmitted in weathered, less dense till. In the vicinity of the Play Area, up to several feet of weathered till is present at some locations, influencing the fate and transport of dense solutions (i.e., dissolved arsenic associated with Thylox solution) and DNAPL. The weathered till in this area typically consists of silty sand with gravel and has a slightly lower density than underlying unweathered till. This concept is presented in more detail in Figure 7-3A and Appendix 6A.

## 4.0 KEY GEOLOGIC CHARACTERISTICS OF THE SEDIMENT AREA

Key geologic characteristics of the sediment area are summarized in Section 3.2.4.3. This section expands on that discussion.

The geologic sequence varies by location and geomorphic position as shown on cross sections A-A’ through D-D’ (Figures 3B-9 through 3B-12). In lakeshore and upper lake slope zones (Figure 3-2), the fill is typically the uppermost geologic unit. Farther from shore in the lower lake slope and lake bottom zones, the uppermost geologic unit is a recent lacustrine deposit—a soft sediment unit with debris (lake-deposited). Figure 3B-2 shows the extent of the recent lacustrine deposit; where present, it is typically the uppermost

geologic unit. Beneath the fill and/or the recent lacustrine deposit in most areas is the Vashon recessional outwash (where present) and the Vashon advance outwash (where present). These outwash deposits are present in most offshore areas except along the majority of the till ridge southeast of the park (see Figures 3B-3 and 3B-4). The uppermost geologic unit on the nearshore portion of the till ridge is either the advance outwash or the pre-Fraser till (see cross section C-C'; Figure 3B-11). The till is present at depth beneath the entire AOI. Geologic unit characteristics are described in Table 3B-1. Geological characteristics of the sediment area with significant influence on the CSM are described below:

#### **4.1. Extent of Offshore Fill**

Fill extends offshore from the upland an average of approximately 80 feet (Figure 3B-1). Farther offshore there are pockets of fill at the mudline surface or just below the mudline, presumably from vessels. The fill has a relatively high black carbon content east and south of the park as described below.

#### **4.2. Glacial Till Ridge**

The glacial till ridge described above extends offshore to the southeast of the park. The till is highest and closest to the mudline just east of the Prow. The till ridge separates thicker outwash (Figures 3B-3 and 3B-4) and recent lacustrine deposits (Figure 3B-11) to the southwest and northeast. The till ridge also appears to be subject to greater hydrodynamic forces (i.e., nearshore areas are non-depositional and possibly erosive) as its substrate is much different from that of areas to the west and north, where organic silt deposits are present closer to shore.

#### **4.3. Sedimentation Rates and Deposition**

Much of Lake Union acts as a depositional basin for the Ship Canal system, in part due to the sill created by the shallowing of the Fremont Cut (relative to lake depths). Suspended sediment from the Lake Washington watershed enters Lake Union. Bedload transport of deposited silts and fine sands may also occur in areas with, or during periods of, faster currents (e.g., exposed shoreline and nearshore areas in the northern part of the lake). North-south circulation patterns and control of lake levels (lake level is allowed to rise during periods of higher runoff during the late winter and spring) slow currents and support settling of suspended solids.

This deposition contributes to the soft sediment that dominates the bottom substrates in much of the lake; however, deposition rates are not uniform over the lake bottom. Nearshore areas are strongly influenced by wind- and vessel-induced waves that tend to create erosional conditions along the shorelines and nearshore slopes, with some exceptions (e.g., protected coves or waterways). The lakeshore (22 feet to about 15 feet United States Army Corps of Engineers [USACE]) and upper lake slope are mostly non-depositional and locally erosional (Figures 3-2 and 3-3). Little, if any, recent lake deposits are found in these nearshore, commonly steeply sloped areas, indicating no net deposition over time (the northeast cove west of the Gas Works Park Marina is an exception). These nearshore areas may contribute sediment to downslope regions through sediment resuspension and downslope transport. Erosion and sediment transport decrease with increasing water depth and flattening of slopes. The lower lake slope is a transitional area covered with 1 to 5 feet of recent lake deposits, indicating slow, transient, or perhaps post-Ship Canal deposition. The thickness of recent lake deposits increases on the lake bottom farther offshore (below about -15 or -20 feet USACE), indicating higher deposition rates or a longer period of deposition.

Sedimentation rates estimated as part of several studies range from about 0.1 to 1.7 centimeters per year (cm/year), depending on location, as described in Section 6.6.2 (Physical Characteristics Supporting Natural Recovery Processes). Also, as noted in Section 6.6.2, within the AOI, sedimentation varies both geographically (e.g., center of the lake versus nearer to shore, exposed nearshore slopes versus the waterway) and with depth. A gray clay “marker bed” observed in many AOI sediment cores likely dates from the construction of the Ship Canal system (1916)<sup>5</sup>. Sediment below this marker bed was mostly deposited prior to industrialization and has less material from human activity<sup>6</sup>. Sediment above this marker bed contains material from human activity and is generally darker in color. The average deposition rate for sediment above the marker bed was derived using the depth of the marker bed. Dividing the depth below the mudline by the number of years of accumulation since 1916, on average, 0.8 cm/year have been deposited in the AOI.

#### 4.4. Character of Sediment Carbon

Total organic carbon (TOC) in sediment ranges from <0.1 to 58 percent (mean of 13.1 percent) within the AOI; in the remainder of Lake Union, TOC has a smaller range (<0.01 to 30 percent) and an average (7.5 percent). Percent TOC in surface sediment within the AOI and vicinity is depicted on Figure 3B-13; however, the figure does not provide a clear picture of the distribution of TOC because different laboratories made different decisions about inclusion versus exclusion of larger plant material and debris in the samples analyzed resulting in a high bias in samples where this non-sediment material was included. In general, lake bottom areas representing lacustrine organic silt have more uniform TOC content whereas nearshore areas are less uniform because of variations in substrate (e.g., gravels versus silts and sands) and input from nearshore over-water and upland carbon sources.

In 2005, sediment samples from the eastern and southern sediment areas within the AOI were analyzed by researchers from Stanford University (Hong and Luthy 2005) to evaluate the types of carbon present (both natural and anthropogenic). Stanford separated the low-density particulate fraction (containing the majority of the TOC) from the mineral fraction and then analyzed the low-density fraction and used light microscopy and scanning electron microscope (SEM) imaging techniques to study the nature of organic carbon. The low-density fraction of sediment was categorized as material related to coal or its combustion products, plant matter, diatoms, or mineral matter. Results are contained in Appendix 2D-8. Significant findings include the following:

- Although the sediment samples were primarily mineral in nature, there was a significant organic carbon fraction component from both anthropogenic and natural sources. Almost all of this carbon was present in the low-density fraction of the sediment.
- Black carbon ranged from 1.4 to 94.3 percent by volume of the low-density carbon fraction of sediment. Samples with the highest percent black carbon included those collected from the fill unit closest to the shoreline (NLU65, NLU56, NLU51, NLU68-SS, NLU55, and NLU73-Stanford) (Figure 3B-14).

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<sup>5</sup> There may have been other inputs to the marker bed. In the late 1920s, Denny Hill was leveled by sluicing the hillside into the wetlands along the southern shore of Lake Union (Cheshiahud Lake Union Loop Master Plan 2009).

<sup>6</sup> In some areas, the gray clay appears to demarcate pre- and post-industrial lake deposits. In other areas, post-industrial deposits underlie the gray clay (diver cores collected south of the Prow show a thin layer of sediment with anthropogenic impacts beneath the clay layer).

- Samples where the majority of the black carbon was identified as carbon black<sup>7</sup> (e.g., lampblack), were located south and southwest of the Prow, with one sample off the southeastern shoreline and another off the northeast shoreline. These samples included NLU64, NLU65, NLU56, NLU51, NLU68-SS, and NLU73-Stanford.
- Sediment sample NLU65-SS-0010 (just west of the Prow) contained very prevalent carbon black aggregates, accounting for as high as 88 percent by volume of the entire low-density fraction of this sample.
- In general, carbon black percentages were highest close to the shoreline and lowest on the lake bottom far from the toe of the slope. Figure 3B-14 depicts the approximate distribution of black carbon in sediment.
- Plants and diatoms made up a significant portion of the light fraction of most of the sediment samples. The low-density fraction in some nearshore samples included up to 41 percent plant material and 66 percent diatomaceous matter, with higher percentages in offshore recent lake deposits (plant material and diatoms collectively accounted for almost all of the light fraction carbon in offshore lake bottom samples). This provides insight into the nature of sediment actively depositing and contributing to natural recovery of lake bottom sediment.

## 5.0 REFERENCES

- Cheshiahud Lake Union Loop Master Plan. 2009. Prepared by MacLeod Reckord Landscape Architects. Prepared for Seattle Parks and Recreation, Seattle Department of Transportations and Seattle Parks Foundation. May 2009.
- Hong, Lei and Richard G Luthy. 2005. Draft Final Report II - Identification of Black Carbon Material in Sediments from Lake Union. Stanford, California: Stanford Univerisity, Department of Civil and Environmental Engineering.
- Phelps, Myra. 1975. Public Works in Seattle: A Narrative History of the Engineering Department; Includes Summary of Ship Canal Construction, Sewer Construction and Landfill Activity.
- Sanborn Fire Insurance. 1919. Sanborn Fire Insurance Map 1905-1950.
- U.S. Army Corps of Engineers (USACE). 1924. Standard Oil: 1919 and 1924 Permits for Bulkhead.
- U.S. Army Corps of Engineers (USACE). 1927. Lake Conditions Map. Lake Union, Washington. Sheet 1 of 3. June 1, 1927. Topography Revised May 1932. Soundings by F.S.G. Added November 1932.
- U.S. Army Corps of Engineers (USACE). 1929. 1929 Bulkhead and Fill Permit: Paramount Briquetting.
- Walker and Associates. 1946. Aerial Photography Survey.

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<sup>7</sup> Carbon black is a colloidal carbon material consisting of nanometer- (nm-) sized spheres and their fused aggregates. It is a solid product of thermal decomposition or incomplete combustion of hydrocarbon materials. This category includes quinoline insolubles that are solids in coal tar and pitch. Lampblack is a type of carbon black generally implying an MGP origin. Soot carbon (or simply "soot") is another type of carbon black.

Walker and Associates. 1956. Aerial Photography Survey.

Washington State Board of Appraisers of Tide and Shore Lands and Commissioner of Public Lands. 1907.  
Lake Union & Lake Washington Shore Lands.

**Table 3B-1**  
**Geologic Unit Characteristics**  
**Gas Works Park Site**  
**Seattle, Washington**

Name <sup>a</sup>	Description	Vertical Thickness <sup>b</sup>	Lateral Extent <sup>b</sup>
<b>Upland Fill</b>	Fill (Af) generally consists of a combination of soil and industrial fill material, or reworked natural deposits. Typically loose to medium dense, brown to black, poorly graded sand with silt, clay, gravel and debris (ash, cinders, wood, brick fragments, agglomerate and other anthropogenic debris).	Fill in the upland ranges from 0.1 to 60 feet thick, see Figure 3B-1. Various caps have been installed throughout, these are described below.	The fill unit is widespread throughout the upland, the lateral extent is also presented in Figure 3B-1.
Fill (Af) (upland) - soil capping (2000-2001, 2005, 2012, 2014-2015)	In 2000-2001 a vegetative soil cap consisting of a geogrid identifier, up to 18 inches of sandy loam topsoil and grass turf layer was placed in the north-central and southeastern portions of the park. In 2005, the northwestern corner of the upland portion of the GWPS was recontoured followed by placement of geotextile fabric and 1 foot of topsoil. In 2012, the northeast corner was capped with a geotextile fabric marker and clean topsoil. In 2014-2015, as part of the Kite Hill soil cover maintenance, a geogrid, gravel drainage layer and turf area soil was placed followed by hydroseeding and sod placement.	Soil caps typically 6 to 24 inches thick. Up to 9 feet of fill was added in the northwest corner.	The lateral extent of the various caps are presented in Figure 3B-7. This includes the 2000-2001 5.7 acres in the north-central and southeastern portions of the park, 2005 NW corner, 2012 NE corner and 2014-2015 Kite Hill.
Fill (Af) (upland) - soil cover (1970s park development)	After excavation of former MGP underground structures, the park was vastly regraded. From 1962 to 1970, the western portion of the upland was used to stockpile material generated from construction along Interstate-5, the Safeco building in the University District and other off-site areas. During the park development the stockpile was regraded to the general current topography of Kite Hill.	Approximately less than 8 feet thick through most of the park. Exceptions are the berms just south of the trail, where thickness reaches 12 feet, and Kite Hill, where 60 feet or more may be present.	Extent of this Fill is widespread across the park, as most of the land was regraded during park construction, including Kite Hill and berms just south of the trail.
Fill (Af) (upland) - "Gas Works Deposit" (pre-1970s)	A layer of soil mixed with cinders, brick, wood, concrete and historical substances; this latter content includes raw materials, products and byproducts from the MGP, refinery and other sources (USGS, 1986).	Thickest at the water's edge; approximately 10 feet in the eastern shoreline near the former light oil plant and 14 feet or more around the Kite Hill area.	Fill occurs throughout most of the upland portion of the GWPS but is not present at Harbor Patrol. Fill pinches out in the northern upland.
<b>Offshore Fill</b>	The unit is a loose, dark gray, slightly silty, sandy gravel to gravelly sand mixture. This unit is thought to be associated with the extension of the upland shoreline during the early 1900s.		
Fill (Af) (offshore - south of Prow and west of glacial ridge)	The Fill unit has no observed anthropogenic debris in a localized area starting at the western edge of the Prow extending approximately 120 feet to the east and 40 feet offshore. The Fill unit in this localized area is loose, dark gray with 10 to 15 percent silt, 30 percent medium to coarse sand, gravel up to 2 inches in diameter, and trace to moderate (<20 percent) amounts of decaying wood (bark, twigs, etc.).	Maximum thickness is 11 feet (NLU403-GE-RIFSE, eastern shoreline, 60 feet offshore).	The Fill unit is localized near the shoreline where historical filling and regrading activities occurred. It extends into the lake approximately 50 to 150 feet south of the Prow and 80 to 120 feet east of the park. Offshore borings where Fill was present but not deemed to be laterally extensive or continuous were not included in the lateral extent of Fill depicted on Figure 3B-1.
Fill (Af) (offshore - east)	Contains trace to moderate (<20 percent) amount of agglomerate and other brick-like fragments. Charred wood is present.		
<b>Recent Beach and Shallow Shelf Deposits (Qb)</b>	Generally loose to medium dense and gray to dark gray. Water reworked. Often contains scattered wood and organic fragments, thin silty lamina or beds, thin peat beds, and occasional mollusc shell fragments. This layer is distinctive from the underlying recessional outwash, till, and glacial outwash layers and most of the fill that covers it. This unit is interpreted to be the former lakeshore beach, wave-cut bench and shallow slope deposits that developed in the former shoreline zone.	Occurs at lake level and up to about 10 feet below lake level. Where present, Qb ranges from 0 to 8 feet thick and is typically in the range of 2 to 4 feet.	Very limited extent where present. Generally occurs near or below lake level close to the pre-development (i.e., 1899) shoreline. Sand and gravel deposits at former shoreline beach, on shallow wave-cut bench and on lake bottom slope below the wave-cut bench. The Qb is a localized deposit and is absent in most areas. For this reason, Qb was grouped with Qvr in the cross sections and lateral extent maps.
<b>Recent Deposits</b>	Recent deposits are present offshore consisting of fine-grained, unconsolidated, very soft, reddish brown to black organic silt and clay with fibrous organic matter and minor sand and rootlets, deposited by settling of suspended sediment onto the lake bed, with minor debris. Recent Deposits have high organic matter content (14 percent to 39.7 percent) and low shear strength, but there is downward "firming" as strength increases (undrained shear strength test results range from 68 to 230 pounds per square foot (psf)). Upper Recent Deposit and Lower Recent Deposit layers are separated in most localities by a thin gray silt layer (i.e., the marker bed from ship canal construction) approximately 0.25 feet thick.	See below.	
Recent Lacustrine Deposits (Ql) - Upper	Very soft, black organic silt with minor sand and fresh rootlets as well as various amounts of woody material and anthropogenic debris. The anthropogenic material found in the upper 3.5 feet of the Upper Recent Deposit includes garbage, wood debris, bricks and agglomerate. The agglomerate found is in general 0.5 to 3 inches in diameter, vesicular, dense and dark colored.	Thickens offshore; 2 to 5 feet in thickness. Note: thickness was interpolated from grab sample, core and boring data. These data were supplemented by soft-sediment-probing fieldwork. Probing consisted of pushing first the pointed end of the probing rod and then the 6-inch-diameter disc end of the probing rod. Probing data were used to fill in data gaps and guide the interpretation of the thickness of Recent sediments. Appendix 3H provides information on the distribution of thickness of these soft sediment deposits.	Present throughout the sediment except for in the nearshore areas (within approximately 50 feet of the eastern shoreline and 100 feet of the southern and western shoreline), see Figure 3B-2. Thins from the western portion of the AOI sediment area to the east.
Recent Lacustrine Deposits (Ql) - Lower	Soft, reddish brown organic silt with decomposing rootlets and a spongy, blocky texture. No anthropogenic material is found in this unit.	Thickens offshore; typically 5 to 15 feet thick and a maximum of up to 50 feet thick at GWS-GC05 and GWS-GC06.	
<b>Vashon Recessional Glaciolacustrine Deposits (Qvrl)</b>	Glacial lake deposits consisting of gray, firm to stiff silt and clay with thin interbeds of fine sand. May contain scattered dropstones or sandy to gravelly layers, and trace amounts of organic matter. Locally present below Recent Lacustrine Deposits and within or above recessional outwash.	Maximum of 20 feet thick offshore (GWS-GC06 500ft offshore on the western sediments) and 4 feet thick in the upland (GEI-3 in the Play Area).	Qvrl is not present across most of the upland; however it was encountered near the eastern shoreline in two borings (GEI-3 and MW-35S). It was present in four explorations in the sediment, the furthest approximately 600 feet offshore the southeast corner of the AOI (NLU49).

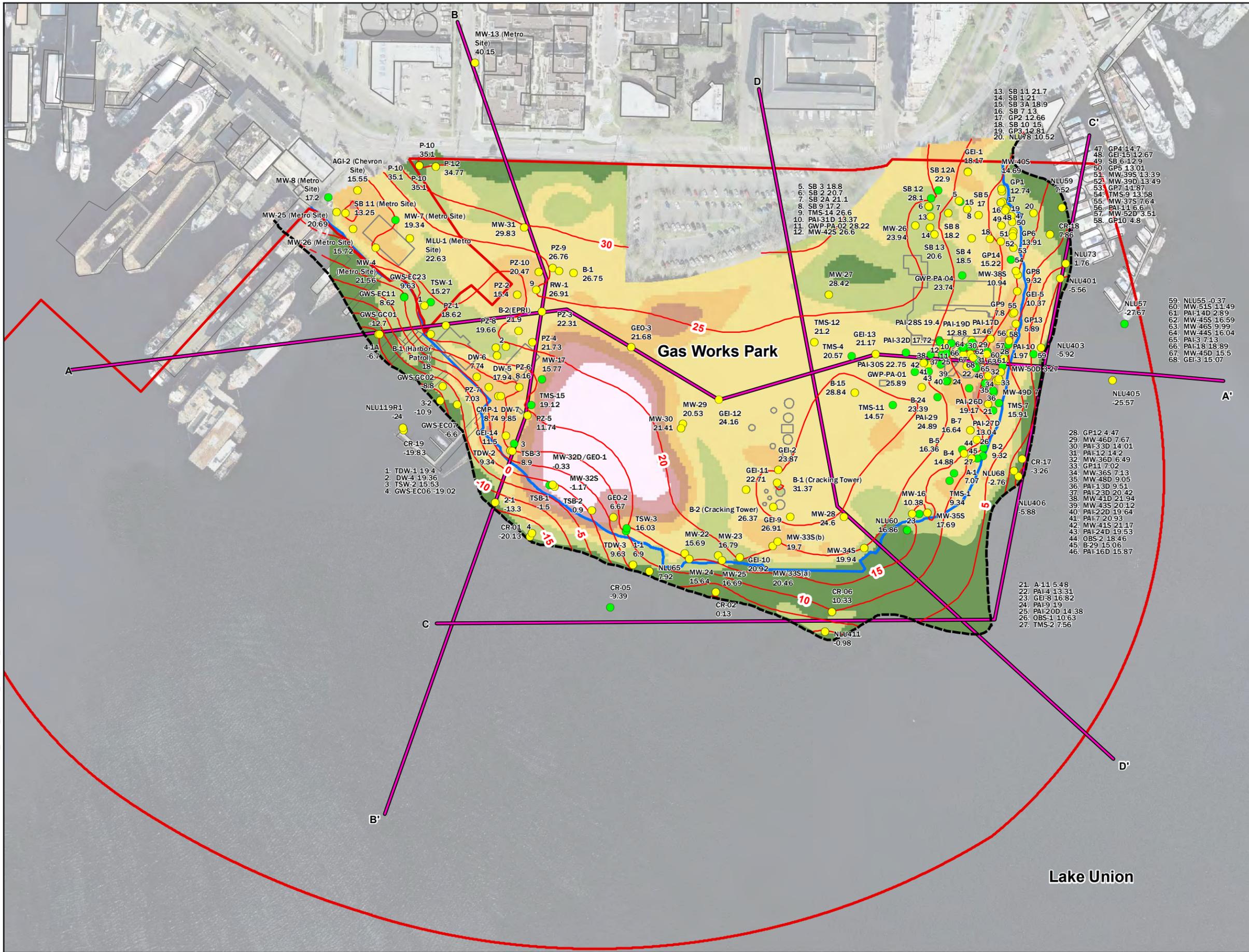
Name <sup>a</sup>	Description	Vertical Thickness <sup>b</sup>	Lateral Extent <sup>b</sup>
<b>Vashon Recessional Outwash (Qvr)</b>	Generally composed of brown to gray, loose to dense clean sand or gravel, to sand and gravel mixtures with variable minor amounts of silt. The Qvr is the upper deposit of the Vashon Drift glacial sequence. Localized zones of interbedded silts and sands are found within this unit. These zones vary in thickness from 1.5 to 2.5 feet; the individual layers of silt and medium-grained sand vary in thickness from 1 to 3 inches.	Typically 5 to 10 feet thick. Maximum of 26.5 feet thick at Harbor Patrol.	Qvr is present on the western and southwestern half of the AOI upland and along the west-east trending glacial trough by the Play Area extending out into the eastern sediments, see Figure 3B-3. Qvr occurs predominantly as a thin and discontinuous blanket on glaciated uplands and as thicker deposits in former glacial meltwater channels in low-lying areas. The Qvr thins towards the southeast-trending glacial ridge and is missing along the crest of the glacial ridge. Qvr is absent in most of the eastern upland (main exception is the Glacial Trough) and thins and terminates to the NE in the western upland.
<b>Vashon Advance Outwash (Qva)</b>	Advance glacial outwash comprising a dense to very dense, gray to brown, poorly graded, slightly silty sand (predominantly fine and medium grained) with interbeds of clean coarser sand, thin silt beds, or sand and gravel mixtures. Advance outwash was deposited in broad proglacial outwash plains or deltaic deposits that were overridden by the advancing glacier. It may include subglacial meltwater channel deposits.	Typically 5 to 15 feet thick. The maximum thickness encountered is 20 feet for the upland (DW-4) and 17 feet offshore (NLU80).	Qva is present on the southwestern portion of the AOI upland and adjacent offshore area, extending to the southeast within the sediments and along the northeast portion of the upland extending out into the northeastern sediments, see Figure 3B-4. Qva is not present across the north central and southeast parts of the upland. The eastern and western flanks of the Qpqt ridge are locally overlain with a thin and discontinuous veneer of Qva.
<b>Pre-Fraser Till (Qpqt) and Related Units - Qpqt</b>	The pre-Fraser glacial till group primarily consists of glacially overridden, medium dense to very dense diamicts with clayey to silty fine sand matrix with variable gravel content, and scattered cobbles and boulders. The composition of the pre-Fraser glacial till group is vertically and laterally variable and it includes strata that vary in apparent density, degree of weathering and other properties. In the upland, the pre-Fraser glacial till is characterized by variable density. In the vicinity of the Play Area, up to several feet of weathered till is present at some locations; the weathered till in this area typically consists of silty sand with gravel and has a slightly lower density than the unweathered till below. Color ranges from gray-brown where weathered to gray where unweathered. This group includes glacial subunits that have recognizable and distinctive characteristics, but are generally not extensive enough to be mapped as separate units. Basal till is not a significant component of the Qpqt unit.	Qpqt is at least 70 feet thick and is the thickest and most widespread geologic unit. It was never fully penetrated.	Qpqt occurs throughout the GWPS and surrounding areas, see Figure 3B-5.
<b>Pre-Fraser Till (Qpqt) and Related Units - Pre-Fraser Glaciolacustrine Deposits (Qpgl)</b>	Laminated to massive, gray, very stiff to hard silt, clayey silt, and silty clay deposited in proglacial lakes. May contain scattered dropstones and thin sandy to gravelly lenses.	Qpgl offshore is up to 3 feet thick	Locally present (minor unit) off the southern shoreline and farther off the southwestern shoreline. Qpgl has been observed in only one upland location (MW-23, close to the shoreline).
<b>Pre-Fraser Till (Qpqt) and Related Units - Pre-Fraser Diamict (Qpgd)</b>	Till-like diamict containing variable amounts of sand and gravel in a silty to clayey matrix that was generally deposited by suspension. Soil behavior ranges from hard and cohesive where the matrix is clayey, to dense or very dense where the matrix is silty to sandy and non-cohesive. A gravelly diamict with a fine sand and silt matrix and little or no cohesion constitutes the majority of the Qpgd group by volume. Qpgd may also occur as thin lenses within glaciolacustrine deposits.	Where present, Qpgd is typically 2 to 12 feet thick and the maximum thickness is greater than 18 feet.	This subunit is locally present (minor unit) in sporadic locations on the eastern half of the upland, and in the southwestern shoreline area.
<b>Pre-Fraser Till (Qpqt) and Related Units - Pre-Fraser Subglacial Meltout Till (Qpgtm)</b>	Meltout till is composed of interbedded basal till or diamict and lenses to layers of cleaner glaciofluvial sand and gravel. This unit was deposited in meltwater channels and cavities below glacial ice, has been glacially overridden and is very dense. The color ranges from rusty where oxidized, to gray brown to gray.	Where present, Qpgtm is typically 1 foot thick.	This subunit appears to be present locally (minor unit) in the area of MW-31.

**Notes:**

<sup>a</sup> Color codes correspond to those used in geologic stratigraphy Figures 3-5A and 3-5B and cross sections A-A' to D-D' (Figures 3B-9 to 3B-12).

<sup>b</sup> Vertical thickness and lateral extents of units are depicted in plan view on Figures 3B-1 to 3B-5.

See text for full acronym list.



### Legend

- Area of Investigation
- Shoreline (OHWM)
- A A' Cross-Section
- Estimated lateral extent of Fill
- TDW-3 9.63 Exploration number and elevation of bottom of boring within Fill Deposit
- GEI-1 18.17 Exploration which completely penetrated Fill Deposits and elevation of bottom of Fill Deposit

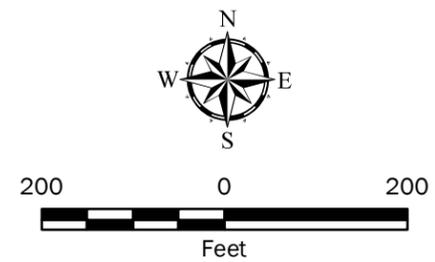
### Thickness of Fill (ft)

- 0.1 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 60

### Notes:

1. Upland extent of Fill is approximate and based on review of boring logs and cut/fill maps.
2. Isolated outlier explorations that have Fill are not included in lateral extent delineation because they are isolated occurrences and not continuous from shoreline.
3. Interpolation was done using Golden Software, Inc.'s Surfer 8.0 kriging method with default settings.
4. Base map 2005 USGS aerial photograph. Does not show current conditions.
5. Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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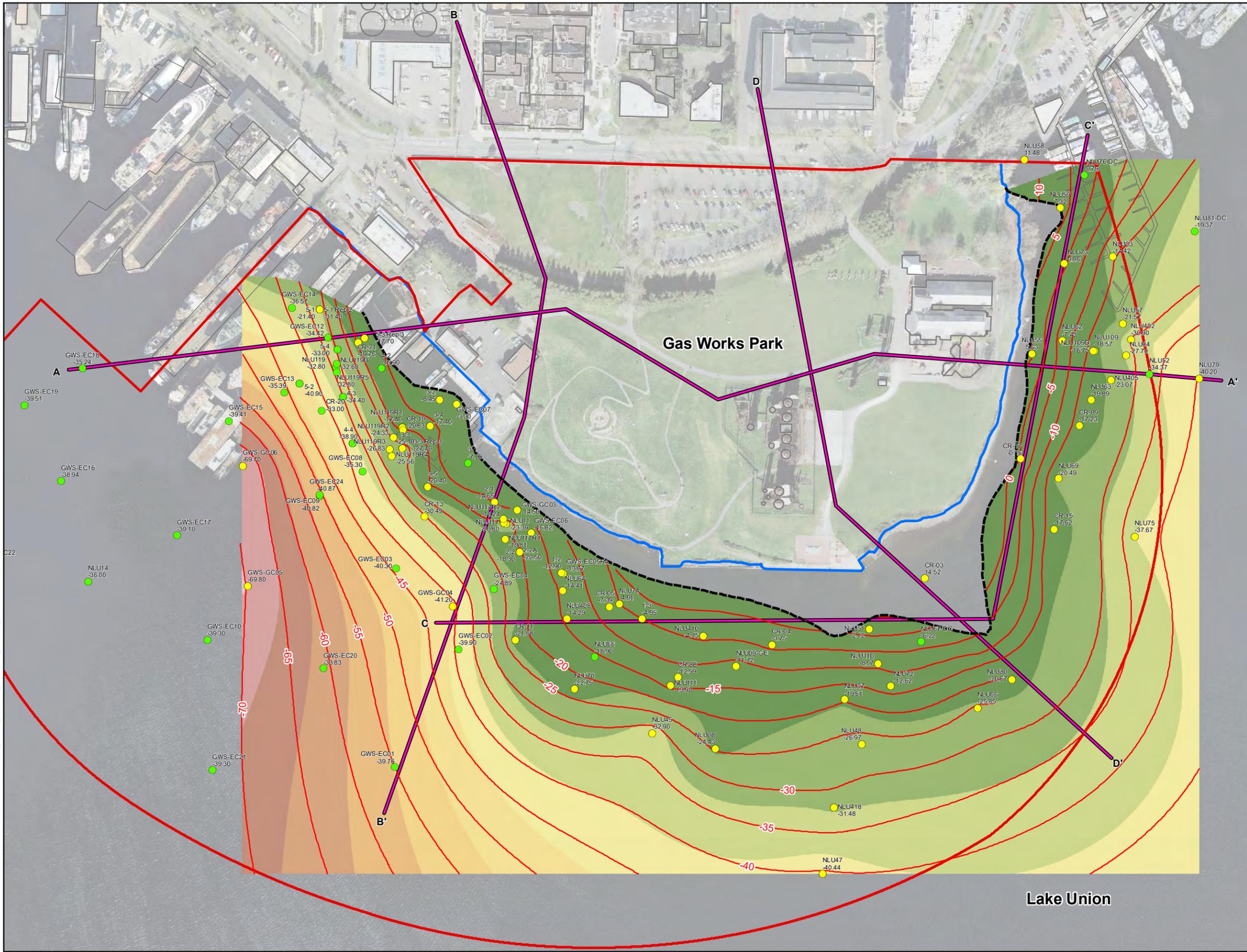


**Fill (Af) Isopach and Base of Fill Structure Contour Map**

Gas Works Park Site  
Seattle, Washington

**GEOENGINEERS** Figure 3B-1

Path: P:\010186846\GIS\MXD\Phase0\1T1635018684601\_F3B-2\_Isopach\_Structure\_Recent\_QI.mxd Map Revised: 11 November 2021 alatson



**Legend**

- Area of Investigation
- Shoreline (OHWM)
- Cross-Section
- Elevation of base of Recent Deposit - 5 ft. contour
- Estimated lateral extent of Recent Deposit

GEI-4 9.53 Exploration number and elevation of bottom of boring within Recent Deposit  
 TDW-3 9.63 Exploration which completely penetrated the Recent Deposit and elevation of base of Recent Deposit

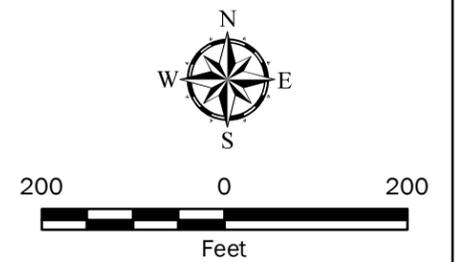
**Isopach Recent Deposits (ft)**

0.1 - 5	30 - 35
5 - 10	35 - 40
10 - 15	40 - 45
15 - 20	45 - 50
20 - 25	50 - 55
25 - 30	55 - 60

**Notes:**

- Thin deposit of Recent at CR-03 interpreted to be discontinuous.
- Interpolation was done using Golden Software, Inc's Surfer 8.0 kriging method with default settings.
- Basemap 2005 USGS aerial photograph. Does not show current conditions.
- Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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**Recent Deposits (QI) Isopach and Base of QI Structure Contour Map**

Gas Works Park Site  
Seattle, Washington

**GEOENGINEERS** Figure 3B-2



**Legend**

- Area of Investigation
- Shoreline (OHWM)
- A A' — Cross-Section
- Elevation of top of Qvr - 5 ft. contour
- - - Elevation of top of Qvr - 5 ft. contour - Estimated
- Estimated lateral extent of Qvr
- GEI-4 9.53 ● Exploration number and elevation of top of Qvr

**Thickness of Qvr (ft)\***

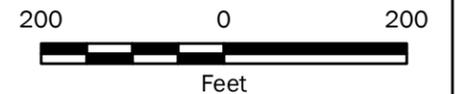
- 0.1-5
- 5-10
- 10-15
- 15-20
- 20-25

\*Thickness contouring is based on borings that fully penetrate Qvr and does not take into account thicknesses of Qvr in borings that partially penetrate Qvr.

**Notes:**

1. Interpolation was done using Golden Software, Inc's Surfer 8.0 kriging method with default settings.
2. PAI-28, A-11, PAI-1, PAI-15 and GEI-6 not used for contouring; elevation is an estimate.
3. Basemap 2005 USGS aerial photograph. Does not show current conditions.
4. Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet
5. Qvr not included for mapping purposes.

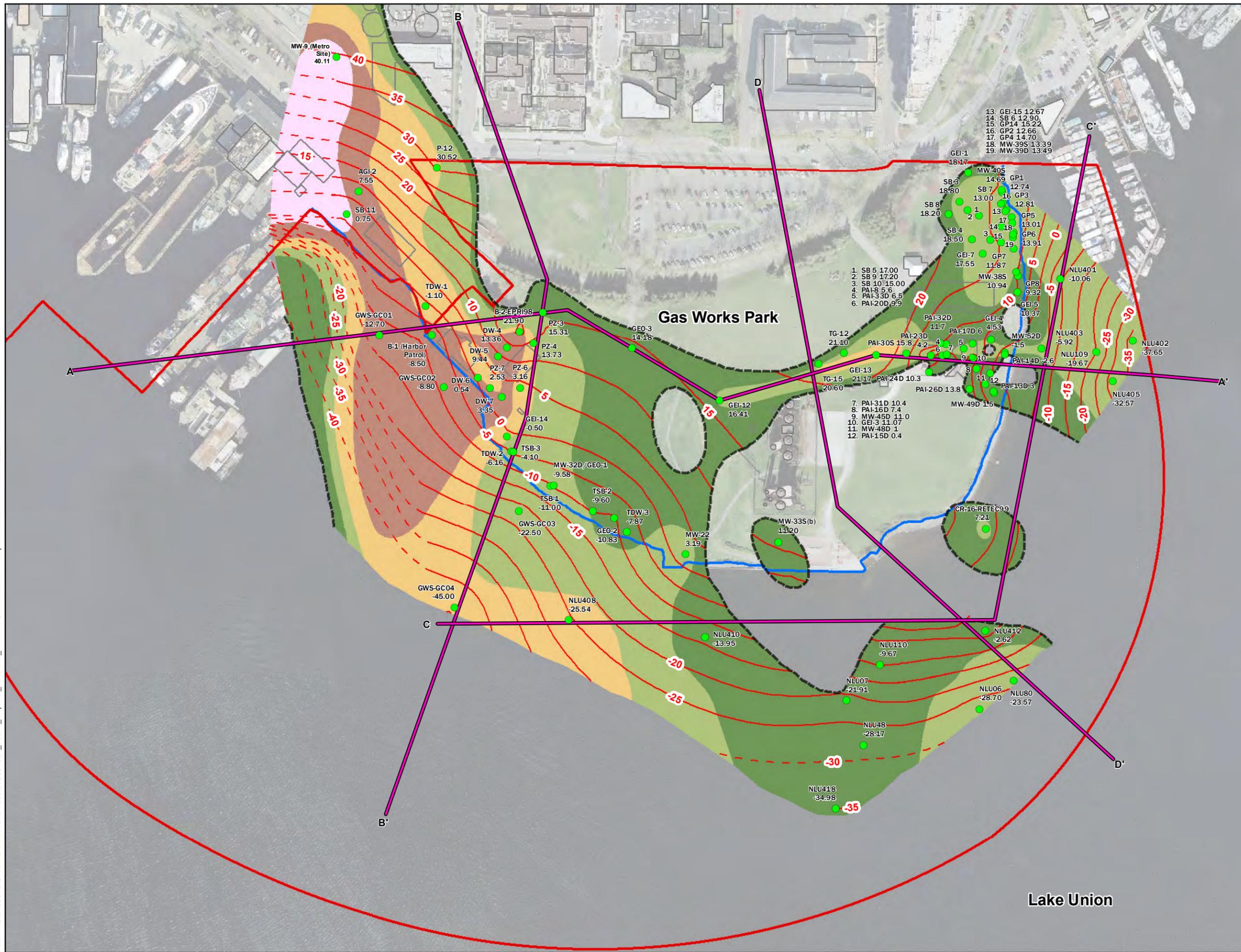
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**Recessional Outwash (Qvr) Isopach and Structure Contour Map**

Gas Works Park Site  
Seattle, Washington

1. MW-52D 3.5
2. NLU11 -23.39
3. NLU117R2 -18.24
4. SB 11 (Metro Site) 13.25
5. PAI-30S 22.75
6. PAI-20D 14.4
7. PAI-32D 17.7
8. PAI-19D 12.9
9. PAI-7 20.9
10. PAI-31D 13.4
11. MW-43S 20.1
12. PAI-33D 14
13. MW-45D 16.4
14. PAI-4 12.31
15. PAI-14D 2.89
16. PAI-15D 10.4
17. PAI-21BD 17.8
18. GEI-6 8.13
19. MW-48D 9.5
20. GP11 7.02
21. PAI-13D 9.5
22. MW-36D 6.49



**Legend**

- GEI-1 18.17 Exploration number and elevation of top of Qva
- A A' Cross-Section
- Original Estimated Lateral Extent of Qva
- Elevation of Top of Qva - 5ft. contour
- - - Estimated Elevation of Top of Qva - 5ft. contour - estimated
- Area of Investigation
- Shoreline (OHWM)

**Thickness of Qva (ft)\***

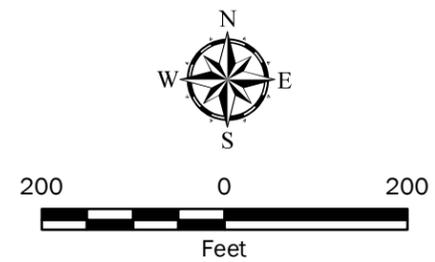
- 0.1-5
- 5-10
- 10-15
- 15-20
- 20-25

\*Thickness Contouring is based on difference between top of Qva surface and top of Qpqt surface, as well as thicknesses of Qva in borings that fully penetrate Qva.

**Notes:**

1. Interpolation was done using Golden Software, Inc.'s Surfer 8.0 kriging method with default settings.
2. Basemap 2005 USGS aerial photograph. Does not show current conditions.
3. Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

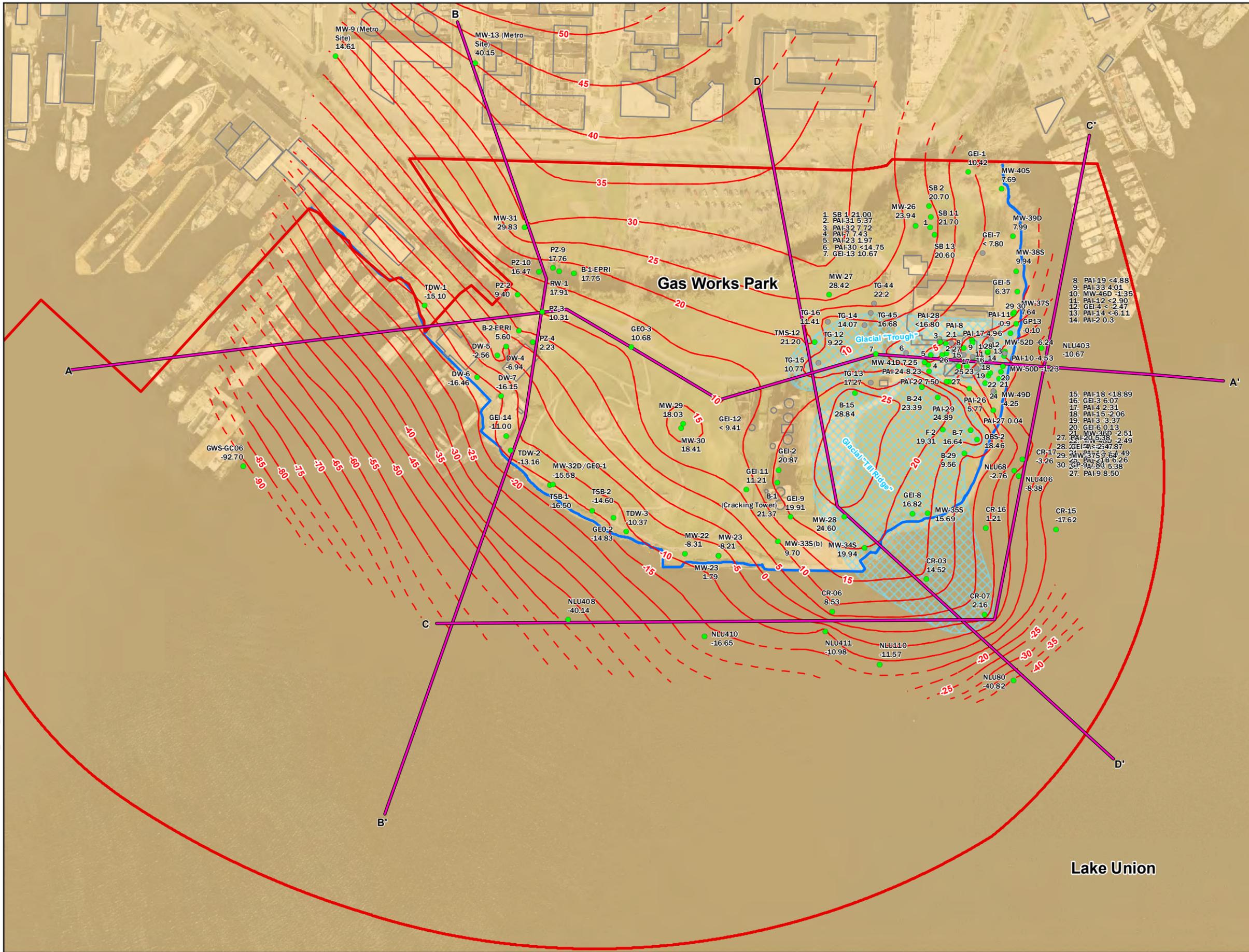
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**Advanced Outwash (Qva) Isopach and Structure Contour Map**

Gas Works Park Site  
Seattle, Washington

**GEOENGINEERS** Figure 3B-4



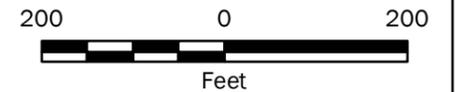
**Legend**

- Area of Investigation
- Shoreline (OHWM)
- A A' — Cross-Section
- Elevation of Qpqt - 5 ft. contour
- - - Elevation of Qpqt - 5 ft. contour - Estimated
- GEI-1 10.42 ● Exploration number and approximate elevation of top of Qpqt
- MW-26 23.94 ● Exploration number and elevation of top of Qpqt
- Estimated Lateral Extent of Qpqt (Qpqt is assumed to be present throughout the site and surrounding areas)

**Notes:**

1. Interpolation was done using Golden Software, Inc.'s Surfer 8.0 kriging method with default settings.
2. PAI-2, GEI-3 and GEI-6 not used for contouring; elevation is an estimate.
3. Basemap 2005 USGS aerial photograph. Does not show current conditions.
4. Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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**Till (Qpqt) Structure Contour Map**

Gas Works Park Site  
Seattle, Washington



**Figure 3B-5**

P:\0186846\01\CAD\Task\_1678 RIFS Stakeholder RD RIFS\_2021\Appendix 3B\018684601\_F3B6\_Net Cut and Fill Contours.dwg TAB:Net Cut Fill Contours Date Exported: 11/29/21 - 17:31 by csticket



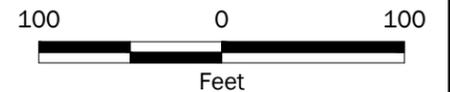
**Legend**

-  Area of Investigation Line
-  1973 Shoreline
-  Limit of Historical Topographic Coverage Overlap
-  Fill 5 Net Fill Contour (1973-1976)
-  Cut 5 Net Cut Contour (1973-1976)

**Notes:**

1. Reference: Cut and Fill Map prepared by AECOM (2009). Contours are approximate.
2. Source: Gas Works Park Grading Plan by Haag (1973). Gas Works Park Site Plan As-built revised by Haag (1976). Master Plan for Myrtle Edwards Park by Haag (1971).

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**Park Development:  
Net Cut and Fill Contours**

Gas Works Park Site  
Seattle, Washington



Figure 3B-6

P:\0186846\GIS\MXD\Phase01\1635\018684601\_F3B-7\_FillPlacedasCaps.mxd Date Exported: 11/29/21 by maugust



**Legend**

- Area of Investigation
- Shoreline (OHWM)

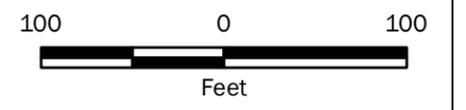
**Soil Caps**

- 2001: Vegetative Soil Cap
- 2005: Vegetative Soil Cap
- 2012: Vegetative Soil Cap
- 2014: Vegetated Soil Cap

**Notes:**

1. References: Construction Completion Report by RETEC 2001. As-Built Set of Drawings by Seattle Parks and Recreation 2005. NE Corner Capping Project by Hart Crowser 2012c, adjusted for existing structures. Kite Hill Construction Completion Report 2015.
2. Basemap 2005 USGS aerial photograph. Does not show current conditions.
3. Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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**Fill Placed as Soil Caps**

Gas Works Park Site  
Seattle, Washington

**Figure 3B-7**

Path: P:\00186846\GISMXD\Phase01\171678\018684601\_F3-12\_ShorelineProgression2021.mxd Map Revised: 23 February 2021 maugust

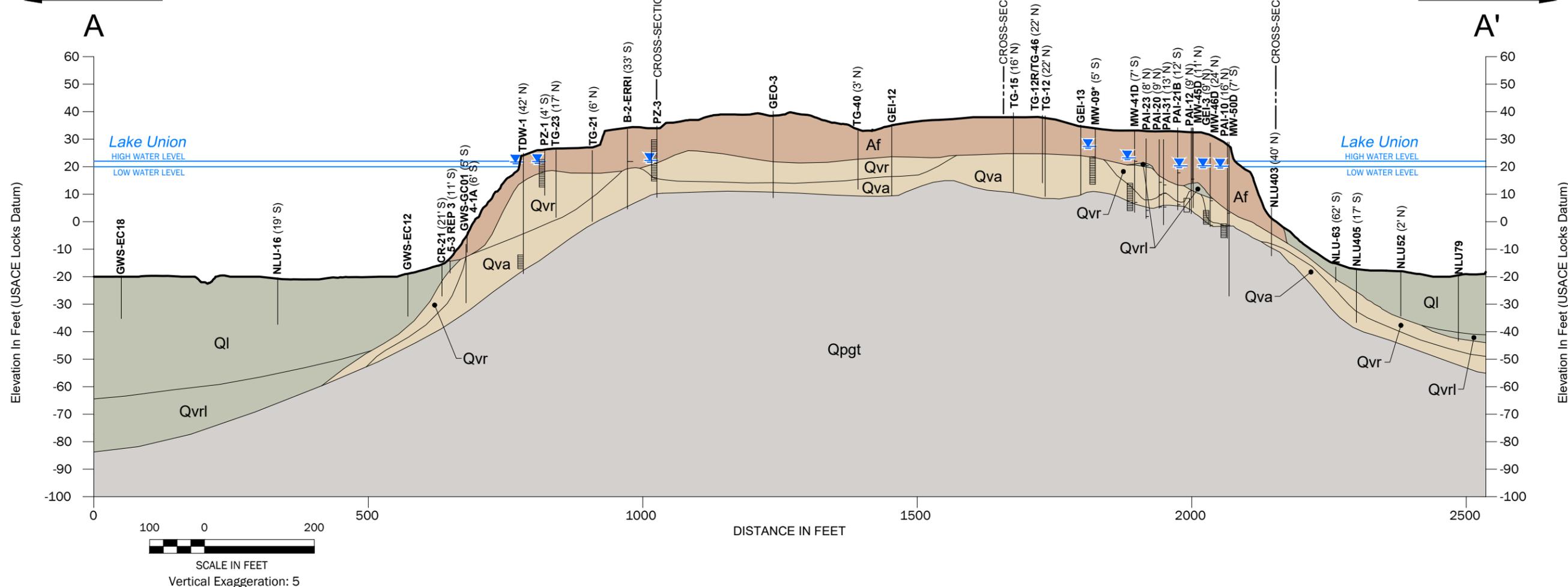
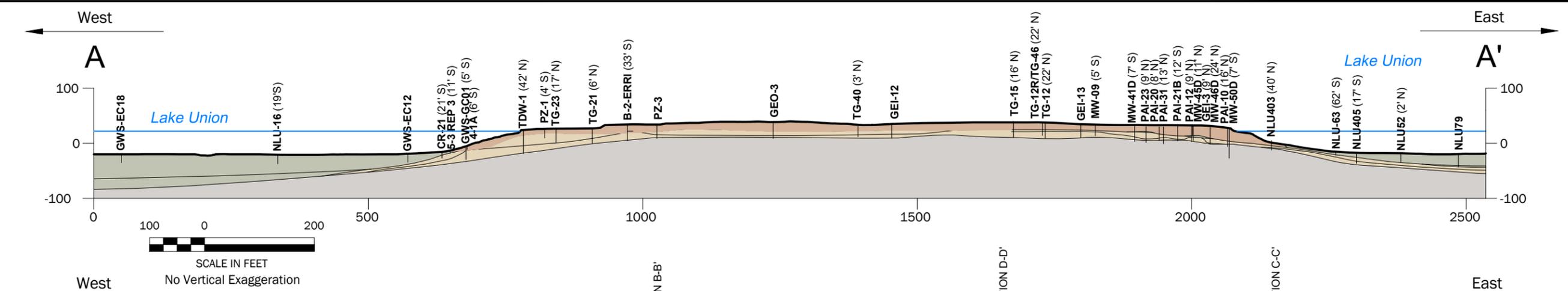


**Notes:**  
 1. Source: Current shoreline shown as observed in a 2011 aerial photo. The 1973 shoreline shown as in Gas Works Park Grading Plan by Haag (1973) a or b. The 1929 shoreline shown as delineated in USACE bathymetric map, drafted in 1927 revised in 1929. The 1919 shoreline shown as delineated in 1919 Sanborn Maps. The 1907 shoreline shown as delineated in the Lake Union Shore Lands, 1907. The 1899 shoreline shown as delineated in US Coast and Geodetic Survey (1899).  
 2. Shoreline depictions are approximate and do not take into account seasonal fluctuations of lake level.  
 3. Basemap 2005 USGS aerial photograph. Does not show current conditions.  
 DISCLAIMER: This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. The locations of all features are approximate. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

**Shoreline Changes  
and Fill History**

Gas Works Park Site  
Seattle, Washington

**GeoENGINEERS** **Figure 3B-8**



**Legend**

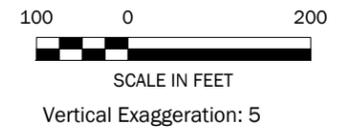
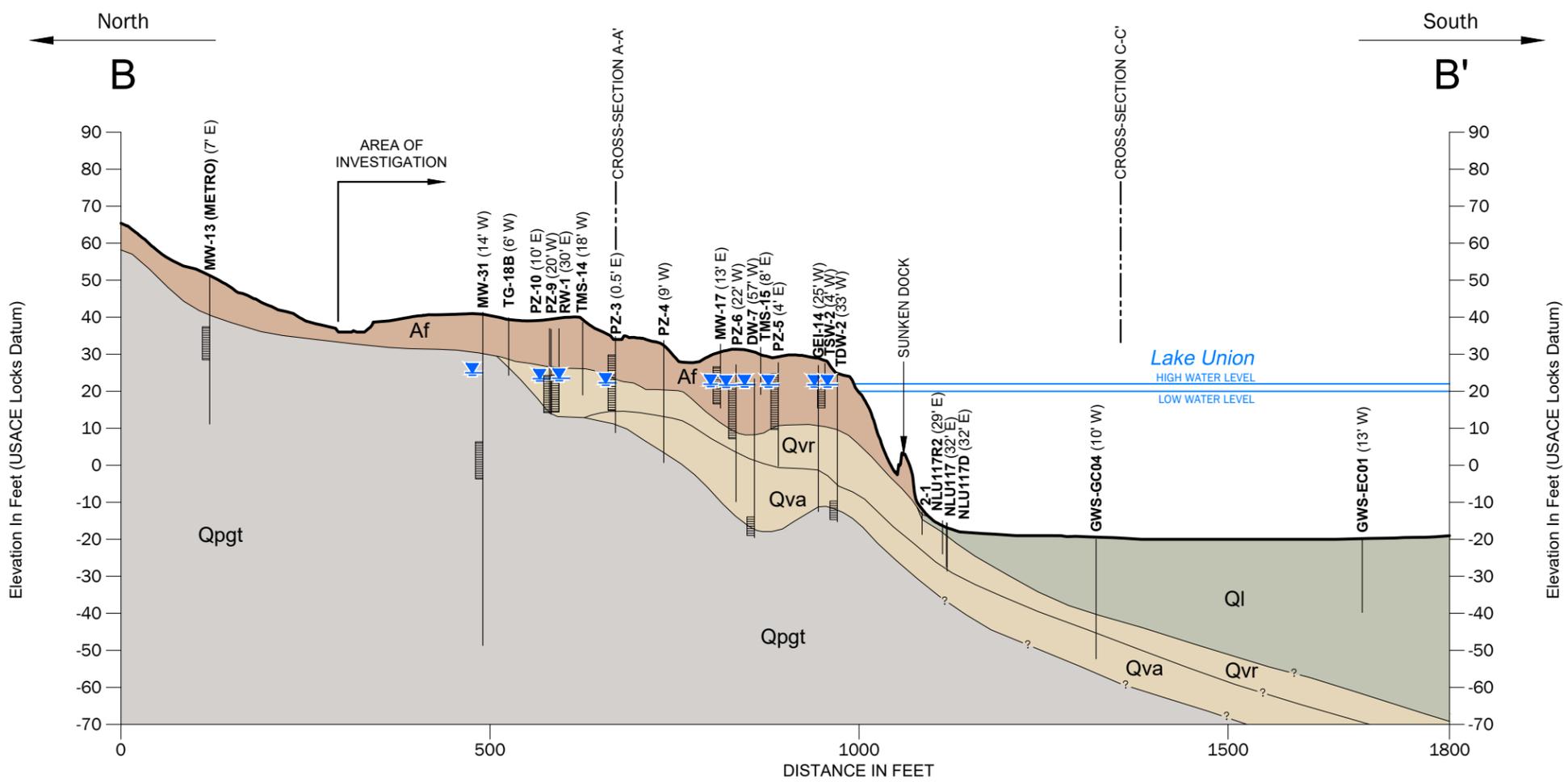
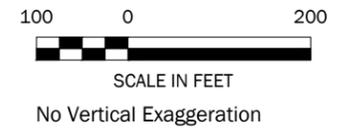
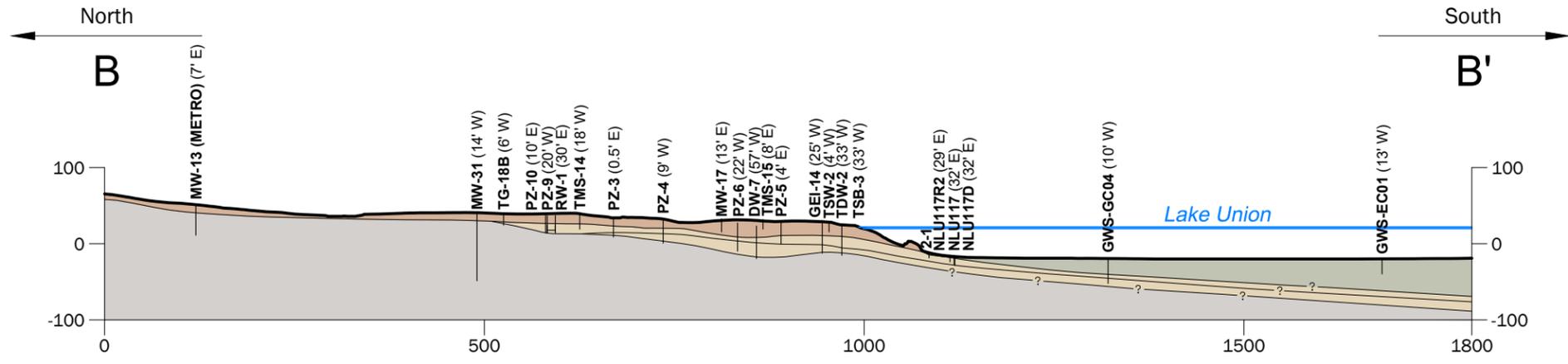
- Geologic Units**
- Fill (Af)
- Lake Sediment (Ql, Qvrl)
- Outwash (Qvr, Qva)
- Till (Qpqt)
- Static Groundwater Level
- Well Screen Interval
- Soil Contact

**Notes:**

- Groundwater level measured on April 22, 2013 in monitoring wells TDW-1, PZ-1, PZ-3, and MW-9 and February 2018 in monitoring wells MW-41D, MW-45D, MW-46D, and MW-50D.

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

<b>Geologic Cross Section A-A'</b>	
Gas Works Park Site Seattle, Washington	
	<b>Figure 3B-9</b>



**Legend**

- Geologic Units**
- Fill (Af)
- Lake Sediment (QI, Qvrl)
- Outwash (Qvr, Qva)
- Till (Qpqt)
- Exploration Offset
- Exploration ID
- Static Groundwater Level
- Well Screen Interval
- Soil Contact

**Notes:**

- Groundwater level measured on April 14, 2016.  
Groundwater level data not available for MW-13 (METRO).

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

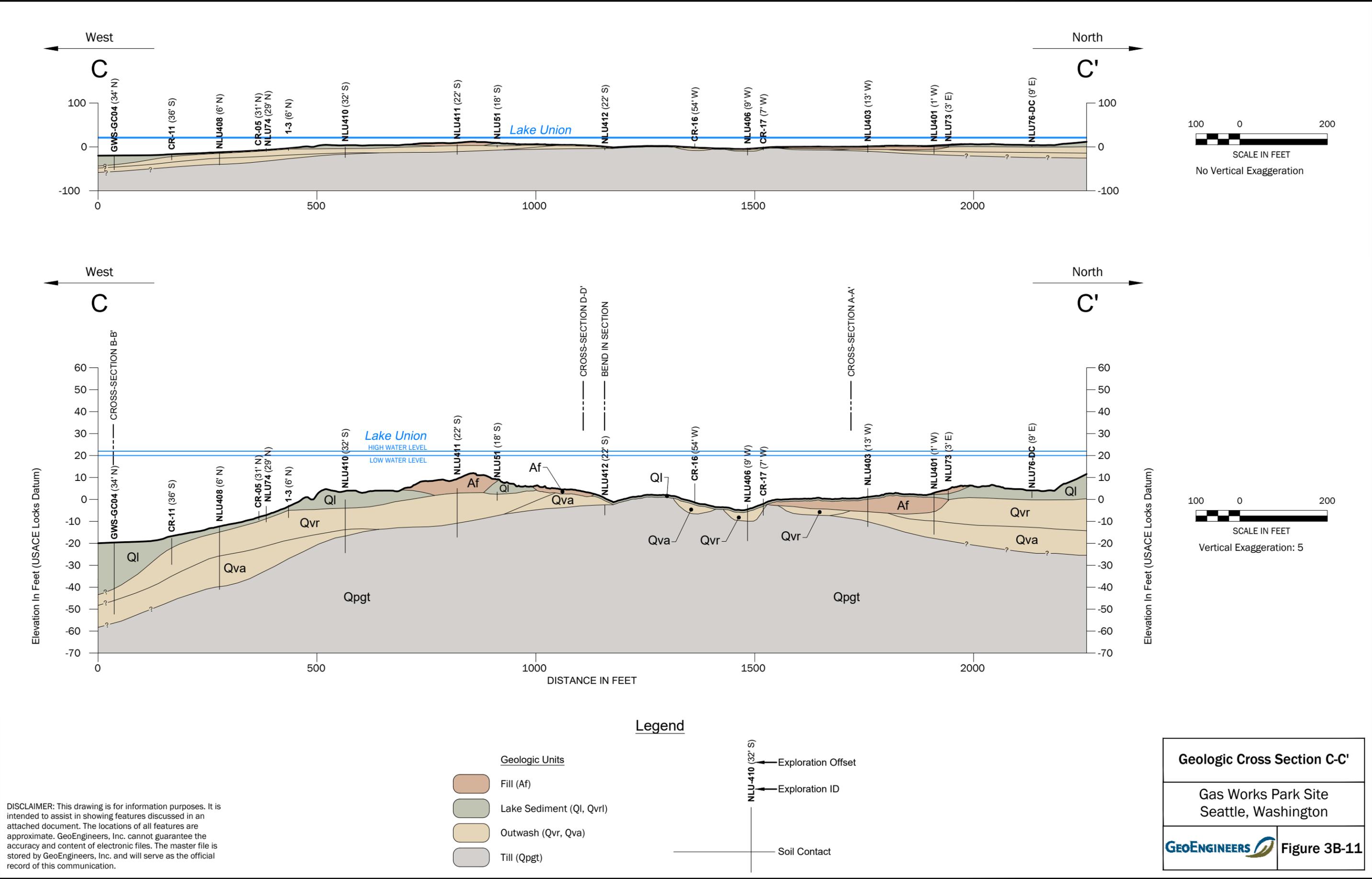
**Geologic Cross Section B-B'**

Gas Works Park Site  
Seattle, Washington

**GEOENGINEERS** **Figure 3B-10**

P:\0186846\01\CAD\Task 1678 RIFS\Stakeholder Review Draft\0186846-01\F3-8-F3-11\_Geologic Cross-Sections.dwg TAB:3-9\_B-B' Date Exported: 03/05/21 - 15:36 by csticket

P:\0186846\01\CAD\Task 1678 RIFS\Stakeholder Review Draft\0186846-01\F3-8-F3-11\_Geologic Cross-Sections.dwg TAB:3-10\_C-C' Date Exported: 03/05/21 - 15:37 by cstckel

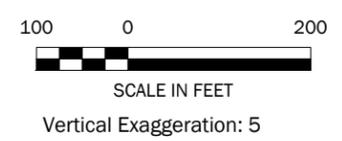
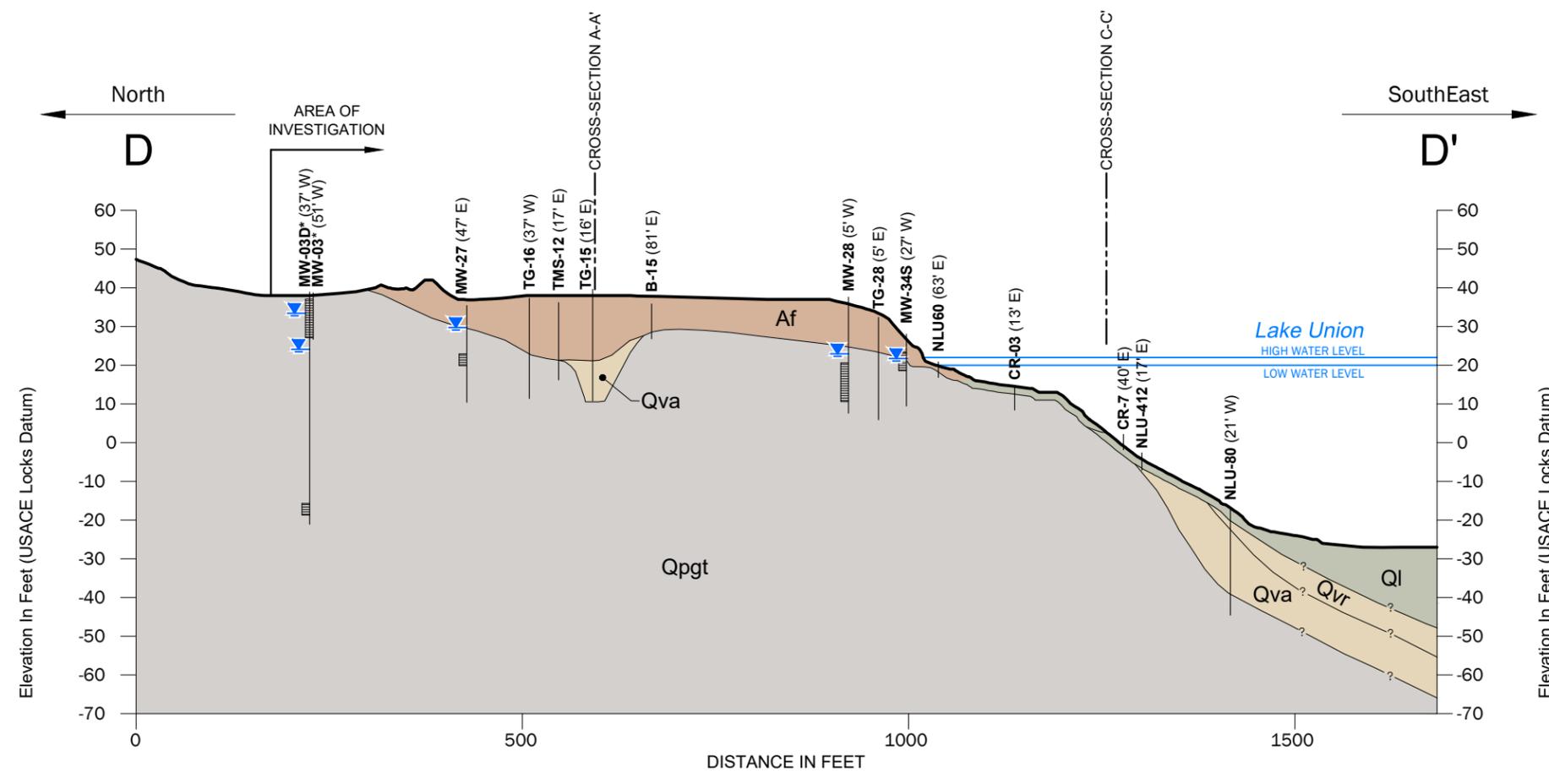
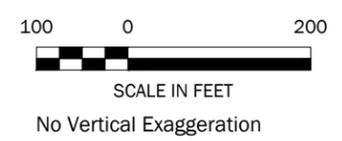
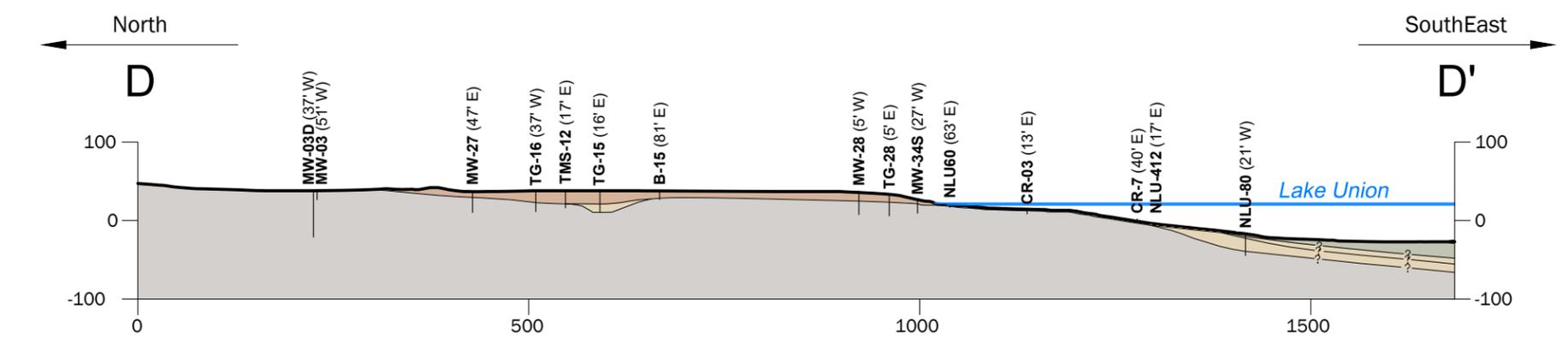


DISCLAIMER: This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. The locations of all features are approximate. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers,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

**Geologic Cross Section C-C'**

Gas Works Park Site  
Seattle, Washington

**GEOENGINEERS** Figure 3B-11



**Legend**

- Geologic Units**
- Fill (Af)
  - Lake Sediment (Ql, Qvr)
  - Outwash (Qvr, Qva)
  - Till (Qpqt)
- Well Symbols**
- Exploration Offset
  - Exploration ID
  - Static Groundwater Level
  - Well Screen Interval
  - Soil Contact

**Notes:**

- Groundwater level measured on April 22, 2013.

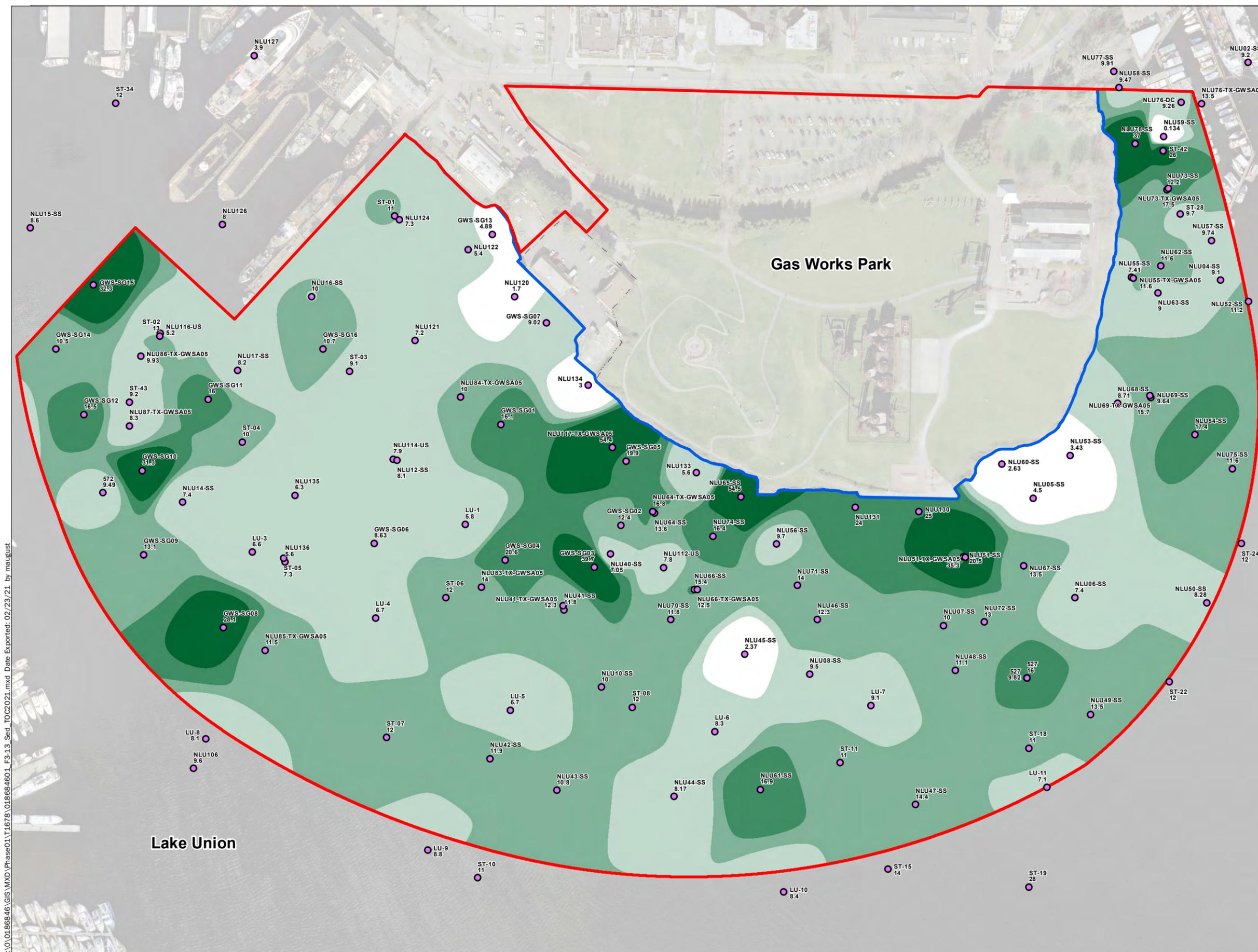
**DISCLAIMER:** This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. The locations of all features are approximate. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers,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

**Geologic Cross Section D-D'**

Gas Works Park Site  
Seattle, Washington

**GEOENGINEERS** **Figure 3B-12**

P:\0186846\01\CAD\Task 1678 RIFS\Stakeholder Review Draft\0186846-01\F3-8-F3-11\_Geologic Cross-Sections.dwg TAB:3-11\_D-D' Date Exported: 03/05/21 - 15:37 by csticke



**Legend**

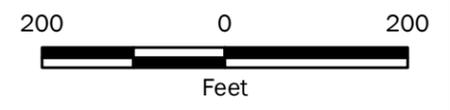
- Area of Investigation
- Shoreline (OHWM)
- Surface Sample

**Interpolated Total Organic Carbon (TOC) Content (% dry weight)**

	<5
	5-10
	10-15
	15-25
	>25

- Notes:**
1. Surface Sediment is defined as the top 6 inches of sediment.
  2. TOC content showed a large variation between labs (roughly 2.5 times in split samples) due to differences in sample preparation and testing method. The values posted are minimum values.
  3. Some labs screened sediment samples to remove large organic debris and plant material prior to analyses; other labs included all material submitted for analysis resulting in widely varying estimates of sediment organic carbon.
  4. Concentration contour map generated through interpolation using an Inverse Distance Weighted (IDW) scheme (power=6). Maximum reach from each sampling location is equal to 500 feet. Contoured interval may differ from actual data shown due to influence by neighboring values.
  5. Where the sample was below detection limit, 1/2 the detection limit was used in the interpolation.
  6. Basemap 2005 USGS aerial photograph. Does not show current conditions.
  7. Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet.

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



**Surface Sediment  
Total Organic Carbon**

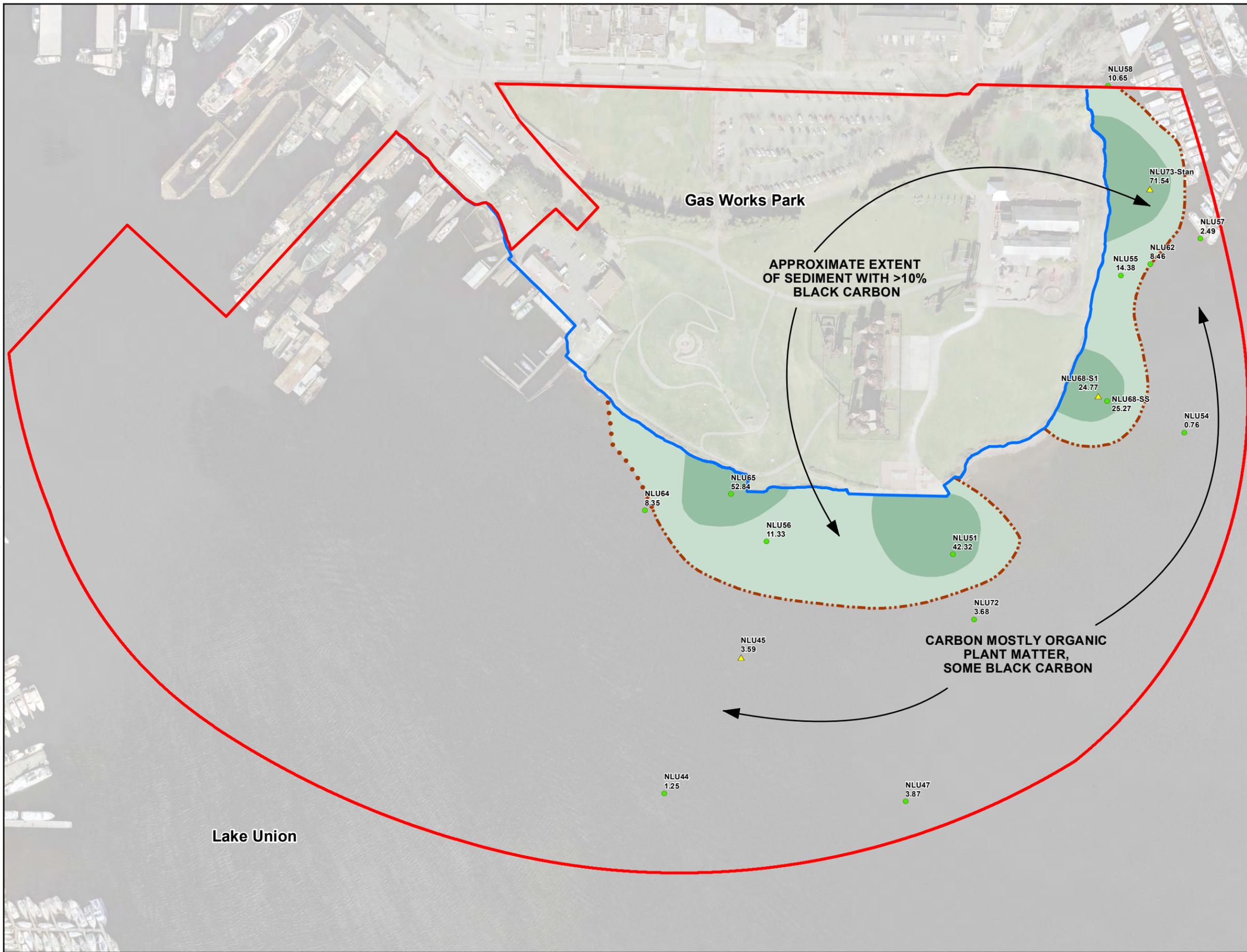
**Gas Works Park Site  
Seattle, Washington**

---

**GeoENGINEERS** **Figure 3B-13**

P:\01\_86846\GIS\MXD\Phase01\1678\_018684601\_F3-13\_Sed\_TOC2021.mxd Date Exported: 02/23/21 by maugust

Path: P:\00186846\GIS\MXD\Phase0\111678\018684601\_F5-27\_BlackCarbon2021.mxd Map Revised: 25 February 2021 maugust



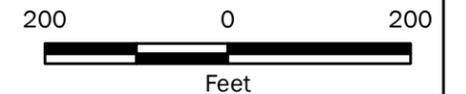
**Legend**

- Area of Investigation
  - Shoreline (OHWM)
  - Grab Sample
  - ▲ Core Sample
- Percent Black Carbon (% by Volume of Whole Sample)**
- 10-20
  - >20
  - Extent of Black Carbon >10%
  - Extent of Black Carbon >10% Uncertain

**Notes:**

1. Black carbon defined in Section 5.3.5.
2. Depicted extent of black carbon is approximate.
3. Most samples are from 0 to 0.33 feet bml; some samples are up to 1.6 feet bml.
4. Basemap 2005 USGS aerial photograph. Does not show current conditions.
5. Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet.

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



**Black Carbon in Near-surface Sediment**

Gas Works Park Site  
Seattle, Washington



**Figure 3B-14**

**ATTACHMENT 3B-1**  
**Regional Geologic Setting Memorandum**  
**June 2, 2011**

# REGIONAL GEOLOGIC SETTING MEMORANDUM

June 2, 2011

**To:** Roy Jensen – Hart Crowser

John Keeling, Ching-Pi Wang, Maura O'Brien, Washington State Department of Ecology

**From:** GWSA Technical Team

**Re: Regional Geologic Setting  
Gas Works Sediment Area**

---

This memorandum summarizes the regional geologic setting and geologic history of the greater Gas Works Sediment Area (GWSA) and adjacent uplands. This understanding of regional geology was used to develop the updated geologic units presented in the April 4, 2011 Revised Geologic Conceptual Site Model (CSM) memorandum (GWSA Technical Team, 2011), and also to develop the Revised Hydrogeologic Conceptual Site Model Memorandum (dated April 18, 2011). Together, these materials provide the context for construction and calibration of the site-wide, three-dimensional groundwater flow model of the GWSA.

This memorandum is being provided for informational purposes only. It includes an introduction to the regional setting and geology that is relevant to the updated site-specific geologic interpretation.

This memorandum has been prepared by the GWSA Technical Team on behalf of Puget Sound Energy and the City of Seattle.

## Regional Geologic Setting

The GWSA and adjacent upland occupy Brown's Point, a prominent natural point formed where the crest of south-plunging Wallingford Hill enters Lake Union. Wallingford Hill is a glaciated drumlin that was shaped by southward flow of one or more Pleistocene glaciations. Regional geophysical studies (Blakely et al., 1999) show magnetic anomalies along the trends of some of the waterways and prominent drainages or topographic lows in the area including Salmon Bay, Lake Union, and the Lake Washington Ship Canal. These linear magnetic anomalies are believed to be related to offsets in bedrock that form the basement of the Seattle Basin. Regionally, some of these offsets have been shown to extend through the upper Tertiary and Quaternary soils that lie above bedrock, and are associated with faults. Coincidence of linear magnetic anomalies with topographic lineaments is considered strong evidence for a fault origin of these features.

Information on soil stratigraphy along these linear trends is derived from regional design studies that cross nearby and presumably genetically similar lineaments. These regional design studies include the light rail tunnel alignment study with a crossing below the Lake Washington Ship Canal (this section is shown in Troost, et al., 2003), and the Sound Transit University Link light rail alignment study (Aspect Consulting, 2008). Other recent studies that provide data on regional geologic development include Brightwater Conveyance project reports (CDM, 2005a and 2005b).

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Stratigraphic data from recent regional design studies combined with regional geophysical data suggest that the Y-shaped arms of Lake Union result from preferential erosion that has re-occurred during multiple glacial and nonglacial intervals along long-lived northwest, and to a lesser extent, northeast trending weaknesses in the Quaternary soils. Developing models suggest that tectonically weakened soils can become preferential paths for erosion by glacial ice scour and subglacial meltwater flow during glacial coverage. The model also suggests the tectonically weakened soils can become preferential paths for recessional streams during glacial retreat. The subsequent low areas act as preferential sites for accumulation of glaciolacustrine deposits and sandy advance outwash during the next glacial advance, followed by partial removal during glaciation, then filling with recessional outwash and recessional glaciolacustrine deposits during glacial retreat. The post-glacial low areas also preferentially accumulate fine-grained and organic-rich sediments during nonglacial intervals such as the Holocene. This repeated and localized deposition and erosion has apparently created the complex geology of the site with thin and discontinuous layers and lateral pinchouts.

### ***GWSA Upland Grading and Filling***

Historic photos and the earliest accurate topographic map of the site area that predates significant development (U.S. Coast and Geodetic Survey, 1899) show that Brown's Point consisted of a low-lying, gently sloping bench at the base of the Wallingford Hill drumlin, with two ravines along the west side of the ridge, and a smaller linear ridge (a glacial flute) between the ravines and the crest of the drumlin. Comparison with modern topography shows that the ravines were filled and ground surface rose by as much as 20 feet. The flute and other steep portions of the lower drumlin including areas that had been cut for the railroad grade were re-graded and the ground surface lowered by up to about 20 feet. Much of the rest of the site in the industrial area appears to have remained at similar ground surface elevations. Where re-grading and localized cuts occurred, pre-development surficial deposits, which could include topsoil, recessional outwash, and weathered and un-weathered till or any other older units present, may have been partially or fully removed.

The 1899 map clearly shows the railroad line and otherwise mostly undeveloped site and shoreline. In 1899, no extensive filling appeared to have occurred in the GWSA uplands area except in the Metro facility area shoreline where filling had extended land by up to 140 feet into the lake. Since 1899, additional filling has extended the land surface by up to 250 feet into the lake.

### **Revised Geologic Model Development**

The revised CSM relies heavily on data from the new monitoring wells installed in 2010 (MW-26 through MW-31). Use of sonic drilling to collect continuous soil core facilitated re-evaluation of the geologic units that compose the bulk of the site. The GWSA Technical Team incorporate the recently developed understanding of regional glacial and tectonic processes as well as newly available stratigraphic information and models from recent regional projects (described in the Regional Geologic Setting section above), as well as historical site data into the revised CSM. Our geologic model also assumes that a shoreline was developed at the site, as was the case on other large lakes, with a wave-cut notch eroded into the uplands, a beach near lake level, and a sub lake level wave-cut bench that extended some distance from the shoreline.

In re-evaluating existing (pre-2010) borehole data, we revised some older interpretations based on these newer data and a more complete understanding of region-wide and on-site geologic processes.

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### ***Selection of Geologic Units***

Geologic units generally correspond to those developed by the Pacific Northwest Center for Geologic Mapping Studies (GeoMapNW) and used on the Geologic Map of Seattle (Troost et al., 2005). Assignment of relative ages (e.g. whether a till is Vashon age or pre-Fraser) were inferred on the basis of stratigraphic position and comparison to regionally recognized geologic units and their sedimentary characteristics. Split-spoon sampler blow counts and more subjective density observations were used to differentiate glacially over-ridden soils from those that are not over-ridden.

The geologic unit descriptions presented in the Revised Geologic Conceptual Site Model CSM memorandum include regionally recognized geologic units and also show the observed range of sedimentary characteristics (i.e. sub units) within a larger unit. Because geologic units are often transitional or variable or have limited lateral extent, some distinctive soil types are of necessity grouped within broader geologic units.

### ***Geologic Interpretation***

The Pre-Fraser glacial till (Qpgt) unit is the most extensive and oldest unit encountered at the site and it forms the core of the Wallingford Hill drumlin as it extends below the site. It is present as the lowest unit in most of the deeper borings in the interior of the site and thus forms the site basement unit. In many areas of the uplands, the Qpgt is encountered near the ground surface and is overlain by only a thin veneer of fill (and/or glacial outwash deposits). The approximate shape and location of the Wallingford Hill drumlin apparently pre-dated the Vashon glaciation as the eastern and western flanks of the pre-Fraser drumlin ridge are locally overlain with a thin and discontinuous veneer of very dense glacial outwash, interpreted to be Vashon advance outwash (Qva). Much of this advance outwash may have been deposited when the low area of Lake Union was a sub-glacial meltwater channel.

Our review of new soils data suggests that there is little or no Vashon basal till (Qvt) present at the site. It would lie stratigraphically above the pre-Fraser glacial till and advance outwash units. If originally present, it was apparently removed from the uplands during re-grading operations.

Advance outwash deposits and the Qpgt are both locally overlain by a discontinuous veneer of recessional glacial outwash (Qvr) and other younger soil units. Where recessional outwash lies above advance outwash, the contact between them is indicated by a significant and abrupt contrast in soil density. Recessional outwash deposits appear to extend well into the lake. They thin and terminate on the uplands of the site, generally within several feet of elevation of lake level where they were presumably eroded away at the pre-development lake shoreline, or were removed from the uplands of the site by grading.

In the lake, silty and clayey recessional glaciolacustrine deposits (Qvrl) are locally present above recessional outwash. These deposits are interpreted to date from late in the Vashon glaciation and early Holocene when there was still abundant glacial sediment entering the lake. These deposits are generally composed of fine-grained mineral sediment, in contrast with the recent (Holocene) lake sediments (Ql) which followed and contain a high proportion of fine organic matter.

Recent Lacustrine deposits (Ql) occur in the lake and below some fill deposits that were placed in the lake. This deposit has accumulated since the retreat of the last glacier and limited deeper

June 2, 2011

offshore borings suggest that recent lake deposits are at least several tens of feet thick in the interior of the lake. The upper portion of the recent lake deposits contain elevated amounts of wood and organic matter, presumably from historic logging, land clearing, and saw mill operations around Lake Union. They are also noted to contain other anthropogenic debris.

Up to about five feet of apparently water-reworked sediment with wood and organic fragments, occasional mollusk shells, and silt and peat layers occurs at lake level and up to about 10 feet below lake level. This layer is identified as recent beach deposits (Qb) and is distinctive from the recessional outwash, till, and glacial outwash layers below and most of the fill that covers it. This unit is interpreted to be the former lake shore beach, wave-cut bench, and shallow slope deposits that developed in the former shoreline zone.

Ravines and shoreline areas were filled to level the ground and extend land into the lake. Fill now caps the majority of the site to an average thickness of about 10 feet. Thicker fill is present below "Kite Hill" and near the present shorelines. In most of the uplands, fill lies directly on top of the Pre-Fraser till unit.

## References

- Aspect Consulting, 2008, Geologic and Hydrogeologic Interpretation – Sound Transit University Link Light Rail Project, Consultant report prepared for Sound Transit.
- Blakely, R.J., Wells, R.E., and Weaver, C.S. 1999. Puget Sound Aeromagnetic Maps and Data. U.S. Geological Survey Open-File Report 99-514.
- CDM, 2005a, Geotechnical Data Report, Brightwater Conveyance System, East Contract. Report submitted to King County Department of Natural Resources, June 2005.
- GeoEngineers, Floyd|Snider, and Aspect, 2011, Revised Geologic Conceptual Site Model, April 4, 2011.
- GeoEngineers, Floyd|Snider, and Aspect, 2011, Revised Hydrogeologic Conceptual Site Model, April 18, 2011.
- CDM, 2005b, Geologic and Hydrogeologic Regimes, Brightwater Conveyance, Report submitted to King County Department of Natural Resources.
- Troost, K.G., Booth, D.B., Wisher, A.P., and Shimel, S.A., 2005, The geologic map of Seattle, a progress report, U.S. Geological Survey, Open-file report 2005-1252, scale 1:24,000.
- Troost, K.G., Booth, D.B., and Laprade, W.T., 2003, Quaternary geology of Seattle, in Swanson, T.W., ed., Western Cordillera and adjacent areas: Boulder, Colorado, Geological Society of America Field Guide 4., p. 267-284.
- U.S. Coast and Geodetic Survey, 1899, Topographic resurvey of Seattle bay and city, Washington, U.S. Treasury Department.

**APPENDIX 3C**  
**Compilation of Wells and Boring Logs**

**ATTACHMENT 3C-1**  
**Upland Logs**

**Supplemental Data Report  
Groundwater Investigation and Site Evaluation  
(Tetra Tech 1987)**

**1986 Borings**





GEOLOGIC LOG OF EXPLORATION

LOCATION SKETCH (SHOW DIMENSIONS TO MAPPED FEATURES)



See previous page

SURFACE ELEVATION 56.09 ft DATUM NGVD

CLIENT/OWNER: City of Seattle

TETRA TECH PROJECT NO.: TC-3015 Gas Works Park

EXPLORATION NUMBER MW01 SHEET 2 OF 3

START DATE 1 Nov. 1986 HOUR 11:30 AM

GROUND SURFACE CONDITIONS: dry manufactured gravel

TETRA TECH REPRESENTATIVE: Kurt Schmieder

EXPLORATION CONTRACTOR: USGS WRD Tacoma

OPERATOR: USGS Santa Barbara - Dave Wiley

DRILL TYPE/METHOD: Hollow Stem Auger/Air Rotary w. 3 conc. bit

HAMMER WEIGHT & STROKE: N.A.

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE %	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY	DEPTH SCALE	UNIFIED SYMBOL	WATER LEVEL INFORMATION						
											DATE	TIME	DEPTH TO WATER	HOLE DEPTH			
													1 Nov. 86				
DESCRIPTION OF STRATIGRAPHY																	
											S. A. A.						
											Moist cuttings at 25 ft level - capillary fringe.						
											Water in cuttings from ~27 ft level - air rotary bit is at 30 ft.						
											Change at 30 ft to clean sand and pea gravel, rounded, with no evident fine fraction. Moderately sorted.						
											Change at 38 ft back to very poorly sorted sand through boulders to 1-2 ft with minor silt, clay fraction.						

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

FINISH DATE: 1/11/86 HOUR: 12:50 PM OR CONT. 0

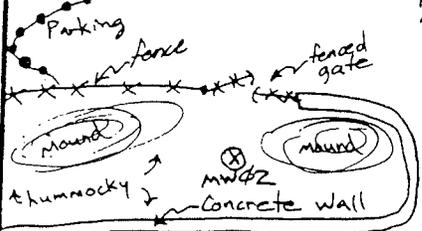






**GEOLOGIC LOG OF EXPLORATION**

LOCATION SKETCH Seattle  
(SHOW DIMENSIONS TO MAPPED FEATURES) Marine Police



Northlake Way  
SURFACE ELEVATION 21.87' DATUM NGVD

CLIENT/OWNER: City of Seattle

TETRA TECH PROJECT NO.: TZ-3015

EXPLORATION NUMBER MW02 SHEET 1 OF 1

START DATE 1 November 1986 HOUR 7:45 AM

GROUND SURFACE CONDITIONS: wet, some standing water

TETRA TECH REPRESENTATIVE: Kurt Schmiere

EXPLORATION CONTRACTOR: USGS WRD Tacoma

OPERATOR: USGS Santa Barbara - Dave Wiley

DRILL TYPE/METHOD: Hollow Stem Auger and Air Rotary/Drive Hammer

HAMMER WEIGHT & STROKE: 3000 lbs @ 140 strokes/min. Hard rock bit

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/G	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY
			Piston core		2'	2'	2'	
					2'	2'	2'	
					2'	4"		

Air rotary cuttings / Auger cuttings

DEPTH SCALE

UNIFIED SYMBOL

WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
	1 November 1986	7:45 AM	~6ft	7.5ft	

**DESCRIPTION OF STRATIGRAPHY**

0 to 0.5 ft: soil/root zone  
fairly clean blue clay from 0.5 ft to 1.5 ft

Very dark, dry mixture of petroleum/coal residue and sediment; predominantly rounded gravel to 2.5 inches with a significant sand fraction.

Water encountered at ~5.5 ft; core barrel won't hold  
Auger cuttings very dark down to 6.5 ft - contaminated  
slightly lighter (very dark w. contamination); black/gray/blue  
in color with some intermixed sediment  
encountered obstruction; switched from auger to hard rock bit.

Dark gray sand and gravel mixture with dark contaminants. Sand through boulders to 1-2 ft; apparently well graded from 7 1/2 to 14 ft (bottom)  
This zone (7.5-14 ft) is probable contaminant filled channel deposit.

Borehole terminated at 14 ft level.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

FINISH DATE: 1/11/86 HOUR: 09:30 Kurt Schmiere  
OR CONT.

# WATER WELL REPORT

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name U.S. Geological Survey Address 1201 Pacific Ave., Tacoma, WA 98402  
 (2) LOCATION OF WELL: County King — NE 1/4 NE 1/4 Sec 19 T.25 N. R. 4E  
 Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic  Industrial  Municipal   
 Irrigation  Test Well  Other

(4) TYPE OF WORK: Owner's number of well GWP-2  
 (if more than one).....  
 New well  Method: Dug  Bored   
 Deepened  See Cable  Driven   
 Reconditioned  log Rotary  Jetted

(5) DIMENSIONS: Diameter of well 2 inches.  
 Drilled 14.7 ft. Depth of completed well 13.9 ft.

(6) CONSTRUCTION DETAILS: PVC casing  
 Casing installed: 2" Diam. from 0.3 ft. to 3.9 ft.  
 Threaded  " Diam. from " ft. to " ft.  
 Welded  " Diam. from " ft. to " ft.

Perforations: Yes  No   
 Type of perforator used.....  
 SIZE of perforations " in. by " in.  
 " perforations from " ft. to " ft.  
 " perforations from " ft. to " ft.  
 " perforations from " ft. to " ft.

Screens: Yes  No   
 Manufacturer's Name Hydrophilic  
 Type PVC Model No. ....  
 Diam. 2" Slot size .010 from 3.9 ft. to 13.9 ft.  
 Diam. " Slot size " from " ft. to " ft.

Gravel packed: Yes  No  Size of gravel: #8 sand  
 Gravel placed from 1.5 ft. to 14 ft.

Surface seal: Yes  No  To what depth? 1.5 ft.  
 Material used in seal  Bentonite/cement   
 Did any strata contain unusable water? Yes  No   
 Type of water? " Depth of strata " ft.  
 Method of sealing strata off .....

(7) PUMP: Manufacturer's Name.....  
 Type: Nona H.P. ....

(8) WATER LEVELS: Land-surface elevation 31.99 ft.  
 above mean sea level.....  
 Static level 11.52 ft. below top of well Date 11/2/86  
 Artesian pressure " lbs. per square inch Date.....  
 Artesian water is controlled by.....  
 (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level  
 Was a pump test made? Yes  No  If yes, by whom? .....

Yield:	gal./min. with	ft. drawdown after	hrs.
"	"	"	"
"	"	"	"

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
.....	.....	.....	.....	.....	.....

Date of test .....

Baller test..... gal./min. with..... ft. drawdown after..... hrs.  
 Artesian flow..... g.p.m. Date.....  
 Temperature of water..... Was a chemical analysis made? Yes  No

(10) WELL LOG:  
 Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation

MATERIAL	FROM	TO
Sand, fine to medium, brown; gravel to 1/2 inch; root zone. (Fill)	0	1.1
Sand, fine, black; gravel, 1/2 inch; wood and cinders. (Gas Works deposits)	1.1	4.4
Sand, medium, dark gray; cobbles. (Recessional drift)	4.4	5
Sand, medium, brownish-gray; cobbles. (Recessional drift)	5	7
Sand, medium, gray; gravel, 1 inch; cobbles; some clay. No water in returns but water in hole. (Recessional drift)	7	14.7
Covered with locking iron water box set flush to land surface.		
Note: Well was drilled using an auger from 0 to 7 feet, then air rotary from 7 to 14.7 feet.		
Work started <u>11/1</u> , 19 <u>86</u> Completed <u>11/1</u> , 19 <u>86</u>		

**WELL DRILLER'S STATEMENT:**  
 This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Ronald C. Lane  
 (Person, firm, or corporation) (Type or print)  
 Address 1201 Pacific Avenue, Tacoma, WA 98402  
 [Signed] Ronald C Lane  
 (Well Driller)  
 License No. 1467 Date March 4, 1987

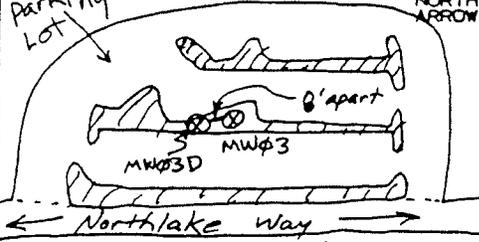


**GEOLOGIC LOG  
OF EXPLORATION**

CLIENT/OWNER: City of Seattle  
 TETRA TECH PROJECT NO.: TC-3015 Gas Works Park  
 EXPLORATION NUMBER MW03 SHEET 1 OF 1  
 START DATE 31 October 1986 HOUR 2:10 PM  
 GROUND SURFACE CONDITIONS: starting to dry out; patchy clouds w. some sun  
 TETRA TECH REPRESENTATIVE: Kurt Schmiederer  
 EXPLORATION CONTRACTOR: USGS WRD Tacoma  
 OPERATOR: USGS Santa Barbara - Dave Wiley  
 DRILL TYPE/METHOD: Hollow Stem Auger  
 HAMMER WEIGHT & STROKE: N.A.

**LOCATION SKETCH**

(SHOW DIMENSIONS TO MAPPED FEATURES)  
PARTIAL LOT



SURFACE ELEVATION 32.12 ft DATUM NGVD

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE (lb/in <sup>2</sup> )	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY
			core	min.	2"	2"	0	
			mod.		2"	2"	2	
			Auger cuttings			4.4"	4.4	
							6	
							8	
							10	
							11	
							12	
							13	
							14	
							15	
							16	
							17	
							18	
							19	
							20	

UNIFIED SYMBOL

WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
	31 Oct. 1986	3:45 AM (15:45)	5.5 ft.	6 ft.	N.A.

**DESCRIPTION OF STRATIGRAPHY**

0 - 0.5 ft root zone/organic layer.  
 1 - Sand and gravel, mod well graded fine through coarse sand and gravel, pea through 1 inch; well rounded. Organic rich matrix.  
 2 - Sand and gravel, mod. well rounded, fairly clean (low in organics) gravel is subangular to subrounded to 1 inch. Reddish brown in color = fill.  
 3 - Water encountered at 5.5 ft. - core barrel won't hold sample.  
 4 - Cobble layer ~1 ft thick at 5.5-6.5 ft level.  
 5 - Below this: moderately well graded mixture of sand through pea gravel, mod. to well rounded, small fines component. Sediment is saturated. Occasional cobble.  
 6 - Borehole terminated at 11-12 ft level with caving.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

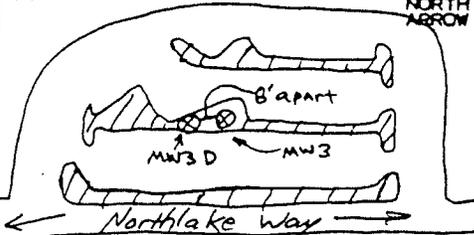
D/M/Y (5:15 AM)  
 FINISH DATE: 31/10/86 HOUR: 17:15 OR CONT.

**TE** GEOLOGIC LOG OF EXPLORATION

CLIENT/OWNER: City of Seattle  
 TETRA TECH PROJECT NO.: TE-3015 Gas Works Park  
 EXPLORATION NUMBER MW03 DEEP SHEET 1 OF 3 (15:30)  
 START DATE 1 November 1976 HOUR 2 PM - abandoned; 3:38 PM this borehole  
 GROUND SURFACE CONDITIONS: Clear - dry.

LOCATION SKETCH

(SHOW DIMENSIONS TO MAPPED FEATURES)



SURFACE ELEVATION 32.21 ft DATUM NGVD

TETRA TECH REPRESENTATIVE: Kurt Schmierer  
 EXPLORATION CONTRACTOR: USGS WRD Tacoma  
 OPERATOR: USGS Santa Barbara - Dave Wiley  
 DRILL TYPE/METHOD: Air Rotary with hardrock bit (3 cone)  
 HAMMER WEIGHT & STROKE: 3000 lbs. @ 140 strokes/minute

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/6	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY	DEPTH SCALE
							0		
							1		
							2		
							3		
							4		
							5		
							6		
							7		
							8		
							9		
							10		
							11		
							12		
							13		
							14		
							15		
							16		
							17		
							18		
							19		
							20		

moderate  
 Air rotary cuttings blown out of bore.

UNIFIED SYMBOL

WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
	1 Nov. 1976	4 PM (16:00)	11 ft	12 ft	12 ft

DESCRIPTION OF STRATIGRAPHY

Root zone/soil horizon  $\phi$  - > 1 ft. Organic rich.

Well graded mixture of sand and gravel with minor fine fraction of silt and clay. Coarse fraction is predominantly well rounded gravel to 1.5 inches, mostly 3/4 to 1 1/2 inches, but some pea gravel and cobbles. Cobbles are minor constituents, most are 3-4 inches dia. (interpreted from cuttings). Sands are fine to medium grained, with lesser coarse grained sand.

↓

Water encountered at approximately 11 ft.

Same as above - continuous, little variation.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED. P/M/Y  
 FINISH DATE: 3/11/86 HOUR:            OR CONT.

First attempted hole was augered to water with no casing. Hole could not be kept open below water due to severe caving and backfilling. Drill rig was moved 3 ft east, hammer installed, and new MW3 D drilled using 3-cone hardrock bits cased with 8 inch steel casing for entire length of borehole.



GEOLOGIC LOG OF EXPLORATION

LOCATION SKETCH (SHOW DIMENSIONS TO MAPPED FEATURES)



See previous page.

CLIENT/OWNER: City of Seattle  
TETRA TECH PROJECT NO.: TC-3015 Gas Works Park  
EXPLORATION NUMBER MW 3 DEEP SHEET 2 OF 3  
START DATE 1 November 1986 HOUR 15:30 (3:30 PM)  
GROUND SURFACE CONDITIONS: clear and dry.

TETRA TECH REPRESENTATIVE: Kurt Schmierer  
EXPLORATION CONTRACTOR: USGS WRD Tacoma  
OPERATOR: USGS Santa Barbara - Dave Wiley  
DRILL TYPE/METHOD: Air rotary with 3-cone hardrock bit.  
HAMMER WEIGHT & STROKE: 3000 lbs @ 140 strokes/minute.

SURFACE ELEVATION 32.21 ft DATUM NGVD

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/G	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY	DEPTH SCALE
									20
									1
									2
									3
									4
									5
									6
									7
									8
									9
									30
									1
									2
									3
									4
									5
									6
									7
									8
									9
									40

WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
	1 Nov. 1986	4 PM (1600)	11 ft	12 ft	12 ft

UNIFIED SYMBOL

DESCRIPTION OF STRATIGRAPHY

Same as above; sand with gravel to 1 inch.

↓

Change to sand at approximately 29 ft. Sand is medium to coarse grained, gray in color, with minor silt/clay component. Saturated.

↓

Change to well graded mixture of sand and gravel. Fine sand through gravel to 1 inch, minor clay/silt component; occasional cobble to 3-4 inches.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

FINISH DATE: 3/11/86 HOUR: DAILY OR CONT.

**TE** GEOLOGIC LOG OF EXPLORATION

CLIENT/OWNER: City of Seattle  
 TETRA TECH PROJECT NO.: TZ-3015 Gas Works Park  
 EXPLORATION NUMBER MW3 DEEP SHEET 3 OF 3  
 START DATE 1 Nov. 1986 HOUR 3:30 PM  
 GROUND SURFACE CONDITIONS: dry

LOCATION SKETCH  
 (SHOW DIMENSIONS TO MAPPED FEATURES)



See previous page.

TETRA TECH REPRESENTATIVE: Kurt Schmierer  
 EXPLORATION CONTRACTOR: USGS WRD Tacoma  
 OPERATOR: USGS Santa Barbara - Dave Wiley  
 DRILL TYPE/METHOD: Air rotary w. 3-cone hardrock bit.  
 HAMMER WEIGHT & STROKE: 3000 lbs @ 140 strokes/minute.

SURFACE ELEVATION 32.214 DATUM NGVD

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/G	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY	DEPTH SCALE
							0		0
							1		1
							2		2
							3		3
							4		4
							5		5
							6		6
							7		7
							8		8
							9		9
							50		50
							1		1
							2		2
							3		3
							4		4
							5		5
							6		6
							7		7
							8		8
							9		9

UNIFIED SYMBOL	WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
		1 Nov. 1986	4 PM (16:00)	11 ft	12 ft	12 ft

DESCRIPTION OF STRATIGRAPHY

Same as above: sand/gravel mixture, rounded, to 1 inch, minor silt/clay fraction. Occasional cobble, 3 to 6 inches.

continuous, little variation.

Borehole terminated at 60 ft with 8" steel casing driven to 57 ft level.

TERMINATED at 60 ft

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

FINISH DATE: 3/11/86 HOUR: 12:30 PM OR CONT.



# WATER WELL REPORT

STATE OF WASHINGTON

Application No. \_\_\_\_\_  
Permit No. \_\_\_\_\_

(1) OWNER: Name U.S. Geological Survey Address 1201 Pacific Ave., Tacoma, WA 98402  
 (2) LOCATION OF WELL: County King NE  $\frac{1}{4}$  NE  $\frac{1}{4}$  Sec 19 T 25 N. R. 4E W. WA  
 Bearing and distance from section or subdivision corner \_\_\_\_\_

(3) PROPOSED USE: Domestic  Industrial  Municipal   
 Irrigation  Test Well  Other

(4) TYPE OF WORK: Owner's number of well (if more than one) GWP-3D  
 New well  Method: Dug  Bored   
 Deepened  Cable  Driven   
 Reconditioned  Rotary  Jetted

(5) DIMENSIONS: Diameter of well 2 inches.  
 Drilled 60 ft. Depth of completed well 57.6 ft.

(6) CONSTRUCTION DETAILS: PVC casing  
 Casing installed: 2 " Diam. from 0.4 ft. to 57.6 ft.  
 Threaded  " Diam. from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
 Welded  " Diam. from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Perforations: Yes  No   
 Type of perforator used \_\_\_\_\_  
 SIZE of perforations \_\_\_\_\_ in. by \_\_\_\_\_ in.  
 \_\_\_\_\_ perforations from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
 \_\_\_\_\_ perforations from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
 \_\_\_\_\_ perforations from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Screens: Yes  No   
 Manufacturer's Name Hydrophilic  
 Type PVC Model No. \_\_\_\_\_  
 Diam. 2" Slot size 0.10 from 54.6 ft. to 57.6 ft.  
 Diam. \_\_\_\_\_ Slot size \_\_\_\_\_ from \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

Gravel packed: Yes  No  Size of gravel: #8 sand  
 Gravel placed from 47 ft. to 57 ft.

Surface seal: Yes  No  To what depth? 2 ft.  
 Material used in seal bentonite/cement  
 Did any strata contain unusable water? Yes  No   
 Type of water? \_\_\_\_\_ Depth of strata \_\_\_\_\_  
 Method of sealing strata off \_\_\_\_\_

(7) PUMP: Manufacturer's Name \_\_\_\_\_  
 Type: None HP \_\_\_\_\_

(8) WATER LEVELS: Land-surface elevation above mean sea level 32.21 ft.  
 Static level 14.67 ft. below top of well Date 11/3/86  
 Artesian pressure \_\_\_\_\_ lbs. per square inch Date \_\_\_\_\_  
 Artesian water is controlled by \_\_\_\_\_ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level  
 Was a pump test made? Yes  No  If yes, by whom? \_\_\_\_\_  
 Yield: \_\_\_\_\_ gal./min. with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.  
 " " " " " "  
 " " " " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test \_\_\_\_\_  
 Bailer test \_\_\_\_\_ gal./min. with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.  
 Artesian flow \_\_\_\_\_ g.p.m. Date \_\_\_\_\_  
 Temperature of water \_\_\_\_\_ Was a chemical analysis made? Yes  No

(10) WELL LOG:  
 Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation

MATERIAL	FROM	TO
Root zone. (Fill)	0	0.5
Sand, fine, brown, clayey; gravel pea to 2 inch; cobbles. (Recessional drift)	0.5	5
Sand, fine, brown, clayey; gravel pea to 2 inch; many cobbles; water at 5 1/2 feet. (Recessional drift)	5	7
Sand, fine, brown, clayey, saturated; gravel, pea. (Recessional drift)	7	12
Sand, gray, silty, clayey. (Recessional drift)	12	24
Sand, medium to coarse, gray, clayey, silty; gravel to 1 inch; some cobbles to 3 inches; water bearing. (Till)	24	38
Sand, medium to coarse, gray; gravel to 1/2 inch; no cobbles. (Advance drift)	38	60
Covered with locking iron water box set flush to land surface.		

Work started 11/1 1986 Completed 11/3 1986

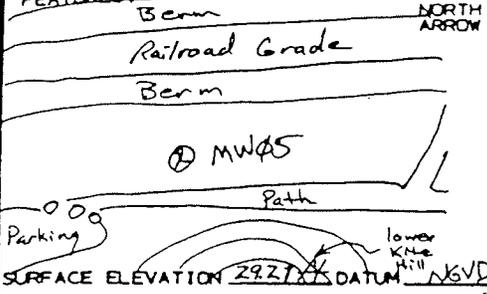
WELL DRILLER'S STATEMENT:  
 This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Ronald C. Lane (Type or print)  
 Address 1201 Pacific Avenue, Tacoma, WA 9840  
 [Signed] Ronald C. Lane (Well Driller)  
 License No. 1467 Date March 4 1987



GEOLOGIC LOG  
OF EXPLORATION

LOCATION SKETCH  
(SHOW DIMENSIONS TO MAPPED  
FEATURES)



CLIENT/OWNER: City of Seattle  
TETRA TECH PROJECT NO.: TC-3015 Gas Works Park

EXPLORATION NUMBER MW45 SHEET 1 OF 1  
START DATE 28 October 1986 HOUR ~ 11 AM

GROUND SURFACE CONDITIONS: Wet grass next to asphalt roadway/path

TETRA TECH REPRESENTATIVE: Kurt Schmierer  
EXPLORATION CONTRACTOR: USGS WRD Tacoma  
OPERATOR: USGS Santa Barbara - Dave Wiley  
DRILL TYPE/METHOD: Hollow Stem Auger  
HAMMER WEIGHT & STROKE: NA

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/6"	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GEOPHYSIC RECOVERY	DEPTH SCALE	UNIFIED SYMBOL	WATER LEVEL INFORMATION
									0		DATE: 28 October 1986
									1		TIME: 3:30 PM (15:30)
									2		DEPTH TO WATER: ~13 ft. (+)
									3		HOLE DEPTH: 18.5 ft.
									4		CASING DEPTH:
									5		
									6		
									7		
									8		
									9		
									10		
									11		
									12		
									13		
									14		
									15		
									16		
									17		
									18		
									19		
									20		

DESCRIPTION OF STRATIGRAPHY

0-1 ft: Sod/root zone/soil layer rich in organics.  
Predominantly sand with cobbles to 3 inches and silt/clay fraction.  
Sand, medium to coarse grained, with gravel to 3/4 inch silt/clay fraction. Numerous tar fragments. HNU reads 5-10 units on cuttings at borehole.  
Sand with petroleum saturated matrix, some brick residue 4-inch thick tarry layer - very solid, black. Very oily/slimy sediment (mostly sand). HNU: >20 units.  
Layered sand, silt, clay with intermittent oily layers which run off-scale on HNU at 0-20 units on HNU.  
Sand and gravel, rounded, with minor clay lenses; regular oily layers which give 100 units steady on HNU.  
Silty, clayey sand and gravel with cobbles to 3 inches; also contains construction fill (mainly brick) and dark petroleum contamination throughout. HNU=100.  
Sands and gravel, well rounded, poorly sorted, well graded with minor silt/clay component. Ubiquitous petroleum contamination to 70 units on HNU.  
Well graded sand/gravel mixture with occasional cobble; well rounded. Sediments are petroleum saturated. Water in this sample tube, with oily contamination.  
Same as above; water/oily saturation.  
Water encountered with augers at 18.5 ft. level. (13 ft level)  
Boring terminated in petroleum contaminated sediment at the 20 ft. level.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

FINISH DATE: 28/10/86 HOUR: 16:40 (4:40 PM) OR CONT.



GAS WORKS PARK  
WELL COMPLETION SPECIFICATIONS

Date: 27 May 1987  
Field Geologist: Kurt Schmierer  
(Signature): *Kurt E. Schmierer*  
Well Numbers: MW05  
Ground Elevation: 29.21 ft NGVD  
Start of Drilling: 28 October 1986  
(Day/Time) ~ 11 AM  
Finish of Well  
Development:  
(Day/Time)

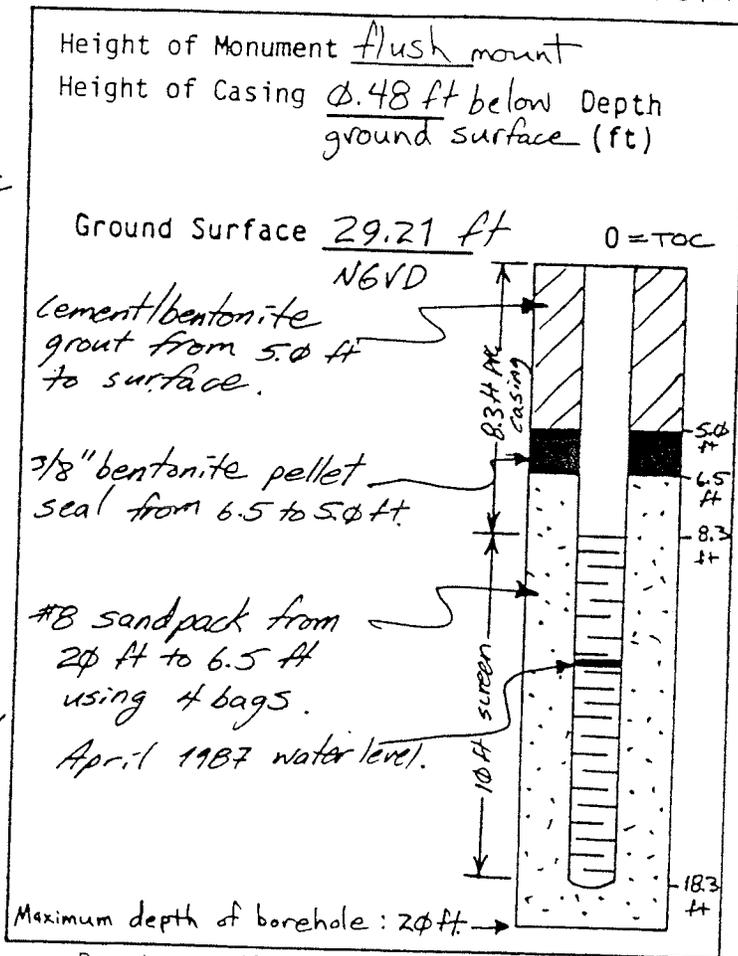
Drilling Company: USGS Santa Barbara  
Drillers: Dave Wiley &  
Stu Klady  
Pete Armstrong  
Type of Rig: Ingersoll-Rand  
Air Rotary

Nominal Hole Diam.: 8 inches  
Casing Type: welded joint PVC  
Casing size (id): 2 inch dia.  
Screen type: slotted PVC  
Slot size:  $\phi$ .  $\phi$ 1 $\phi$  inch  
Well Dev. Method: gas-powered  
surface pump with  
steel surging wand.  
Groundwater Measurements

Date/Time: 24 Apr. 1987  
Depth (TOC): 12.34 ft.  
Elevation: 16.39 ft.  
Datum: NGVD

Hydraulic Conductivity test method: pump test.

Saturated hydraulic conductivity:



Denote on diagram: location and thickness of annular fill material, screened interval(s), product and water levels.



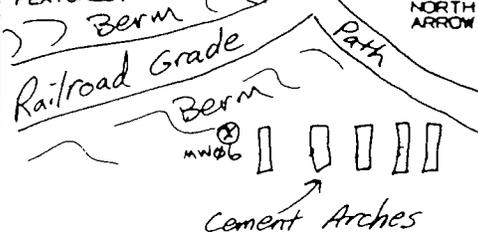




GEOLOGIC LOG OF EXPLORATION

CLIENT/OWNER: City of Seattle

LOCATION SKETCH (SHOW DIMENSIONS TO MAPPED FEATURES)



TETRA TECH PROJECT NO.: TC-3015 Gas Works Park  
EXPLORATION NUMBER MW06 SHEET 1 OF 1  
START DATE 27 Oct. 1986 HOUR ~9 AM  
GROUND SURFACE CONDITIONS: Wet; some standing H<sub>2</sub>O.

TETRA TECH REPRESENTATIVE: Kurt Schmirer  
EXPLORATION CONTRACTOR: USGS WRD Tacoma  
OPERATOR: USGS Santa Barbara - Dave Wiley  
DRILL TYPE/METHOD: Auger (hollow stem)  
HAMMER WEIGHT & STROKE: N.A.

SURFACE ELEVATION 27.16 ft DATUM NGVD

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/6"	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY	DEPTH SCALE	UNIFIED SYMBOL	WATER LEVEL INFORMATION	DESCRIPTION OF STRATIGRAPHY
									0			Soil/root zone, organic rich to 0.5 ft.
					2'	2'	2'		1			Clay/silt/sand/gravel to 1/2" mixture, predom. fine sand
									2			Sand (brown) with clay/silt fraction and rounded gravel to 3/4 inc
									3			Perched water encountered at 1.5 ft level.
					2'	2'	4'		4			Silty sand with rounded pea gravel, concrete fragments, cinders
									5			Water encountered at 3.5 ft level. black
					2'	2'	6'		6			Black contaminated sand with rounded pea gravel and concrete and wood fragments. Saturated.
							6.6'		7			Black (tarry?) plant wastes from 6.6 to 7.3 ft; then
					2'	0.9'	7.5'		8			Gray sand with some silt/clay and gravel fractions, to 7.5 ft (probable caved infill; assume from cutting that contaminated deposit extends to bottom of borehole)
									9			Borehole terminated at 10 ft level.
									10			
									11			
									12			
									13			
									14			
									15			
									16			
									17			
									18			
									19			
									20			

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

FINISH DATE: 27 Oct 1986 HOUR, NOON OR CONT. 0



GAS WORKS PARK

WELL COMPLETION SPECIFICATIONS

Date: 27 May 1987  
 Field Geologist: Kurt Schmiorek  
 (Signature): *Kurt S. Schmiorek*  
 Well Numbers: MW06  
 Ground Elevation: 27.16 ft NGVD  
 Start of Drilling: 27 Oct. 1987  
 (Day/Time) ~ 9 AM  
 Finish of Well  
 Development:  
 (Day/Time)

Drilling Company: USGS Santa Barbara  
 Drillers: Dave Wiley & 2  
 assistants: sty Klady  
 & Pete Armstrong  
 Type of Rig: Ingersoll-Rand  
 Air Rotary

Nominal Hole Diam.: 8 inches  
 Casing Type: welded joint PVC  
 Casing size (id): 2 inch dia.  
 Screen type: slotted PVC  
 Slot size: .010"  
 Well Dev. Method: gas-powered  
 surface pump with  
 steel surging wand.  
Groundwater Measurements

Date/Time: 23 Apr. 1987  
 Depth (TOC): 1.60 ft  
 Elevation: 25.14 ft  
 Datum: NGVD

Hydraulic Conductivity test method: pumpdown/  
rate of rise

Saturated  
 hydraulic  
 conductivity:

Height of Monument flush mount  
 Height of Casing 0.42 ft below Depth  
ground surface (ft)

Ground Surface 27.16 ft  
 (NGVD)

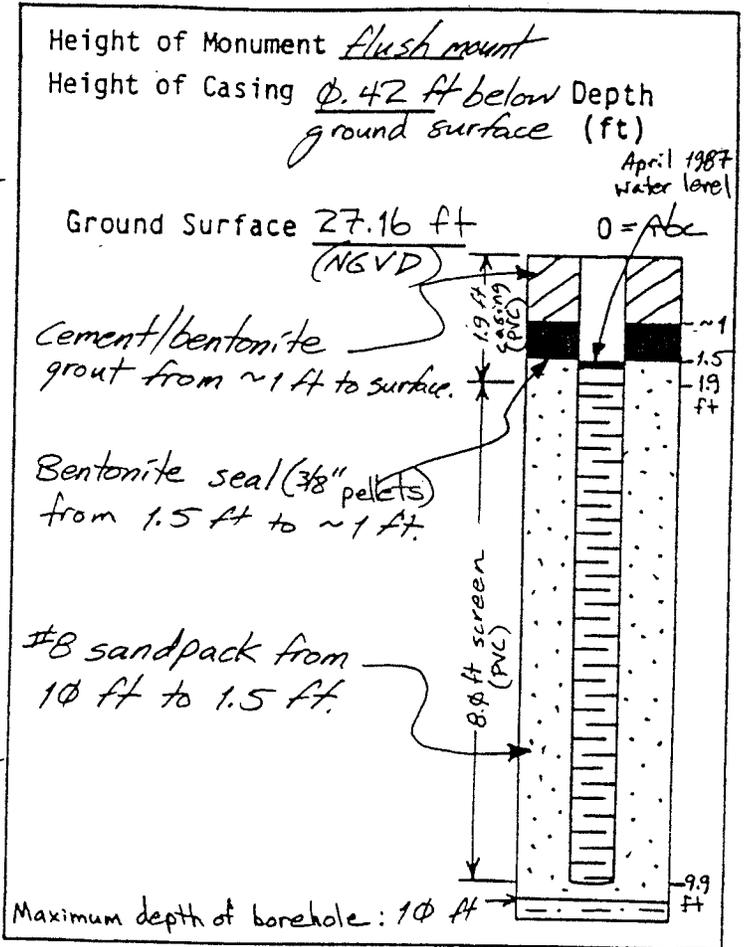
April 1987  
 water level

Cement/bentonite  
 grout from ~1 ft to surface.

Bentonite seal (3/8" pellets)  
 from 1.5 ft to ~1 ft.

#8 sandpack from  
 10 ft to 1.5 ft.

Maximum depth of borehole: 10 ft



Denote on diagram: location and  
 thickness of annular fill material,  
 screened interval(s), product and  
 water levels.

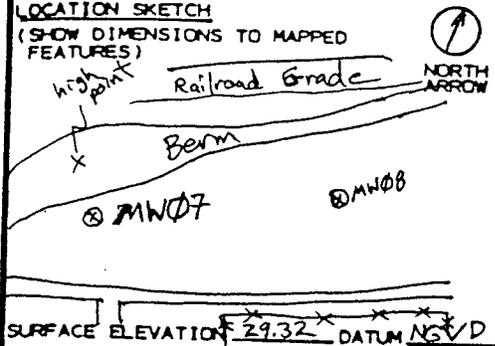




**GEOLOGIC LOG OF EXPLORATION**

**LOCATION SKETCH**

(SHOW DIMENSIONS TO MAPPED FEATURES)



CLIENT/OWNER: City of Seattle

TETRA TECH PROJECT NO.: TC-3015 - Gas Works Park

EXPLORATION NUMBER MW07 SHEET 1 OF 1

START DATE 28 October 1986 HOUR 7:30 AM

GROUND SURFACE CONDITIONS: Moist - no standing water.

TETRA TECH REPRESENTATIVE: Kurt Schmierer

EXPLORATION CONTRACTOR: USGS Tacoma - WRD

OPERATOR: USGS Santa Barbara - Dave Wiley

DRILL TYPE/METHOD: Hollow Stem Auger

HAMMER WEIGHT & STROKE: NA

SURFACE ELEVATION 29.32 \* DATUM NGVD

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/6"	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY
			Piston core using split-barrel sampler.	2.2	2'	2'	2.2	
				2.2	2'	2'	2.2	
				2.2	2'	2'	4.4	
				2.2	2'	2'	6.6	
				2.2	2'	2'	8.8	
				2.2	2'	2'	11	
				2.2	2'	2'	13.2	
			2.2	2'	2'	15.4		

UNIFIED SYMBOL	WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
		28 Oct. 86	~9:45 AM	~14 ft	17 ft	

**DESCRIPTION OF STRATIGRAPHY**

0 Dark brown soil horizon/root zone. Organic rich.

1 Rust-colored sand and gravel, well rounded, poorly sorted. Iron oxide staining. Minor silt/clay fraction.

2 HN

3 Orange iron-oxide stained sand/gravel mixture, well rounded, with minor silt/clay fraction. HNu reads a steady 1 unit over background on  $\phi$ -20 scale.

4 Well graded sand/gravel mixture; color change from rust red to yellow due to presence of sulfur.

5

6 Sand with some gravel to 1/2 inch; well rounded, occasional cobble. Minor silt/clay fraction; increases with depth. HNu reads 3.5 units @ 8.8 ft on sample core. Color change to dark, petroleum staining. No iron oxides.

7 Sand with minor gravel to 1/2 inch; intermittent silt/clay lenses, usu. with intermixed sand. Diesel odor.

8 Clay rich at top of core, with intermixed sand, gravel. Lower portion of core predominantly sand w. some gravel, well rounded. Diesel odor. HNu = 2.5 units, OVA ran off scale, set off alarm while driving last 2 cores.

9 Runny, wet clay indicates water encountered: ~4 ft level; predominantly well rounded sand with some gravel to 1/2 inch, minor silt/clay component.

10

11

12 Borehole terminated at ~17 ft level in water saturated sand/gravel/fines mixture, mostly sand.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

D/M/Y  
FINISH DATE: 29/10/86 HOUR: 11:00 AM OR CONT.



GAS WORKS PARK

WELL COMPLETION SPECIFICATIONS

Date: 27 May 1987  
 Field Geologist: Kurt Schmierer  
 (Signature): *Kurt Schmierer*  
 Well Numbers: MW07  
 Ground Elevation: 29.32 ft NGVD  
 Start of Drilling: 28 October 1986  
 (Day/Time) 07:30 AM  
 Finish of Well  
 Development:  
 (Day/Time)

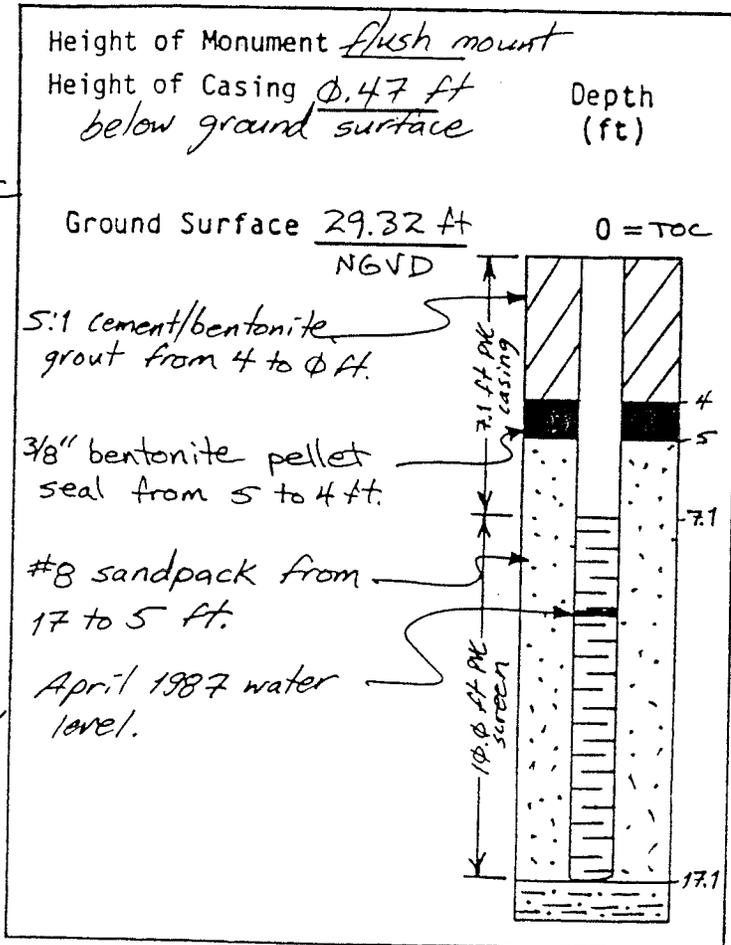
Drilling Company: USGS Santa Barbara  
 Drillers: Dave Wiley  
 Stu Klady  
 Pete Armstrong  
 Type of Rig: Ingersoll-Rand  
 Air Rotary

Nominal Hole Diam.: 8 inches  
 Casing Type: welded joint PVC  
 Casing size (id): 2 inch dia.  
 Screen type: slotted PVC  
 Slot size:  $\phi . \phi 1 \phi$  inch  
 Well Dev. Method: gas-powered  
 surface pump with  
 steel surging wand.  
Groundwater Measurements

Date/Time: 24 Apr. 1987  
 Depth (TOC): 9.60 ft  
 Elevation: 19.25 ft  
 Datum: NGVD

Hydraulic Conductivity test method: pump test.

Saturated  
 hydraulic  
 conductivity:



Denote on diagram: location and thickness of annular fill material; screened interval(s), product and water levels.









GAS WORKS PARK  
WELL COMPLETION SPECIFICATIONS

Date: 27 May 1987  
Field Geologist: Kurt Schmierer  
(Signature): *Kurt Schmierer*  
Well Numbers: MW08  
Ground Elevation: 29.88 ft NGVD  
Start of Drilling: 27 Oct. 1986  
(Day/Time) ~ 13:00  
Finish of Well  
Development:  
(Day/Time)

Drilling Company: USGS Santa Barbara  
Drillers: Dave Wiley  
Stu Klady  
Pete Armstrong  
Type of Rig: Ingersoll-Rand Air  
Rotary

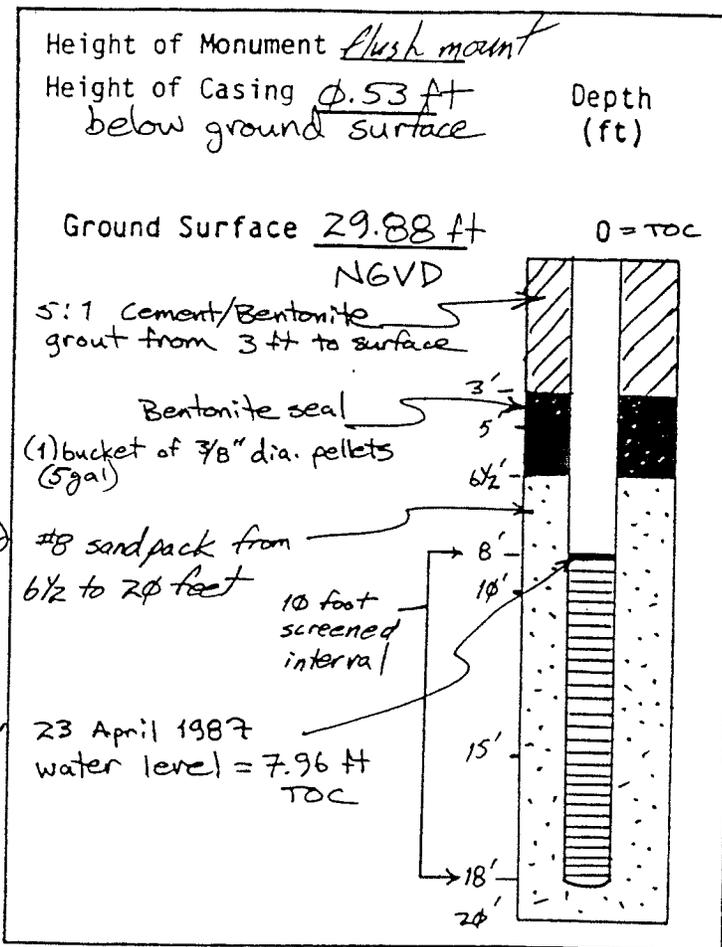
Final Hole Diam.: 8 inches  
Casing Type: welded PVC  
Casing size (id): 2 inch dia.  
Screen type: slotted PVC  
Slot size: 0.010 inch  
Well Dev. Method: surface  
pump w. surging pipe

Groundwater Measurements

Date/Time: 23 Apr. 1987  
Depth (TOC): 7.96 feet (TOC)  
Elevation: 29.88 feet  
Datum: NGVD

Hydraulic Conductivity test method: *Rate-of-recovery pump test.*

Saturated hydraulic conductivity:



Denote on diagram: location and thickness of annular fill material, screened interval(s), product and water levels.





**GEOLOGIC LOG  
OF EXPLORATION**

CLIENT/OWNER: City of Seattle  
 TETRA TECH PROJECT NO.: TE-3015 Gas Works Park  
 EXPLORATION NUMBER MWD09 SHEET 1 OF 1  
 START DATE 31 October, 1986 HOUR 10 AM  
 GROUND SURFACE CONDITIONS: damp; slight breeze

LOCATION SKETCH  
(SHOW DIMENSIONS TO MAPPED  
FEATURES)



TETRA TECH REPRESENTATIVE: Kurt Schriener  
 EXPLORATION CONTRACTOR: USGS WRD Tacoma  
 OPERATOR: USGS Santa Barbara - Dave Wiley  
 DRILL TYPE/METHOD: Hollow Stem Auger  
 HAMMER WEIGHT & STROKE: N.A.

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/8"	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY
			Split barrel sampler		2'	2'	2'	
			max. 1/2" cuttings only below 6 ft.		2'	2'	4'	
					2'	1'	5.9'	
								No samples obtained below 6 ft.

UNIFIED SYMBOL	WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
		31 Oct 86	~ NOON	~ 19 ft	~ 23 ft	Auger

DESCRIPTION OF STRATIGRAPHY

Soil/root zone to 0.5 ft brown w. sign. black from contamination. Below this: silt/sand/gravel mixture, black-brown, moderately high contaminant levels. HNU: 200(+) units over borehole

1 silt/sand/gravel mixture to 1.5 inches, well rounded. Gray, red, black staining - looks like ash - mostly black from petroleum contamination. HNU reads 300 units over borehole.

2 Building debris - mostly brick - broken, angular w. some rounded sand & gravel, clay/silt fraction. Moderately dry w. gray and black contamination (cinders/slag?); finer grained than above. HNU reads up to 100 units over borehole, steady 300(+) units; driller's airspace up to 200(+) units, usu. around 5 units. Last split-barrel sample was wet on outside = water (perched?). Due to airborne contaminant problem, decided to auger w/o sampling. Lost water after augering through clay at 10 ft. Material below 6 ft was logged from cuttings only, no piston cores:

3 Material in cuttings contains clay through gravel to 2 in, well rounded, apparently well graded, but no bedding int. in cuttings. Black cuttings above 10 ft level; below this is blue/gray clay w. intermixed sediment. Scrap pipe, brick encountered from 13-15 ft level.

4 Below this level: clay through gravel, cobbles to 3 in, apparently well graded, with significant silt/clay fraction.

5 Continuous to 23 ft level.

6 H<sub>2</sub>O encountered

7 Borehole terminated at 23 ft level.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

FINISH DATE: 31/10/86 HOUR: 12:45 PM OR CONT.

Barreled cuttings read steady 100 units on HNU at top of barrel, 200(+) units directly over cuttings. All HNU readings this page are over background (= 4 units maximum).



GAS WORKS PARK

WELL COMPLETION SPECIFICATIONS

Date: 27 May 1987  
 Field Geologist: Kurt Schmierer  
 (Signature): *Kurt Schmierer*  
 Well Numbers: MW09  
 Ground Elevation: 27.62 ft NGVD  
 Start of Drilling: 31 October 1986  
 (Day/Time) ~10 AM  
 Finish of Well  
 Development:  
 (Day/Time)

Drilling Company: USGS Santa Barbara  
 Drillers: Dave Wiley  
 Stu Klady  
 Pete Armstrong  
 Type of Rig: Ingersoll-Rand  
 Air Rotary

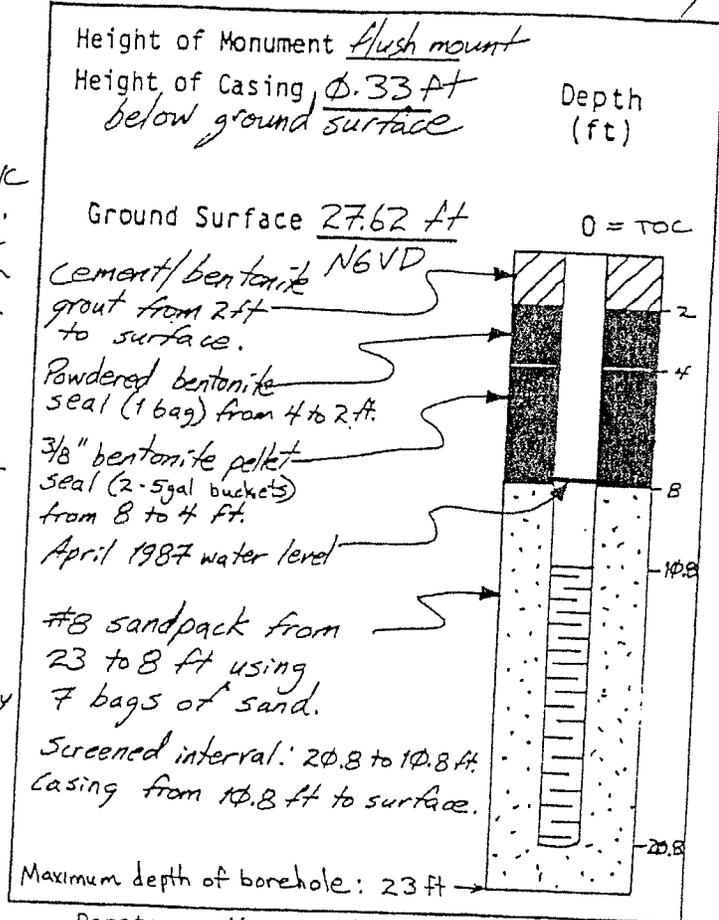
Nominal Hole Diam.: 8 inches  
 Casing Type: welded joint PVC  
 Casing size (id): 2 inch dia.  
 Screen type: slotted PVC  
 Slot size:  $\phi. \phi 1 \phi$  inch  
 Well Dev. Method: gas-powered  
 surface pump with steel  
 surging wand.

Groundwater Measurements

Date/Time: 24 Apr. 1987  
 Depth (TOC): 7.74 ft.  
 Elevation: 19.55 ft.  
 Datum: NGVD

Hydraulic Conductivity test method: pump test.

Saturated hydraulic conductivity:



Denote on diagram: location and thickness of annular fill material, screened interval(s), product and water levels.



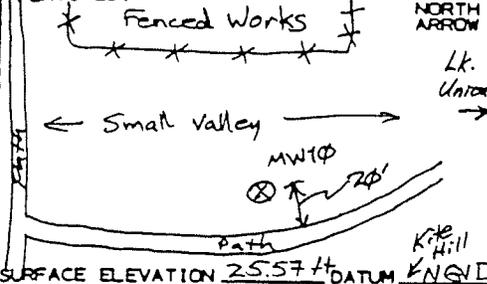


**GEOLOGIC LOG  
OF EXPLORATION**

CLIENT/OWNER: City of Seattle  
 TETRA TECH PROJECT NO.: TE-3015 Gas Works Park  
 EXPLORATION NUMBER MW10 SHEET 1 OF 1  
 START DATE 28 October 1986 HOUR 4:30 PM  
 GROUND SURFACE CONDITIONS: wet grass.

**LOCATION SKETCH**

(SHOW DIMENSIONS TO MAPPED FEATURES)



TETRA TECH REPRESENTATIVE: Kurt Schmirer  
 EXPLORATION CONTRACTOR: USGS WRD Tacoma  
 OPERATOR: USGS Santa Barbara - Dave Wiley  
 DRILL TYPE/METHOD: Hollow Stem Auger  
 HAMMER WEIGHT & STROKE: N.A.

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/6"	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY
0								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
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27								
28								
29								
30								

UNIFIED SYMBOL	WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
		29 Oct. 86	9:30 AM	10.5 ft	~11 ft	Auger

**DESCRIPTION OF STRATIGRAPHY**

Soil/root zone: organic rich layer, dark brown; to 0.5 ft.  
 Mixture of fines/sand/gravel to 1/2 inch, rounded; small cobbles.  
 Sand is predominant, some fines (silt, clay).  
 Gravelly sand, moderately well graded. Gravel is well rounded, 1/2 to 1 inch; occasional cobble.  
 HNU readings: 20-29 units directly on core; 12-20 in airspace.  
 Iron oxides in sandy matrix = reddish yellow color.  
 Increased cobble content with depth. HNU readings in driller's airspace down to ~5 units over background.  
 Large granitic cobble momentarily stopped progress here.  
 Change at 9.7 ft level to pure coarse salt and pepper sand, subround to round; water bearing.  
 Thin (2 inch) clay horizon at 12 ft. level; return to medium to coarse sands below clay layer.  
 Color change in sand due to iron oxide presence from salt/pepper to reddish gray. Few fines.  
 Continued medium to coarse sand, rounded, water bearing. Moderately well sorted, few fines.  
 Borehole terminated at 16.5 ft level.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

FINISH DATE: 29/10/86 HOUR: 10:00 AM OR CONT.







GAS WORKS PARK  
WELL COMPLETION SPECIFICATIONS

Date: 27 May 1987  
 Field Geologist: *Kurt Schmiere*  
 (Signature): *Kurt Schmiere*  
 Well Numbers: MW11  
 Ground Elevation: 31.51 ft NGVD  
 Start of Drilling: 30 October 1986  
 (Day/Time) 10:30 AM  
 Finish of Well  
 Development:  
 (Day/Time)

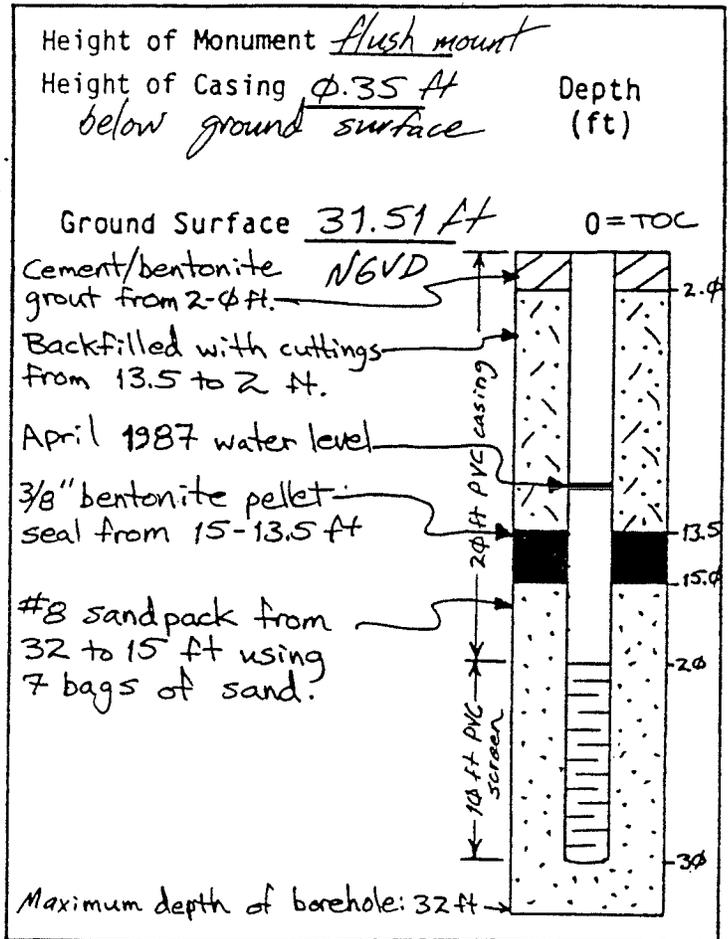
Drilling Company: USGS Santa Barbara  
 Drillers: Dave Wiley  
 Jta Klady  
 Pete Armstrong  
 Type of Rig: Ingersoll-Rand Air  
 Rotary

Nominal Hole Diam.: 8 inches/4 in.  
 Casing Type: welded joint PVC  
 Casing size (id): 2 inch dia.  
 Screen type: slotted PVC  
 Slot size:  $\phi$ . $\phi$ 1 $\phi$  inch  
 Well Dev. Method: gas-powered  
 surface pump with steel  
 surging wand.  
Groundwater Measurements

Date/Time: 24 Apr. 1987  
 Depth (TOC): 11.9 $\phi$  ft  
 Elevation: 19.26 ft  
 Datum: NGVD

Hydraulic Conduct-Rate-of-recovery  
 ivity test method: pump test.

Saturated  
 hydraulic  
 conductivity:



Denote on diagram: location and thickness of annular fill material, screened interval(s), product and water levels.







GAS WORKS PARK  
WELL COMPLETION SPECIFICATIONS

Date: 27 May 1987  
 Field Geologist: Kurt Schmierer  
 (Signature): *Kurt Schmierer*  
 Well Numbers: MW12  
 Ground Elevation: 18.73 ft NGVD  
 Start of Drilling: 31 October 1986  
 (Day/Time) 07:45 AM  
 Finish of Well  
 Development:  
 (Day/Time)

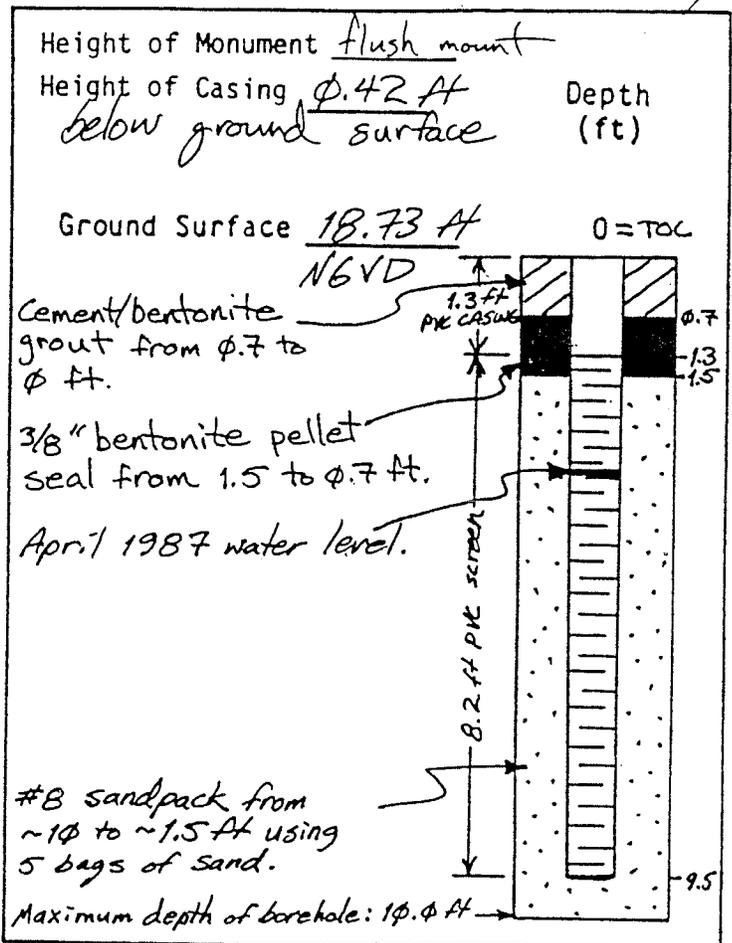
Drilling Company: USGS Santa Barbara  
 Drillers: Dave Wiley  
 Stu Klady  
 Pete Armstrong  
 Type of Rig: Ingersoll-Rand  
 Air Rotary

Nominal Hole Diam.: 8 inches  
 Casing Type: welded joint PVC  
 Casing size (id): 2 inch dia.  
 Screen type: slotted PVC  
 Slot size:  $\phi$ .  $\phi$ 1  $\phi$  inch  
 Well Dev. Method: gas-powered  
 surface pump with steel  
 surging wand.  
Groundwater Measurements

Date/Time: 24 Apr. 1987  
 Depth (TOC): 3.18 ft  
 Elevation: 15.13 ft  
 Datum: NGVD

Hydraulic Conduct-Rate-of-recovery  
 ivity test method: pump test.

Saturated  
 hydraulic  
 conductivity:



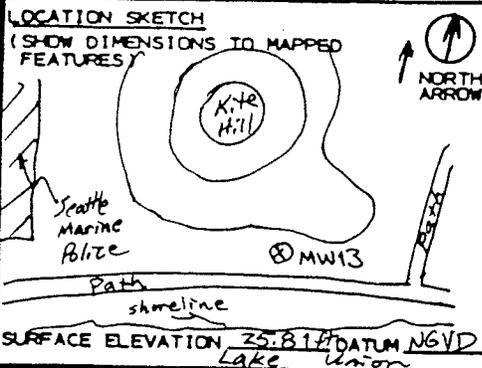
Denote on diagram: location and thickness of annular fill material, screened interval(s), product and water levels.





**GEOLOGIC LOG OF EXPLORATION**

CLIENT/OWNER: City of Seattle  
 TETRA TECH PROJECT NO.: TC-3015 Gas Works Park  
 EXPLORATION NUMBER MW13 SHEET 1 OF 1  
 START DATE 29 October 1988 HOUR 2 PM  
 GROUND SURFACE CONDITIONS: Raining steady - very wet. standing water.

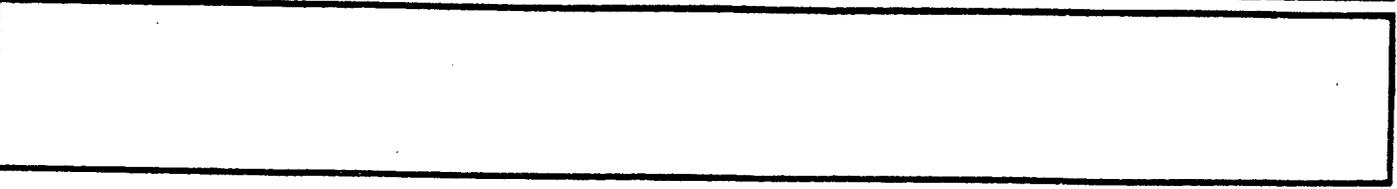


TETRA TECH REPRESENTATIVE: Kurt Schmierer  
 EXPLORATION CONTRACTOR: USGS WRD Tacoma  
 OPERATOR: USGS Santa Barbara - Dave Wiley  
 DRILL TYPE/METHOD: Hollow Stem Auger  
 HAMMER WEIGHT & STROKE: N.A.

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE #	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY	DEPTH SCALE	UNIFIED SYMBOL	WATER LEVEL INFORMATION			
											DATE	TIME	DEPTH TO WATER	HOLE DEPTH
											29 Oct. 86	3:43 PM (15:43)	12 ft	13 ft
					2'	2'	2'				DESCRIPTION OF STRATIGRAPHY			
											Soil/root zone w. broken glass down to 0.5 ft.			
											0.5 to 1.9 ft is sandy loam rich in organics.			
											1.9 to 2.4 ft is black carbon residue with pebbles.			
											Gap in infilling.			
											Compacted solid black carbon residue (lamp black) with no intermixed sediment - pure.			
											Compacted solid black carbon residue - No HNU response.			
							6.6'				Continued solid black carbon residue - textural change from very fine, compacted material to granular black carbon, highly compacted. No HNU response.			
							8.8'				Carbon zone ends at 9.5 ft; change to silt/sand/gravel mixture to 1 inch; well rounded; mod. well graded; sandy matrix contains some iron oxides. Wood from 10.4-10.5 ft. No pea gravel fraction i.e. ~ bimodal. Some carbon.			
							11'				At 11 ft: organic/carbon material mixed with sediment gives way to clay/silt/sand/gravel to 1 in, well rounded, mod well graded (no pea gravel); blue-gray in color, wet. Some wood fragments.			
							13.1'				Predominantly subangular fine to coarse sand with lesser clay, silt; gravel (rounded) to 1.5 inches.			
											Borehole terminated at 18 ft. level.			

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

FINISH DATE: 29/10/88 HOUR: 4:30 PM OR CONT.

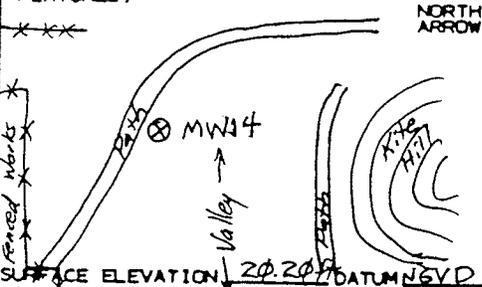






**GEOLOGIC LOG  
OF EXPLORATION**

LOCATION SKETCH Lake Union  
(SHOW DIMENSIONS TO MAPPED  
FEATURES)



CLIENT/OWNER: City of Seattle

TETRA TECH PROJECT NO.: TC-3015 Gas works Park

EXPLORATION NUMBER MW14 SHEET 1 OF 1

START DATE 29 October 1986 HOUR 10:45 AM

GROUND SURFACE CONDITIONS: moist, but no standing water

TETRA TECH REPRESENTATIVE: Kurt Schmierer

EXPLORATION CONTRACTOR: USGS WRD Tacoma

OPERATOR: USGS Santa Barbara - Dave Wiley

DRILL TYPE/METHOD: Hollow Stem Auger

HAMMER WEIGHT & STROKE: N.A.

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/6"	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY
					2'	2'	2'	
					2'	1.5'	4'	
					2'	1.5'	6.2'	
					2'	1.7'	8'	
					2'	2'	10.5'	

DEPTH SCALE	UNIFIED SYMBOL
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
	29 Oct. 86	~NOON	7 ft	8 ft	Auger

**DESCRIPTION OF STRATIGRAPHY**

Soil/root zone w. pebbles to 0.5 ft. Remainder to 2 ft is fine to med. grained sand, subangular to rounded, occasional pebble; med. well sorted, poorly graded. Brown. Color change to reddish orange, higher proportion of rounded pebbles; includes (3) interbeds of hardened, black, tarry deposits up to 4 inches thick, more common from 3.5 to 4 ft than above.

Brown sand through pebbles to 1/2 inch, moderately well graded, poorly sorted. Becomes clay rich at 5.7 ft. Below 5.7 ft: black, dry petroleum residue in sediment, gravel (rounded) to 1.5 inches. From 6 to 8 ft: increased pea gravel; very well graded sand/gravel mixture with water showing at 7 ft.

Well graded sand through gravel, subangular to well rounded; color change from brown to blue/gray due to presence of petroleum contaminants (bottom of core) Very well graded, poorly sorted mixture of clay/silt/sand/gravel/lobbles to 4 inches. Borehole terminated at 12 ft.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

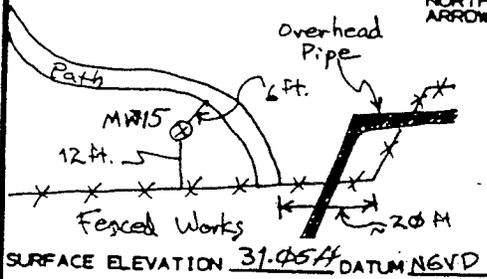
FINISH DATE: 29 Oct 86 HOUR: 12:30 PM OR CONT.





GEOLOGIC LOG OF EXPLORATION

LOCATION SKETCH (SHOW DIMENSIONS TO MAPPED FEATURES)



CLIENT/OWNER: City of Seattle  
TETRA TECH PROJECT NO.: TC-3015 Gas Works Park  
EXPLORATION NUMBER MW15 SHEET 1 OF 1  
START DATE 30 October 1986 HOUR 7:30 AM  
GROUND SURFACE CONDITIONS: Wet grass, very windy.

TETRA TECH REPRESENTATIVE: Kurt Schmierer  
EXPLORATION CONTRACTOR: USGS WRD Tacoma  
OPERATOR: USGS Santa Barbara - Dave Wiley  
DRILL TYPE/METHOD: Hollow Stem Auger  
HAMMER WEIGHT & STROKE: N.A.

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/6"	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY	DEPTH SCALE	UNIFIED SYMBOL	WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
												30 Oct. 86	9:40 AM	-15 ft	17.5 ft	NA. - Auger

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/6"	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY	DEPTH SCALE
									0
					2'	0'	2'		1
					2'	0'	4'		2
					2'	2'	6'		3
					2'	2'	8'		4
					2'	2'	10'		5
					2'	1.5'	11.5'		6
					2'	2'	14'		7
					2'	2'	16'		8
					2'	1.5'	17.5'		9
									10
									11
									12
									13
									14
									15
									16
									17
									18
									19
									20
									21

DESCRIPTION OF STRATIGRAPHY

Soil/root zone; organic rich, to 0.5 ft.

Extremely poor recovery 0-4 ft; interpreted from cuttings: loose, unconsolidated sand and gravel to 1 inch, with brick fragments, tar, broken slag, and dark petroleum staining; also iron staining (red) and yellow (sulfur?) staining present.

Unconsolidated gravel, well graded, angular through rounded, with sand and cobbles to 3 inches. Considerable amount of broken brick, slag, tar, and oily residue; iron staining. Roughly equal proportions of sand and gravel to 1.5 inches, moderate to well rounded; brown at 6 ft level, some iron staining, dark with petroleum staining in 7-8 ft interval. Less construction rubble than above.

Same as above with less petroleum staining.

Roughly equal parts sand and gravel to 1 inch, well rounded, dark with petroleum staining. Occasional cobble to 2 inches.

Silt/sand/gravel mixture (to 1 inch), well rounded; upper portion is oil stained; lower portion contains some bluegray clay.

Very coarse grained sand/gravel/cobbles to 2 inches; mostly gravel/cobbles, rounded, dark w. petroleum staining; becomes finer grained, iron stained at 14.5 ft. Lithologic change to blue/gray clay/silt/fine sand mixture at 15 ft; fine grained salt & pepper sand, subangular, at 15.5 ft, well sorted. Change to very coarse gravel w. cobbles to 1.5 inches at 16.5 ft level, mod. well rounded, some clay/silt, sandy matrix, well graded - petroleum stained, dark. Continued to 20(+)-ft - last cuttings from borehole are dk. w. petrol staining. Borehole terminated at ~21 ft. level.

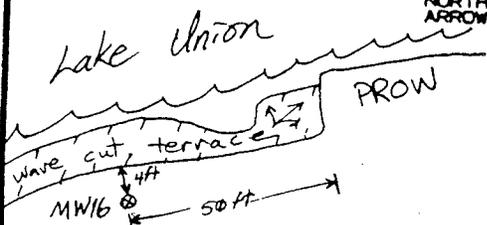
NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.  
FINISH DATE: 30 Oct 1986 HOUR: 10 AM OR CONT.





**GEOLOGIC LOG OF EXPLORATION**

LOCATION SKETCH (SHOW DIMENSIONS TO MAPPED FEATURES)



SURFACE ELEVATION 16.56 ft DATUM NGVD

CLIENT/OWNER: City of Seattle  
 TETRA TECH PROJECT NO.: TZ-3015 Gas Works Park  
 EXPLORATION NUMBER MW16 SHEET 1 OF 1  
 START DATE 30 October 1986 HOUR 3 PM (15:00)  
 GROUND SURFACE CONDITIONS: Raining light but steady; on wet grass just above (north of) wave-cut terrace (cobble/slag)  
 TETRA TECH REPRESENTATIVE: Kurt Schmirerer  
 EXPLORATION CONTRACTOR: USGS WRD Tacoma  
 OPERATOR: USGS Santa Barbara, Dave Wiley  
 DRILL TYPE/METHOD: Hollow stem auger  
 HAMMER WEIGHT & STROKE: N.A.

CASING DEPTH	CASING DRIVE RESISTANCE	SAMPLE NO.	SAMPLE TYPE	PENETRATION RESISTANCE/G	LENGTH DRIVEN	SAMPLE LENGTH RECOVERED	DEPTH (FT.)	GRAPHIC RECOVERY
			Air-lift core					
			Med-high		2'	8"	~1'	
					2'	10"	23'	
			Auger cuttings only					

UNIFIED SYMBOL	WATER LEVEL INFORMATION	DATE	TIME	DEPTH TO WATER	HOLE DEPTH	CASING DEPTH
		30 Oct 86	3:30 PM (15:30)	~2 ft	2 (+) ft	N.A. - Auger

**DESCRIPTION OF STRATIGRAPHY**

Soil/root zone, organic rich to  $\phi$ .5 ft, remainder of core is Tarry gravel/sand mixture, some slag to 1 inch. HNU reads 400 units at borehole.

Very thick tarry mixture with intermixed sand, gravel. HNU readings: steady 1000 units at borehole (over background). Encountered water at ~2 ft level. Color change: above water, tar is black; below 2 ft level, tar is blue/black. No piston cores attempted below 4 ft,  $\therefore$  remainder of log is interpreted from drill cuttings.

Between 4 ft and ~13 ft level: Predominantly tar, with some intermixed sediment. Material is blue/black in color. Some probable layers of nearly pure tarry materials, with little or no intermixed sediment. Material is very sticky (a shovel full inverted over barrel sticks to shovel blade, must be scraped off). I did not handle the material to determine sediment content and size. All cuttings have very large quantities of the blue/black tar/oil sludge.

Borehole terminated at ~13 ft level in very tarry deposit.

NOTES: ADD 'C' TO SAMPLE TYPE IF A CATCHER IS USED.

D/M/Y  
 FINISH DATE: 30/10/86 HOUR: 4:15 PM (16:15) OR CONT.



GAS WORKS PARK  
WELL COMPLETION SPECIFICATIONS

Date: 27 May 1987  
 Field Geologist: Kurt Schmiesser  
 (Signature): *Kurt S. Schmiesser*  
 Well Numbers: MW16  
 Ground Elevation: 16.56 ft NGVD  
 Start of Drilling: 30 October 1986  
 (Day/Time) 15:00 (3 PM)  
 Finish of Well  
 Development:  
 (Day/Time)

Drilling Company: USGS Santa Barbara  
 Drillers: Dave Wiley  
 Stu Klady  
 Pete Armstrong  
 Type of Rig: Ingersoll-Rand  
 Air Rotary

Nominal Hole Diam.: 8 inches/4 in  
 Casing Type: welded joint PVC  
 Casing size (id): 2 inch dia.  
 Screen type: slotted PVC  
 Slot size:  $\phi$ .  $\phi$  1  $\phi$  inch  
 Well Dev. Method: gas-powered  
 surface pump with steel  
 surging wand.

Groundwater Measurements

Date/Time: 24 Apr. 1987  
 Depth (TOC):  $\phi$ .  $\phi$  5 ft  
 Elevation: 15.58 ft  
 Datum: NGVD

Hydraulic Conductivity test method: pump test.

Saturated  
 hydraulic  
 conductivity:

Height of Monument flush mount  
 Height of Casing  $\phi$ . 48 ft      Depth  
 below ground surface      (ft)

Ground Surface 16.56 ft      0 = TOC

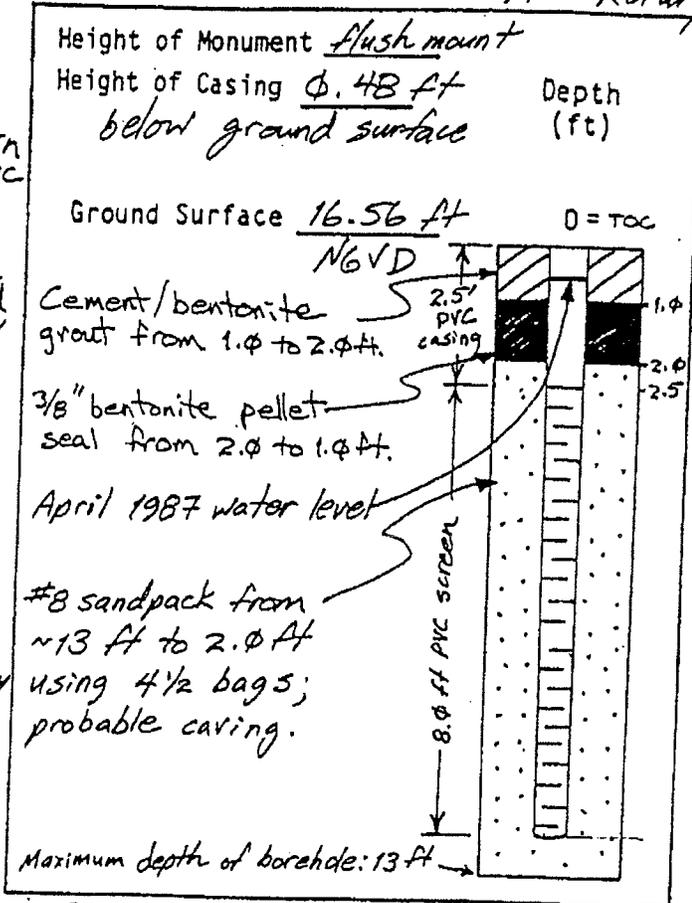
Cement/bentonite  
 grout from 1.  $\phi$  to 2.  $\phi$  ft.

3/8" bentonite pellet  
 seal from 2.  $\phi$  to 1.  $\phi$  ft.

April 1987 water level

#8 sandpack from  
 ~13 ft to 2.  $\phi$  ft  
 using 4 1/2 bags;  
 probable caving.

Maximum depth of borehole: 13 ft



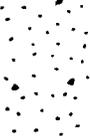
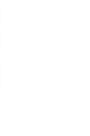
Denote on diagram: location and  
 thickness of annular fill material,  
 screened interval(s), product and  
 water levels.

MW  
 1.7  
 below  
 WT

**Focused Field Investigation and  
Irrigation Feasibility Study  
(HDR Engineering 1988)**

**1988 Borings**

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>MW 17</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2				<i>SILTY SAND: Light brown, some clay, some fine gravel</i>	
		4				<i>SILTY SAND: Light brown, some clay, some coarse gravel</i>	
		6				<i>CLAYEY SAND: Brown, some coarse gravel</i>	
		8				<i>SILTY SAND: Dark brown, some fine gravel, trace clay, moist</i>	
		10				<i>SAND: Dark brown, moist, many wood fragments, especially branches and roots (10% by volume)</i>	▽
		12					
		14					
		16				<i>CLAYEY SAND: Dark brown/gray, with fine to coarse gravel</i>	
		18				▽ <i>Approximate depth to Groundwater</i>	
		20					
		22					
		24					
WATER LEVEL						BOTTOM DEPTH OF BORING: <i>17.3'</i>	
WHILE DRILLING:							
AFTER DRILLING:		HOURS AFTER DRILLING					
LOGGED BY: <i>Sprague</i>		SAMPLED BY: <i>Actor</i>		<b>HDR ENGINEERING, INC.</b>			
DATE:		COMPLETED: <i>6/21/88 1125</i>					
STARTED: <i>6/21/88 1040</i>							

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #1</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2			[Symbol: Dotted pattern]	<i>SAND: Dark brown, some silt, trace organics, some coarse gravel</i>	
		4			[Symbol: Vertical lines with dots]	<i>SILTY SAND: Black, some coarse gravel, moist</i>	
		6			[Symbol: Vertical lines with dots]		
		8			[Symbol: Vertical lines with dots]		▽
		10			[Symbol: Vertical lines with dots]		
		12			[Symbol: Vertical lines with dots]		
		14			[Symbol: Vertical lines with dots]		
		16			[Symbol: Vertical lines with dots]		
		18			[Symbol: Vertical lines with dots]		
		20			[Symbol: Vertical lines with dots]	<i>▽ Approximate depth to Groundwater</i>	
		22			[Symbol: Vertical lines with dots]		
		24			[Symbol: Vertical lines with dots]		
BOTTOM DEPTH OF BORING:							
WATER LEVEL							
WHILE DRILLING:							
AFTER DRILLING:				HOURS AFTER DRILLING			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE:							
STARTED: <i>6/24/88 0831</i>				COMPLETED: <i>6/24/88 0851</i>			



HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #2</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2			▲	<i>SILTY SAND: Gray, coarse gravel</i>	
		4			▲	<i>SILTY SAND: Black, fine gravel, becoming more silty</i>	
		6			▲		
		8			▲	<i>SILTY GRAVEL: Black, several cobbles</i>	
		10			▲		
		12			▲	▽ <i>Approximate depth to Groundwater</i>	▽
		14			▲		
		16			▲		
		18			▲		
		20			▲		
		22			▲		
		24			▲		
BOTTOM DEPTH OF BORING: <i>14.75'</i>							
WATER LEVEL							
WHILE DRILLING:							
AFTER DRILLING:				HOURS AFTER DRILLING			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Acton</i>			
STARTED: <i>6/24/88</i>				COMPLETED: <i>6/24/88</i>			
DATE: <i>1012</i>				DATE: <i>1029</i>			



HDR ENGINEERING, INC.



# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #4</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2			●●●●●	<i>SILTY SAND: Light brown, fine to medium grained, some coarse gravel</i>	
		4			●●●●●	<i>SILTY SAND: Black, fine to medium grained, some cobbles</i>	
		6			●●●●●	<i>SAND: Black, medium to coarsely grained, some silt, several pods of black silty clay, some fine gravel, highly organic with roots, some oily tar</i>	<i>OVA readings between 10-40ppm</i>
		8			●●●●●		
		10			●●●●●		
		12				<i>SILTY CLAY: Black, fine, moist, highly organic with roots, some fine gravel</i>	<i>Moisture at 11.5'</i>
		14					▽
		16				<i>Impenetratable object hit at 15', drilling terminated</i>	
		18					
		20					▽ <i>Approximate depth to Groundwater</i>
		22					
		24					
BOTTOM DEPTH OF BORING: <i>14.4'</i>							
WATER LEVEL							
WHILE DRILLING:				AFTER DRILLING:			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Ac tor</i>			
STARTED: <i>6/27/88 0820</i>				COMPLETED: <i>6/27/88 0837</i>			
							HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #5</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2			●●●●●●●●●●	<i>SILTY SAND: Light brown, fine to medium grained, some coarse gravel, some organics</i>	
		4			●●●●●●●●●●	<i>SILTY SAND: Dark brown, medium to coarse grained, some fine gravel, some pods of clay, tan</i>	
		6			●●●●●●●●●●		▽
		8			●●●●●●●●●●		
		10			●●●●●●●●●●	<i>GRAVEL: Fine to coarse, becoming smaller with increase in depth, some fine grained sand</i>	
		12			●●●●●●●●●●		
		14			●●●●●●●●●●		
		16				<i>▽ Approximate depth to Groundwater</i>	
		18					
		20					
		22					
		24					
BOTTOM DEPTH OF BORING: <i>14.5'</i>							
WATER LEVEL							
WHILE DRILLING:							
AFTER DRILLING:				HOURS AFTER DRILLING			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE:							
STARTED: <i>6/27/88 0945</i>				COMPLETED: <i>6/27/88 0953</i>			



HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #6</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2				<i>SILTY SAND: Black, fine to coarse grained, some coarse gravel, some organics with roots</i>	
		4				<i>SILTY SAND: Black, fine. Some fine gravels, only sheen</i>	
		6					
		8					
		10				<i>GRAVEL: Very coarse, up to 4" diameter, some sand, black, fine to medium grained, very oily sheen</i>	
		12					Moisture at 11'
		14					
		16				▽ <i>Approximate depth to Groundwater</i>	
		18					
		20					
		22					
		24					
BOTTOM DEPTH OF BORING: <i>14.4'</i>							
WATER LEVEL							
WHILE DRILLING:				AFTER DRILLING:			
				HOURS AFTER DRILLING			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE:							
STARTED: <i>6/27/88 1055</i>				COMPLETED: <i>6/27/88 1107</i>			



HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Work</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #7</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2				<i>SILTY SAND: Brown, fine to medium grained, some fine gravel, trace organics</i>	▽
		4				<i>SILTY SAND: Black, fine to medium grained, some coarse gravel, some organics, oily sheen</i>	<i>Water at 2'</i>
		8					
		10				▽ <i>Approximate depth to Groundwater</i>	<i>OVA reading 10-80 ppm in breathing zone</i>
		12					
		14					
		16					
		18					
		20					
		22					
		24					
						BOTTOM DEPTH OF BORING: <i>7.5'</i>	
WATER LEVEL							
WHILE DRILLING:							
AFTER DRILLING:				HOURS AFTER DRILLING			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE:							
STARTED: <i>6/27/88 1300</i>				COMPLETED: <i>6/27/88 1308</i>			



HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #8</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2			[Symbol]	<i>SILTY SAND: Brown, fine to medium grained, some fine gravel</i>	
		4			[Symbol]	<i>SILTY SAND: Brown, fine to medium grained, some coarse gravel, some large brick fragments</i>	
		6			[Symbol]	<i>SILT: Black, some fine to medium grained sand, some coarse gravel, some organics with roots</i>	
		8			[Symbol]		
		10			[Symbol]		
		12			[Symbol]	<i>CLAY: Gray, some silt, some fine sand, some fine gravel, very moist</i>	<i>OVA reading 50 ppm in breathing zone ▽</i>
		14			[Symbol]		
		16				<i>▽ Approximate depth to Groundwater</i>	
		18					
		20					
		22					
		24					
BOTTOM DEPTH OF BORING: <i>14.8'</i>							
WATER LEVEL							
WHILE DRILLING:				AFTER DRILLING:			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE:				HOURS AFTER DRILLING			
STARTED: <i>6/27/88 1341</i>				COMPLETED: <i>6/27/88 1357</i>			



HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608 - 004 - 102</i>			
BORING NUMBER: <i>TMS #9</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2			•••••	<i>SILTY SAND: Dark brown, fine to medium grained, heavily organic with roots, some fine gravel</i>	
		4			•••••	<i>SILTY SAND: Black, fine to medium grained, heavily organic, heavily gravelled, fine to coarse</i>	▽
		6			•••••		
		8			•••••		
		10			•••••		
		12			•••••		
		14			•••••		
		16			•••••	▽ <i>Approximate depth to Groundwater</i>	
		18			•••••		
		20			•••••		
		22			•••••		
		24			•••••		
						BOTTOM DEPTH OF BORING: <i>13.1'</i>	
WATER LEVEL							
WHILE DRILLING:				AFTER DRILLING:			
				HOURS AFTER DRILLING			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE:							
STARTED: <i>6/28/88 0804</i>				COMPLETED: <i>6/28/88 0818</i>			



HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #10</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2			●●●●●●●●	<i>SILTY SAND: Black, fine to medium grained, heavily organic with roots, some coarse gravel</i>	
		4			●●●●●●●●	<i>SAND: Tan, medium to coarsely grained, some fine gravel</i>	
		6			●●●●●●●●	<i>SILTY SAND: Gray, fine grained, some pods of clay, some fine gravel, moist</i>	<i>OVA reading 2-5 ppm in breathing zone</i>
		8			●●●●●●●●		
		10			●●●●●●●●		▽
		12			●●●●●●●●		
		14			●●●●●●●●		
		16				<i>▽ Approximate depth to Groundwater</i>	
		18					
		20					
		22					
		24					
						BOTTOM DEPTH OF BORING: <i>14.7'</i>	
WATER LEVEL							
WHILE DRILLING:				AFTER DRILLING:			
AFTER DRILLING:				HOURS AFTER DRILLING			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE:							
STARTED: <i>6/28/88 0910</i>				COMPLETED: <i>6/28/88 0928</i>			



HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #11</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2			[Symbol]	<i>SILTY SAND: Black, fine to medium grained, some fine to coarse gravel, some organics</i>	
		4			[Symbol]		
		6			[Symbol]	<i>CLAY: Black, silty, very dense, some brown medium grained sand, some fine gravel, moist</i>	
		8			[Symbol]	<i>CLAY: Black, silty, very dense, heavily organic, with roots and wood chips, moist</i>	
		10			[Symbol]	<i>SILTY SAND: Black, fine grained, dense, moist, some pods of gray clay, trace organics</i>	
		12			[Symbol]		
		14			[Symbol]		▽
		16			[Symbol]		
		18			[Symbol]	<i>GRAVEL: Coarse</i>	
		20				▽ <i>Approximate depth to Groundwater</i>	
		22					
		24					
BOTTOM DEPTH OF BORING: <i>17.6'</i>							
WATER LEVEL							
WHILE DRILLING:				AFTER DRILLING:			
AFTER DRILLING:				HOURS AFTER DRILLING			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE:				DATE:			
STARTED: <i>6/28/88 1046</i>				COMPLETED: <i>6/28/88 1102</i>			



HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #12</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2				<i>SILTY SAND: Brown, fine to medium grained, some fine gravel, some organics</i>	
		4				<i>SILTY SAND: Black, fine to medium grained, fine to coarse gravel, some organics</i>	
		6					
		8					
		10				<i>CLAY: Black, silty, dense, moist, heavily organic with wood chips, several pods of gray clay, several pods of tan fine grained sand, some fine gravel</i>	
		12					
		14					
		16				<i>CLAY: Gray, silty, moist, dense, some pods of fine grained sand</i>	
		18					▽
		20					
		22				<i>▽ Approximate depth to Groundwater</i>	
		24					
WATER LEVEL						BOTTOM DEPTH OF BORING: <i>19.6'</i>	
WHILE DRILLING:							
AFTER DRILLING:							
LOGGED BY: <i>Williams</i>				HOURS AFTER DRILLING			
DATE:				SAMPLED BY: <i>Actor</i>			
STARTED: <i>6/28/88 1300</i>				COMPLETED: <i>6/28/88 1318</i>			
HDR ENGINEERING, INC.							

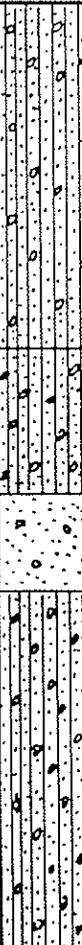
# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #13</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2				<i>SILTY SAND: Dark brown, fine to coarse grained, some organics</i>	
		4				<i>GRAVEL: Coarse, some bricks</i>	
		4				<i>BRICKS: Large chunks of wood</i>	
		6				<i>SILTY SAND: Black, fine grained, several pods of gray densely packed silty clay</i>	
		8				<i>GRAVEL: Fine, to coarse</i>	
		10				<i>SAND: Brown, medium to coarse grained, some pods of gray silty clay, some fine gravel</i>	
		16				<i>GRAVEL: Large rounded cobbles</i>	
		18				<i>SAND: Brown, medium to coarse grained, some pods of gray silty clay, some fine gravel</i>	
		20				▽ <i>Approximate depth to Groundwater</i>	
						BOTTOM DEPTH OF BORING: <i>19.4'</i>	
WATER LEVEL							
WHILE DRILLING:				AFTER DRILLING:			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE: <i>6/29/88 0857</i>				COMPLETED: <i>6/29/88 0916</i>			



HDR ENGINEERING, INC.

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #14</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2 4 6 8 10 12 14 16 18 20 22 24				<p><i>SILTY SAND: Dark brown, fine to coarse grained, heavily gravelled, fine, some organics</i></p> <p><i>SILTY SAND: Black, fine grained, oily, moist</i></p> <p><i>SAND: Dark brown, medium to coarse grained, some fine gravel, some pods of brown silty clay</i></p> <p><i>SILTY SAND: Light brown, fine to medium grained, dense, very moist, some coarse gravel</i></p>	<p><i>OVA reading 5 ppm in breathing zone; &gt;1000 ppm at hole</i></p> <p style="text-align: center;">▽</p> <p><i>▽ Approximate depth to Groundwater.</i></p>
BOTTOM DEPTH OF BORING: <i>19.4'</i>							
WATER LEVEL							
WHILE DRILLING:				AFTER DRILLING:			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
STARTED: <i>6/29/88 1018</i>				COMPLETED: <i>6/29/88 1035</i>			



**HDR ENGINEERING, INC.**

# HDR ENGINEERING, INC.

PROJECT NAME: <i>Gas Works</i>				PROJECT NUMBER: <i>06608-004-102</i>			
BORING NUMBER: <i>TMS #15</i>				BORING LOCATION:			
SAMPLE				GROUND SURFACE ELEVATION:			
NUMBER	TIME	DEPTH (FEET)	LENGTH (FEET)	RECOVERY (%)	TYPE	DESCRIPTION (USC)	REMARKS
		2				<i>SILTY SAND: Dark brown, fine to coarse grained, loosely packed, some fine gravel, some organics</i>	
		4					
		6				<i>SAND: Dark brown, medium to coarse grained, some fine gravel, some silt. very moist</i>	
		8					
		10					<i>Found piece of broken cable 4" x 1/2"</i>
		12					
		14				<i>▽ Approximate depth to Groundwater</i>	
		16					
		18					
		20					
		22					
		24					
						BOTTOM DEPTH OF BORING: <i>12.8'</i>	
WATER LEVEL							
WHILE DRILLING:				AFTER DRILLING:			
				HOURS AFTER DRILLING			
LOGGED BY: <i>Williams</i>				SAMPLED BY: <i>Actor</i>			
DATE:							
STARTED: <i>6/29/88 1259</i>				COMPLETED: <i>6/29/88 1306</i>			



HDR ENGINEERING, INC.

**Fate and Transport Assessment of  
PAHs from Tar, Gas Works Park  
(Electric Power Research  
Institute and Puget Sound Energy 1998)**

**1997 and 1998 Borings**



**WELL INSTALLATION LOG**  
Recovery Well RW-1

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Gas Works Park Old Railroad Grade, ~20' West of MLS-1		DRILLING CO.: Cascade Drilling
START DATE: 03/30/98 TIME: 14:10	BORING ID: 10 inches	DRILLER: James Goble
COMPLETION DATE: 03/30/98 TIME: 16:30	TOTAL DEPTH: 22.5 feet bgs	RIG TYPE: CME-55
WATER LEVEL DURING DRILLING: 19.0' bgs	TOP OF CASING: 33.31 feet (NAVD88)	METHOD: Hollow-stem Auger*
SURFACE ELEV.: 33.66 feet (NAVD88)		LOGGED BY: G. Sega

DEPTH (in feet)	WELL CONSTRUCTION	SOIL DESCRIPTION		SAMPLE DATA										
		U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)						
0 - 10	FLUSH-MOUNT WELL MONUMENT WELL CAP CONCRETE													
10 - 15	2" DIAMETER SCHEDULE 40 PVC BLANK	SP		SAND WITH GRAVEL, ASH AND CINDERS (GAS WORKS PARK UNIT); Light brown to tan; medium- to coarse-grained; <10% fines; 20% gravel to 4 cm maximum diameter; abundant ash and cinders; few brick fragments; dry.										
15 - 20	BENTONITE CHIPS			5.0' - No ash or cinders present; dry; slight odor; rock in tip of sampler.										
20 - 25	RMC LONESTAR #2-12 SAND			7.0' - Dry; slight odor; rock in tip of sampler.										
25 - 30				9.0' - Dry; slight odor.										
30 - 33.31				9.8' - Orange staining to 10.0 feet bgs.										

REMARKS: \* Hand dug to 5.0 feet bgs. SP hollow-stem auger used to total depth. Lithology descriptions were taken from Monitoring Well Installation Log for PZ-9.

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA				
	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)		
10	SP								
	SP-SM								
	SP								
	SP								
	SP								
	SM								
	SP								
	SW-SM								
15	SM								
	SW-SM								
	SM								
	SW-SM								
	SM								

2" DIAMETER SCHEDULE 40 PVC BLANK

2" DIAMETER SCHEDULE 40 PVC  
0.010" SLOTTED SCREEN

RMC LONESTAR #2-12 SAND



REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth. Lithology descriptions were taken from Monitoring Well Installation Log for PZ-9.



**WELL INSTALLATION LOG**  
Recovery Well RW-1

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

DEPTH (in feet)	WELL CONSTRUCTION	SOIL DESCRIPTION		SAMPLE DATA					
		U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	
0	<p>2" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN</p> <p>RMC LONESTAR #2-12 SAND</p> <p>POINTED END CAP</p>	SM							
22.5		SC	<p>CLAYEY SAND; Gray; fine-grained; 30% stiff fines; very hard; dry to moist; no sheen; no odor.</p>						
				Total depth = 22.5 feet bgs.					

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth. Lithology descriptions were taken from Monitoring Well Installation Log for PZ-9.



# WELL INSTALLATION LOG

## Piezometer PZ-1

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-110 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Gas Works Park		DRILLING CO.: TEG
START DATE: 12/04/97 TIME: 08:00	BORING ID: inches	DRILLER: Todd
COMPLETION DATE: 12/04/97 TIME: 10:00	TOTAL DEPTH: 16.0 feet bgs	RIG TYPE: Strata Probe
WATER LEVEL DURING DRILLING: 5.5' bgs	TOP OF 2" CASING: 21.55 feet (NAVD88)	METHOD: Direct Push/Split Spoon
SURFACE ELEV.: 22.00 feet (NAVD88)		LOGGED BY: J. F. Gibbens

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA			
			U.S.C.S.	LITHOLOGY		TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0					<b>PAVEMENT:</b> Underlain by gravel sub-base.					
0 - 3			GWP		<b>SILTY SANDY GRAVEL;</b> Black; with ash/wood fragments; some oily wood/coal; no sheen; no odor.  GRADES with wood; solid.	SS		HARD	50	0
3 - 6					GRADES with wood; solid.	SS		SOFT	30	0
6 - 14			SD		<b>SILTY COARSE SAND;</b> Gray; with some wood debris; occasional well rounded gravel fragments; wet; no sheen; no odor.  GRADES with brown/gray interbed of sandy silt. GRADES to gray fine to medium sand; no sheen; no odor. GRADES to gray-brown sandy silt; with wood; no sheen; no odor. GRADES to gray-black silty sandy coarse gravel; no sheen; no odor.	SS		SOFT	80	0
14 - 16			VT		<b>SILTY SANDY COARSE GRAVEL;</b> Gray; very hard; no sheen; no odor.	SS		HARD VERY HARD	80	0
16.0			Total depth = 16.0 feet bgs.							

REMARKS: ■ - Analytical Sample  
 ▣ - Sample Interval  
 SS - Split Spoon



# WELL INSTALLATION LOG

## Piezometer PZ-2

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-110 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Gas Works Park		DRILLING CO.: TEG
START DATE: 12/04/97 TIME: 10:10	BORING ID: inches	DRILLER: Todd
COMPLETION DATE: 12/04/97 TIME: 14:00	TOTAL DEPTH: 26.0 feet bgs	RIG TYPE: Strata Probe
WATER LEVEL DURING DRILLING: 14.0' bgs	TOP OF 2" CASING: 30.95 feet (NAVD88)	METHOD: Direct Push/Split Spoon
SURFACE ELEV.: 31.15 feet (NAVD88)		LOGGED BY: J. F. Gibbens

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA				
	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)				
0											
0 - 1.5	CONCRETE	TOPSOIL									
1.5 - 20	GWP	SILTY SANDY GRAVEL	SS	SOFT	60	0					
20 - 21	SD	GRADES to gray/brown-black silty gravelly medium sand; some wood debris; brick fragments; no sheen; slight creosote odor.	SS	MOD SOFT	50	0					
21 - 22		GRADES to gray gravelly sand; some wood debris; slight sheen; slight creosote odor.	SS	VERY SOFT	40	0					
22 - 23		GRADES to gray silty fine sand; no sheen; slight odor.	SS	SOFT	10	0					
23 - 24		GRADES with gray/brown silt interbed.									
24 - 25		GRADES with gray/brown silt interbed.									
25 - 26		GRADES to uniform coarse gravel (pea gravel); strong sheen; stained and possible product; strong odor.	SS	SL HARD	4.1						
26 - 27		GRADES to cobbly coarse gravel; strong sheen; stained and possible product; strong odor.	SS	HARD	50	12					
27 - 28		GRADES to uniform fine to medium sand; stained black; moderate sheen; moderate odor.	SS	HARD	100	0.5					
28 - 29		GRADES to black sandy gravel; with silt; wood; stained; moderate odor.	SS		40	0					
29 - 30	VT	FINE TO MEDIUM SAND	SS	HARD	100	0					
30 - 31		GRADES to gray medium sand; with black-stained lenses; occasional dropstone (egg size); slight sheen; moderate odor.	SS	HARD	100	0					
31 - 32		GRADES to gray medium sand; with dropstone gravel; coarser at bottom; no sheen; slight odor.		VERY HARD		0					
32 - 33		SANDY SILTY GRAVEL									
33 - 34		Total depth = 26.0 feet bgs.									

REMARKS:    ■ - Sample Interval  
              SS - Split Spoon



# WELL INSTALLATION LOG

## Piezometer PZ-3

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-110 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Gas Works Park		DRILLING CO.: TEG
START DATE: 12/04/97 TIME: 14:00	BORING ID: inches	DRILLER: Todd
COMPLETION DATE: 12/04/97 TIME: 17:05	TOTAL DEPTH: 26.0 feet bgs	RIG TYPE: Strata Probe
WATER LEVEL DURING DRILLING: ' bgs	TOP OF 2" CASING: 30.83 feet (NAVD88)	METHOD: Direct Push/Split Spoon
SURFACE ELEV.: 31.03 feet (NAVD88)		LOGGED BY: J. F. Gibbens

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA			
			U.S.C.S.	LITHOLOGY		TYPE	DEPTH	BLOWS/6"	% RECOVERY	PTD (ppm)
0					FILL					
0 - 1.5	CONCRETE									
1.5 - 14.5	BENTONITE		GWP	Silty Sand	<p><b>SILTY SANDY GRAVEL</b>; Black; no sheen; slight odor.</p> <p>3.5'-4.5' - Gray gravelly fine- to medium-grained sand; no sheen; moderate odor.</p> <p>4.5'-6.0' - Black sandy gravel; with brick fragments, glass and wood; stained; moderate odor.</p> <p>6.0'-6.5' - Some zones of medium-grained sand; stained with oil; moderate odor.</p> <p>6.5'-8.0' - Gray silty clay; with some vegetation; dry; hard; no sheen; no odor.</p> <p>8.0'-8.25' - Oil-soaked, matted vegetation; strong sheen; strong odor.</p> <p>8.25'-10.0' - Green sandy silty clay; dry; hard; no sheen; slight odor.</p> <p>10.0'-10.25' - Uniform pea gravel.</p> <p>10.25'-11.0' - Dark brown fine-grained sand; no sheen; slight odor.</p> <p>11.0'-11.75' - Gray gravelly silt; with wood debris; slight odor.</p> <p>11.75'-12.5' - Gray sandy gravel; slight odor.</p>	SS	SOFT	100		
14.5 - 15			SB	Sand	<p><b>FINE- TO MEDIUM-GRAINED SAND</b>; Uniform; oily; strong sheen/stain; strong odor.</p> <p>13.5'-14.0' - Tan/brown fine-grained sand; with thin (&lt;1/8") silt interbeds.</p> <p>14.0'-16.3' - Very oily (saturated?); strong odor.</p>	SS	HARD	100		

REMARKS:    □ - Sample Interval  
                   SS - Split Spoon



WELL INSTALLATION LOG  
Piezometer PZ-3

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA				
			U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0			SB						0
16.3									
17.0									
17.0					SS		MOD HARD	100	
19.0									0
19.0									
19.5									
19.5					SS		HARD	100	
22.5									0
22.5					SS		HARD	70	
24.5									
25			VT						0
26.0									
Total depth = 26.0 feet bgs.									

1" DIAMETER SCHEDULE 80 PVC  
0.010" SLOTTED SCREEN

CAP

10/20 SILICA SAND

REMARKS: □ - Sample Interval  
SS - Split Spoon



# WELL INSTALLATION LOG

## Piezometer PZ-4

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-110 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Gas Works Park		DRILLING CO.: TEG
START DATE: 12/05/97 TIME: 08:00	BORING ID: inches	DRILLER: Kevin
COMPLETION DATE: 12/05/97 TIME:	TOTAL DEPTH: 33.0 feet bgs	RIG TYPE: Strata Probe
WATER LEVEL DURING DRILLING: 'bgs	TOP OF 2" CASING: 30.30 feet (NAVD88)	METHOD: Direct Push/Split Spoon
SURFACE ELEV.: 30.48 feet (NAVD88)		LOGGED BY: J. F. Gibbens

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA				
	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)				
0	CONCRETE										
0 - 1			SS	SOFT	90	0					
1 - 1.5			SS	MOD SOFT	50	0					
1.5 - 2			SS	SOFT	40	0					
2 - 2.5			SS	SOFT	50	0					
2.5 - 3			SS	SOFT	90	0					
3 - 3.5			SS	MOD HARD	100	0					
3.5 - 4			SS	HARD	42	1					
4 - 4.5			SS	MOD HARD	100	0					
4.5 - 5			SS	HARD	90	8					
5 - 25			SS		80	>400					

REMARKS: □ - Sample Interval  
SS - Split Spoon

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION			SAMPLE DATA				
			U.S.C.S.	LITHOLOGY		TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
28	1" DIAMETER SCHEDULE 80 PVC 0.1" SLOTTED SCREEN	10/20 SILICA SAND	SD	[Dotted pattern]	GRADES to oil-stained medium sand; strong odor.	SS	SOFT	90	0	0
30			GRADES to brown; uniform medium sand; moderate odor.		28					
30	CAP	10/20 SILICA SAND	VT	[Dotted pattern with circles]	GRADES with black oil-stained lense ~1.5" thick; strong odor.	SS	VERY HARD	80	0	0
30					GRADES to brown uniform medium sand; moderate odor.					>150
30					GRADES with some thin (<1" thick) silt lenses.					>150
30					GRADES to black, oily, stained medium sand; with occasional gravel; very strong odor.					>150
30					GRADES to black saturated medium sand; strong odor.					>150
30					SILTY SANDY COBBLY GRAVEL; Gray; no sheen; slight odor.					0
30					Total depth = 33.0 feet bgs.					

REMARKS: □ - Sample Interval  
SS - Split Spoon



# WELL INSTALLATION LOG

## Piezometer PZ-5

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-110 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Seattle Harbor Police Lot		DRILLING CO.: TEG
START DATE: 12/05/97 TIME: 11:35	BORING ID: inches	DRILLER: Kevin
COMPLETION DATE: 12/05/97 TIME: 15:00	TOTAL DEPTH: 28.0 feet bgs	RIG TYPE: Strata Probe
WATER LEVEL DURING DRILLING: 7.72' bgs	TOP OF 2" CASING: 24.28 feet (NAVD88)	METHOD: Direct Push/Split Spoon
SURFACE ELEV.: 24.49 feet (NAVD88)		LOGGED BY: J. F. Gibbens

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA			
	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PTD (ppm)			
0			SS		SOFT	60	0			
0-1		TOPSOIL / GRASS; Black.								
1-2		GRADES to gray uniform medium sand; dry.								
2-3		SILTY SANDY ASH; Black; with wood-brick fragments; no sheen; no odor.	SS			0				
3-4		NO - sheen; no odor on spoon.	SS			0				
4-5		NO - sheen; no odor on spoon.	SS			0				
5-6		NO - sheen; no odor on spoon.	SS			0				
6-7		GRADES to black silty sand; with brick fragments; slight sheen; moderate odor.	SS		SOFT	20	0			
7-8		GRADES to black sandy gravel; stained; strong odor.	SS		SOFT	40				
8-9		GRADES to black silty mud; strong odor.	SS							
9-10		GRADES to black sandy gravel; stained; strong odor.	SS		SOFT	100	100			
10-11		SILTY SANDY GRAVEL; Gray.	SS							
11-12		GRADES to gray sandy silt; with thin (<1") medium sand interbeds.	SS		HARD	80	0			
12-13		GRADES to gray gravelly medium sand; no sheen; slight odor.	SS							
13-14		GRADES to gray gravelly silt; no sheen; slight odor.	SS		VERY HARD	50	0			
14-15		GRADES to gray fine uniform sand.	SS							
15-16		GRADES to gray silty sandy gravel; no sheen; slight odor.	SS							
16-17		GRADES to gray silty fine sand; very hard; no sheen; slight odor.	SS		HARD	0	0			
17-18		GRADES to gray silty gravelly sand; some iron staining; no sheen; no odor.	SS							
18-19		GRAVELLY SILT; Gray; dry; very hard; no sheen; very slight odor.	SS		VERY HARD	20	0			
19-20										
20-21										
21-22										
22-23										
23-24										
24-25										
25-26										
26-27										
27-28										
28		Total depth = 28.0 feet bgs.								

REMARKS:  - Sample Interval  
 - Split Spoon



# WELL INSTALLATION LOG

## Piezometer PZ-6

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-110 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Seattle Harbor Police Lot		DRILLING CO.: TEG
START DATE: 12/05/97 TIME: 15:00	BORING ID: inches	DRILLER: Kevin/Todd
COMPLETION DATE: 12/08/97 TIME: 10:30	TOTAL DEPTH: 37.0 feet bgs	RIG TYPE: Strata Probe
WATER LEVEL DURING DRILLING: 7.03' bgs	TOP OF 2" CASING: 23.55 feet (NAVD88)	METHOD: Direct Push/Split Spoon
SURFACE ELEV.: 23.91 feet (NAVD88)	LOGGED BY: J. F. Gibbens	

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA			
		U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)		
0										
0 - 1	CONCRETE	GWP	ASPHALT	SS	SOFT	70	0			
1 - 5	BENTONITE		ASHY CINDERS; Yellow/red. GRADES to black ash; with brick fragments and wood; no sheen; no odor.	SS	SOFT	20	0			
5 - 10			GRADES to yellowish ashy cinders; with gravel. GRADES to black oily wood fiber; slight odor.	SS	SOFT	0				
10 - 15			GRADES with some smelly black mud in catcher; strong odor. GRADES with black oily water; small amount of coarse gravel; scrap metal. GRADES to coarse gravel.	SS	SOFT	0	0			
15 - 20			GRADES with some coarse gravel in catcher. GRADES to black ashy fine sand. GRADES to gray silty sandy gravel; with black oily lenses; strong odor.	SS	MOD HARD	10				
20 - 25	10/20 SILICA SAND	SD	GRAVELLY MEDIUM TO COARSE SAND; Gray; no sheen; slight odor.	SS	HARD	100	0			
25 - 30			GRADES to gray gravelly medium sand; no sheen; slight odor. GRADES to gray uniform fine sand; no sheen; slight odor. GRADES to gray sandy gravel.	SS	HARD	100	0			
30 - 35			GRADES to gray uniform medium sand. GRADES to black oily stained sand at bottom 2". GRADES to gray gravelly medium sand; stained at bottom; moderate odor.	SS	MOD HARD	100	64	0		
35 - 40			GRADES to gray uniform fine sand; sheen; strong odor.	SS	MOD HARD	100	41			
Total depth = 37.0 feet bgs.										

REMARKS: Hole collapsing - using piston sample from 13.0 feet bgs on.  
 ☒ - Sample Interval  
 SS - Split Spoon



# WELL INSTALLATION LOG

## Piezometer PZ-7

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-110 Gas Works Park	CLIENT: EPRI
LOCATION: Seattle, Washington; Seattle Harbor Police Lot	DRILLING CO.: TEG
START DATE: 12/08/97 TIME: 10:45	BORING ID: inches
COMPLETION DATE: 12/08/97 TIME: 14:30	TOTAL DEPTH: 35.0 feet bgs
WATER LEVEL DURING DRILLING: ' bgs	TOP OF 2" CASING: 21.12 feet (NAVD88)
SURFACE ELEV.: 21.28 feet (NAVD88)	METHOD: Direct Push/Split Spoon
	LOGGED BY: J. F. Gibbens

DEPTH (in feet)	WELL CONSTRUCTION	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	SAMPLE DATA				
					TYPE	DEPTH	BLOWS/6"	% RECOVERY	PTD (ppm)
0				ASPHALT; Underlain by gravel sub-base.					
0 - 4.5	1" DIAMETER SCHEDULE 80 PVC PVC BLANK								
4.5 - 20	BENTONITE CONCRETE	GWP		COARSE GRAVEL; No sheen; no odor. <i>GRADES</i> to gray sandy gravel; no sheen; no odor. <i>GRADES</i> with wood; no sheen; no odor. <i>GRADES</i> with yellow sandy ash; no sheen; no odor. <i>GRADES</i> with soft asphalt material; no sheen; no odor. <i>GRADES</i> with soft black asphalt material; some coal tar; waste coal fragments; no sheen; no odor. <i>GRADES</i> to soft black ashy mush; coal fragments; wood fiber; no sheen; no odor. ROCK in shoe. <i>GRADES</i> with wood; with some black silt; slight sheen; slight odor.	SS		VERY SOFT	60	0
20 - 21.12	1" DIAMETER SCHEDULE 80 PVC 0.1" SLOTTED SCREEN								
21.12 - 35	10/20 SILICA SAND THREADED END CAP	SD		FINE TO MEDIUM SAND; Gray; highly stained; strong odor. <i>GRADES</i> to coarse uniform gravel. <i>GRADES</i> to gray gravelly fine to medium sand; slight sheen; strong odor. <i>GRADES</i> to gray sandy silty coarse gravel; no sheen; very slight odor.  <i>GRADES</i> to gray fine to medium sand; no sheen; slight odor. <i>GRADES</i> to gray coarse sand. <i>GRADES</i> to gray silty sandy gravel.  <i>GRADES</i> to gray very uniform fine sand; no sheen; very slight odor.	SS		MOD HARD	70	0
21.12 - 22					SS		MOD HARD	80	0
22 - 23					SS		MOD HARD	100	0
23 - 24					SS				
24 - 25					SS				
25 - 26					SS				
26 - 27					SS				
27 - 28					SS				
28 - 29					SS				
29 - 30					SS				
30 - 31					SS				
31 - 32					SS				
32 - 33					SS				
33 - 34					SS				
34 - 35					SS				
35				Total depth = 35.0 feet bgs.					

REMARKS: □ - Sample Interval  
SS - Split Spoon



# WELL INSTALLATION LOG

## Piezometer PZ-8

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-110 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Seattle Harbor Police Lot		DRILLING CO.: TEG
START DATE: 12/08/97 TIME: 15:30	BORING ID: inches	DRILLER: Eric
COMPLETION DATE: 12/08/97 TIME: 19:00	TOTAL DEPTH: 20.0 feet bgs	RIG TYPE: Strata Probe
WATER LEVEL DURING DRILLING: ' bgs	TOP OF 2" CASING: 21.73 feet (NAVD88)	METHOD: Direct Push/Split Spoon
SURFACE ELEV.: 21.92 feet (NAVD88)		LOGGED BY: J. F. Gibbens

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA			
			U.S.C.S.	LITHOLOGY		TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0					<b>ASPHALT:</b> Underlain by coarse gravel sub-base.					
0 - 1	1" DIAMETER SCHEDULE 80 PVC BLANK	BENTONITE			<b>SILTY ASH:</b> Black; no sheen; no odor.	SS		SOFT	100	0
1 - 5	1" DIAMETER SCHEDULE 80 PVC	CONCRETE	GWP		<i>GRADES</i> to green-brown; silty fine sand; no sheen; no odor.					
5 - 6					<i>GRADES</i> with concrete; no sheen; no odor.	SS		SOFT	50	0
6 - 7					<i>GRADES</i> to greenish silty fine sand; no sheen; no odor.					
7 - 8			SD		<i>GRADES</i> with wood; no sheen; no odor.					
8 - 10		10/20 SILICA SAND			<b>FINE TO MEDIUM SAND:</b> Gray; no sheen; slight odor.	SS		SOFT	80	6.1
10 - 11					<i>GRADES</i> to brown woody silt; no sheen; slight odor.					4.1
11 - 12					<i>GRADES</i> to gray sandy medium gravel; strong sheen; moderate odor.	SS		MOD SOFT	90	0
12 - 13					<i>GRADES</i> to gray silty fine sand; no sheen; slight odor.					
13 - 14					<i>GRADES</i> to gray uniform medium sand; no sheen; slight odor.	SS		SOFT	90	0
14 - 15					<i>GRADES</i> to gray silty sandy medium gravel; no sheen; moderate odor.					
15 - 16					<i>GRADES</i> to gray uniform fine sand; no sheen; slight odor.	SS		MOD SOFT	100	0
16 - 17					<i>GRADES</i> to gray gravelly medium sand; no sheen; slight odor.					7.0
17 - 18					<i>GRADES</i> to silty medium sand; highly stained; strong odor.					0
18 - 19					<i>GRADES</i> to gray fine to medium sand; no sheen; slight odor.					0
19 - 20	THREADED END CAP									
Total depth = 20.0 feet bgs.										

REMARKS: □ - Sample Interval  
SS - Split Spoon



WELL INSTALLATION LOG  
Piezometer PZ-9

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park	CLIENT: EPRI
LOCATION: Seattle, Washington; Gas Works Park Old Railroad Grade, ~30' West of MLS-1	DRILLING CO.: Cascade Drilling
START DATE: 03/30/98 TIME: 12:15	BORING ID: 8 inches
COMPLETION DATE: 03/30/98 TIME: 12:50	TOTAL DEPTH: 23.0 feet bgs
WATER LEVEL DURING DRILLING: 19.0' bgs	TOP OF 2" CASING: 33.09 feet (NAVD88)
SURFACE ELEV.: 33.51 feet (NAVD88)	METHOD: Hollow-stem Auger*
	LOGGED BY: G. Segal

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA				
	FLUSH-MOUNT WELL MONUMENT	WELL CAP	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0									
					SOIL: Brown; sand with silt and gravel; abundant rootlets; dry to moist.				
			SP		SAND WITH GRAVEL, ASH AND CINDERS (GAS WORKS PARK UNIT); Light brown to tan; medium- to coarse-grained; <10% fines; 20% gravel to 4 cm maximum diameter; abundant ash and cinders; few brick fragments; dry.				
5					5.0' - No ash or cinders present; dry; slight odor; rock in tip of sampler.				
					7.0' - Dry; slight odor; rock in tip of sampler.				
					9.0' - Dry; slight odor.				
10					9.8' - Orange staining to 10.0 feet bgs.				

REMARKS:

- \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.
- Lithology descriptions taken from Boring Log for B-1 (MLS-1).
- - Sample Interval
- SS - Split Spoon

DEPTH (in feet)	WELL CONSTRUCTION	SOIL DESCRIPTION		SAMPLE DATA					
		U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	
0 15 20	2" DIAMETER SCHEDULE 40 PVC BLANK  2" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN  RMC LONESTAR #2-12 SAND	SP		<b>SAND (STRATIFIED DRIFT UNIT);</b> Light gray to brown; fine-grained; <10% fines; moist; no odor.					
		SP-SM		<b>SAND WITH SILT;</b> Light gray to brown; fine-grained; 10% to 15% fines; wet; no odor.					
		SP		<b>SAND;</b> Brown to gray; medium- to coarse-grained; <10% fines; wet.					
		SP		<b>SAND;</b> As at 10.0 feet bgs.					
		SP		<b>SAND;</b> Light brown; fine- to medium-grained; 10% fines; wet.					
		SM		<b>SILTY SAND;</b> Light gray to buff; fine-grained; 25% fines; wet.					
		SW-SM		<b>SAND WITH GRAVEL;</b> Brown with gold (mica) flecks; medium- to coarse-grained; 20% gravel to 0.8 cm diameter; wet.					
		SM		<b>SAND WITH SILT AND GRAVEL;</b> Light brown; fine- to coarse-grained; 10% fines; 15% to 20% gravel to 4 cm diameter; wet. <i>15.0' - Fines increasing to 20% at 16.0 feet bgs.</i>					
		SM		<b>SILTY SAND</b>					
		SW-SM		<b>SAND WITH SILT AND GRAVEL;</b> Gray; fine- to coarse-grained; 10% fines; 20% gravel to 3 cm diameter; wet; slight odor.					
SM		<b>SILTY SAND WITH GRAVEL;</b> Brown; fine- to medium-grained; 20% fines; 10% gravel to 2 cm maximum diameter; wet; slight sheen; slight odor.	SS		50	30			

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth. Lithology descriptions taken from Boring Log for B-1 (MLS-1).  
 □ - Sample Interval  
 SS - Split Spoon



WELL INSTALLATION LOG  
Piezometer PZ-9

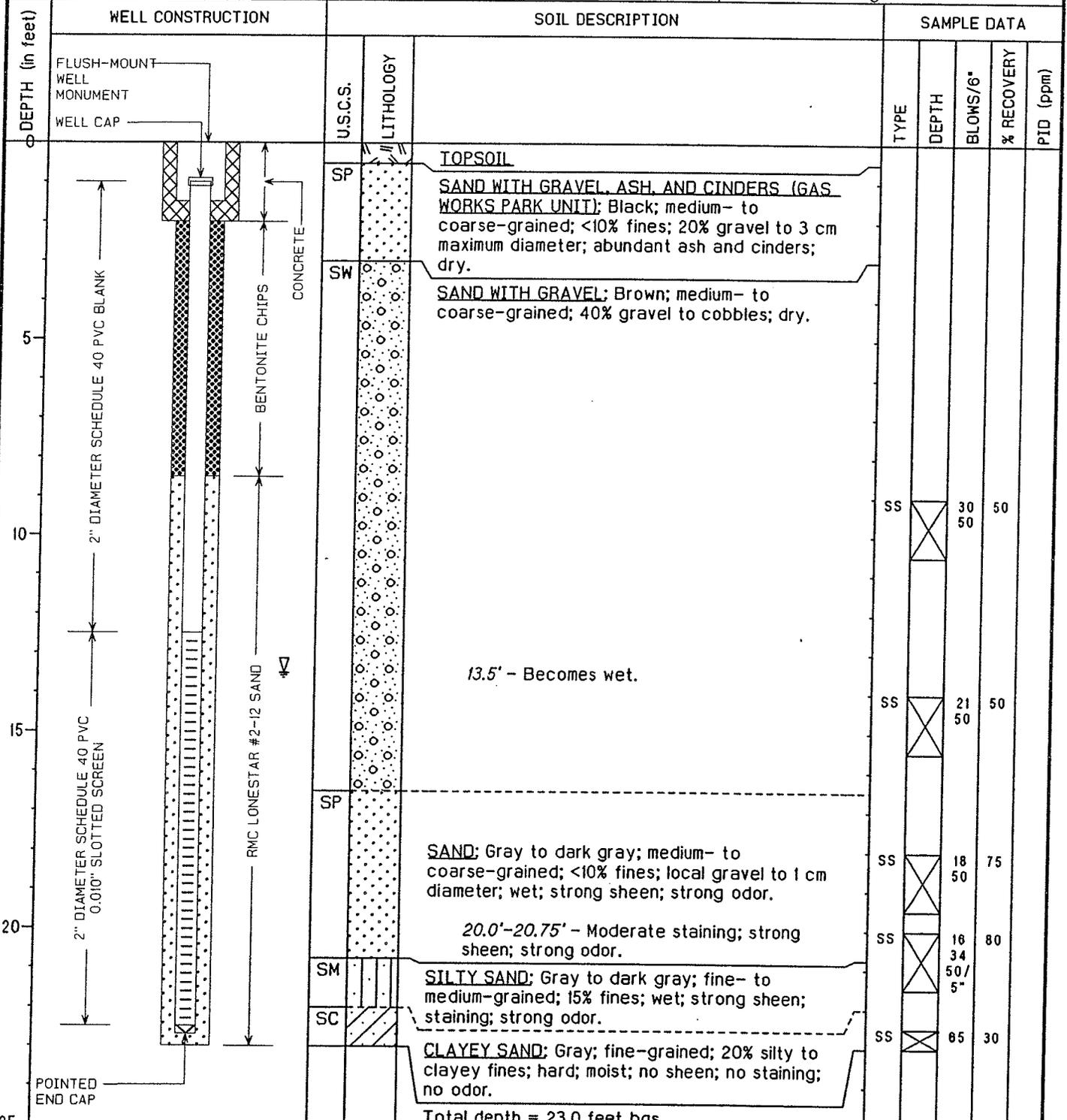
1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA				
			U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0	2" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN  RMC LONESTAR #2-12 SAND  POINTED END CAP		SM						
5			SC		CLAYEY SAND; Gray; fine-grained; 30% stiff fines; very hard; dry to moist; no sheen; no odor.  Total depth = 23.0 feet bgs.	SS		50	30
25									
30									

REMARKS:

- \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.
- Lithology descriptions taken from Boring Log for B-1 (MLS-1).
- - Sample Interval
- SS - Split Spoon

PROJECT NO: 5-3434-210 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Gas Works Park Old Railroad Grade, ~60' West of MLS-1		DRILLING CO.: Cascade Drilling
START DATE: 03/30/98 TIME: 09:10	BORING ID: 8 inches	DRILLER: James Goble
COMPLETION DATE: 03/30/98 TIME: 10:25	TOTAL DEPTH: 23.0 feet bgs	RIG TYPE: CME-55
WATER LEVEL DURING DRILLING: 13.5' bgs	TOP OF 2" CASING: 32.83 feet (NAVD88)	METHOD: Hollow-stem Auger*
SURFACE ELEV.: 33.72 feet (NAVD88)		LOGGED BY: G. Sega



REMARKS: \* Hand dug to 4.0 feet bgs; hollow-stem auger used to total depth.  
 □ - Sample Interval  
 SS - Split Spoon



# WELL INSTALLATION LOG

DW-4

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Northeast End of Harbor Patrol Lot		DRILLING CO.: Cascade Drilling
START DATE: 02/06/98 TIME: 08:05	BORING ID: 8 inches	DRILLER: B. Gose
COMPLETION DATE: 02/06/98 TIME: 11:10	TOTAL DEPTH: 37.3 feet bgs	RIG TYPE: CME-75
WATER LEVEL DURING DRILLING: 4.0' bgs	TOP OF CASING: 21.76 feet (NAVD88)	METHOD: Hollow-stem Auger*
SURFACE ELEV.: 22.10 feet (NAVD88)		LOGGED BY: G. Sega

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA				
	FLUSH-MOUNT MONUMENT	WELL CAP	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	
				ASPHALT							
				SAND WITH GRAVEL, ASH AND CINDERS (GAS WORKS PARK UNIT); Dark brown; 20% gravel to cobbles; abundant cinders, ash, brick and wood fragments; dry.							
				CINDERS; Black; dry.							
				ASH; Gray; dry.							
				WOOD; Unable to hand dig; will drill through and begin sampling at 4.0 feet bgs.							
				WOOD, CINDERS AND ASH; Wet; slight odor.	SS	5 13 10 8	25				
			SP	SAND WITH GRAVEL; Dark brown; medium- to coarse-grained; 15% gravel to 3 cm maximum diameter; abundant root fragments; wet; slight odor.	SS	11 11 16 16	75				
			SP	SAND (STRATIFIED DRIFT UNIT); Greenish-gray; medium- to coarse-grained; few gravels <1 cm diameter; <10% fines; wet; slight odor.							
			SP-SM	SAND WITH SILT; Light gray to brown; medium-grained; 10% fines; wet; slight odor.	SS	10 14 21 21	100				
10										19	

**REMARKS:** \* Hand dug to 2.75 feet bgs; hollow-stem auger used to total depth.  
 □ - Sample Interval  
 NM - Not Measured  
 SS - Split Spoon

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WELL INSTALLATION LOG  
DW-4

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA				
			U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
20			SP						
					SS		36 50/ 5"	40	281
					SS		22 36 50/ 4"	100	
			SP						1566
			SP						
			SP						
25			SP		SS		60	50	
			SM						719
			SP						
			SM		SS		24 36 50/ 5"	50	
			SM						968
			SM						
			SM						
			SP						
			SP						
30			SP						

2" DIAMETER SCHEDULE 40 PVC BLANK

BENTONITE CHIPS

RMC LONESTAR #2-12 SAND

REMARKS: \* Hand dug to 2.75 feet bgs; hollow-stem auger used to total depth.  
 Ⓢ - Sample Interval  
 NM - Not Measured  
 SS - Split Spoon





# WELL INSTALLATION LOG

DW-5

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Harbor Patrol Lot, 8 feet North of Underground Tank		DRILLING CO.: Cascade Drilling
START DATE: 02/09/98 TIME: 08:00	BORING ID: 8 inches	DRILLER: S. Krueger
COMPLETION DATE: 02/09/98 TIME: 09:10	TOTAL DEPTH: 29.3 feet bgs	RIG TYPE: CME-75
WATER LEVEL DURING DRILLING: 7.0' bgs	TOP OF CASING: 21.59 feet (NAVD88)	METHOD: Hollow-stem Auger*
SURFACE ELEV.: 21.92 feet (NAVD88)		LOGGED BY: G. Sega

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION			SAMPLE DATA				
	FLUSH-MOUNT MONUMENT	WELL CAP	U.S.C.S.	LITHOLOGY		TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0			SP	ASPHALT						
				SAND WITH GRAVEL (GAS WORKS PARK UNIT); Brown; abundant ash and wood fragments; dry. WOOD; Large chunks; with sand; dry to moist.						
5			SM	SILTY SAND WITH GRAVEL; Gray; medium- to coarse-grained; 20% fines; 15% gravel to 4 cm maximum diameter; abundant ash and wood fragments; dry.						
				5.0' - Dry to 5.5 feet bgs.						
			GP	GRAVEL; Dark brown (product); 50% gravel to 3 cm diameter; 50% wood fragments; saturated with product.						
			SP	SAND; Greenish-gray; medium- to coarse-grained; <10% fines; wet; slight sheen; slight odor.						
				9.0' - Wet; no sheen; slight odor.						
10			SP	SAND WITH GRAVEL; Gray; medium- to coarse-grained; <10% fines; gravel to 2 cm diameter; wet; no sheen; slight odor.						
			SP	SAND; Gray; fine- to medium-grained; <10% fines; wet; no sheen; slight odor.						
15			SP	SAND; Gray; fine- to medium-grained; <10% fines; wet; no sheen; slight odor.						

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
 ■ - Analytical Sample  
 ⊠ - Sample Interval  
 SS - Split Spoon

DEPTH (in feet)	WELL CONSTRUCTION	SOIL DESCRIPTION		SAMPLE DATA				
		U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
25	2" DIAMETER SCHEDULE 40 PVC BLANK  2" DIAMETER SCHEDULE 40 PVC 0.010" SLOT SCREEN  BENTONITE CHIPS  RMC LONESTAR #2-12 SAND  POINTED END CAP	SP	SAND; Dark gray; medium- to coarse-grained; <10% fines; local gravel to 1 cm diameter; wet; slight sheen; slight odor.	SS	18 21 23 26	75	38	
		SM	SILTY SAND WITH GRAVEL; Greenish-gray; medium- to coarse-grained; 25% fines; 20% gravel to 5 cm diameter; wet; no sheen; slight odor.  17.5' - Percent fines decreasing to 15%.	SS	18 40 50/ 3"	20	45	
20					SS	30 32 35 40	50	54
				22.5' - Percent fines increasing to 30%.	SS	32 50	50	20
25			SP	SAND WITH GRAVEL; Dark gray; medium- to coarse-grained; <10% fines; 20% gravel to 1.5 cm diameter; wet; strong sheen; strong odor; product on tip of sampler.	SS	42 50/ 4"	50	87
		SW	SAND WITH GRAVEL; Dark gray to brown (product); fine- to coarse-grained; 15% gravel to 5 cm diameter; <10% fines; wet; moderate product present.	SS	70	75	0	
		CL	SANDY CLAY WITH GRAVEL; Gray; 20% fine-grained sand; 15% gravel to 3 cm diameter; very hard; dry; no sheen or odor.	SS	100/ 4"	30	0	
30			Total depth = 29.3 feet bgs.					

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
 ■ - Analytical Sample  
 ▨ - Sample Interval  
 SS - Split Spoon



**WELL INSTALLATION LOG**  
DW-6

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park		CLIENT: EPRI	
LOCATION: Seattle, Washington; Harbor Patrol Building, ~30 feet East of Southeast Corner		DRILLING CO.: Cascade Drilling	
START DATE: 02/09/98 TIME: 11:20	BORING ID: 8 inches	DRILLER: S. Krueger	
COMPLETION DATE: 02/09/98 TIME: 13:20	TOTAL DEPTH: 42.25 feet bgs	RIG TYPE: CME-75	
WATER LEVEL DURING DRILLING: 4.0' bgs	TOP OF CASING: 21.04 feet (NAVD88)	METHOD: Hollow-stem Auger*	
SURFACE ELEV.: 21.39 feet (NAVD88)		LOGGED BY: G. Sega	

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA				
	FLUSH-MOUNT MONUMENT WELL CAP	CONCRETE	U.S.C.S. LITHOLOGY		TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0			GP	ASPHALT					
0 - 4.0			GP	GRAVEL WITH SAND (GAS WORKS PARK UNIT); Light brown; 75% gravel to 4 cm maximum diameter; 25% medium- to coarse-grained sand; local metal and wood debris.  4.0' - Wet.					
4.0 - 5.0				NO RECOVERY	SS	10 12 24 28	0		NM
5.0 - 9.0			SM	SILTY SAND WITH GRAVEL; Gray; fine- to coarse-grained; 20% slightly clayey fines; 15% gravel to 3 cm diameter; few brick fragments; wet.  9.0' - Wet.	SS	5 16 7 7	30		1
9.0 - 9.8				CINDERS; Black; wet; slight odor. 9.8' - Wood fragments to 10.0 feet bgs.	SS	3 4 5 5	60		2
9.8 - 13.0			SM	SILTY SAND WITH GRAVEL; Dark gray; 15% fines; 15% gravel to 2 cm diameter; abundant shell fragments; wet; slight odor.	SS	3 4 4	50		1
13.0 - 15.0			SP	SAND WITH GRAVEL; Gray; medium-grained; 15% gravel to 2 cm diameter; abundant ash and wood fragments; moist.  13.0' - Moist; slight odor.	SS	4 9 9 8	33		2

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
 □ - Sample Interval  
 NM - Not Measured  
 SS - Split Spoon

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WELL INSTALLATION LOG  
DW-6

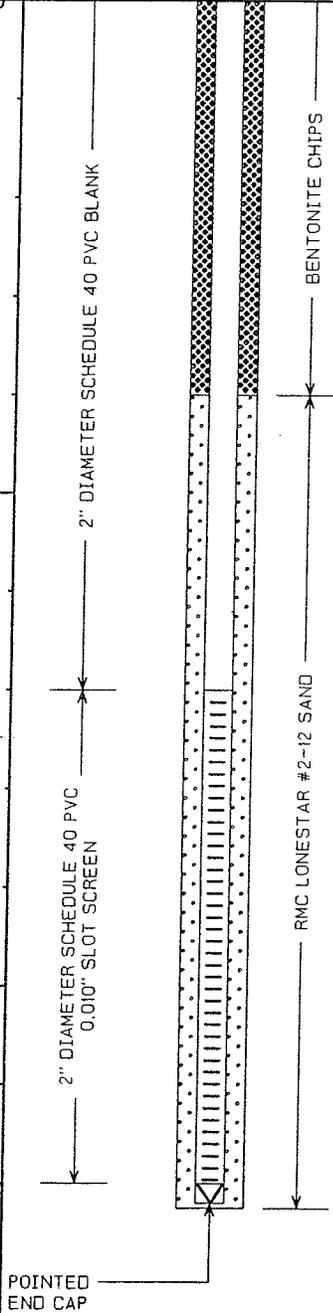
1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA						
	2" DIAMETER SCHEDULE 40 PVC BLANK	BENTONITE CHIPS	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)		
0 20 25 30			SP	15.0' - Gravel increasing to 25%; few wood fragments; wet; slight odor.	SS	6	50				
			SM	SILTY SAND WITH GRAVEL; Gray; medium- to coarse-grained; 15% fines; 15% gravel to 2 cm diameter; wet; slight odor.	SS	7			1		
				WOOD (FRAGMENTS); Wet; moderate odor.	SS	8	15				
			SM		SS	9					
					SS	10			46		
					SS	10					
						SILTY SAND WITH GRAVEL (STRATIFIED DRIFT UNIT); Dark gray; fine- to coarse-grained; 40% gravel to 4 cm diameter; 15% fines; wet; slight odor.	SS	21	30		
							SS	25			11
							SS	23			
					GP	GRAVEL WITH SAND; Dark gray; 80% gravel to 5 cm diameter; 20% medium- to coarse-grained sand; <10% fines; wet; slight odor.	SS	31	75		
							SS	50			10
					SP	SAND WITH GRAVEL; Gray; medium- to coarse-grained; 30% gravel to 1 cm diameter; wet; slight odor.	SS	20	100		
		ML		SS	21						
		SM	GRAVELLY SILT; Brown to gray; soft; 50% gravel to 4 cm diameter; moist to wet.		22			8			
			SILTY SAND WITH GRAVEL; Gray; fine- to medium-grained; 20% fines; 20% gravel to 3 cm diameter; wet.								
		SP	SAND WITH GRAVEL AND COBBLES; Gray; fine- to medium-grained; <10% fines; 30% gravel and cobbles to 8 cm diameter; wet; slight odor.	SS	32	100					
				SS	50			10			
		GM	SILTY GRAVEL WITH SAND; Gray; 65% gravel to 4 cm diameter; 20% fine- to coarse-grained sand; 15% fines; wet; slight odor.	SS	45	75					
				SS	50/4"			7			
		SP									

REMARKS:

- \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.
- ▣ - Sample Interval
- NM - Not Measured
- SS - Split Spoon

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA				
	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)		
30	SP	SAND WITH GRAVEL; Gray; coarse-grained; <10% fines; 40% gravel to 1 cm diameter; few gravels to 5 cm diameter; wet; slight odor.	SS	36 50	100	30			
		NO RECOVERY; ROCK IN TIP OF SAMPLER	SS	36 50/ 4"	0	NM			
35	SM	SILTY SAND; Gray; fine-grained; 40% fines; wet; slight odor.	SS	50/ 5"	25	34			
		NO RECOVERY; NO SHEEN OR PRODUCT ON SAMPLER	SS	60/ 3"	0	NM			
40			SS	26 50	0	NM			
	CL	SANDY CLAY WITH GRAVEL; Gray; 20% fine-grained sand; 15% gravel to 2 cm diameter; moist; no sheen or odor.	SS	100/ 5"	15	0			
Total depth = 42.25 feet bgs.									



REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
 ■ - Sample Interval  
 NM - Not Measured  
 SS - Split Spoon



# WELL INSTALLATION LOG

DW-7

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Southeast End of Harbor Patrol Lot		DRILLING CO.: Cascade Drilling
START DATE: 02/09/98 TIME: 08:00	BORING ID: 8 inches	DRILLER: S. Krueger
COMPLETION DATE: 02/09/98 TIME: 10:00	TOTAL DEPTH: 42.9 feet bgs	RIG TYPE: CME-75
WATER LEVEL DURING DRILLING: 5.0' bgs	TOP OF CASING: 21.46 feet (NAVD88)	METHOD: Hollow-stem Auger*
SURFACE ELEV.: 21.80 feet (NAVD88)		LOGGED BY: G. Sega

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION			SAMPLE DATA						
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0	FLUSH-MOUNT MONUMENT WELL CAP	CONCRETE	ASPHALT									
0 - 5	2" DIAMETER SCHEDULE 40 PVC BLANK	BENTONITE CHIPS	CONCRETE			SW	ASPHALT					
0 - 5			CONCRETE			SW	CONCRETE					
5 - 7			SAND WITH GRAVEL, ASH AND CINDERS (GAS WORKS PARK UNIT); Gray to brown; local brick and wood fragments; dry.									
7 - 9			SAND WITH SILT; Gray; fine- to coarse-grained; 20% fines; abundant brick and shell fragments; local cinders and ash; wet at 5.0 feet bgs.			SW-SM		SS	1	1	100	
7.0'			No ash; few brick fragments; wet.					SS	3	2	100	
9.0'			Wet to 10.2 feet bgs.					SS	1	1	60	
11.0'			Local ash and glass shards; wet.					SS	1	1	20	
13.0'			Wet to 14.2 feet bgs.					SS	1	2	30	

REMARKS: \* Hand dug to 5.0 feet below ground surface. Hollow-stem auger used to total depth.  
 ■ - Analytical Sample  
 ▨ - Sample Interval  
 SS - Split Spoon

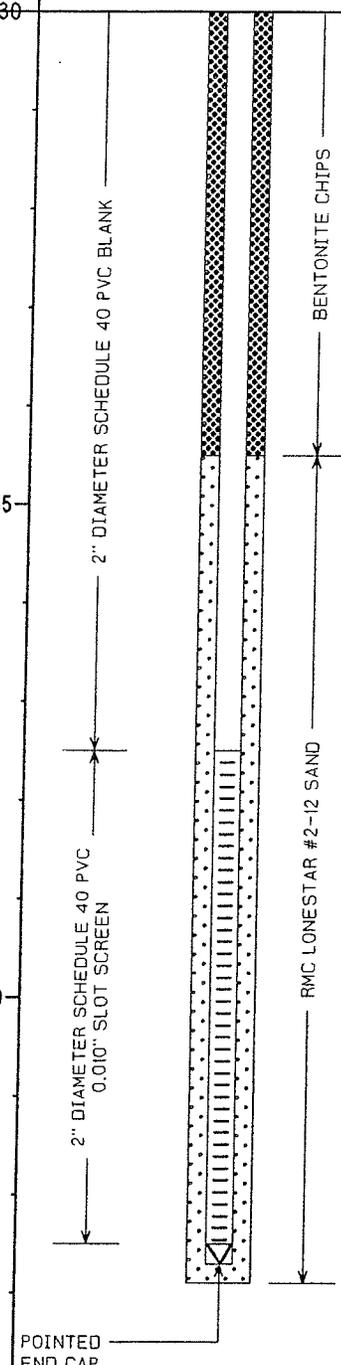
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DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA						
	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PTD (ppm)				
5 20 25 30	SW	<p>2" DIAMETER SCHEDULE 40 PVC BLANK</p> <p>BENTONITE CHIPS</p>	SS	12	60	42	24	24	14	18	
	SM		10	75	0						NM
	SP		17								
	SP		18								
	SP		26								
	SP		26								
	SP		26								
	SP		28								
	SP		28								
	SP		28								
	SP		6								
	GP		13								
SW	29										
SP	24										
SP	32										
SP	55										
SP	32										
SP	50										
SP	60										
SP	26										
SP	50/5"										
SP	60										
SP	13										

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
 ■ - Analytical Sample  
 ▨ - Sample Interval  
 SS - Split Spoon

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION		SAMPLE DATA				
	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)		
30	SP	[Pattern]	SS	32 50/4"	75	16			
	SM	[Pattern]							
	SP	[Pattern]	SS	26 50/4"	75	11			
35			SS	36 50/3"	0	NM			
	GP	[Pattern]	SS	50 70/2"	35	110			
	SP	[Pattern]	SS	32 60	25	103			
	CL	[Pattern]	SS	90/4"	30	0			
Total depth = 42.9 feet bgs.									



REMARKS:

- \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.
- - Analytical Sample
- ▨ - Sample Interval
- SS - Split Spoon



# BORING LOG

B-1

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park	CLIENT: EPRI
LOCATION: Seattle, Washington; ~100 feet Northeast of PZ-3	DRILLING CO.: Cascade Drilling
START DATE: 02/05/98 TIME: 12:45	BORING ID: 8 inches
COMPLETION DATE: 02/05/98 TIME: 14:15	BORING DEPTH: 25.5 feet bgs
WATER LEVEL DURING DRILLING: 11.0' bgs	SURFACE ELEV.: 33.5 feet (NAVD88)
DATE MEASURED: 02/05/98	METHOD: Hollow-stem Auger*
	LOGGED BY: G. Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0							SOIL; Brown; sand with silt and gravel; abundant rootlets; dry to moist.
5	SS	15	30			SP	SAND WITH GRAVEL, ASH AND CINDERS (GAS WORKS PARK UNIT); Light brown to tan; medium- to coarse-grained; <10% fines; 20% gravel to 4 cm maximum diameter; abundant ash and cinders; few brick fragments; dry.
		17					5.0' - No ash or cinders present; dry; slight odor; rock in tip of sampler.
		17					
		15					
	SS	26	30				7.0' - Dry; slight odor; rock in tip of sampler.
		50					
	SS	44	75				9.0' - Dry; slight odor.
		29					
		26					
		23					9.8' - Orange staining on sand to 10.0 feet bgs.
10	SS	10	80			SP	SAND (STRATIFIED DRIFT UNIT); Light gray to brown; fine-grained; <10% fines; moist; no odor.
		10				SP	
		14				SM	SAND WITH SILT; Light gray to brown; fine-grained; 10% to 15% fines; wet; no odor.
		21				SP	
	SS	20	75			SP	SAND; Brown to gray; medium- to coarse-grained; <10% fines; wet.
		30				SP	SAND; As at 10.0 feet bgs.
		50				SM	SAND; Light brown; fine- to medium-grained; 10% fines; wet.
	SS	22	75			SP	SILTY SAND; Light gray to buff; fine-grained; 25% fines; wet.
		32				SW	SAND WITH GRAVEL; Brown with gold (mica) flecks; medium- to coarse-grained; 20% gravel to 0.8 cm diameter; wet.
		46				SM	SAND WITH SILT AND GRAVEL; Light brown; fine- to coarse-grained; 10% fines; 15% to 20% gravel to 4 cm diameter; wet.
15	SS	17	75			SM	15.0' - Fines increasing to 20% at 16.0 feet bgs.
		17				SW	
		27				SM	SILTY SAND
		55					SAND WITH SILT AND GRAVEL; Gray; fine- to coarse-grained; 10% fines; 20% gravel to 3 cm diameter; wet; slight odor.
	SS	35	50			SM	SILTY SAND WITH GRAVEL; Gray; fine- to coarse-grained; 20% fines to slightly clayey; 20% gravel to 3 cm diameter; wet; slight to moderate odor.
		50					

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth. Hole was backfilled with hydrated bentonite chips.  
PID was not working.  
■ - Sample Interval  
SS - Split Spoon

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
21.0'	SS	36 50	50			SM	21.0' - Slight to moderate odor.
	SS	30 40 50/ 3"	75			SP SM SW- SM/ CL	<p>SAND; Gray; medium- to coarse-grained; &lt;10% fines; few gravels to 1 cm diameter; wet; slight odor.</p> <p>SILTY SAND WITH GRAVEL; Light gray; fine-grained; 20% slightly clayey fines; 15% gravel to 3 cm diameter; wet; slight odor.</p> <p>SAND WITH SILT AND GRAVEL; Light gray; fine- to coarse-grained; 10% fines; 15% gravel to 3 cm diameter; wet; no odor.</p> <p>CLAY WITH SAND (VASHON TILL UNIT); Thinly (~2 mm) laminated gray and white clay; 10% fine-grained sand; 10% gravel to 1 cm diameter; very hard; dry; no odor.</p>
25.5'	SS	65	10				Total depth = 25.5 feet bgs.
30							
35							
40							

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth. Hole was backfilled with hydrated bentonite chips. PID was not working.  
 □ - Sample Interval  
 SS - Split Spoon



DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PTD (ppm)	U.S.C.S.	LITHOLOGY
10					0	SW	
	SS	39 17 22 25	75			SW SM	11.5' - Reddish brick fragments.  <b>SAND WITH GRAVEL (STRATIFIED DRIFT UNIT);</b> Light brown to brown; fine- to coarse-grained; 15% gravel to 1 cm diameter; trace rootlets; ~10% fines; moist.  <b>SAND WITH SILT AND GRAVEL;</b> Greenish-gray; fine- to coarse-grained; 15% gravel to 2 cm diameter; 10% to 15% fines; wet.
15	SS	36 50	25		0		13.5' - Gravel increasing to 25% and 4 cm maximum diameter; wet.
	SS	20 30 30 50	100			SM	<b>SILTY SAND;</b> Dark greenish-gray; fine- to medium-grained; 15% fines; wet; heavy staining and sheen; strong odor.
					736	SP	<b>SAND WITH GRAVEL;</b> Dark brown to black (product); medium- to coarse-grained; 10% to 15% gravel to 3 cm diameter; <10% fines; saturated with oily product; strong odor.
						SP	<b>SAND;</b> Dark greenish-gray; medium- to coarse-grained; <10% fines; wet; product present; strong sheen and odor (saturated zone).
	SS	19 36 50/ 5"	100			SP	<b>SAND;</b> Greenish-gray; fine-grained; wet; medium sheen. 17.5' - Sand increasing in grain size to medium- to coarse-grained at 17.75 feet bgs; increasing sheen to heavy sheen at 17.75 feet bgs. 18.0' - 1-inch thick product zone; strong odor.
					235	SP	<b>SAND;</b> Greenish-gray; medium- to coarse-grained; 40% fines; wet; moderate sheen at 18.0 to 18.25 feet bgs; heavy sheen at 18.25 to 19.0 feet bgs; 1-inch thick product zone at 19.0 feet bgs; strong odor.
20						SP	<b>SAND;</b> Greenish-gray; fine- to medium-grained; <10% fines; wet; medium sheen; strong odor.

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth. Hole was backfilled with hydrated bentonite chips.  
 ■ - Analytical Sample  
 □ - Sample Interval  
 SS - Split Spoon

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	SS	28 50	50			SP	<p><b>SAND</b>; Greenish-gray; medium- to coarse-grained; &lt;10% fines; trace gravel to 6 mm diameter; heavy sheen; local brown product staining; strong odor.</p> <p>20.0' - Grading to unit below.</p>
						SW	
					75		<p><b>SAND WITH GRAVEL</b>; Greenish-gray; fine- to coarse-grained; &lt;10% fines; 15% to 20% gravel to 3 cm diameter; heavy sheen; strong odor; product present at 20.8 to 21.0 feet bgs (may be remaining product inside auger from saturated zone at 16.5 feet bgs).</p>
						GW	
	SS	28 30 50/ 5"	50		145		<p><b>GRAVEL WITH SAND</b>; Brown to gray (product); 80% well-graded gravel to 4 cm diameter; 20% medium- to coarse-grained sand; heavy sheen; strong odor; product present at 22.5 feet bgs (may be remaining product inside auger from saturated zone at 16.5 feet bgs).</p>
25	SS	19 50/ 5"	50		116		<p>25.0' - Product present (may be remaining product inside auger from saturated zone at 16.5 feet bgs).</p>
						GP	
	SS	85	30		88		<p><b>GRAVEL WITH SAND</b>; Greenish-gray to brown (product); 60% poorly-graded gravel to 2 cm diameter; 40% medium- to coarse-grained sand; saturated with product.</p>
						SP	
	SS	100/ 5"	25		0	GC	<p><b>SAND WITH CLAY (VASHON TILL)</b>; Light greenish-gray; fine-grained; 10% to 15% clayey fines; wet; no sheen; slight odor.</p> <p><b>CLAYEY GRAVEL</b>; Light greenish-gray; 75% well-graded gravel to 3 cm diameter; 15% clayey fines; 10% fine-grained sand; moist; no sheen or odor.</p>
							Total depth = 29.0 feet bgs.

**REMARKS:**

\* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
Hole was backfilled with hydrated bentonite chips.

■ - Analytical Sample

▨ - Sample Interval

SS - Split Spoon



# WELL INSTALLATION LOG

Monitoring Well MW-22

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Southwest End of Kite Valley, ~30' North of Lake		DRILLING CO.: Cascade Drilling
START DATE: 02/10/98 TIME: 12:00	BORING ID: 8 inches	DRILLER: S. Krueger
COMPLETION DATE: 02/10/98 TIME: 13:15	TOTAL DEPTH: 34.5 feet bgs	RIG TYPE: CME-75
WATER LEVEL DURING DRILLING: 3.0' bgs	TOP OF CASING: 20.40 feet (NAVD88)	METHOD: Hollow-stem Auger*
SURFACE ELEV.: 20.70 feet (NAVD88)		LOGGED BY: G. Segal

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA			
	FLUSH-MOUNT MONUMENT	WELL CAP	U.S.C.S.	LITHOLOGY	DESCRIPTION	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0					TOPSOIL: Sand, grass, roots; moist.					
0-1			SP-SM		SAND WITH SILT AND GRAVEL (GAS WORKS PARK UNIT): Light brown; medium- to coarse-grained; 15% fines; 15% gravel to 3 cm maximum diameter; dry.					
1-2			SP-SM		CINDERS: Black; dry; slight odor.					0
2-3			SM		SAND WITH SILT AND GRAVEL: As at 0.5 feet bgs; dry; no odor.					
3-4			SP		SILTY SAND WITH GRAVEL; Black (staining?); medium- to coarse-grained; 20% soft, slightly clayey fines; 15% gravel to 3 cm diameter; abundant wood fragments; wet; slight odor.	SS	6	100		
4-5			SP			6				
5-6			SP			6				
6-7					SAND WITH GRAVEL; Brown; medium- to coarse-grained; 25% gravel to 1 cm diameter; abundant brick fragments; wet; no odor.	SS	3	0		
7-8					SAND; Dark gray to brown; fine- to medium-grained; <10% fines; abundant wood fragments; wet.	SS	3			
8-9						4				
9-10						13				NM
10-11			SP		SAND WITH GRAVEL (POSSIBLY STRATIFIED DRIFT UNIT); Gray; medium- to coarse-grained; <10% fines; 20% gravel to 2 cm diameter; wet.	SS	17	100		
11-12						18				
12-13						20				
13-14						23				
14-15					NO RECOVERY					
15-16			SM		SAND WITH GRAVEL (STRATIFIED DRIFT UNIT); Greenish-gray; medium- to coarse-grained; 30% gravel to 2 cm diameter; wet.	SS	17	100		
16-17						23				
17-18						23				
18-19						28				
19-20			SP		SILTY SAND WITH GRAVEL; Greenish-gray; medium- to coarse-grained; 20% fines; 30% gravel to 2 cm diameter; wet.	SS	17	100		
20-21						25				
21-22						32				
22-23						35				
23-24					SAND WITH GRAVEL; As at 9.0 feet bgs; wet.	SS	28	75		
24-25					SAND; Greenish-gray; medium-grained; <10% fines; wet.	SS	30			
25-26						33				
26-27						35				
27-28						22				
28-29			SP		SAND WITH GRAVEL; Greenish-gray; fine- to coarse-grained; <10% fines; 30% gravel to 5 cm diameter; wet.	SS	25	50		
29-30						27				
30-31						28				
31-32						50				
32-33			SW							
33-34										
34-35										
35-36			SW							

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
 ■ - Analytical Sample  
 ▨ - Sample Interval  
 NM - Not Measured  
 SS - Split Spoon

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION			SAMPLE DATA				
			U.S.C.S.	LITHOLOGY		TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
25	<p>2" DIAMETER SCHEDULE 40 PVC 0.010" SLOT SCREEN</p> <p>RMC LONESTAR #2-12 SAND</p> <p>POINTED END CAP</p>		SW		<p><u>SAND</u>; Greenish-gray; fine- to coarse-grained; 5% to 10% fines; local gravel to 1 cm diameter; wet.</p>	SS	42	50/4"	60	0
30			SM		<p><u>SILTY SAND WITH GRAVEL</u>; Gray; fine- to medium-grained; 20% fines; 15% gravel to 4 cm diameter; wet.</p>	SS	70		30	0
35			CL		<p><u>SANDY CLAY WITH GRAVEL (VASHON TILL UNIT)</u>; Gray; 15% fine-grained sand; 15% gravel to 2 cm diameter; very hard; dry.</p>	SS	80		30	0
35						<p><u>SANDY CLAY WITH GRAVEL (VASHON TILL UNIT)</u>; Gray; 15% fine-grained sand; 15% gravel to 2 cm diameter; very hard; dry.</p>	SS	35	50/5"	70
35					<p>Total depth = 34.5 feet bgs.</p>	SS	100		30	0
40										
45										
50										

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
 ■ - Analytical Sample  
 ▨ - Sample Interval  
 NM - Not Measured  
 SS - Split Spoon

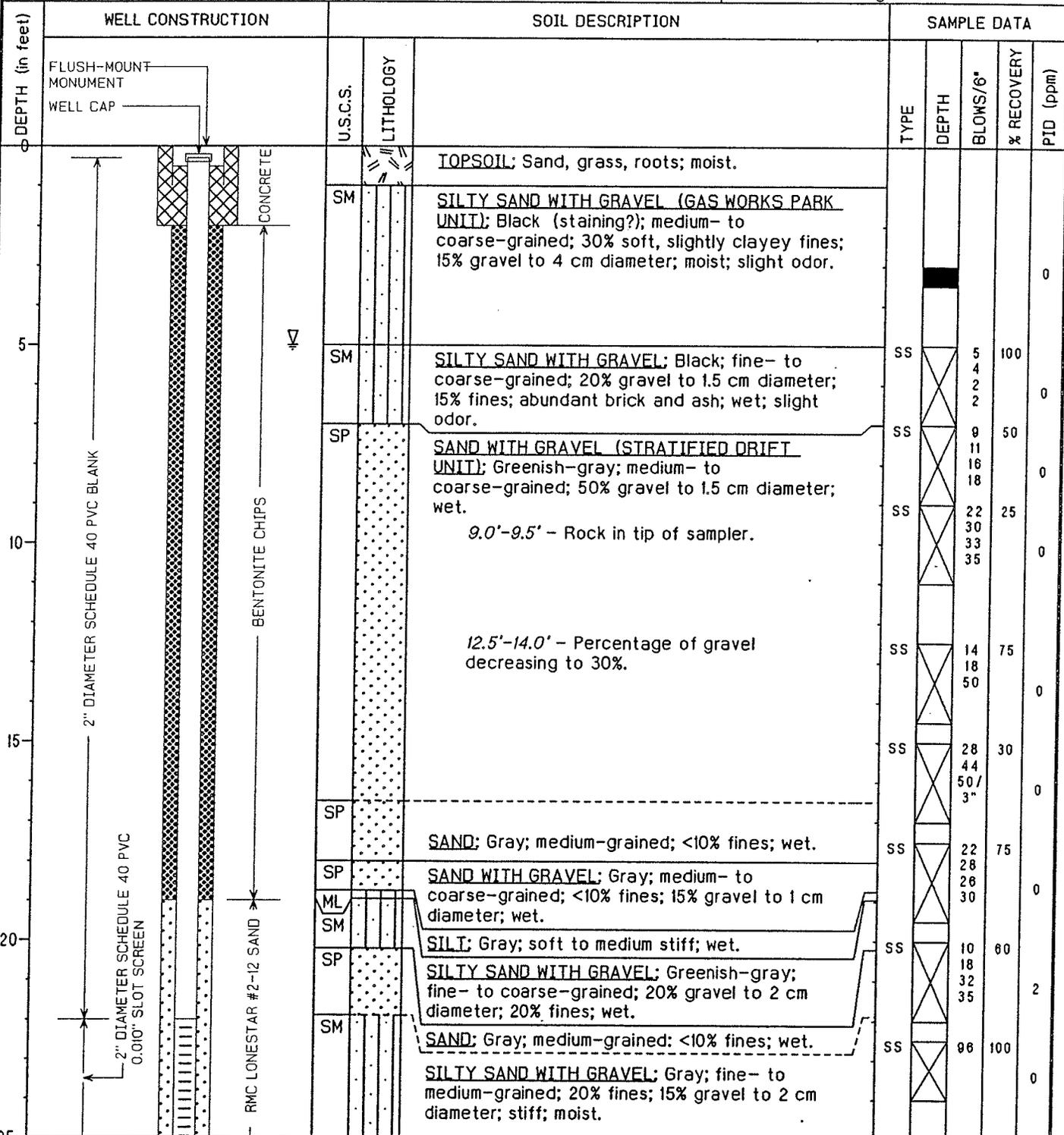


# WELL INSTALLATION LOG

## Monitoring Well MW-23

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Southwest Side of Kite Valley, ~30' North of Lake		DRILLING CO.: Cascade Drilling
START DATE: 02/11/98 TIME: 08:05	BORING ID: 8 inches	DRILLER: S. Krueger
COMPLETION DATE: 02/11/98 TIME: 09:15	TOTAL DEPTH: 33.0 feet bgs	RIG TYPE: CME-75
WATER LEVEL DURING DRILLING: 5.0' bgs	TOP OF CASING: 19.51 feet (NAVD88)	METHOD: Hollow-stem Auger*
SURFACE ELEV.: 19.96 feet (NAVD88)		LOGGED BY: G. Segal



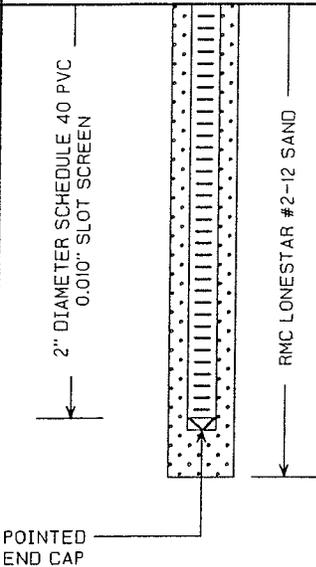
REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
 ■ - Analytical Sample  
 ▨ - Sample Interval  
 SS - Split Spoon



**WELL INSTALLATION LOG**  
Monitoring Well MW-23

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA			
	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)			
25.0	SM		SS	25.0'-25.5' - Wet.	100	33	0			
27.5	CL		SS	CLAY: Gray and white laminations (~2 mm thick); very hard; dry.	80	50	0			
29.0	SM		SS	SILTY SAND WITH GRAVEL: As at 22.5 feet bgs; stiff to hard; dry to moist.	65	33	0			
30.5	SM		SS	SILTY SAND WITH GRAVEL: Gray; fine- to medium-grained; 10% to 15% fines; 15% gravel to 1 cm diameter; wet.	100	33	0			
32.0	CL		SS	CLAY WITH SAND (VASHON TILL UNIT): Gray; 20% fine-grained sand; very hard; dry.						
				Total depth = 33.0 feet bgs.						



REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth.  
 ■ - Analytical Sample  
 ▨ - Sample Interval  
 SS - Split Spoon



# WELL INSTALLATION LOG

## Monitoring Well MW-24

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park		CLIENT: EPRI
LOCATION: Seattle, Washington; Southwest End of Kite Valley, ~30' North of Lake		DRILLING CO.: Cascade Drilling
START DATE: 02/10/98 TIME: 14:30	BORING ID: 8 inches	DRILLER: S. Krueger
COMPLETION DATE: 02/10/98 TIME: 14:40	TOTAL DEPTH: 15.0 feet bgs	RIG TYPE: CME-75
WATER LEVEL DURING DRILLING: 3.0' bgs	TOP OF CASING: 20.34 feet (NAVD88)	METHOD: Hollow-stem Auger*
SURFACE ELEV.: 20.67 feet (NAVD88)		LOGGED BY: G. Sega

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION				SAMPLE DATA												
	FLUSH-MOUNT MONUMENT	WELL CAP	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)										
0																			
0 - 1.5		WELL CAP			TOPSOIL; Sand, grass, roots; moist.														
1.5 - 3.0			SP		SAND WITH SILT AND GRAVEL (GAS WORKS PARK UNIT); Light brown; medium- to coarse-grained; 15% fines; 15% gravel to 3 cm maximum diameter; dry.														
3.0 - 3.5			SM		CINDERS; Black; dry; slight odor.														
3.5 - 5.0			SM		SAND WITH SILT AND GRAVEL; As at 0.5 feet bgs; dry; no odor.														
5.0 - 6.5			SP		SILTY SAND WITH GRAVEL; Black (staining?); medium- to coarse-grained; 20% soft, slightly clayey fines; 15% gravel to 3 cm diameter; abundant wood fragments; wet; slight odor.														
6.5 - 8.0			SP		SAND WITH GRAVEL; Brown; medium- to coarse-grained; 25% gravel to 1 cm diameter; abundant brick fragments; wet; no odor.														
8.0 - 9.5			SP		SAND; Dark gray to brown; fine- to medium-grained; <10% fines; abundant wood fragments; wet.														
9.5 - 10.5			SP		SAND WITH GRAVEL (POSSIBLY STRATIFIED DRIFT UNIT); Gray; medium- to coarse-grained; <10% fines; 20% gravel to 2 cm diameter; wet.														
10.5 - 11.5					NO RECOVERY														
11.5 - 13.0					SAND WITH GRAVEL (STRATIFIED DRIFT UNIT); Greenish-gray; medium- to coarse-grained; 30% gravel to 2 cm diameter; wet.														
13.0 - 14.0			SM		SILTY SAND WITH GRAVEL; Greenish-gray; medium- to coarse-grained; 20% fines; 30% gravel to 2 cm diameter; wet.														
14.0 - 15.0			SP		SAND WITH GRAVEL; As at 9.0 feet bgs; wet.														
15.0					Total depth = 15.0 feet bgs.														

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth. No samples were collected. Lithologic descriptions are taken from well installation log for MW-22.



**WELL INSTALLATION LOG**  
Monitoring Well MW-25

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 5-3434-210 Gas Works Park	CLIENT: EPRI
LOCATION: Seattle, Washington; Southeast End of Kite Valley, ~25' North of Water	DRILLING CO.: Cascade Drilling
START DATE: 02/11/98 TIME: 10:20	BORING ID: 8 inches
COMPLETION DATE: 02/11/98 TIME: 10:30	TOTAL DEPTH: 15.0 feet bgs
WATER LEVEL DURING DRILLING: 5.0' bgs	TOP OF CASING: 19.39 feet (NAVD88)
SURFACE ELEV.: 19.72 feet (NAVD88)	METHOD: Hollow-stem Auger*
	LOGGED BY: G. Segal

DEPTH (in feet)	WELL CONSTRUCTION	SOIL DESCRIPTION		SAMPLE DATA										
		U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)						
0	FLUSH-MOUNT MONUMENT WELL CAP													
0 - 5	2" DIAMETER SCHEDULE 40 PVC BLANK BENTONITE CHIPS CONCRETE	SM	[Pattern]	TOPSOIL; Sand, grass, roots; moist.										
5 - 9.0	2" DIAMETER SCHEDULE 40 PVC 0.010" SLOT SCREEN RMC LONESTAR #2-12 SAND	SM	[Pattern]	SILTY SAND WITH GRAVEL (GAS WORKS PARK UNIT); Black (staining?); medium- to coarse-grained; 30% soft, slightly clayey fines; 15% gravel to 4 cm diameter; moist; slight odor.										
9.0 - 12.5		SP	[Pattern]	SAND WITH GRAVEL (STRATIFIED DRIFT UNIT); Greenish-gray; medium- to coarse-grained; 50% gravel to 1.5 cm diameter; wet. 9.0'-9.5' - Rock in tip of sampler.										
12.5 - 14.0				12.5'-14.0' - Percentage of gravel decreasing to 30%.										
14.0 - 15.0	POINTED END CAP			Total depth = 15.0 feet bgs.										

REMARKS: \* Hand dug to 5.0 feet bgs; hollow-stem auger used to total depth. No samples were collected. Lithologic descriptions are taken from well installation log for MW-23.

**Focused Feasibility Study Report  
Appendix I  
Technical Memorandum and Associated Data  
Evaluation of Air Sparging as a Potential  
Interim Remedial Action at Gas Works Park  
(Tetra Tech and Key Environmental 1998)**

**1998 Borings**

# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-1  
 PROJECT NAME Gas Works Park DATE COMPLETED March 30, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 10.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL  $\nabla$  2.0  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL  $\nabla$  \_\_\_\_\_  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
210			SS		1	SW		Well graded sand (SW), trace fines, ~15% fine to coarse gravel, fine to coarse grained, very dark grey to black 7.5 YR N3/0 to 7.5 YR N2/0	1	
					2				2	
					3			Saturated, strong HC odor, sheen, fill	3	
					4				4	
					5	GP		Poorly graded gravel (GP) beginning at 5', dark grey, free product at 4.5' strong HC odor, gravel, fine grained, ~20% fine to coarse sand	5	
110			SS		6			~4" of SP, slight odor, slight sheen	6	
70.7	12		SS		7				7	
					8			No sheen	8	
496			SS		9				9	
	16		SS		10				10	

DRAFT

BWC GWP 5/8/98

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## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238)

BORING/WELL NUMBER B-1

PROJECT NAME Gas Works Park

DATE COMPLETED March 30, 1998

continued from previous page

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
				-11			End of boring = 10 ft Backfilled with bentonite chips  <div style="text-align: center; font-size: 48px; font-weight: bold; opacity: 0.5;">DRAFT</div>	-11	
				-12				-12	
				-13				-13	
				-14				-14	
				-15				-15	
				-16				-16	
				-17				-17	
				-18				-18	
				-19				-19	
				-20				-20	
				-21				-21	

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER <u>55-2175-06 (238)</u>	BORING/WELL NUMBER <u>B-2</u>
PROJECT NAME <u>Gas Works Park</u>	DATE COMPLETED <u>March 30, 1998</u>
LOCATION <u>Seattle, Washington</u>	TOTAL DEPTH OF BORING <u>13.0</u>
COORDINATES _____	INITIAL WATER LEVEL $\nabla$ <u>2.0</u>
DRILLING METHOD <u>Geoprobe</u>	STATIC WATER LEVEL $\nabla$ _____
SAMPLING METHOD <u>SS/Continuous</u>	LOGGED BY <u>A. Ackerman</u>
GROUND ELEVATION _____	TOP OF CASING ELEVATION _____

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM						
75.3		24	SS	X	1	SW		Well graded sand with gravel (SW), ~30% fine gravel, _____ coarse, very dark grey 7.5 YR N3/0, saturated, sheen, strong HC odor, fill	1							
			SS	X	2						Well graded sand with gravel (SW) ~20% fine to coarse gravel, _____ fine to coarse, dark brown 7.5 YR 3/2, saturated, HC odor, slight sheen, fill	2	$\nabla$			
			SS	X	3											
356		22	SS	X	4			SW		Well graded sand with gravel (SW) ~20% fine to coarse gravel, _____ fine to coarse, dark brown 7.5 YR 3/2, saturated, HC odor, slight sheen, fill	3					
			SS	X	5											
			SS	X	6											
500		22	SS	X	7					SW		Very dark grey 7.5 YR N3/0	4			
			SS	X	8											
			SS	X	9											
>2000		11	SS	X	10							SW		Well graded sand and gravel, ~40% gravel (_____), HC odor, _____ fine to coarse, gravel fines, 7.5 YR N2/0, saturated	5	
						6										

BWC GWP 5/8/98

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-2  
 PROJECT NAME Gas Works Park DATE COMPLETED March 30, 1998

continued from previous page

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
> 2000		10	SS	11			<b>DRAFT</b> Sheen, ~20% fine gravel, trace bricks at 12', no sheen	11	
			SS	12	12				
			SS	13	13				
							End of boring = 13 ft Backfilled with bentonite chips	13	
				14				14	
				15				15	
				16				16	
				17				17	
				18				18	
				19				19	
				20				20	
				21				21	

BWC GWP 5/8/98

# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-3  
 PROJECT NAME Gas Works Park DATE COMPLETED March 30, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 17.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL  $\nabla$  7.3  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL  $\nabla$  \_\_\_\_\_  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
2.3	16	SS	X	1	SM	[Symbol]	Silty sand (SM) ~ 30% fines, gravel, fine to medium sand, brown 7.5 YR 5/2, moist, reworked till, no sheen  <div style="text-align: center; font-size: 48px; font-weight: bold; opacity: 0.5;">DRAFT</div> sheen  7.5 YR N4/0	1	
		SS	X	2		[Symbol]		2	
				3		[Symbol]		3	
		SS	X	4		[Symbol]		4	
5.3	7	SS	X	5		[Symbol]		5	
				6		[Symbol]		6	
		SS	X	7		[Symbol]		7	
247	24	SS	X	8		[Symbol]	8		
				9	SW	[Symbol]	Well graded sand and gravel (SW), ~ 40% fine to coarse gravel, fine to coarse sand, black 7.5 YR N2/0, sheen HC odor	9	
				10		[Symbol]		10	

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238)

BORING/WELL NUMBER B-3

PROJECT NAME Gas Works Park

DATE COMPLETED March 30, 1998

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
5.8		12	SS	X	11			<h1>DRAFT</h1> <p>Till and silty sand with gravel, ~30% fines, ~10% fine gravel, hard, moist to dry, no sheen</p> <p>Sand with gravel, ~30% fines, trace fine to coarse gravel, saturated, dark grey 7.5 YR N4/0, non plastic, hard, till</p>	11	
			SS	X	12				12	
6.2		12	SS	X	13				13	
			SS	X	14				14	
			SS	X	15				15	
3.8		12	SS	X	16			16		
			SS	X	17			17		
11.7		2	SS	X	17			17		
					18			18		
					19			19		
					20			20		
					21			21		
								End of boring = 17' Backfilled with bentonite chips		

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# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER <u>55-2175-06 (238)</u>	BORING/WELL NUMBER <u>B-4</u>
PROJECT NAME <u>Gas Works Park</u>	DATE COMPLETED <u>March 30, 1998</u>
LOCATION <u>Seattle, Washington</u>	TOTAL DEPTH OF BORING <u>11.0</u>
COORDINATES _____	INITIAL WATER LEVEL <u>▽ 5.2</u>
DRILLING METHOD <u>Geoprobe</u>	STATIC WATER LEVEL <u>▽</u>
SAMPLING METHOD <u>Continuous</u>	LOGGED BY <u>A. Ackerman</u>
GROUND ELEVATION _____	TOP OF CASING ELEVATION _____

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
46.4		26	SS	X	1	SM		6" topsoil, silt sand (SM), ~30% fines, ~10% fine to coarse gravel, sand, fine grained to medium coarse grained, moist, no sheen, brown 7.5 YR 5/2, reworked till	1	
			SS	X	2				2	
84.2		26	SS	X	4				4	
			SS	X	5			Poorly graded sand, ~15% fines, trace gravel, moist, black 7.5 YR N2/0, moist, bricks, no sheen	5	
								_____ fine to coarse, trace fine gravel, very dark grey 7.5 YR N 3/0, moist	▽ 5	
					6				6	
		21	SS	X	7			Silty sand, fine grained, very dark grey 7.5 YR N 3/0, saturated, HC odor, sheen	7	
>2000			SS	X	8			_____ fine to coarse, ~15% fine to coarse gravel, saturated, black 7.5 YR N 2/0, HC odor	8	
					9				9	
		2	SS	X	10			Pushed a rock	10	

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**BORING/WELL CONSTRUCTION LOG**

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-4  
 PROJECT NAME Gas Works Park DATE COMPLETED March 30, 1998

continued from previous page

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
			SS	X	11			End of boring = 11 ft Backfilled with bentonite chips	11	
					12			<div> <p><b>DRAFT</b></p> </div>	12	
					13				13	
					14				14	
					15				15	
					16				16	
					17				17	
					18				18	
					19				19	
					20				20	
					21				21	

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# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-5  
 PROJECT NAME Gas Works Park DATE COMPLETED March 30, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 6.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL ▽  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL ▽  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
7.0		17	SS	X	1	SW		6" topsoil, well graded sand with gravel, ~8% fines, ~15% fine gravel, sand fine to coarse, dark brown 7.5 YR 4/2, moist, slight sheen, HC odor	1	
			SS	X	2				2	
			SS	X	3				3	
			SS	X	4			End of boring = 3.5 ft Backfilled with bentonite chips	4	
			SS	X	5				5	
					6				6	
					7				7	
					8				8	
					9				9	
					10				10	

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## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-5(A)  
 PROJECT NAME Gas Works Park DATE COMPLETED April 1, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 8.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL  $\nabla$  3.0  
 DRILLING METHOD \_\_\_\_\_ STATIC WATER LEVEL  $\nabla$  \_\_\_\_\_  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
5.3		28	SS		1	SW		2" topsoil, well graded sand (SW), ~5-15% fines, trace fine gravel, sand fine to coarse, moist, HC odor, slight sheen, very dark grey 7.5 YR 3/0, to black 7.5 YR 2/0, fill, hard	1	
			SS		2			<p style="text-align: center; font-size: 2em; opacity: 0.5;">DRAFT</p> <p>Strong HC odor, saturated</p>	2	
			SS		3				3	
> 2000		28	SS		4				4	
			SS		5	GW		Well graded gravel (GW) (slag), fine to coarse 10% sand, trace fines, black 7.5 YR 2/0, saturated sheen, trace interstitial free product	5	
			SS		6				6	
			SS		7				7	
> 2000		15	SS		8	SM		Silty sand (SM), ~35% fines, trace fine to coarse gravel, _____ fine to coarse, HC odor, no sheen, dark grey 4/0, moist, till	8	
								End of boring = 8' Backfilled with bentonite chips	8	
					9				9	
					10				10	

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# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-6  
 PROJECT NAME Gas Works Park DATE COMPLETED March 31, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 13.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL ▽ 3.2  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL ▽  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
83.4		24	SS	1			3" topsoil, well graded sand, ~10% fines, ~15% fine gravel, sand fine to medium, trace coarse, moist, very slight sheen, HC odor, fill	1	
			SS	2			~30% fines	2	
				3			Silty sand, ~25% fines, sand fine to coarse, trace gravel to 4', saturated	3	▽
> 2000		25	SS	4			Well graded gravel, fine to coarse, ~30% fine to coarse sand, ~10% fines, very dark grey 7.5 YR, _____ to black 7.5 YR _____, saturated, HC odor, sheen, fine to coarse gravel _____	4	
			SS	5				5	
				6				6	
> 2000		19	SS	7			SW fine to coarse, 10% fine gravel, ~10% fines, black 2.5 YR 2/0, saturated, sheen, HC odor, fill	7	
			SS	8			Silty sand, ~35% fines, sand fine coarse, trace fine gravel, dark grey 7.5 YR N4/0, moist, no sheen, hard	8	
				9				9	
> 2000			SS	10				10	

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**BORING/WELL CONSTRUCTION LOG**

PROJECT NUMBER 55-2175-06 (238)

BORING/WELL NUMBER B-6

PROJECT NAME Gas Works Park

DATE COMPLETED March 31, 1998

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
			SS	X	11				11	
> 2000			SS	X	12				12	
			SS	X	13				13	
					14			End of boring Backfilled with bentonite chips	14	
					15				15	
					16				16	
					17				17	
					18				18	
					19				19	
					20				20	
					21				21	

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# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-7  
 PROJECT NAME Gas Works Park DATE COMPLETED March 31, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 11.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL ▽ 3.3  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL ▽  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
15.4		27	SS	1	SW		3" topsoil, well graded sand (SW), fine coarse, trace fines, trace fine gravel, dark brown 7.5 YR 4/3 to black 7.5 YR 2/0, moist, slight HC odor, no sheen, fill	1	
			SS	2				2	
				3				3	
> 2000		24	SS	4	GW		Well graded gravel (GW) (slag) fine to coarse, ~ 10% sand, trace fines, black 4.5 YR 2/0, saturated, sheen, HC odor, trace interstitial free product	4	
			SS	5				5	
				6			Saturated, HC odor, slight sheen, fill	6	
> 2000			SS	7				7	
85.2		21	SS	8	GW		Silty sand, ~ 30% fines, 10% fine gravel, sand fine to coarse, slight sheen, saturated, till hard	8	
				9				9	
				10				10	

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**BORING/WELL CONSTRUCTION LOG**

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-7  
 PROJECT NAME Gas Works Park DATE COMPLETED March 31, 1998

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
					11			End of boring = 11 ft Backfilled with bentonite chips	11	
					12				12	
					13				13	
					14				14	
					15				15	
					16				16	
					17				17	
					18				18	
					19				19	
					20				20	
					21				21	

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# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-8  
 PROJECT NAME Gas Works Park DATE COMPLETED March 31, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 11.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL  $\nabla$  4.3  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL  $\nabla$  \_\_\_\_\_  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
18.4		23	SS	X	1	SW		2" topsoil, well graded sand (SW), ~10% - 30% fines, fine to coarse sands, ~15% fine to coarse gravel, dark brown 7.5 YR 4/4 to very dark grey 7.5 YR 3/0 at 1', moist, very slight sheen, fill	1	
			SS	X	2				2	
					3			~30% fines as above	3	
			SS	X	4	GW		Well graded gravel (GW) (slag) fine to coarse, ~10% fine to coarse sand, trace fines, black 7.5 YR 2/0, saturated, slight sheen, HC odor	4	
1026		20	SS	X	5				5	
					6				6	
			SS	X	7	GP		Poorly graded gravel (GP) (slag) fine grained trace sand and fines, black 7.5 YR 2/0, saturated, sheen, HC odor	7	
>2000		25	SS	X	8				8	
					9			Silty sand, ~25% fines, sand fine to coarse, trace to 10% fine gravel, dark grey 7.5 YR 4/0, saturated, hard	9	
52.5		20	SS	X	10				10	

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# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238)

BORING/WELL NUMBER B-8

PROJECT NAME Gas Works Park

DATE COMPLETED March 31, 1998

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
			SS		11			End of boring = 11 ft Backfilled with bentonite chips	11	
					12				12	
					13				13	
					14				14	
					15				15	
					16				16	
					17				17	
					18				18	
					19				19	
					20				20	
					21				21	

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## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER	55-2175-06 (238)	BORING/WELL NUMBER	B-9
PROJECT NAME	Gas Works Park	DATE COMPLETED	March 31, 1998
LOCATION	Seattle, Washington	TOTAL DEPTH OF BORING	15.0
COORDINATES		INITIAL WATER LEVEL	▽ 7.8
DRILLING METHOD	Geoprobe	STATIC WATER LEVEL	▽
SAMPLING METHOD	Continuous	LOGGED BY	A. Ackerman
GROUND ELEVATION		TOP OF CASING ELEVATION	

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
13.4		19	SS	X	1	SM		Silty sand (SM), ~30-40% fines, fine to coarse grained (80% fine grained), trace fine gravel, moist, dark brown 7.5 YR 4/2, no sheen, slight HC odor	1	
					2				2	
					3				3	
					4				4	
12.5		25	SS	X	5	SP		Poorly graded sand with silty (SP), ~10% fines, sand fine grained, dark brown 7.5 YR 3/2, moist, sheen	5	
					6				6	
					7				7	
16.2		28	SS	X	8	SW		Well graded sand (SW), fine to coarse, ~10% fine to coarse gravel, black 7.5 YR 2/0, moist, no sheen	8	
					9				9	
					10				10	
					12				10	

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238)

BORING/WELL NUMBER B-9

PROJECT NAME Gas Works Park

DATE COMPLETED March 31, 1998

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
670		9	SS	11			SW/slag as above, coarse grained, no product, HC odor, no sheen	11	
			SS	12	GW		GW/slag as above, coarser grained, no product, HC odor, no sheen	12	
49.2		20	SS	13	SM	Silty sand (SM), ~25% fines, _____ fine to coarse (~70% fine grained), trace fine gravel, hard, dark grey 7.5 YR 4/0, saturated, no sheen, till	13		
			SS	14			14		
			SS	15		End of boring = 15' Backfilled with bentonite chips	15		
				16			16		
				17				17	
				18				18	
				19				19	
				20				20	
				21				21	

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# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-10  
 PROJECT NAME Gas Works Park DATE COMPLETED March 31, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 11.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL ▽ 5.5  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL ▽  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM	
38.3		21	SS	X	1	SW		4" topsoil, well graded sand with silt (SW), ~10% fines, sand fine to coarse (65% fine grained), trace fine gravel, moist to saturated at 2.8', HC odor, no sheen, dark brown 7.5 YR 3/2	1		
			SS	X	2				<p style="text-align: center; font-size: 2em; font-weight: bold; opacity: 0.5;">DRAFT</p>		2
				X	3						
>2000		21	SS	X	4			Silty sand (SM), ~40% fines, sand fine to coarse, trace fine gravel, dark brown 2.5 YR 4/2, saturated, free product present 4.5' - 5.5'	4		
			SS	X	5				5		
				X	6				6		
			SS	X	7				7		
				X	8	SM		Silty sand (SM), ~30% fines, fine to coarse (80% fines), trace fine to coarse gravel, saturated, HC odor, dark grey 7.5 YR 4/0, hard, till	8		
>2000			SS	X	9						9
				X	10						10

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# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238)

BORING/WELL NUMBER B-10

PROJECT NAME Gas Works Park

DATE COMPLETED March 31, 1998

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
					11			End of boring = 11 ft Backfilled with bentonite chips	11	
					12				12	
					13				13	
					14				14	
					15				15	
					16				16	
					17				17	
					18				18	
					19				19	
					20				20	
					21				21	

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# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-11  
 PROJECT NAME Gas Works Park DATE COMPLETED March 31, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 11.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL ▽ 4.8  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL ▽  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM	
123		24	SS	1	SW		3" top soil, SW with silt (SW), ~10% fines, sand f-c (80% fine grained), trace fine gravel, dark brown 7.5 YR 3/3, trace organics at 2.5', moist, no sheen, reworked till	1		
			SS	2			<b>DRAFT</b>	2		
				3	ML			Silty with sand (ML), ~20-40% fine to coarse sand, trace fine gravel, slight plasticity, very dark grey 7.5 YR 3/0, moist, HC odor, no sheen, trace organics, trace slag	3	
87.0		20	SS	4					4	
			SS	5				5		
				6			Soft from 6-6.5', saturated, no sheen, dark brown from 6-6.5', very dark grey 7.5 YR 3/0 from 6.5'	6		
232		25	SS	7				7		
			SS	8				8		
				9				9		
125			SS	10	SM		Silty sand (SM), ~25% fines, fine to coarse, trace fine gravel, very dark grey 7.5 YR 3/0,	10		

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-11  
 PROJECT NAME Gas Works Park DATE COMPLETED March 31, 1998

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
			SS	X	11			moist/saturated, hard, till	11	
					11			End of boring = 11 ft Backfilled with bentonite chips	11	
					12			<div style="font-size: 4em; opacity: 0.5;">DRAFT</div>	12	
					13				13	
					14				14	
					15				15	
					16				16	
					17				17	
					18				18	
					19				19	
					20				20	
					21				21	

# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-12  
 PROJECT NAME Gas Works Park DATE COMPLETED April 1, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 9.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL ▽  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL ▼  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
38.1	24		SS	X	1	SW		layers ~4" of SM/ML with sand/SW with silt, all with 5-10% fine gravel, colors from brown-grey, black, dry-moist, no odor, no sheen, hard fill, trace wood chips at 2.8'	1	
			SS	X	2				2	
					3				3	
29.6	23		ML		4		Silt with sand (ML), ~20% fine sand, ~5% fine to coarse gravel, color variable	4		
			SS	X	5		4-6" layers with similar materials, but different color, less sand 4.5-5'	5		
			SS	X	6		Less silt 5.5-6', moderate plasticity, slight HC odor, no sheen, saturated at 5.5'	6		
31.5	4		SS	X	7		heterogeneous fill layers as above, saturated	7		
			SS	X	8			8		
27.2	8		SS	X	8	SM			8	
			SS	X	9		Silty sand (SM), ~20% fines, sand fine to coarse (~80% fines) ~8% fine to coarse gravel, hard, moist, no odor, no sheen, till End of boring = 9' Backfilled with bentonite chips	9		
					10			10		

DRAFT

BWC\_GWP\_5/8/98

# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-13  
 PROJECT NAME Gas Works Park DATE COMPLETED April 1, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 12.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL ▽  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL ▽  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
11.3		24	SS	X	1	SW		4" topsoil, well graded sand (SW), ~5-30% sand fine to coarse, ~5% fine gravel throughout, heterogeneous layers (6") of different fill materials, trace slag at 2', dry-moist, strong brown-black, no odor, no sheen	1	
			SS	X	2			<div style="font-size: 48px; opacity: 0.5;">DRAFT</div>	2	
				X	3				3	
14.4		29	SS	X	4				Silt to silty clay, ~5-20% fine sand (sand content variable), _____ to moderate plasticity, _____ brown 7.4 YR 4/8, with heterogeneous brown and grey mottling, changing to very dark grey 7.5 YR 2/0 with mottling at 5.5', trace fine to coarse gravel throughout, moist slight HC odor, _____ sheen, trace wood chips at 6', layered fill	4
			SS	X	5				5	
				X	6				6	
		14	SS	X	7				7	
			SS	X	8			Well graded sand (SW) fine to coarse trace fine gravel, saturated HC odor, trace interstitial product, sheen, fill	8	
32.7			SS	X	9	CL		Clay (CL), moderate plasticity, HC odor, _____ sheen, dry, silty, blue-grey mottled with _____ 5 YR 4/4, trace wood chips, fill	9	
			SS	X	10				10	

BWC\_GWP\_5/8/98

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238)

BORING/WELL NUMBER B-13

PROJECT NAME Gas Works Park

DATE COMPLETED April 1, 1998

continued from previous page

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
174			SS	X	11			Silty sand, ~40% fines, _____ fine, trace medium to coarse grained, trace fine gravel, dry, grey 7.5 YR 5/0, till	11	
			SS	X	12				End of boring = 12' Backfilled with bentonite chips	12
					13				13	
					14				14	
					15				15	
					16				16	
					17				17	
					18				18	
					19				19	
					20				20	
				21				21		

DRAFT

# Parametrix, Inc.

## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238) BORING/WELL NUMBER B-14  
 PROJECT NAME Gas Works Park DATE COMPLETED April 1, 1998  
 LOCATION Seattle, Washington TOTAL DEPTH OF BORING 11.0  
 COORDINATES \_\_\_\_\_ INITIAL WATER LEVEL ▽  
 DRILLING METHOD Geoprobe STATIC WATER LEVEL ▽  
 SAMPLING METHOD Continuous LOGGED BY A. Ackerman  
 GROUND ELEVATION \_\_\_\_\_ TOP OF CASING ELEVATION \_\_\_\_\_

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
11.6		27	SS	X	1	SP	[Stippled pattern]	5" topsoil, poorly graded sand (SP), trace ~10% fines, trace coarse sand, trace fine gravel, sand fine grained, brown 7.5 YR 5/2 to _____ brown 7.5 YR 4/6, dry/moist	1	
			SS	X	2		[Stippled pattern]		2	
51.4		25	SS	X	3	SW	[Dotted pattern]	SW, fine to coarse, trace fine gravel, trace wood chips, black 7.4 YR 2/0, HC odor, very slight sheen	3	
			SS	X	4		[Dotted pattern]	Sandy silt, ~35% fine to coarse sand, ~5% fine gravel, non-plasticity, slightly plastic, moist, very dark grey 7.5 YR 3/0, HC odor, slight sheen	4	
			SS	X	5		[Dotted pattern]		5	
					6		[Dotted pattern]		6	
87.9		25	SS	X	7		[Dotted pattern]	Well graded sand with silt (SW) ~10% fines, sand fine to coarse, trace fine gravel, saturated, HC odor, sheen	7	
			SS	X	8		[Dotted pattern]		8	
					9	CL	[Diagonal hatching]	Silty clay (CL), grey 7.5 YR N5/0, mottled with grey 5 YR 5/1, moist, _____, trace wood chips, fill	9	
36.2			SS	X	10		[Diagonal hatching]		10	

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## BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 55-2175-06 (238)

BORING/WELL NUMBER B-14

PROJECT NAME Gas Works Park

DATE COMPLETED April 1, 1998

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
66.5			SS	X	11	SM		Silty sand (SM), ~40% fines, sand fine grained, trace course sand and fine gravel, dry, grey 5 YR 5/1, till End of boring =	11	
					12				12	
					13				13	
					14				14	
					15				15	
					16				16	
					17				17	
					18				18	
					19				19	
					20				20	
					21				21	

**DRAFT**



**BORING LOG**  
B-16

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action		CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park		DRILLING CO.: Vironex
START DATE: 05/08/98 TIME: 08:22	BORING ID: 2 inches	DRILLER: Ray Carden
COMPLETION DATE: 05/08/98 TIME: 09:20	BORING DEPTH: 12.0 feet bgs	RIG TYPE: GeoProbe 5400
WATER LEVEL DURING DRILLING: 8.5' bgs	SURFACE ELEV.: feet (MSL)	METHOD: Direct Push
DATE MEASURED: 05/08/98	M. P. ELEVATION: feet (MSL)	LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						SM	SILTY SAND; Light brown; 20% fines; 15% gravel to 2 cm; dry.
					0		
	DP					CL	CLAY WITH SAND; Blue-gray; 25% fine- to medium-grained sand; stiff; medium plasticity; dry.
5					980	SP	SAND WITH GRAVEL; Dark gray (staining); medium-grained; <10% fines; 10% gravel to 1 cm diameter; wood fragments; moist; product present; strong odor.
						SM	SILTY SAND WITH GRAVEL; Gray to dark gray; 50% fine- to medium-grained sand; 40% soft clayey fines; 10% gravel to 1 cm diameter; moist; product in cracks and gaps; odor.
							ASH/CHARCOAL; Black; fine hard powder; dry; slight odor.
	DP					MZ	SILT; Dark gray to black; 60% soft fines; 40% fine- to medium-grained sand; wet; sheen on sample; odor present.
10					180	GP	GRAVEL WITH SAND; Dark gray; 80% gravel to 1 cm diameter; 20% fine- to medium-grained sand; wet; sheen; odor.
						SP	TILL; Gray; sand with silt and gravel; very hard; dry.
							Total depth = 12.0 feet bgs.

REMARKS:    ☒ - Sample Interval  
              DP - Direct Push



# BORING LOG

B-17

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: I-3586-420 Gas Works Park Remedial Design/Action		CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park		DRILLING CO.: Vironex
START DATE: 05/08/98 TIME: 09:30	BORING ID: 2 inches	DRILLER: Ray Carden
COMPLETION DATE: 05/08/98 TIME: 10:20	BORING DEPTH: 16.0 feet bgs	RIG TYPE: GeoProbe 5400
WATER LEVEL DURING DRILLING: 10.0' bgs	SURFACE ELEV.: feet (MSL)	METHOD: Direct Push
DATE MEASURED: 05/08/98	M. P. ELEVATION: feet (MSL)	LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
					0	SM	SILTY SAND WITH GRAVEL; Light brown; fine- to medium-grained sand; 25% fines; 10% gravel to 2 cm diameter; wet at 2.5 feet bgs.
5	DP					SM	SILTY SAND WITH GRAVEL; Dark brown; 30% very hard fines (coal/ash); 15% gravel to 2 cm diameter; dry; slight odor. 4.0'-6.5' - Local lenses of gray sand with gravel; slight odor.
					200	SP	SAND WITH GRAVEL (REWORKED TILL); Gray to dark gray; medium- to coarse-grained; 20% stiff fines; 15% gravel to 2 cm diameter; moist; sheen on samples; odor present.
	DP					SP	SAND; Brown; medium-grained; <10% fines; rootlets and organics; loose; dry.
10					240	SM	SAND WITH GRAVEL (REWORKED TILL); As at 6.5 feet bgs; dry.
						SP	SAND WITH GRAVEL; Black; medium-grained; 30% gravel to 3 cm diameter; wet; sheen; odor.
						SM	SAND WITH GRAVEL (REWORKED TILL); Soft clayey fines; moist to wet; local sheen; odor.
	DP				20	SM	SILTY SAND; Black; fine-grained; 30% stiff fines; dry; slight odor. 12.0'-13.0' - Decreasing percentage of fines; moist to wet.
						SP	SAND; Black; fine- to medium-grained; 10% to 15% fines; local gravel; wet; sheen; odor.
15						SM	TILL
							Total depth = 16.0 feet bgs.

REMARKS: Ø - Sample Interval  
DP - Direct Push



# BORING LOG

B-18

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action

CLIENT: Puget Sound Energy

LOCATION: Seattle, Washington; Gas Works Park

DRILLING CO.: Vironex

START DATE: 05/08/98 TIME: 10:20 BORING ID: 2 inches

DRILLER: Ray Carden

COMPLETION DATE: 05/08/98 TIME: 10:45 BORING DEPTH: 16.0 feet bgs

RIG TYPE: GeoProbe 5400

WATER LEVEL DURING DRILLING: 8.5' bgs SURFACE ELEV.: feet (MSL)

METHOD: Direct Push

DATE MEASURED: 05/08/98 M. P. ELEVATION: feet (MSL)

LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/ft*	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						SP-SM	SAND WITH SILT AND GRAVEL; Dry.
5	DP					SP	SAND WITH GRAVEL, ASH AND CINDERS; Dark brown; medium- to coarse-grained; 15% gravel to 3 cm diameter; abundant debris; moist at 6.0 feet bgs; slight odor.
						∇	8.0'-10.0' - Becomes wet at 8.5 feet bgs; odor present.
10	DP					SM	SAND WITH SILT AND GRAVEL (REWORKED TILL); Gray to dark brown; fine- to medium-grained; 25% medium stiff fines; 10% gravel to 2 cm diameter; wet; slight odor.
							12.0'-14.5' - Gray; wet; slight odor.
15						SM	TILL
							Total depth = 16.0 feet bgs.

REMARKS: ■ - Sample Interval  
DP - Direct Push



**BORING LOG**  
B-19

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action		CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park		DRILLING CO.: Vironex
START DATE: 05/08/98 TIME: 11:26	BORING ID: 2 inches	DRILLER: Ray Carden
COMPLETION DATE: 05/08/98 TIME: 11:50	BORING DEPTH: 12.0 feet bgs	RIG TYPE: GeoProbe 5400
WATER LEVEL DURING DRILLING: 9.5' bgs	SURFACE ELEV.: feet (MSL)	METHOD: Direct Push
DATE MEASURED: 05/08/98	M. P. ELEVATION: feet (MSL)	LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PTD (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						SP-SM	SAND WITH SILT AND GRAVEL; Dry.
						SM	SILTY SAND WITH CINDERS AND BRICK; Dark brown; 20% medium stiff fines; moist.
5	DP						7.0' - 2-inch thick black wood.
						SP-SM	SAND WITH SILT AND GRAVEL (REWORKED TILL); Gray; fine- to medium-grained; 25% medium stiff fines; 10% gravel to 2 cm diameter; moist to wet.
						SP	SAND WITH GRAVEL; Black; 50% medium- to coarse-grained sand; 50% gravel to 1 cm diameter; abundant wood fragments; wet.
10	DP					SP	SAND WITH BRICK AND ASH FRAGMENTS; Dark brown; medium- to coarse-grained; loose; wet.
						SM	TILL
							Total depth = 12.0 feet bgs.

REMARKS: □ - Sample Interval  
DP - Direct Push



**BORING LOG**  
B-20

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/08/98 TIME: 13:00	BORING ID: 2 inches
COMPLETION DATE: 05/08/98 TIME: 13:20	BORING DEPTH: 12.0 feet bgs
DRILLER: Ray Carden	RIG TYPE: GeoProbe 5400
WATER LEVEL DURING DRILLING: 7.0' bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED: 05/08/98	M. P. ELEVATION: feet (MSL)
	METHOD: Direct Push
	LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						SP-SM	SAND WITH SILT AND GRAVEL; Dry. 2.0' - Large rock.
						SM	SILTY SAND WITH GRAVEL; Dark gray; 15% to 20% stiff fines; moist.
5	DP					SM	SILTY SAND WITH GRAVEL; Gray to dark gray; 20% medium stiff fines.
						SP	SAND WITH GRAVEL, ASH AND CINDERS; Black; local wood and brick fragments; wet; slight odor.
10	DP				*		
					*		
						SM	TILL
							Total depth = 12.0 feet bgs.
15							
20							

REMARKS: □ - Sample Interval  
DP - Direct Push  
\* PID not working.

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A Thermo Electron Company

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**BORING LOG**  
B-21

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/08/98 TIME: 13:20	BORING ID: 2 inches
COMPLETION DATE: 05/08/98 TIME: 14:00	BORING DEPTH: 12.0 feet bgs
DRILLER: Ray Carden	RIG TYPE: GeoProbe 5400
WATER LEVEL DURING DRILLING: 'bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED:	M. P. ELEVATION: feet (MSL)
	METHOD: Direct Push
	LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						SP	GRAVEL WITH SAND; Dark gray; 30% medium- to coarse-grained sand; dry.
					*	SP	SAND WITH GRAVEL; Light tan; medium-grained; 15% gravel to 2 cm diameter; dry.
						SM	SAND WITH GRAVEL; Light tan; medium-grained; 15% gravel to 2 cm diameter; dry.
							SILTY SAND WITH GRAVEL; Dark gray; 30% stiff fines; dry.
5	DP					SM	BRICK FRAGMENTS
							SILTY SAND WITH GRAVEL; Black; fine- to medium-grained sand with ~40% medium stiff fines; 10% gravel to 1 cm diameter; abundant cinders.
						GP	6.0' - Moist; odor present.
					*		SILTY SAND WITH GRAVEL; Dark gray; medium-grained sand with ~40% stiff fines; local clayey lenses; abundant brick fragments; moist to wet; slight odor.
	DP					SM	GRAVEL WITH SAND; Black; 75% gravel to <1 cm diameter; 25% medium-grained sand and fines; loose; wet; slight odor.
10					*		SILTY SAND WITH GRAVEL; Dark gray; fine-grained sand with 40% soft fines; 10% gravel <1 cm diameter; wet; sheen; odor present.
						SM	TILL
							Total depth = 12.0 feet bgs.

REMARKS: □ - Sample Interval  
DP - Direct Push  
\* PID not working.





# BORING LOG

B-23

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/08/98 TIME: 15:00	BORING ID: 2 inches
COMPLETION DATE: 05/08/98 TIME: 15:45	BORING DEPTH: 12.0 feet bgs
WATER LEVEL DURING DRILLING: ' bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED:	M. P. ELEVATION: feet (MSL)
	METHOD: Direct Push
	LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						SP	SAND WITH BRICK FRAGMENTS, CINDERS AND GRAVEL; 40% debris and gravel to 3 cm diameter; dry.
					40	SM	SILTY SAND WITH GRAVEL; Dark gray; 40% medium stiff, slightly clayey fines; dry to moist; slight odor. 4.0'-6.0' - Local wood fragments; moist.
5	DP						
						SM	SILT; Gray; 25% stiff fines; local gravel to 4 cm diameter; moist to wet.
					60		
						SP	SAND; Black; fine- to medium-grained; local gravel to <1 cm diameter; local brick fragments; strong sheen. 8.5'-10.0' - Wet; product present.
10	DP						
					120	SM	TILL
							Total depth = 12.0 feet bgs.
15							
20							

REMARKS: □ - Sample Interval  
DP - Direct Push



# BORING LOG

B-24

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/08/98 TIME: 15:50	BORING ID: 2 inches
COMPLETION DATE: 05/08/98 TIME: 16:15	BORING DEPTH: 12.0 feet bgs
DRILLER: Ray Carden	RIG TYPE: GeoProbe 5400
WATER LEVEL DURING DRILLING: ' bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED:	M. P. ELEVATION: feet (MSL)
	METHOD: Direct Push
	LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/8"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP					SP-SM	SAND WITH SILT; Light brown; local gravel; loose; dry.
						SP	SAND WITH GRAVEL; Brown; medium- to coarse-grained; gravel lenses with sizes 2 to 5 cm diameter; abundant brick and wood fragments; dry.
					100	SM	SILTY SAND WITH GRAVEL; Dark brown; medium-grained; 20% medium stiff fines; 15% gravel to 2 cm diameter; wet; slight odor.
	DP					SP	SILTY SAND WITH GRAVEL; Dark brown; medium- to coarse-grained; 30% stiff fines; 15% gravel to 1.5 cm diameter; abundant brick and cinder fragments; dry.
5							SAND WITH GRAVEL; Dark brown; medium- to coarse-grained; 30% gravel to <1 cm diameter; abundant cinders; moist to wet; slight odor.
					160	SM	ASH
	DP					SM	SILTY SAND WITH GRAVEL; As at 3.0 feet bgs; dry to moist.
							SAND WITH GRAVEL; As at 4.0 feet bgs; slight odor.
10						SM	TILL
							Total depth = 12.0 feet bgs.
15							
20							

REMARKS: □ - Sample Interval  
OP - Direct Push



**BORING LOG**  
B-25

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/08/98 TIME: 16:20	BORING ID: 2 inches
COMPLETION DATE: 05/08/98 TIME: 17:15	BORING DEPTH: 18.0 feet bgs
WATER LEVEL DURING DRILLING: 7.0' bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED: 05/08/98	M. P. ELEVATION: feet (MSL)
	METHOD: Direct Push
	LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
					80	SP-SM	SAND WITH SILT AND GRAVEL; Brown; 15% fines; 15% gravel to 2 cm diameter; local wood fragments; dry.
5	DP						NO RECOVERY
					600	SP	SAND WITH GRAVEL; Dark brown to black; 30% gravel to <1 cm diameter; wet; slight odor.
10	DP				2520	SM	SILTY SAND WITH GRAVEL; Brown to gray; 25% soft fines; 20% gravel to 2 cm diameter; wet; strong kerosene-like odor (different odor from other borings). 9.0'-10.5' - Clear to light brown product present.  11.0' - Odor seems to lessen below this depth.  12.0'-13.0' - Sheen on soils; strong odor present.
					3600	SP	SAND; Gray; medium- to coarse-grained; wet; strong odor.
15					640	GP	GRAVEL; Gray; <1 cm diameter; 20% medium- to coarse-grained sand; sheen; strong odor.
	DP					SP	SAND WITH GRAVEL; Gray; medium- to coarse-grained; 40% gravel to 2 cm diameter; no sheen; odor present. 16.0'-17.0' - Slight odor.
					40	SM	SILTY SAND WITH GRAVEL; Gray; medium- to coarse-grained; 20% soft clayey fines; 15% gravel to 2 cm diameter; wet; no odor.
							Total depth = 18.0 feet bgs.

REMARKS: □ - Sample Interval  
DP - Direct Push



# BORING LOG

B-26

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/11/98 TIME: 08:00	BORING ID: 2 inches
COMPLETION DATE: 05/11/98 TIME: 08:30	BORING DEPTH: 12.0 feet bgs
WATER LEVEL DURING DRILLING: bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED:	M. P. ELEVATION: feet (MSL)
	METHOD: Direct Push
	LOGGED BY: G.Sega

DEPTH (in feet)	SAMPLE DATA						SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/8"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY	
0	DP						TOPSOIL	
					0	SP-SM	SAND WITH SILT AND GRAVEL; Brown; fine- to medium-grained; 20% gravel to 4 cm diameter; 15% fines; abundant wood chips; dry.	
							ASH AND CINDERS; Dry.	
5	DP				60	SP-ML	SAND WITH SILT; Dark gray to brown; medium- to coarse-grained; 15% fines; brick fragments; dry.	
							SILT; Greenish-gray; locally sandy; local gravel to 2 cm diameter; very stiff; dry.	
						SM	SILTY SAND WITH GRAVEL (TILL); Gray; 20% very stiff fines; 10% gravel to 2 cm diameter; dry.	
10	DP				0	SP-SM	SAND WITH SILT; Gray; 15% stiff fines; local gravel to 1 cm diameter; wet.	
							Total depth = 12.0 feet bgs.	

REMARKS: □ - Sample Interval  
DP - Direct Push



**BORING LOG**  
B-27

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/11/98 TIME: 08:38	BORING ID: 2 inches
COMPLETION DATE: 05/11/98 TIME: 09:20	BORING DEPTH: 14.0 feet bgs
WATER LEVEL DURING DRILLING: 4.75' bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED: 05/11/98	M. P. ELEVATION: feet (MSL)
	LOGGED BY: G. Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
					60	SP-SM	SAND WITH SILT AND GRAVEL; Dark gray to black; medium-grained; silty zones <4 inches thick; slight odor.
					900	SM	SILTY SAND; Light brown; fine- to medium-grained; 40% fines; 10% gravel to 2 cm diameter; moist; strong odor to light (solvent) smell.
5	DP						4.75' - Becomes wet.
						SM-PT	SILTY SAND WITH PEAT; Dark brown; 40% fine-grained sand; soft to medium stiff; abundant organics; moist; strong odor.
					4180	SM	SILTY SAND; As at 2.5 feet bgs; wet; light brown product present; strong odor.
	DP				4000	SP-SM	SAND WITH SILT AND GRAVEL; Light brown to gray; medium-grained; 15% medium stiff fines; 15% gravel to 2 cm diameter; odor present.
10					3680	GP	GRAVEL WITH SAND; Gray; 70% gravel to 2 cm diameter; 30% medium- to coarse-grained sand; wet; odor present.
					820	SM	SAND WITH SILT AND GRAVEL; As at 7.5 feet bgs; odor present.
	DP						12.5' - Becomes very stiff.
					140	SP	SAND WITH GRAVEL; Gray; fine-grained; 10% gravel to <1 cm diameter; dry; slight odor.
							Total depth = 14.0 feet bgs.

REMARKS:    ▣ - Sample Interval  
              DP - Direct Push



# BORING LOG

B-28

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/11/98 TIME: 09:40	BORING ID: 2 inches
COMPLETION DATE: 05/11/98 TIME: 10:30	BORING DEPTH: 12.0 feet bgs
DRILLER: Ray Carden	RIG TYPE: GeoProbe 5400
WATER LEVEL DURING DRILLING: 3.0' bgs	SURFACE ELEV.: feet (MSL)
METHOD: Direct Push	LOGGED BY: G. Sega
DATE MEASURED: 05/11/98	M. P. ELEVATION: feet (MSL)

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						SP	SAND WITH GRAVEL; Dark brown to black; medium to coarse-grained; 50% gravel to 3 cm diameter; dry.
							CINDERS AND BRICK FRAGMENTS; Dark brown to black.
					60		3.0' - Becomes wet.
5	DP						4.0'-6.0' - Wet; sheen and odor present.
					2960	SM	SILTY SAND; Dark brown to black; 50% fines; abundant wood fragments; soft; sheen and odor present.
						SP	
						SM	SAND WITH SILT AND GRAVEL; Dark brown to black; medium-grained; 30% fines; 25% gravel to 3 cm diameter; loose; wet; sheen and odor present.
	DP				540		SILTY SAND WITH GRAVEL; Gray to dark gray; fine- to medium-grained; 40% medium to stiff fines; 10% gravel to 2 cm diameter; moist to wet; slight odor.
10					1020		8.0'-10.5' - Moist to wet.
					1060	SM	TILL; Clayey sand with gravel; very hard; dry.
							Total depth = 12.0 feet bgs.

REMARKS: □ - Sample Interval  
OP - Direct Push



# BORING LOG

B-29

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/11/98 TIME: 10:40	BORING ID: 2 inches
COMPLETION DATE: 05/11/98 TIME: 11:30	BORING DEPTH: 16.0 feet bgs
WATER LEVEL DURING DRILLING: 'bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED:	M. P. ELEVATION: feet (MSL)
	LOGGED BY: G. Sega

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						SP	SAND WITH GRAVEL; Brown to dark gray; medium- to coarse-grained; 25% gravel to 3 cm diameter; 10% fines; dry to moist.
					60	SP	SAND WITH GRAVEL, ASH AND CINDERS; Black; medium-grained; 10% to 15% fines; 15% gravel to 2 cm diameter; abundant brick fragments; dry.
5	DP						6.0' - Wet; sheen and odor present.
					2320		
	DP						
						SP-SM	SAND WITH SILT AND GRAVEL; Gray; fine- to medium-grained; 25% medium stiff fines; 10% gravel to 2 cm diameter; local 1- to 2-inch thick interbeds of medium- to coarse-grained sand; wet; slight odor.
10	DP						
						GP-SM	GRAVEL WITH SAND; Gray; gravel to 2 cm diameter; 20% medium- to coarse-grained sand; slight odor.
					100		SAND WITH SILT AND GRAVEL; As at 9.0 feet bgs.
						SP	ILL; Clayey sand with gravel; local 1-inch thick sand interbeds.
15							Total depth = 16.0 feet bgs.

REMARKS: Ø - Sample Interval  
DP - Direct Push



# BORING LOG

## B-30

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action		CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park		DRILLING CO.: Vironex
START DATE: 05/11/98 TIME: 12:45	BORING ID: 2 inches	DRILLER: Ray Carden
COMPLETION DATE: 05/11/98 TIME: 13:10	BORING DEPTH: 12.0 feet bgs	RIG TYPE: GeoProbe 5400
WATER LEVEL DURING DRILLING: ' bgs	SURFACE ELEV.: feet (MSL)	METHOD: Direct Push
DATE MEASURED:	M. P. ELEVATION: feet (MSL)	LOGGED BY: G. Segal

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
	DP						TOPSOIL
					40	SP ML	SAND WITH GRAVEL AND CINDERS; Brown to black; fine- to coarse-grained; 10% gravel to 2 cm diameter; abundant brick fragments; dry.
							SILT WITH SAND; Dark brown; 30% fine-grained sand; abundant wood chips; stiff; dry.
	DP					SM	ASH
5					2120		SILTY SAND WITH GRAVEL; Dark brown to gray; fine- to medium-grained; 40% medium stiff fines; 10% gravel to 2 cm diameter; moist; light colored product present; odor present.
					120	SP- SM	SAND WITH SILT AND GRAVEL; Gray; medium-grained; 20% fines; 10% gravel to 2 cm diameter; wet; sheen present; strong odor.
	DP					SP	SAND WITH GRAVEL; Gray; medium- to coarse-grained; 10% to 15% fines; 10% gravel to 2 cm diameter; wet; sheen and odor present.
10						SM	SILTY SAND WITH GRAVEL (TILL); Gray; fine- to medium-grained; 30% very stiff fines; 10% gravel; moist; slight odor present.
					120		Total depth = 12.0 feet bgs.

REMARKS:    ▣ - Sample Interval  
               DP - Direct Push



# BORING LOG

B-31

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/11/98 TIME: 13:15	BORING ID: 2 inches
COMPLETION DATE: 05/11/98 TIME: 13:45	BORING DEPTH: 16.0 feet bgs
WATER LEVEL DURING DRILLING: ' bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED:	M. P. ELEVATION: feet (MSL)
	LOGGED BY: G. Segal

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP					SP	SAND WITH GRAVEL; Brown; medium- to coarse-grained; 20% gravel to 5 cm diameter; 10% fines; dry.
					200	SP-SM	SAND WITH SILT AND GRAVEL; Dark gray to black; fine- to medium-grained; 10% to 20% fines; 10% gravel to 3 cm diameter; abundant cinders and brick fragments; dry.
5	DP					SP	SAND WITH GRAVEL; Light brown to brown; medium- to coarse-grained; 10% gravel to 2 cm diameter; moist.
					100	SM	SILTY SAND WITH GRAVEL; Gray; fine- to medium-grained; 25% medium stiff fines; 15% gravel to 2 cm diameter; moist.  8.0' - 50% recovery; rock.  9.0' - Becomes wet.
10	DP					SP	SAND WITH GRAVEL; Dark gray; medium-grained; 10% fines; 10% gravel to 2 cm diameter; loose; wet; slight odor.
					40		
15	DP					SP	SAND WITH GRAVEL; Gray; medium- to coarse-grained; 10% gravel to 1 cm diameter; <10% fines; moist to wet; slight odor.
							Total depth = 16.0 feet bgs.

REMARKS: □ - Sample Interval  
DP - Direct Push



# BORING LOG

B-32

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/11/98 TIME: 14:05	BORING ID: 2 inches
COMPLETION DATE: 05/11/98 TIME: 14:50	BORING DEPTH: 18.0 feet bgs
WATER LEVEL DURING DRILLING: ' bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED:	M. P. ELEVATION: feet (MSL)
	LOGGED BY: G. Segal

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PI/D (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						ML	SILT WITH SAND AND GRAVEL; Brown; medium stiff; 25% fine-grained sand; 5% to 10% gravel to 1 cm diameter; abundant organics; dry.
5	DP					SP	SAND; Brown to gray; fine- to medium-grained; <10% fines; local gravel to 1 cm diameter; dry to moist.
10	DP						CINDERS; Dry to moist.  9.0' - Becomes wet; product present.
15	DP					SP	SAND WITH GRAVEL; Black; fine- to medium-grained; 10% gravel to 1.5 cm diameter; <10% fines; wet; strong sheen and odor.
	DP					SP-SM	SAND WITH SILT AND GRAVEL; Dark gray; medium- to coarse-grained; 15% gravel to 2 cm diameter; 10% to 15% fines; moist to wet; slight odor.
							Total depth = 18.0 feet bgs.

REMARKS: ⊗ - Sample Interval  
DP - Direct Push



**BORING LOG**  
B-33

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park	DRILLING CO.: Vironex
START DATE: 05/11/98 TIME: 15:10	BORING ID: 2 inches
COMPLETION DATE: 05/11/98 TIME: 15:30	BORING DEPTH: 12.0 feet bgs
WATER LEVEL DURING DRILLING: 8.0' bgs	SURFACE ELEV.: feet (MSL)
DATE MEASURED: 05/11/98	M. P. ELEVATION: feet (MSL)
	LOGGED BY: G. Segal

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
						SP	SAND WITH GRAVEL; Light brown; medium- to coarse-grained; 10% gravel to 2 cm diameter; <10% fines; dry.
						SM	SILTY SAND WITH GRAVEL; Brown; fine- to medium-grained; 20% fines; 10% gravel to 2 cm diameter; dry to moist.
5	DP				100	ML	CINDERS; Black; 25% black medium- to coarse-grained sand with silt; moist to wet; slight odor.
					260		SILT WITH SAND AND GRAVEL; Greenish-gray; soft to medium stiff; medium plasticity; 15% fine-grained sand; 10% gravel to 2 cm diameter; moist.
					320	SM	SILTY SAND WITH CINDERS; Dark gray to black; fine- to medium-grained; 30% medium stiff fines; abundant cinders; moist to wet.
							NO RECOVERY
10	DP				120	SM	SILTY SAND WITH CINDERS; Dark gray to black; fine- to medium-grained; 30% medium stiff fines; abundant cinders; wet; odor present.
						SP	SAND WITH GRAVEL; Gray; medium- to coarse-grained; 20% gravel to 2 cm diameter; wet; sheen and odor present.
						CH	CLAY; Greenish-gray; stiff; high plasticity; dry.
							Total depth = 12.0 feet bgs.

REMARKS:    Ⓚ - Sample Interval  
                 DP - Direct Push

PROJECT NO: 1-3586-420 Gas Works Park Remedial Design/Action		CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Gas Works Park		DRILLING CO.: Vironex
START DATE: 05/11/98 TIME: 15:35	BORING ID: 2 inches	DRILLER: Ray Carden
COMPLETION DATE: 05/11/98 TIME: 16:10	BORING DEPTH: 10.5 feet bgs	RIG TYPE: GeoProbe 5400
WATER LEVEL DURING DRILLING: bgs	SURFACE ELEV.: feet (MSL)	METHOD: Direct Push
DATE MEASURED:	M. P. ELEVATION: feet (MSL)	LOGGED BY: G. Segal

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	DP						TOPSOIL
0					0	SP-SM	SAND WITH SILT AND GRAVEL; Light brown; fine- to medium-grained; 10% to 15% fines; 10% gravel to 2 cm diameter; dry.
5	DP				40	SM	SILTY SAND WITH CINDERS; Black; fine- to medium-grained; 30% fines; abundant cinders; wood and brick fragments; moist.
5					40	SM	SILTY SAND WITH GRAVEL; Greenish-gray with black mottling; fine- to medium-grained; 40% fines; 15% gravel to 4 cm diameter; slight odor.
							NO RECOVERY
	DP					SM	SILTY SAND WITH GRAVEL; Black; fine-grained; 30% soft fines; 10% gravel <1 cm diameter; wet.
10					280	SM	SILTY SAND WITH GRAVEL; As at 5.0 feet bgs; abundant wood fragments; dry; slight odor.
10					20	SP	9.0' - 3-inch tan sand and gravel layer.
10					20	SP	SAND WITH GRAVEL; White to buff; medium- to coarse-grained; 20% gravel to 3 cm diameter; <10% fines; dry.
10							SAND WITH GRAVEL (TILL); Gray; medium- to coarse-grained; 25% gravel to 4 cm diameter; wet.
							Refusal. Total depth = 10.5 feet bgs.

REMARKS: □ - Sample Interval  
DP - Direct Push

**Construction Completion Report  
Gas Works Park  
(ThermoRetec 2001)**

**2000 Borings**



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# WELL INSTALLATION LOG

## Monitoring Well CMP-1

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349  
www.thermoretec.com

PROJECT NO: <i>PSE10-14651-610 Gas Works Park Upland Remediation</i>		CLIENT: <i>Puget Sound Energy</i>
LOCATION: <i>Seattle, Washington; Harbor Patrol, center of shoreline parking lot</i>		DRILLING CO.: <i>Cascade Drilling</i>
START DATE: <i>07/13/00</i> TIME: <i>14:00</i>	BORE HOLE ID: <i>8 inches</i>	DRILLER: <i>J. Goble</i>
COMPLETION DATE: <i>07/13/00</i> TIME: <i>16:50</i>	TOTAL DEPTH: <i>22.0 feet bgs</i>	RIG TYPE: <i>Limited Access CME-75</i>
WATER LEVEL DURING DRILLING: <i>2.0' bgs</i>	TOP OF CASING: <i>0.25 foot bgs</i>	METHOD: <i>Hollow-stem Auger</i>
SURFACE ELEV.: <i>21.41 feet (MSL)</i>	MP ELEV.: <i>21.64 feet (MSL)</i>	LOGGED BY: <i>B. Howard</i>

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION			SAMPLE DATA				
	FLUSH-MOUNT MONUMENT WITH LOCKED CAP	CONCRETE	U.S.C.S.	LITHOLOGY		TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)
0			AC GW	ASPHALT						
5	2" DIAMETER SCHEDULE 40 PVC BLANK	BENTONITE CHIPS			<b>SANDY GRAVEL (GAS WORKS PARK DEPOSIT);</b> Black; fine to coarse; fine- to coarse-grained sand; trace silt; 10% wood chips; cinders; shells; saturated; no sheen; no hydrocarbon odor.  7.5'-9.0' - With 5%-10% wood chips.	DM	9 6 6	15	0	
10	2" DIAMETER SCHEDULE 40 PVC 0.010" SLOT SCREEN	2/12 SILICA SAND	SW		<b>SAND (GAS WORKS PARK DEPOSIT);</b> Black; fine- to coarse-grained; trace fine to coarse gravel; trace silt; cinders; 5% wood chips; shells; saturated; no sheen; no hydrocarbon odor.  12.5'-14.0' - Slight hydrocarbon odor.	DM	1 1 1	18	4.9	
15					15.0'-16.5' - Slight black film on water surface during sheen test (10%); strong hydrocarbon odor.	DM	3 3 3	10	4.9	
20	END CAP		NR		<b>NO RECOVERY:</b> Very soupy; sample fell out of sampler.	DM	1 1 1	0		
22.0					Total depth = 22.0 feet bgs.					

REMARKS: DM - Dames & Moore Sampler  
 ■ - Sample Interval



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# WELL INSTALLATION LOG

## Monitoring Well OBS-1

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349  
www.thermoretec.com

PROJECT NO: PSE10-14651-610 Gas Works Park Upland Remediation		CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Southeast Shoreline Area, 5' from high-water shoreline		DRILLING CO.: Cascade Drilling
START DATE: 07/13/00 TIME: 08:00	BORE HOLE ID: 8 inches	DRILLER: J. Goble
COMPLETION DATE: 07/13/00 TIME: 09:10	TOTAL DEPTH: 12.5 feet bgs	RIG TYPE: Limited Access CME-75
WATER LEVEL DURING DRILLING: 18.0' bgs	TOP OF CASING: 0.25 foot bgs	METHOD: Hollow-stem Auger
SURFACE ELEV.: 18.73 feet (MSL)	MP ELEV.: 19.06 feet (MSL)	LOGGED BY: J. Henley

DEPTH (in feet)	WELL CONSTRUCTION	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION		SAMPLE DATA										
					TYPE	DEPTH	BLOWS/6"	% RECOVERY	PTD (ppm)							
0	FLUSH-MOUNT MONUMENT WITH LOCKED CAP															
5	2" DIAMETER SCHEDULE 40 PVC BLANK	GW	SANDY GRAVEL (GAS WORKS PARK DEPOSIT); Black; fine to medium gravel; fine- to coarse-grained sand; saturated; slight to moderate sheen; moderate hydrocarbon odor.	5.0'-6.0' - Moderate sheen; moderate hydrocarbon odor.	DM	17 20 26	60	10								
	2" DIAMETER SCHEDULE 40 PVC 0.010" SLOT SCREEN					DM	12 13 12	60	1608							
	2 1/2 SILICA SAND	GW				DM	10 9 10	45	391							
10	END CAP			10.0'-11.5' - Grades with subrounded to rounded coarse gravel; heavy sheen; moderate hydrocarbon odor.	DM	16 11 11	35	747								
				Total depth = 12.5 feet bgs.												

REMARKS: DM - Dames & Moore Sampler  
 ■ - Sample Interval





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# WELL INSTALLATION LOG

## Monitoring Well OBS-3

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349  
www.thermoretec.com

PROJECT NO: PSE10-14651-610 Gas Works Park Upland Remediation	CLIENT: Puget Sound Energy
LOCATION: Seattle, Washington; Southeast Shoreline Area, 65' upland from high-water shoreline	DRILLING CO.: Cascade Drilling
START DATE: 07/13/00 TIME: 10:40	BORE HOLE ID: 8 inches
COMPLETION DATE: 07/13/00 TIME: 11:30	TOTAL DEPTH: 12.5 feet bgs
WATER LEVEL DURING DRILLING: 5.0' bgs	TOP OF CASING: 0.25 foot bgs
SURFACE ELEV.: 22.16 feet (MSL)	MP ELEV.: 22.51 feet (MSL)
	METHOD: Hollow-stem Auger
	LOGGED BY: B. Howard

DEPTH (in feet)	WELL CONSTRUCTION		SOIL DESCRIPTION			SAMPLE DATA				
	FLUSH-MOUNT MONUMENT WITH LOCKED CAP	CONCRETE	U.S.C.S.	LITHOLOGY	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	
0			SM							
0-5	2" DIAMETER SCHEDULE 40 PVC BLANK	BENTONITE CHIPS	SM		SILTY SAND; Light brown; fine- to medium-grained; moist; strong odor.	DM	50/2.5"	0		
5-7.5	2" DIAMETER SCHEDULE 40 PVC 0.010" SLOT SCREEN	2 1/2 SILICA SAND	SM		GRAVELLY SILTY SAND; Light gray to brown; very fine- to coarse-grained; with silt; fine to medium gravel; saturated; heavy sheen; strong hydrocarbon odor.	DM	16/50	65	> 1000	
7.5-9.0					7.5'-9.0' - Grades with trace cobbles.	DM	50	45	> 1000	
9.0-12.5			SP		SAND WITH GRAVEL; Gray; very fine- to medium-grained; ~5% gravel; saturated; heavy sheen; strong hydrocarbon odor.	DM		65	> 1000	
	END CAP				Total depth = 12.5 feet bgs.					

REMARKS: 0'-5' - No recovery, encountered rock; lithologic description from 0'-5' bgs taken from B-27.  
DM - Dames & Moore Sampler  
■ - Sample Interval



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# Boring/Well Installation Log

Well # A-1  
Sheet 1 of 2

Project: Gas Works Park	Monument: Sparge Well	Stick Up: 6"
Project #: PSE10-15107-250	Northing: 238922.71 Easting: 1270727.36	Ground Elevation: 20.5'
Location: Sparge Well Area	Rig Type: CME 850 Track	MP Elevation: 21'
Client: Puget Sound Energy	Method: HSA	Total Depth: 20'
Start Date & Time: 11/3/00 0900	Casing ID: 4 1/4"	Filter Pack: 8X12 Silica Sand
Finish Date & Time: 11/3/00 1200	Boring ID: 8"	Seal: 3/8" Bentonite Chips
Contractor: Cascade Drilling	Bit Type:	Grout: Cement/Bentonite Slurry
Driller: Michael	Logged By: Aaron Waggoner	Screen: 2" PVC w/ 0.010" Slots

Remarks & Datum Used:

Sample Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
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SS-1	12-13.5	13-16-14	11		12	SP: (12 - 13.5) Coarse SAND w/ some Gravel; black, stiff, saturated w/ oily water.	8	Rock in shoe
SS-2	14-15.5	3-7-17	39		14	SP: (14 - 15) Same as above.	7	
SS-3	15.5-17	8-15-27	56		15	ML: (15 - 15.5) SILT w/ some Sand; dark grey, wet, stiff, HC odor, sheen on surface of grains.	6	
					16	BLANK: (15.5 - 16) Sluff and heave.	5	Set well @ 15.5'. Sand heave @ 15.5'
					16	SP: (16 - 17) SAND w/ some Silt, trace Gravel; grey, moist, medium dense, HC odor, fine to coarse subrounded sand, fine subrounded gravel.	4	

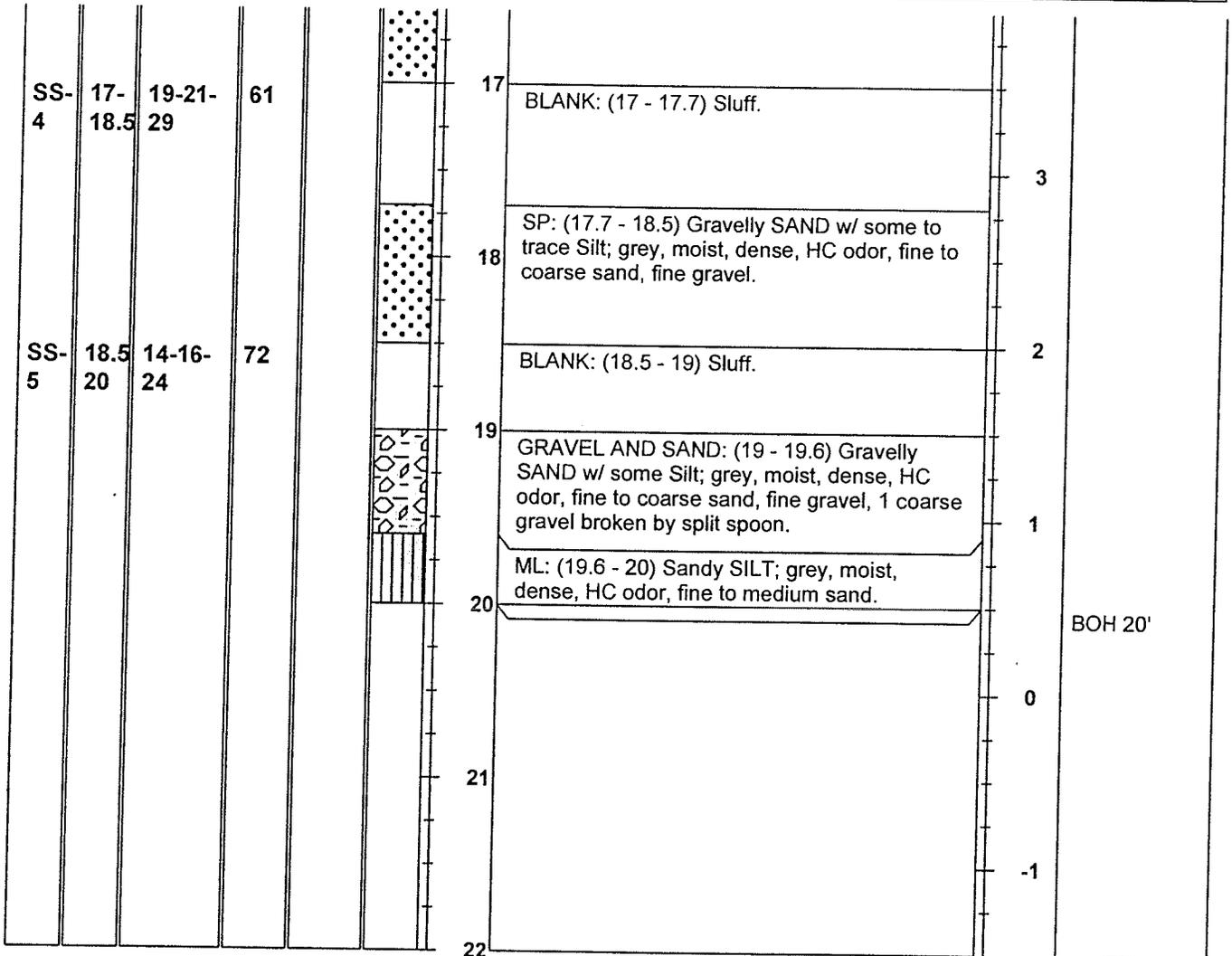
**Sample Type** GP = Geoprobe  
 SS = Split Spoon GS = Grab Sample  
 C = Core Sample

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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/3/00	0920	7.5 - 8
11/13/00	1128	3.4



Sample				Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.					




Sample Type GP = Geoprobe  
 SS = Split Spoon GS = Grab Sample  
 C = Core Sample

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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/3/00	0920	7.5 - 8
11/13/00	1128	3.4



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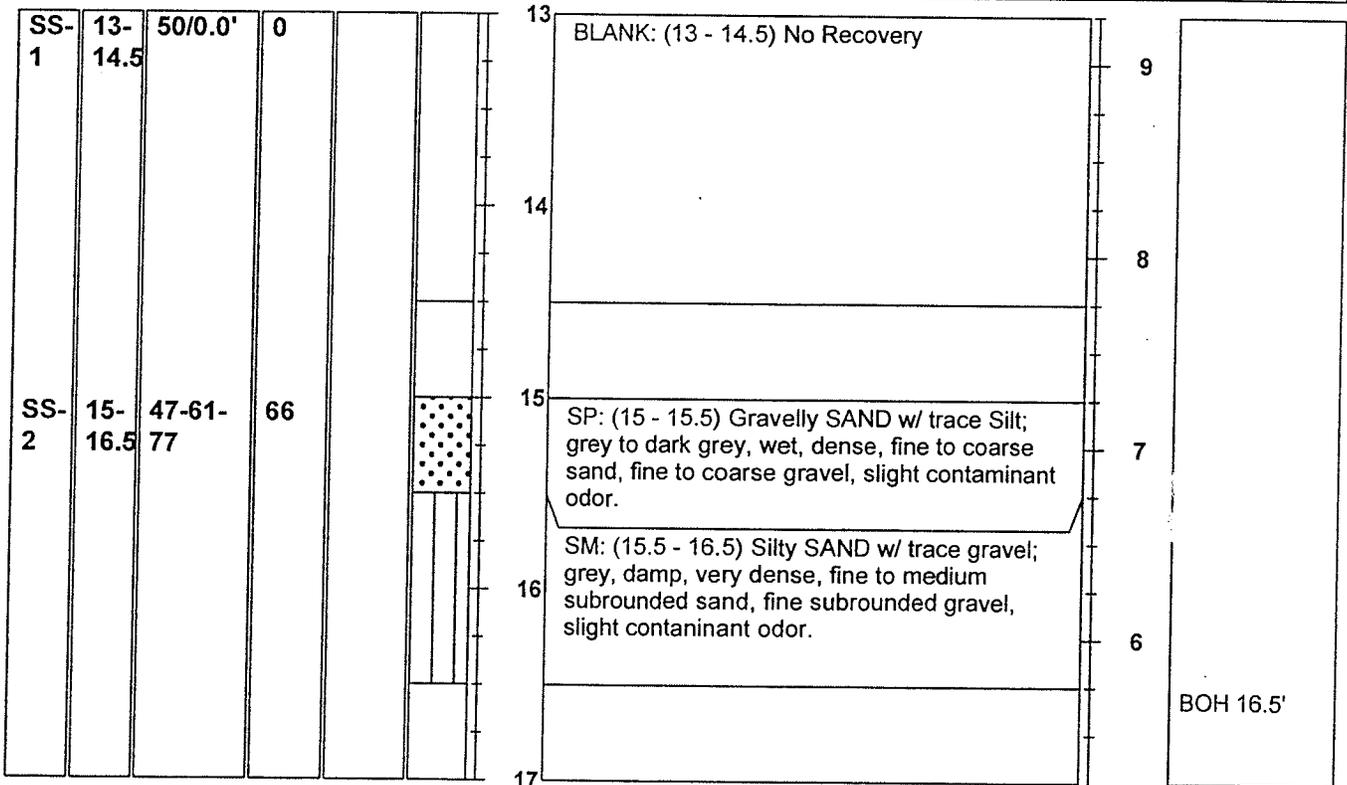
# Boring/Well Installation Log

Well # A-6  
Sheet 1 of 1

Project: Gas Works Park	Monument: Sparge Well	Stick Up: 6"
Project #: PSE10-15107-250	Northing: 238979.99 Easting: 1270745.21	Ground Elevation: 22.25'
Location: Sparge Well Area	Rig Type: CME 55 Limited Access	MP Elevation: 22.75'
Client: Puget Sound Energy	Method: HSA	Total Depth: 16.5'
Start Date & Time: 11/6/00 1540	Casing ID: 4 1/4"	Filter Pack: 8X12 Silica Sand
Finish Date & Time: 11/6/00 1630	Boring ID: 8"	Seal: 3/8" Bentonite Chips
Contractor: Cascade Drilling	Bit Type:	Grout: Cement/Bentonite Slurry
Driller: James Goble	Logged By: Aaron Waggoner	Screen: 2" PVC w/ 0.010" Slots

Remarks & Datum Used:

Sample Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
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**Sample Type** GP = Geoprobe  
 SS = Split Spoon GS = Grab Sample  
 C = Core Sample  
  
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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/13/00	1136	3.11



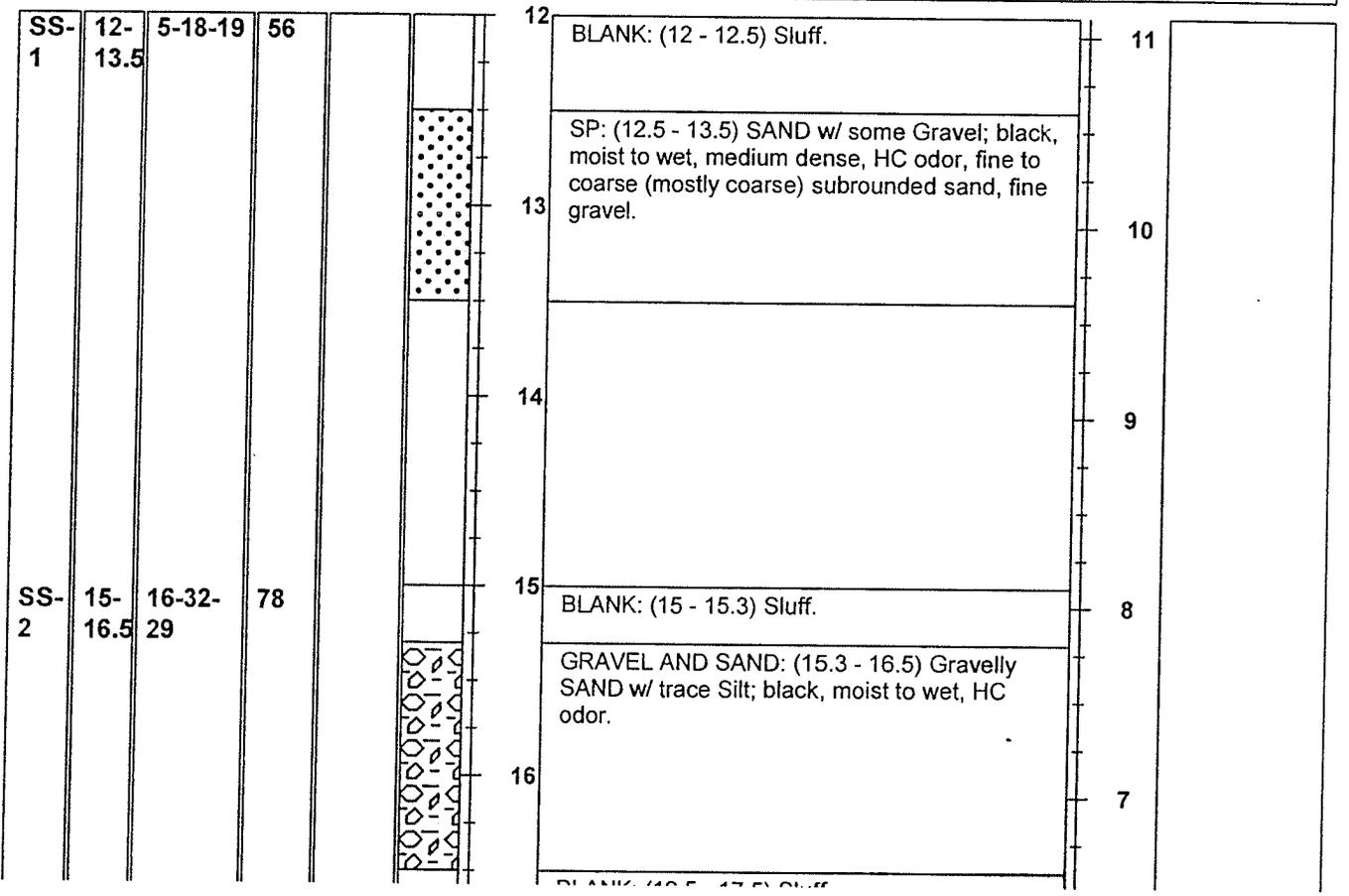
# Boring/Well Installation Log

Well # A-11  
Sheet 1 of 2

Project: Gas Works Park	Monument: Sparge Well	Stick Up: 6"
Project #: PSE10-15107-250	Northing: 239037.27 Easting: 1270763.07	Ground Elevation: 23.1'
Location: Sparge Well Area	Rig Type: CME 850 Track Rig	MP Elevation: 23.6'
Client: Puget Sound Energy	Method: HSA	Total Depth: 20'
Start Date & Time: 11/3/00 1240	Casing ID: 4 1/4"	Filter Pack: 8X12 Silica Sand
Finish Date & Time: 11/3/00 1415	Boring ID: 8"	Seal: 3/8" Bentonite Chips
Contractor: Cascade Drilling	Bit Type:	Grout: Cement/Bentonite Slurry
Driller: Michael	Logged By: Aaron Waggoner	Screen: 2" PVC w/ 0.010" Slots

Remarks & Datum Used:

Sample Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
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Blank: (12.5 - 13.5) SAND w/ some Gravel; black, moist to wet, medium dense, HC odor, fine to coarse (mostly coarse) subrounded sand, fine gravel.

Blank: (15 - 15.3) Sluff.

Sample Type GP = Geoprobe  
SS = Split Spoon GS = Grab Sample  
C = Core Sample

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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/13/00	1144	6.29



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# Boring/Well Installation Log

Well # A-11  
Sheet 2 of 2

Sample					Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date				
SS-3	17-18.5	5-7-20	67		17	BLANK: (16.5 - 17.5) Sluff.	6	
					18	GRAVEL AND SAND: (17.5 - 18.5) Same as above.	5	
SS-4	18.5-20	22-15-15	55		19	BLANK: (18.5 - 19.1) Sluff.	4	
					20	GRAVEL AND SAND: (19.1 - 19.7) Same as above.	3	
					20	SM: (19.7 - 20) Silty SAND w/ trace Gravel; dark grey, moist to wet, medium dense, slight HC odor, fine to medium subrounded sand, fine gravel.	3	BOH 20'
					21		2	
					22			


Sample Type    GP = Geoprobe  
 SS = Split Spoon    GS = Grab Sample  
 C = Core Sample

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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/13/00	1144	6.29



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# Boring/Well Installation Log

Well # A-12  
Sheet 1 of 2

Project: Gas Works Park	Monument: Sparge Well	Stick Up: 6"
Project #: PSE10-15107-250	Northing: 239048.73 Easting: 1270766.64	Ground Elevation: 25.25'
Location: Sparge Well Area	Rig Type: CME 850 Track Rig	MP Elevation: 25.75'
Client: Puget Sound Energy	Method: HSA	Total Depth: 25.5'
Start Date & Time: 11/3/00 1430	Casing ID: 4 1/4"	Filter Pack: 8X12 Silica Sand
Finish Date & Time: 11/3/00 1620	Boring ID: 8"	Seal: 3/8" Bentonite Chips
Contractor: Cascade Drilling	Bit Type:	Grout: Cement/Bentonite Slurry
Driller: Michael	Logged By: Aaron Waggoner	Screen: 2" PVC w/ 0.010" Slots

Remarks & Datum Used:

Sample Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
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SS-1	18-19.5	10-11-20	40		18	BLANK: (18 - 18.6) Sluff.	7	Bentonite chips at top. Probably from Geoprobe.
					19	SP: (18.6 - 19.5) SAND w/ some Gravel; black, wet, medium dense, HC odor, fine to coarse subrounded to rounded sand, fine subrounded gravel.	6	
					20		5	
SS-2	21-22.5	8-12-15	56		21	BLANK: (21 - 21.8) Sluff.	4	
					22	SP: (21.8 - 22.5) Same as above.	3	


**Sample Type** GP = Geoprobe  
 SS = Split Spoon GS = Grab Sample  
 C = Core Sample

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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/13/00	1145	12.39



# Boring/Well Installation Log

Well # A-12  
Sheet 2 of 2

Sample				Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec. Time & Date				
SS-3	22.5-24	9-17-15	73	23	BLANK: (22.5 -22.9) Sluff. SP: (22.9 - 24) SAND w/ some Gravel; black, moist to wet, medium dense, HC odor, slight sheen, fine to coarse subrounded to rounded sand, fine subrounded gravel.	2	Well set @ 23'
SS-4	24-25.5	12-15-19	0	24	BLANK: (24 - 25.5) No Recovery.	1	
				25		0	


Sample Type      GP = Geoprobe  
 SS = Split Spoon      GS = Grab Sample  
 C = Core Sample

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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/13/00	1145	12.39



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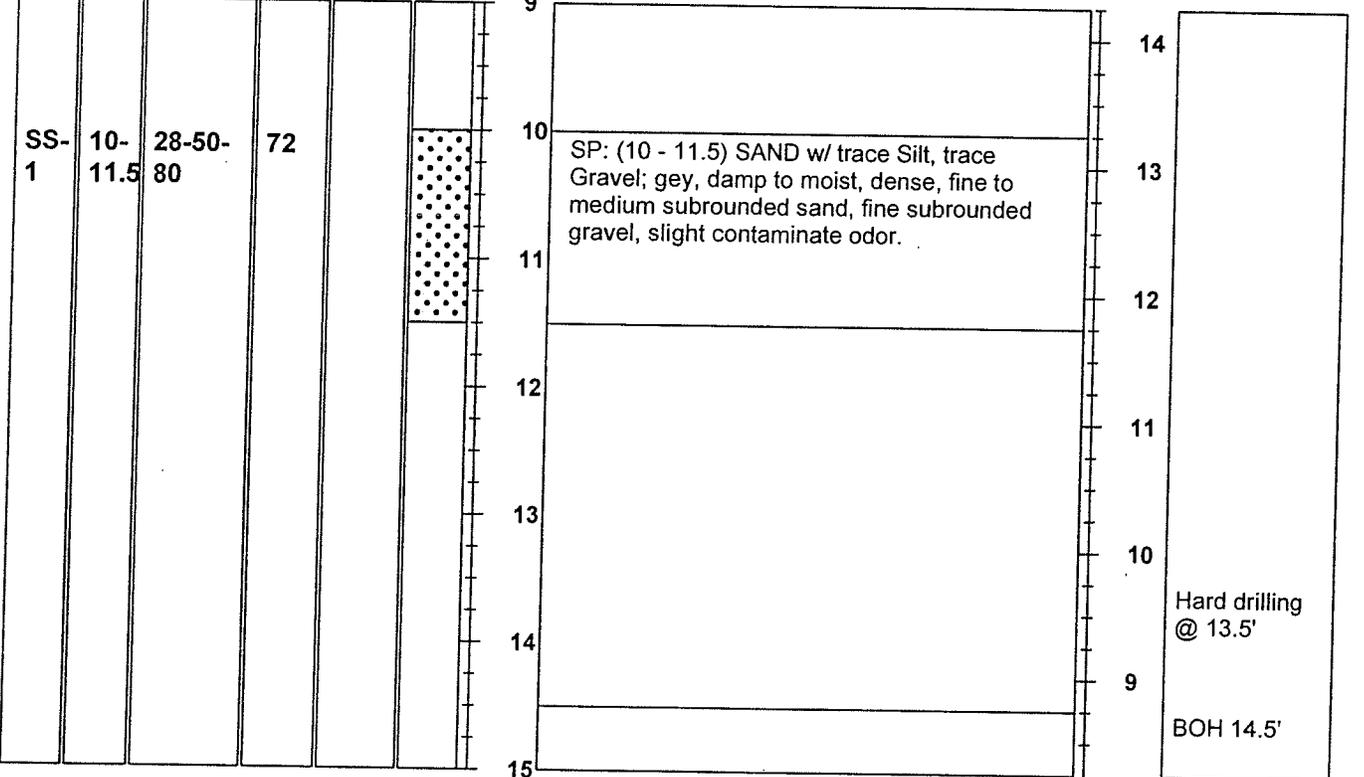
# Boring/Well Installation Log

Well # C-4  
Sheet 1 of 1

Project: Gas Works Park	Monument: Sparge Well	Stick Up: 6"
Project #: PSE10-15107-250	Northing: 238987.02 Easting: 1270721.74	Ground Elevation: 23.25'
Location: Sparge Well Area	Rig Type: CME 55 Limited Access	MP Elevation: 23.75'
Client: Puget Sound Energy	Method: HSA	Total Depth: 14.5'
Start Date & Time: 11/9/00 1140	Casing ID: 4 1/4"	Filter Pack: 8X12 Silica Sand
Finish Date & Time: 11/9/00 1250	Boring ID: 8"	Seal: 3/8" Bentonite Chips
Contractor: Cascade Drilling	Bit Type:	Grout: Cement/Bentonite Slurry
Driller: James Goble	Logged By: Aaron Waggoner	Screen: 2" PVC w/ 0.010" Slots

Remarks & Datum Used: Well broke off @ 3'.

Sample Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
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**Sample Type** GP = Geoprobe  
SS = Split Spoon GS = Grab Sample  
C = Core Sample

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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/13/00	1052	3.87



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# Boring/Well Installation Log

Well # C-5  
Sheet 1 of 1

Project: Gas Works Park	Monument: Sparge Well	Stick Up: 6"
Project #: PSE10-15107-250	Northing: 239006.04 Easting: 1270727.94	Ground Elevation: 23.5'
Location: Sparge Well Area	Rig Type: CME 55 Limited Access	MP Elevation: 24'
Client: Puget Sound Energy	Method: HSA	Total Depth: 15.5'
Start Date & Time: 11/6/00 1120	Casing ID: 4 1/4"	Filter Pack: 8X12 Silica Sand
Finish Date & Time: 11/6/00 1235	Boring ID: 8"	Seal: 3/8" Bentonite Chips
Contractor: Cascade Drilling	Bit Type:	Grout: Cement/Bentonite Slurry
Driller: James Goble	Logged By: Aaron Waggoner	Screen: 2" PVC w/ 0.010" Slots

Remarks & Datum Used:

Sample Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
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SS-1	14-15.5	67-82	100		14	SM: (14 - 15) Silty SAND; gey, damp, dense, fine to very fine subrounded to subangular sand, very slight contaminate odor, no obvious staining.	9	BOH 15.5'
					15	SM: (15 - 15.5) SAND w/ some Silt, trace Clay, and trace Gravel; grey, damp, dense to very dense, fine to medium subrounded to subangular sand, slight to no odor.	8	
					16		7	
					17			


Sample Type GP = Geoprobe  
SS = Split Spoon GS = Grab Sample  
C = Core Sample

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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/13/00	1050	4.57



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# Boring/Well Installation Log

Well # D-4  
Sheet 1 of 1

Project: Gas Works Park	Monument: Sparge Well	Stick Up: 6"
Project #: PSE10-15107-250	Northing: 239001.13 Easting: 1270708.64	Ground Elevation: 23.5'
Location: Sparge Well Area	Rig Type: CME 55 Limited Access	MP Elevation: 24
Client: Puget Sound Energy	Method: HSA	Total Depth: 17'
Start Date & Time: 11/6/00 1330	Casing ID: 4 1/4"	Filter Pack: 8X12 Silica Sand
Finish Date & Time: 11/6/00 1505	Boring ID: 8"	Seal: 3/8" Bentonite Chips
Contractor: Cascade Drilling	Bit Type:	Grout: Cement/Bentonite Slurry
Driller: James Goble	Logged By: Aaron Waggoner	Screen: 2" PVC w/ 0.010" Slots

Remarks & Datum Used:

Sample Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
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SS-1	13-14.5	45-75-62	66		13	GP: (13 - 13.2) Sandy GRAVEL; grey, wet, slight odor, loose, fine to coarse gravel.		
						GP: (13.2 - 14) Sandy GRAVEL w/ trace Silt; grey, moist, very dense, fine gravel, fine to medium sand, slight odor.	10	
SS-2	14.5-16	19-84-77	100		14	SILTY SAND: (14 - 14.5) Silty SAND to SAND; grey to dark grey, moist to wet, dense, fine to coarse subrounded sand, slight odor.	9	
					15	SP: (14.5 - 15.5) coarse SAND; grey, moist to wet, medium dense, fine to coarse subrounded sand. slight odor.	8	
					16	SP: (15.5 - 16) Gravelly SAND w/ trace Silt; grey, moist to wet, very dense, fine subrounded to rounded gravel, fine to coarse subrounded sand.	7	
SS-3	16-17		100		16	SP: (16 - 16.5) SAND w/ trace Silt; grey, wet, dense, fine to coarse subrounded sand, slight odor.		
					17	SILTY SAND: (16.5 - 17) Silty, Gravelly SAND; grey, moist to wet, very dense, fine to coarse subrounded sand, fine subrounded to rounded gravel, slight odor.		
							6	BOH 17'


<b>Sample Type</b> SS = Split Spoon    GS = Grab Sample C = Core Sample GP = Geoprobe	<b>Groundwater</b>		
	Date	Time (hours after completion)	Depth (ft.)
	11/13/00	1044	4.64

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Project: Gas Works Park	Monument: Sparge Well	Stick Up: 6"
Project #: PSE10-15107-250	Northing: 239002.12 Easting: 1270690.87	Ground Elevation: 23.6'
Location: Sparge Well Area	Rig Type: CME 55 Limited Access	MP Elevation: 24.1'
Client: Puget Sound Energy	Method: HSA	Total Depth: 13.5
Start Date & Time: 11/11/00 1300	Casing ID: 4 1/4"	Filter Pack: 8X12 Silica Sand
Finish Date & Time: 11/11/00 1445	Boring ID: 8"	Seal: 3/8" Bentonite Chips
Contractor: Cascade Drilling	Bit Type:	Grout: Cement/Bentonite Slurry
Driller: James Goble	Logged By: Aaron Waggoner	Screen: 2" PVC w/ 0.010" Slots

Remarks & Datum Used:

Sample Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
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							18	PID (ppm)
SS-1	6.5-8	32-62-65	75		6			
					7	SM: (6.5 - 6.7) Silty SAND w/ trace Gravel and 1/4" thick Clay lense @ 6.7"; black, moist, dense, strong HC odor, slight sheen, fine gravel, fine to medium sand.	17	>800
					8	SM: (6.7 - 8) Silty SAND w/ some Gravel, trace Clay; grey, damp, dense, very strong HC odor, fine to coarse subrounded gravel, fine sand.	16	
SS-2	8-9.5	60-80-100	80		8	SM: (8 - 9.5) Silty SAND w/ trace Gravel, trace Clay; grey, damp, very dense to dense, very strong odor, fine sand, fine to coarse subrounded gravel.	15	>3300
					9			
					10		14	


**Sample Type**      GP = Geoprobe  
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 C = Core Sample

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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/14/00	1326	7.56



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# Boring/Well Installation Log

Well # E-3  
Sheet 2 of 2

Sample					Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date				

Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
SS-3	10.5 - 12	100/1"	100		11	SM: (10.5 - 12) Silty SAND w/ trace Clay, trace Gravel; grey, damp to moist, very dense to dense, very strong odor, fine sand, fine to coarse subrounded gravel.	13	PID (ppm) >500 Rock in shoe.
SS-4	12 - 12.5	100/6"	100		12	SM: (12 - 12.5) Same as above.	11	>1500
SS-5	13 - 13.5	100/6"	40		13	SM: (13 - 13.5) Same as above. Big rock in shoe.	10	153 BOH 13.5'


**Sample Type** GP = Geoprobe  
 SS = Split Spoon GS = Grab Sample  
 C = Core Sample  
  
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Groundwater		
Date	Time (hours after completion)	Depth (ft.)
11/14/00	1326	7.56



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# Boring/Well Installation Log

Well # F-2  
Sheet 1 of 2

Project: Gas Works Park	Monument: Sparge Well	Stick Up: 6"
Project #: PSE10-15107-250	Northing: 238983.90 Easting: 1270666.61	Ground Elevation: 24.1'
Location: Sparge Well Area	Rig Type: CME 55 Limited Access	MP Elevation: 24.6'
Client: Puget Sound Energy	Method: HSA	Total Depth: 12.5'
Start Date & Time: 11/10/00 1345	Casing ID: 4 1/4"	Filter Pack: 8X12 Silica Sand
Finish Date & Time: 11/11/00 0830	Boring ID: 8"	Seal: 3/8" Bentonite Chips
Contractor: Cascade Drilling	Bit Type:	Grout: Cement/Bentonite Slurry
Driller: James Goble	Logged By: Aaron Waggoner	Screen: 2" PVC w/ 0.010" Slots

Remarks & Datum Used:

Sample Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date	Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
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SS-1	6.5-8	70/4"	38		7	GRAVEL AND SAND: (6.5 - 6.8) Rock in shoe. Odor and visible contamination.	17	PID (ppm)
SS-2	7.5-9	50/3"	67		8	SM: (7.5 - 7.7) Silty SAND; mottled black and grey, damp.	16	
SS-3	8.5-10	50/2"	100		9	SM: (8.5 - 8.7) Silty SAND w/ some Gravel; dark grey, wet, dense, high dilatency, fine to coarse subangular to subrounded sand, fine to coarse gravel, staining odor and visible contamination.	15	576
SS-4	9.5-11	50/0"	0		10		14	
SS-5	10-11.5	0	33		10	GRAVEL AND SAND: (10 - 10.5) Silty SAND w/ some Gravel; dark grey, mottled to black, moist to wet, dense, fine to coarse subangular to subrounded sand, fine gravel. OVC.	13	>1500


<b>Sample Type</b> GP = Geoprobe SS = Split Spoon GS = Grab Sample C = Core Sample  ThermoRetec 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349. Fax: (206) 624-2839	<b>Groundwater</b>		
	Date	Time (hours after completion)	Depth (ft.)
	11/13/00	1015	5.23



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# Boring/Well Installation Log

Well # F-2  
Sheet 2 of 2

Sample					Graphic Depth (ft.)	Soil and Rock Description	Elevation (ft.)	Comments
Type	Depth Range (ft.)	Blows Per 6 Inch	% Rec.	Time & Date				

SS-6	12	50/1"	100		12	SM: (12 - 12.1) Silty SAND w/ Gravel; dark grey to brown, moist, dense, strong odor, coarse subrounded to rounded gravel, fin to medium subrounded sand.	166	
SS-7	12.5	100/3"	33		13	ML: (12.5 - 12.7) Sandy SILT w/ trace gravel; grey, damp to dry, very dense, strong odor, fine sand, fine subangular to subrounded gravel.	154	BOH 12.5'

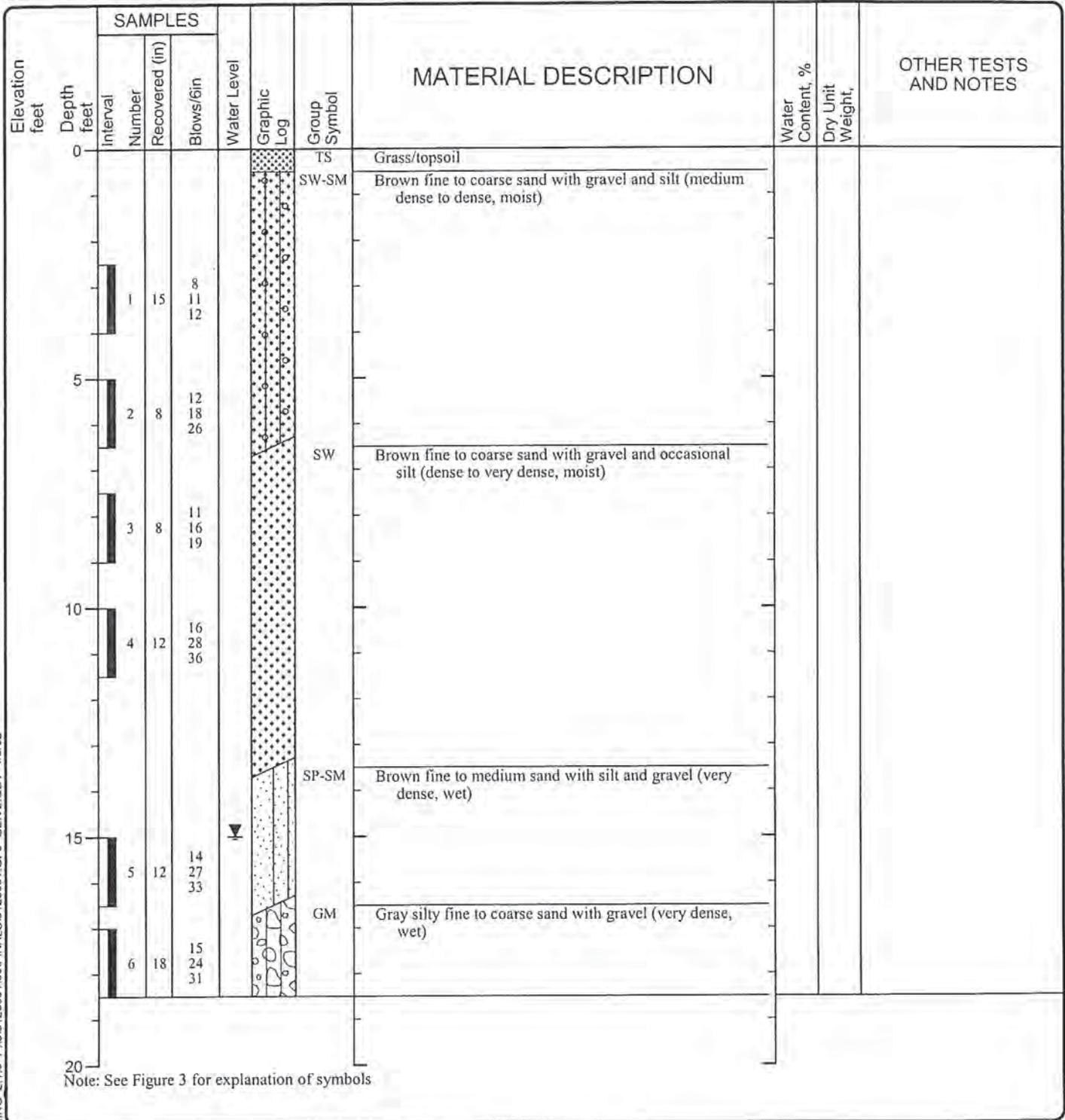

<b>Sample Type</b> GP = Geoprobe SS = Split Spoon GS = Grab Sample C = Core Sample	<b>Groundwater</b>		
	Date	Time (hours after completion)	Depth (ft.)
	11/13/00	1015	5.23

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**Cracking Tower Investigation  
(GeoEngineers, Inc. 2002)**

**2002 Borings**

Date(s) Drilled	03/04/02	Logged By	MAM	Checked By	MAM
Drilling Contractor	Boretac	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 inch ID	Hammer Data	140 (lb) hammer/ 30 (in) drop Rope and Cathead	Drilling Equipment	M-45 Track Drill
Total Depth (ft)	18.5	Surface Elevation (ft)	Approximately 31	Ground Water Level (ft. bgs)	15
Datum/System		Easting	Not Determined	Northing	Not Determined



9123-001-00 GEI GTBORING 2.1.0 P:\919123001\000\FINALS\9123001.GPJ GEIV2.GDT 4/5/02

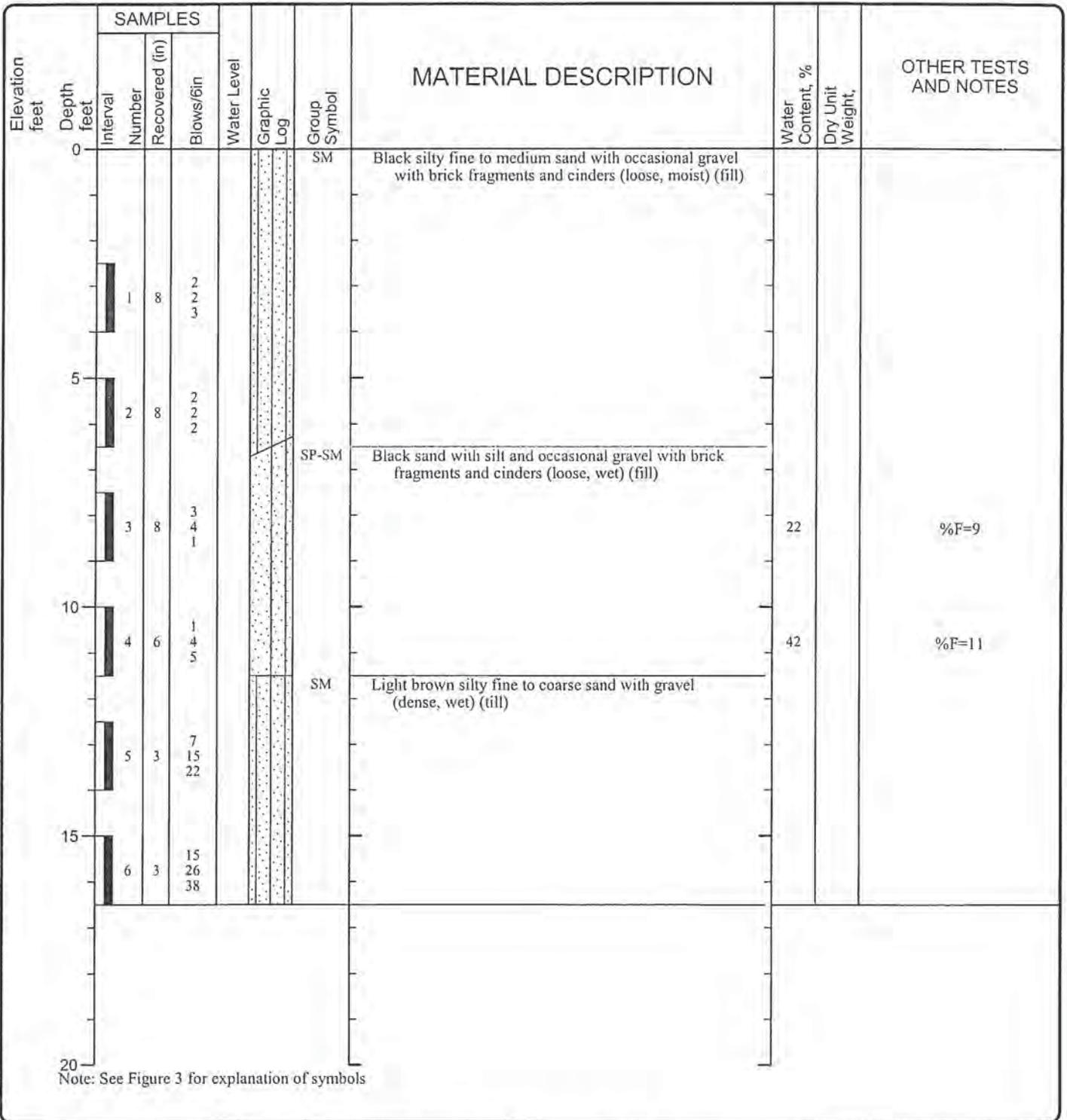
**LOG OF BORING B-1**



Project: Gas Works Park Tower Foundation Evaluation  
 Project Location: Seattle, Washington  
 Project Number: 9123-001-00

Figure: 4  
 Sheet 1 of 1

Date(s) Drilled	03/04/02	Logged By	MAM	Checked By	MAM
Drilling Contractor	Boretec	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 inch ID	Hammer Data	140 (lb) hammer/ 30 (in) drop Rope and Cathead	Drilling Equipment	M-45 Track Drill
Total Depth (ft)	16.5	Surface Elevation (ft)	Approximately 31	Ground Water Level (ft. bgs)	NONE
Datum/ System			Not Determined		Not Determined



### LOG OF BORING B-2



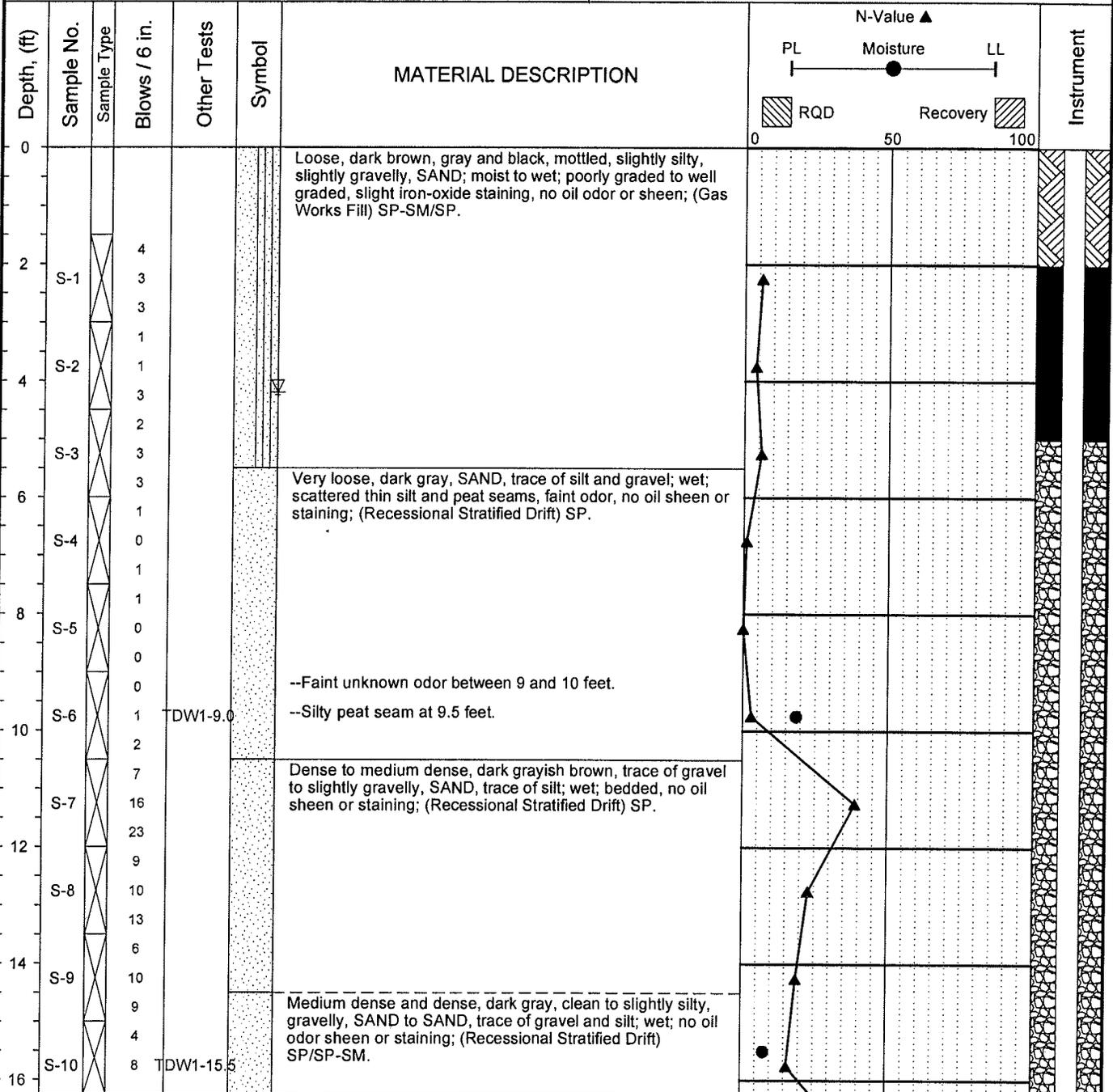
Project: Gas Works Park Tower Foundation Evaluation  
 Project Location: Seattle, Washington  
 Project Number: 9123-001-00

Figure: 5  
 Sheet 1 of 1

**Shoreline Investigation  
Western Study Area  
(Floyd|Snider 2006)**

**2006 Borings**

Project: Gas Works Sediment Cleanup	Surface Elevation: 24.8 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: 24.51 ft. (USACE)
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 239245.21, Easting: 1269573.75	Sampling Method: SPT w/ Auto Hammer



Completion Depth: 43.8ft	Remarks: Standard Penetrations Test (SPT) sampler <b>AND</b> Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started: 9/19/06	
Date Borehole Completed: 9/21/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

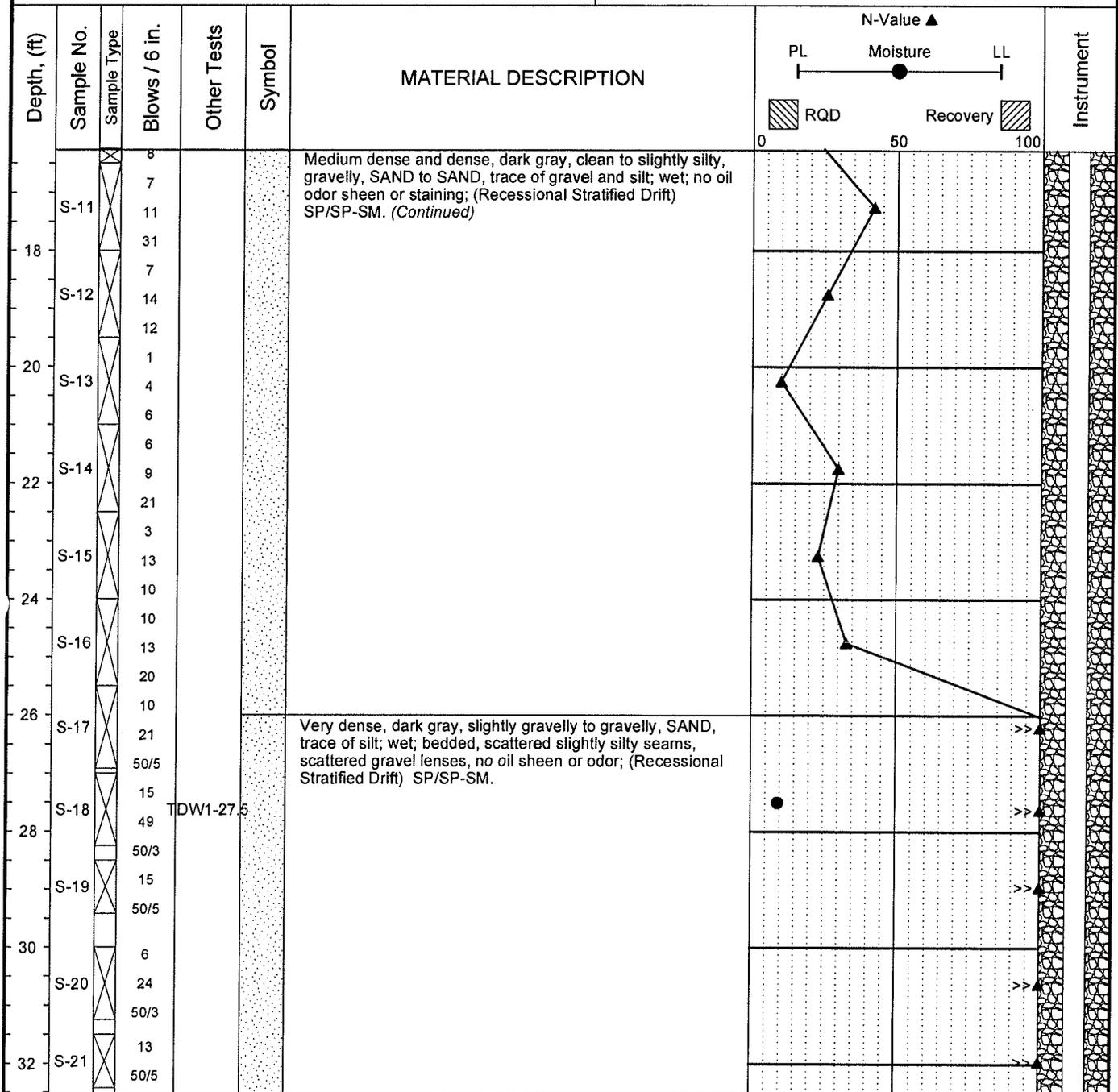
**LOG OF TEST BORING TDW-1**

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**Figure 2**

Project: Gas Works Sediment Cleanup  
 Job Number: 06-091  
 Location: Gas Works Park, Seattle Washington  
 Coordinates: Northing: 239245.21, Easting: 1269573.75

Surface Elevation: 24.8 ft. (USACE)  
 Top of Casing Elev.: 24.51 ft. (USACE)  
 Drilling Method: HSA  
 Sampling Method: SPT w/ Auto Hammer



Completion Depth: 43.8ft  
 Date Borehole Started: 9/19/06  
 Date Borehole Completed: 9/21/06  
 Logged By: J. Lamanna  
 Drilling Company: Boart Longyear

Remarks: Standard Penetrations Test (SPT) sampler **AND** Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.

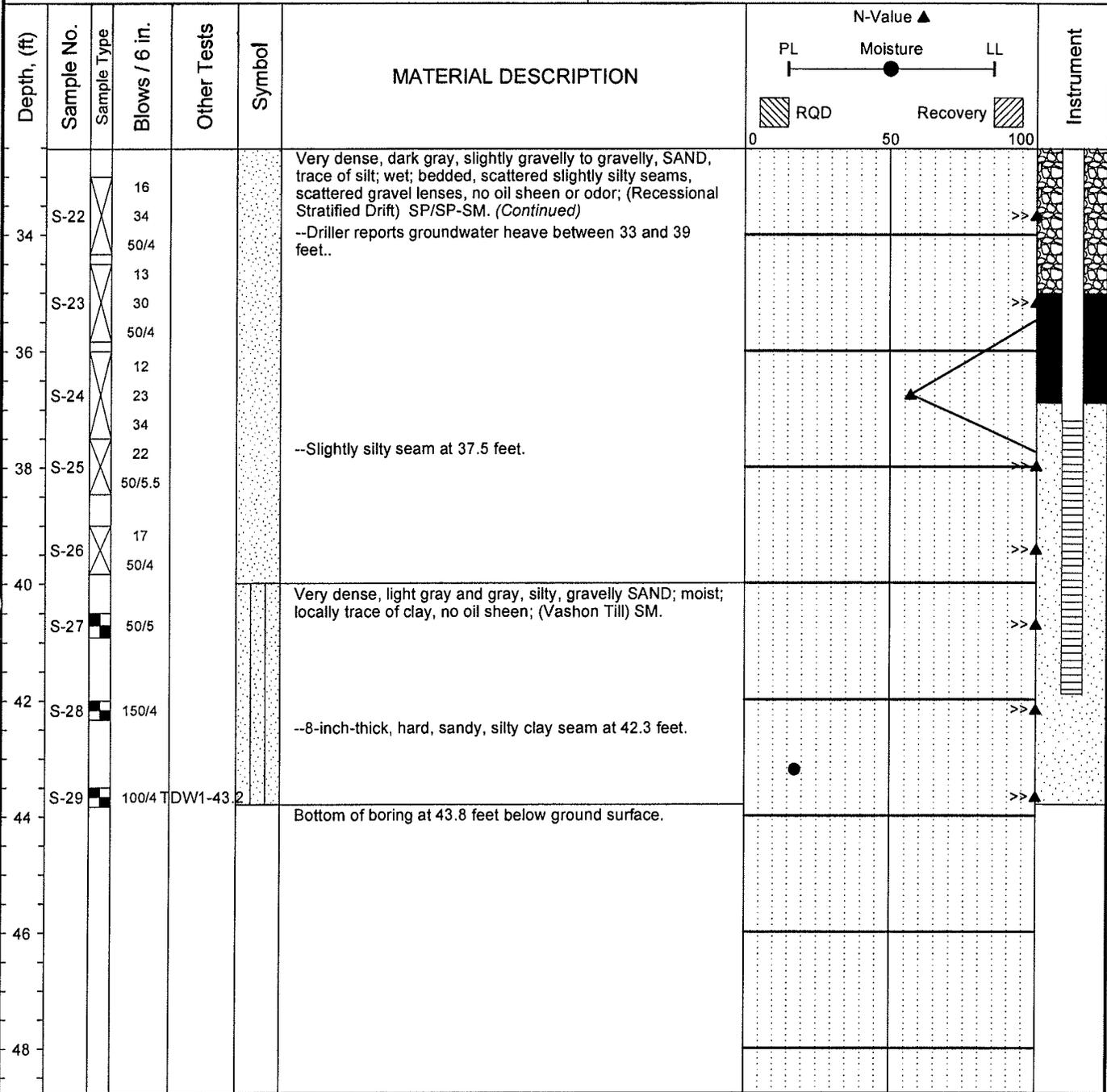
**LOG OF TEST BORING TDW-1**

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**Figure 2**

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Gas Works Sediment Cleanup	Surface Elevation:	24.8 ft. (USACE)
Job Number:	06-091	Top of Casing Elev.:	24.51 ft. (USACE)
Location:	Gas Works Park, Seattle Washington	Drilling Method:	HSA
Coordinates:	Northing: 239245.21, Easting: 1269573.75	Sampling Method:	SPT w/ Auto Hammer



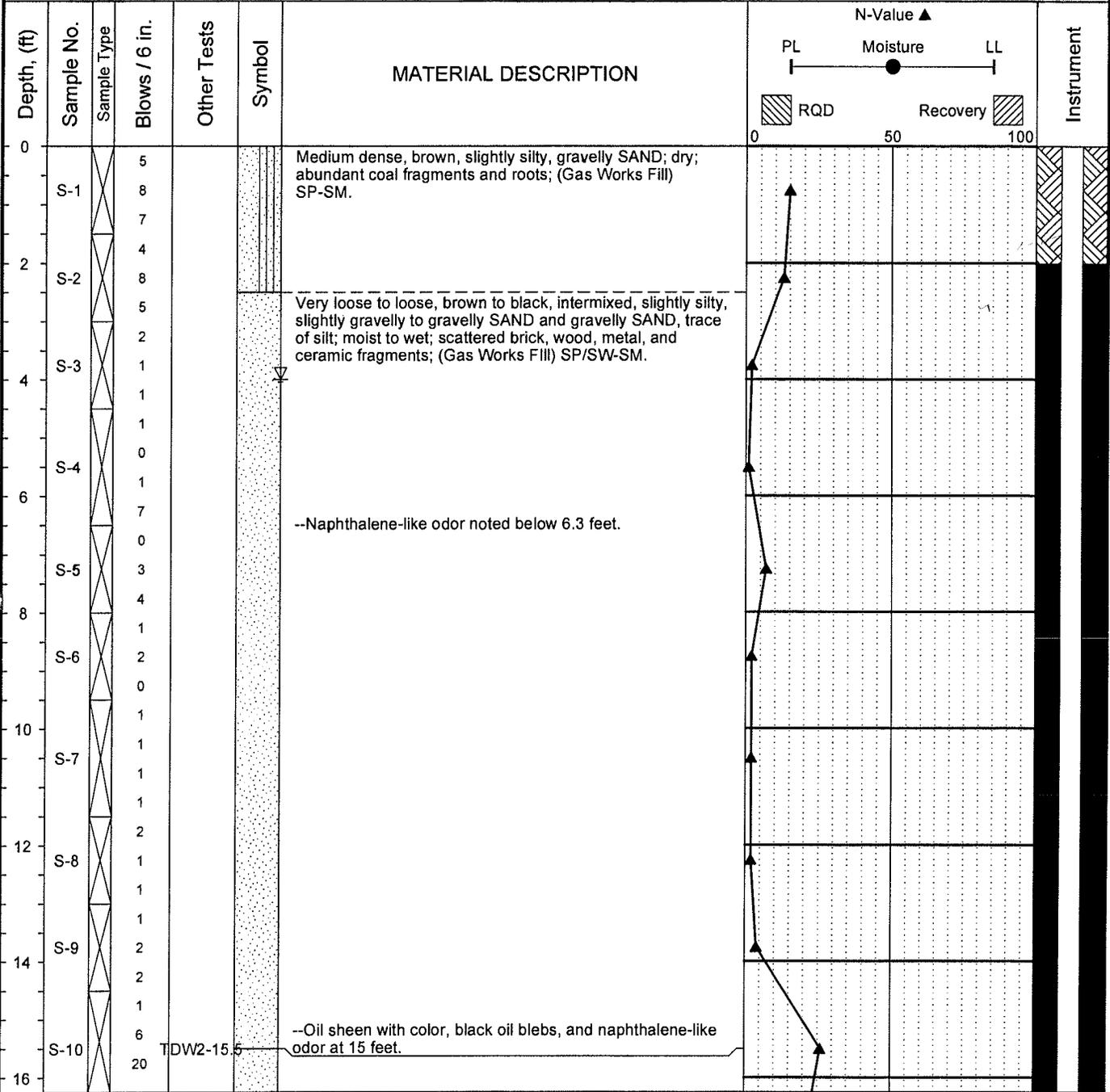
Completion Depth:	43.8ft	Remarks: Standard Penetrations Test (SPT) sampler <b>AND</b> Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started:	9/19/06	
Date Borehole Completed:	9/21/06	
Logged By:	J. Lamanna	
Drilling Company:	Boart Longyear	

**LOG OF TEST BORING TDW-1**

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**Figure 2**

Project: Gas Works Sediment Cleanup	Surface Elevation: 24.7 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: 24.50 ft. (USACE)
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238940.34, Easting: 1269754.99	Sampling Method: SPT w/ Auto Hammer



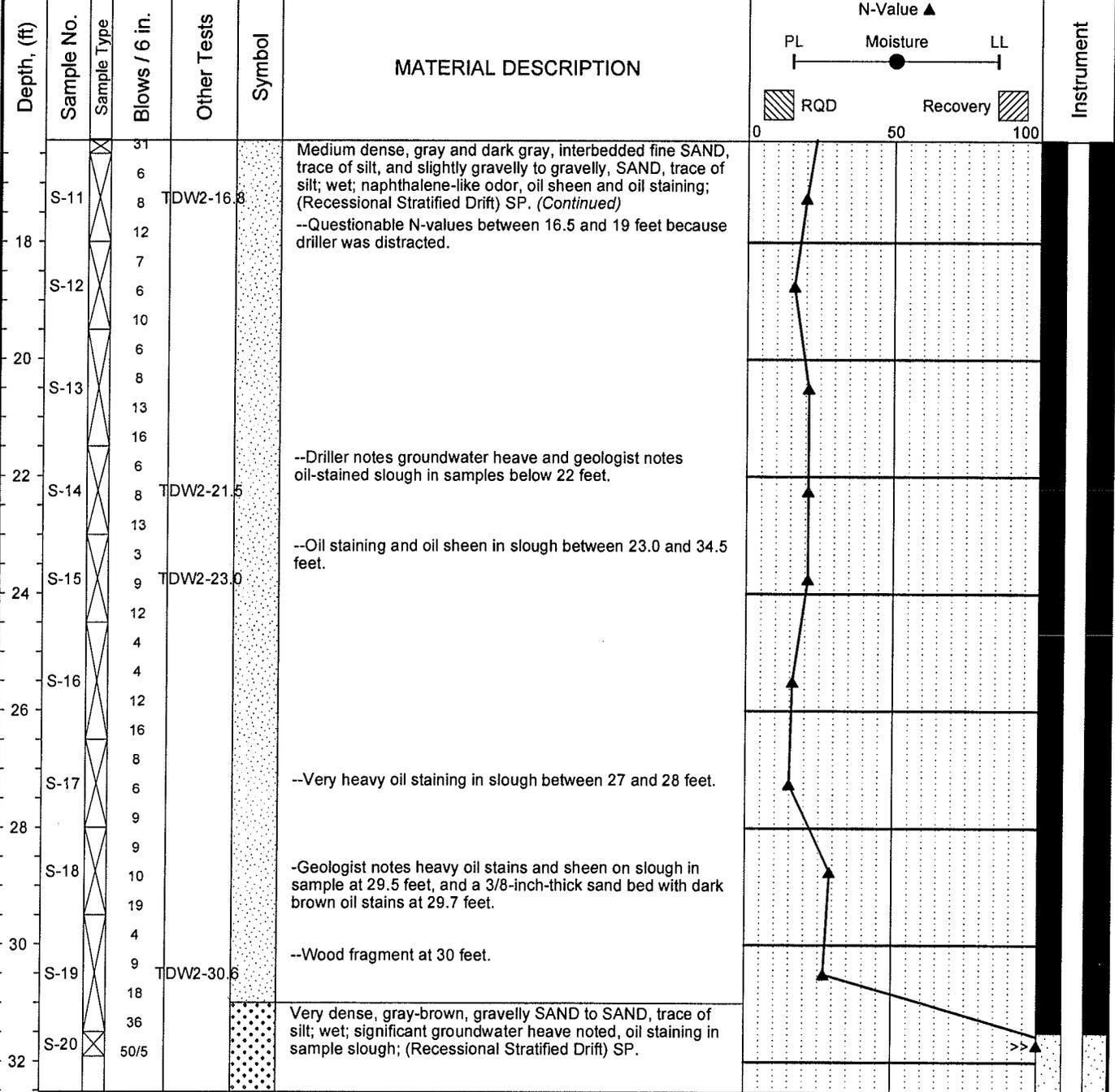
Completion Depth: 40.0ft	Remarks: Standard Penetrations Test (SPT) sampler <b>AND</b> Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started: 9/28/06	
Date Borehole Completed: 9/29/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

**LOG OF TEST BORING TDW-2**

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**Figure 3**

Project: Gas Works Sediment Cleanup	Surface Elevation: 24.7 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: 24.50 ft. (USACE)
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238940.34, Easting: 1269754.99	Sampling Method: SPT w/ Auto Hammer



Completion Depth: 40.0ft	Remarks: Standard Penetrations Test (SPT) sampler <b>AND</b> Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started: 9/28/06	
Date Borehole Completed: 9/29/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

**LOG OF TEST BORING TDW-2**

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**Figure 3**

Project:	Gas Works Sediment Cleanup	Surface Elevation:	24.7 ft. (USACE)
Job Number:	06-091	Top of Casing Elev.:	24.50 ft. (USACE)
Location:	Gas Works Park, Seattle Washington	Drilling Method:	HSA
Coordinates:	Northing: 238940.34, Easting: 1269754.99	Sampling Method:	SPT w/ Auto Hammer

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION	N-Value ▲		Instrument	
							PL	Moisture LL		
34	S-21	⊗	25 50/5.5		⋯	Very dense, gray-brown, gravelly SAND to SAND, trace of silt; wet; significant groundwater heave noted, oil staining in sample slough; (Recessional Stratified Drift) SP. (Continued)	0	50	100	
36	S-22	⊗	2 11 32 50/2		⋯					
38	S-23	⊗	50/2.5		⋯					
40	S-24	⊗	28 50/5		⋯	Very dense, gray, silty, gravelly SAND; moist; no oil staining; (Vashon Till) SM.				
40	S-25	■	86 14/1	TDW2-39.5	⋯	Bottom of boring at 40.1 feet below ground surface.				
42										
44										
46										
48										

Completion Depth:	40.0ft	Remarks: Standard Penetrations Test (SPT) sampler <b>AND</b> Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started:	9/28/06	
Date Borehole Completed:	9/29/06	
Logged By:	J. Lamanna	
Drilling Company:	Boart Longyear	

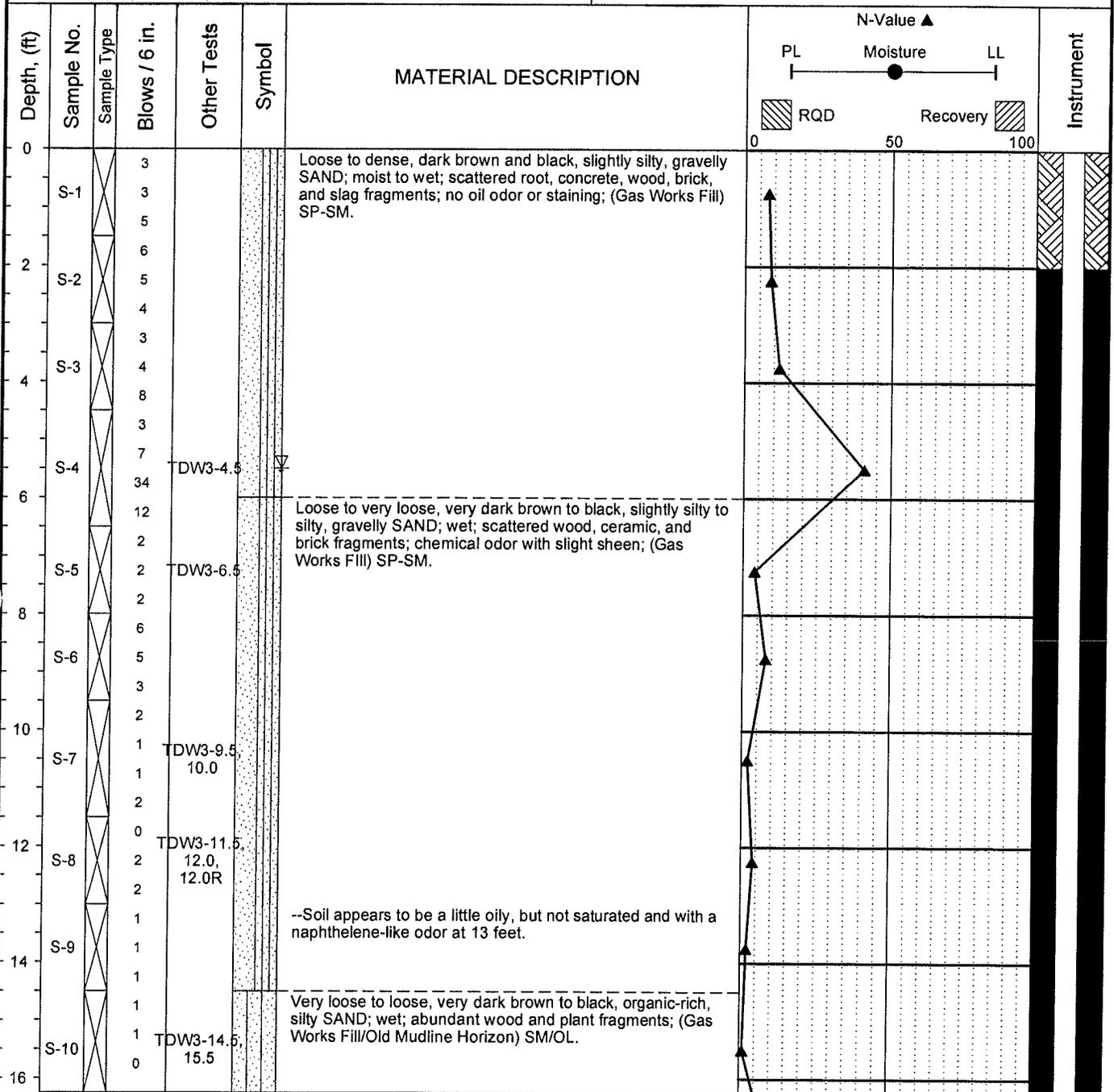
**LOG OF TEST BORING TDW-2**

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**Figure 3**

Project: Gas Works Sediment Cleanup  
 Job Number: 06-091  
 Location: Gas Works Park, Seattle Washington  
 Coordinates: Northing: 238769.82, Easting: 1269998.28

Surface Elevation: 26.6 ft. (USACE)  
 Top of Casing Elev.: 26.50 ft. (USACE)  
 Drilling Method: HSA  
 Sampling Method: SPT w/ Auto Hammer



Completion Depth: 40.8ft  
 Date Borehole Started: 9/26/06  
 Date Borehole Completed: 9/27/06  
 Logged By: J. Lamanna  
 Drilling Company: Boart Longyear

Remarks: Standard Penetrations Test (SPT) sampler **AND** Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.

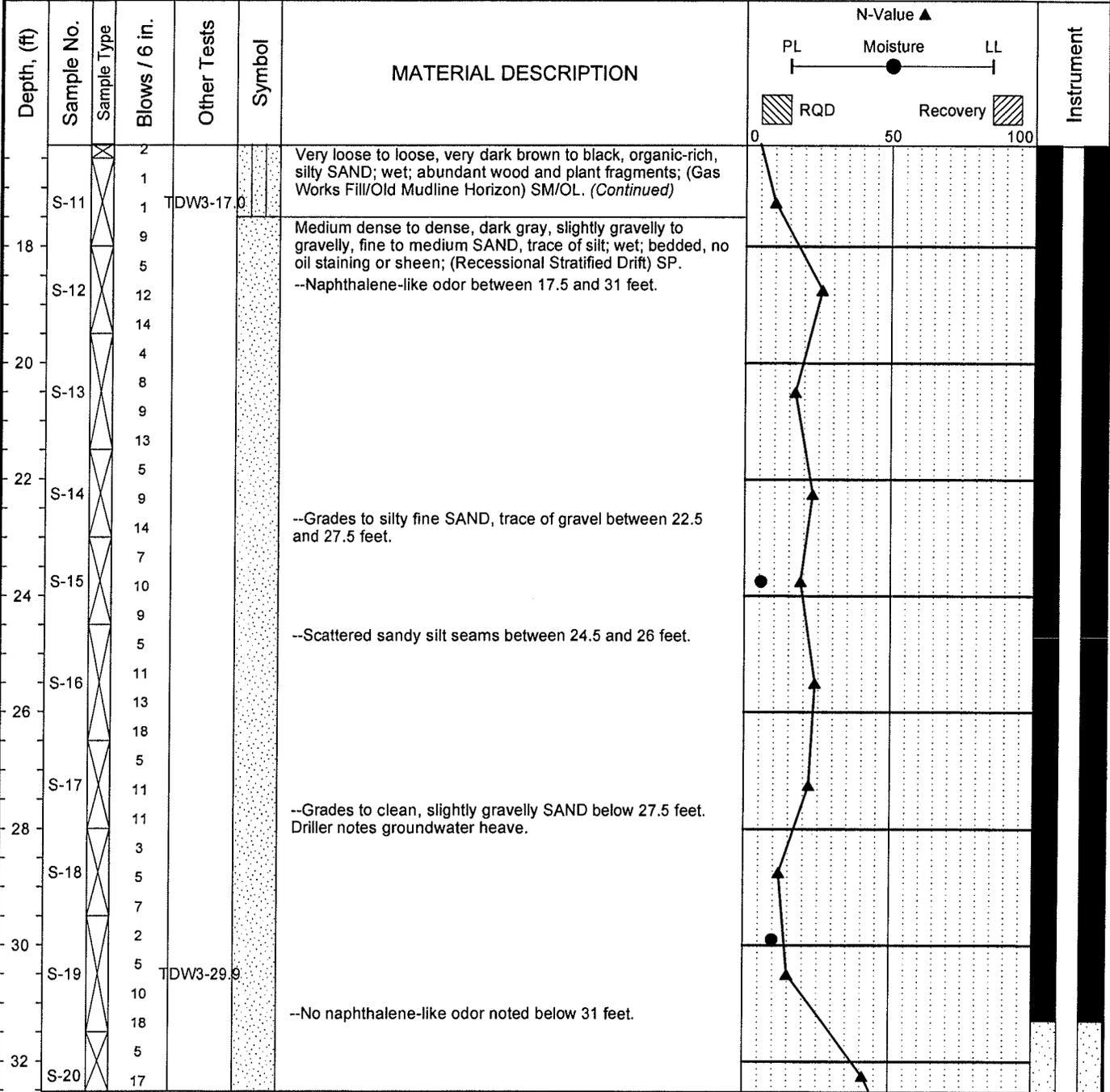
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**LOG OF TEST BORING TDW-3**

**Figure 4**

The stratification lines represent approximate boundaries. The transition may be gradual.

Project: Gas Works Sediment Cleanup	Surface Elevation: 26.6 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: 26.50 ft. (USACE)
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238769.82, Easting: 1269998.28	Sampling Method: SPT w/ Auto Hammer



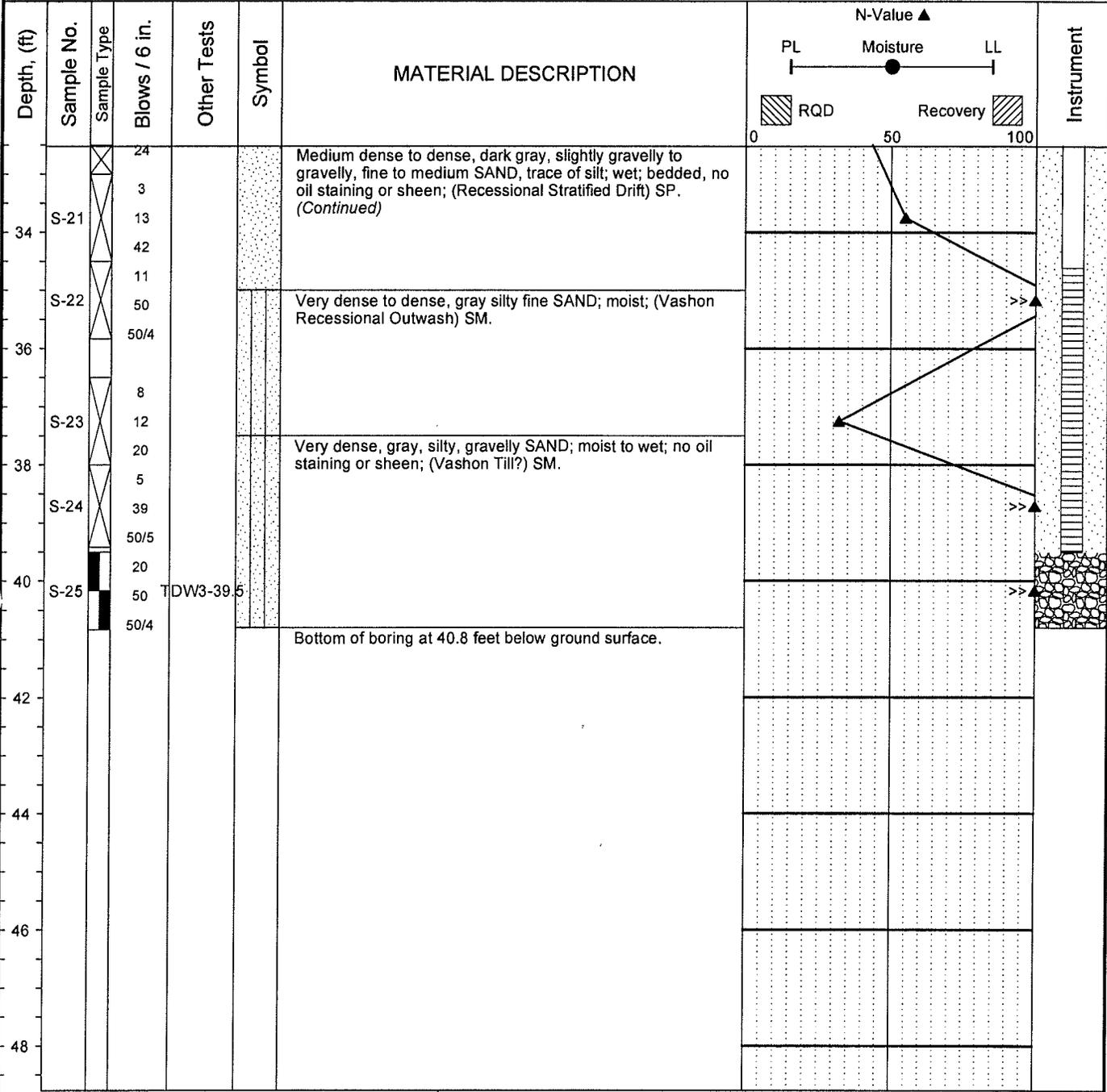
Completion Depth: 40.8ft	Remarks: Standard Penetrations Test (SPT) sampler <b>AND</b> Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started: 9/26/06	
Date Borehole Completed: 9/27/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

**LOG OF TEST BORING TDW-3**

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**Figure 4**

Project: Gas Works Sediment Cleanup	Surface Elevation: 26.6 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: 26.50 ft. (USACE)
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238769.82, Easting: 1269998.28	Sampling Method: SPT w/ Auto Hammer



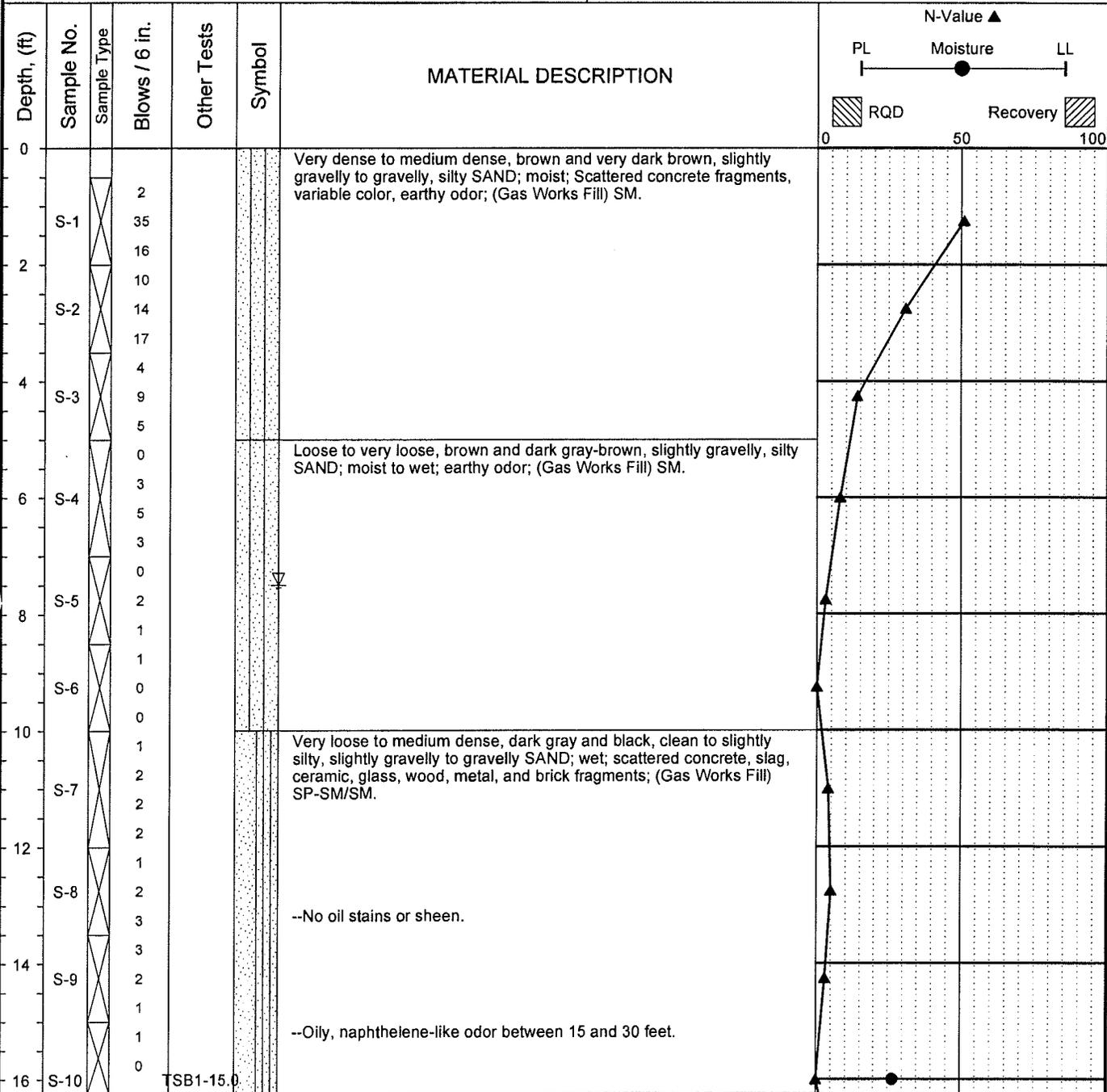
Completion Depth: 40.8ft	Remarks: Standard Penetrations Test (SPT) sampler <b>AND</b> Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started: 9/26/06	
Date Borehole Completed: 9/27/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

**LOG OF TEST BORING TDW-3**

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**Figure 4**

Project: Gas Works Sediment Cleanup	Surface Elevation: 29.0 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: _____
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238867.49, Easting: 1269836.89	Sampling Method: SPT w/ Auto Hammer



Completion Depth: 47.7ft  
Date Borehole Started: 9/25/06  
Date Borehole Completed: 9/25/06  
Logged By: J. Lamanna  
Drilling Company: Boart Longyear

Remarks: Standard Penetrations Test (SPT) sampler AND Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.

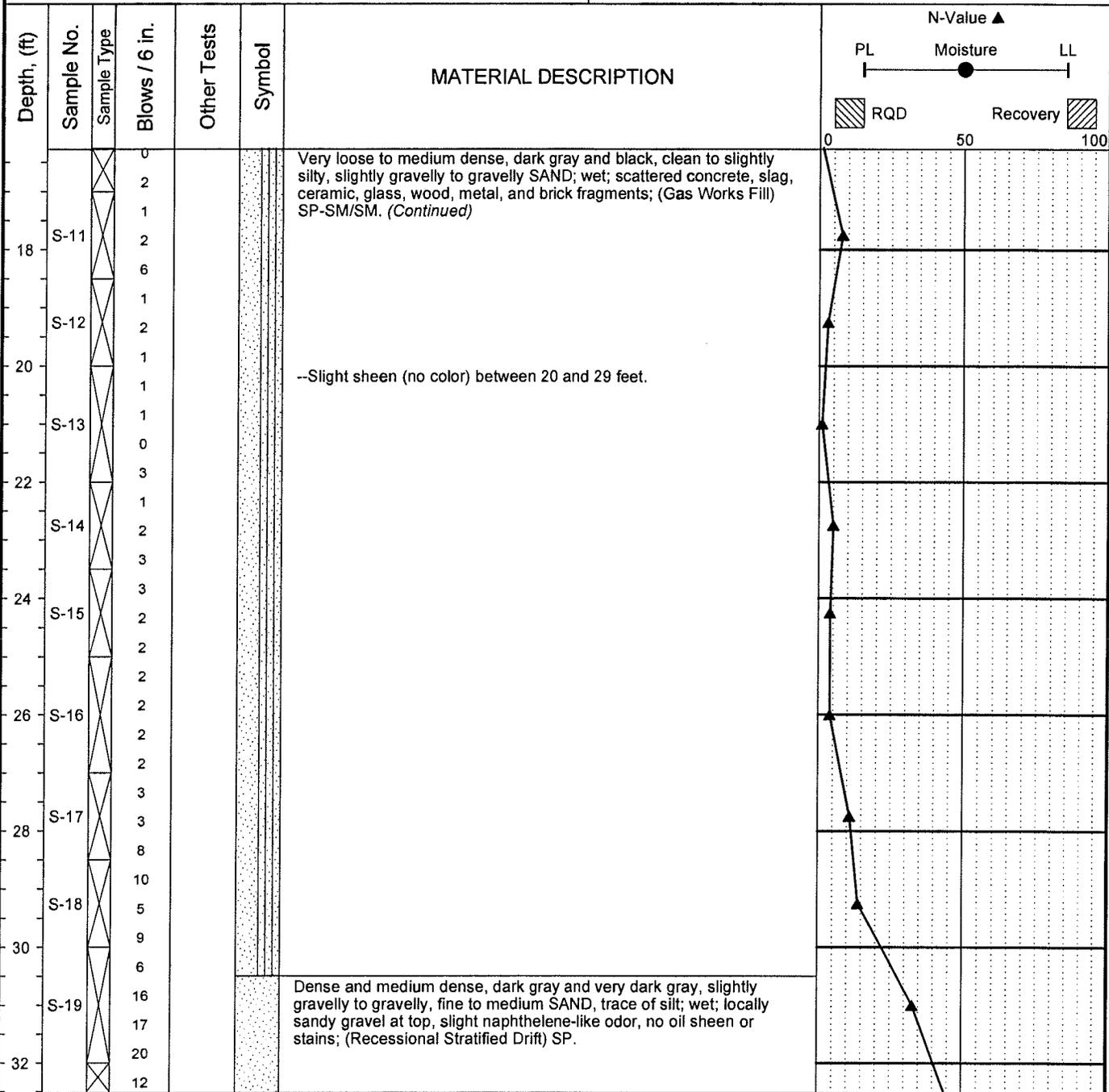
## LOG OF TEST BORING TSB-1

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**Figure 5**

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Gas Works Sediment Cleanup	Surface Elevation:	29.0 ft. (USACE)
Job Number:	06-091	Top of Casing Elev.:	
Location:	Gas Works Park, Seattle Washington	Drilling Method:	HSA
Coordinates:	Northing: 238867.49, Easting: 1269836.89	Sampling Method:	SPT w/ Auto Hammer



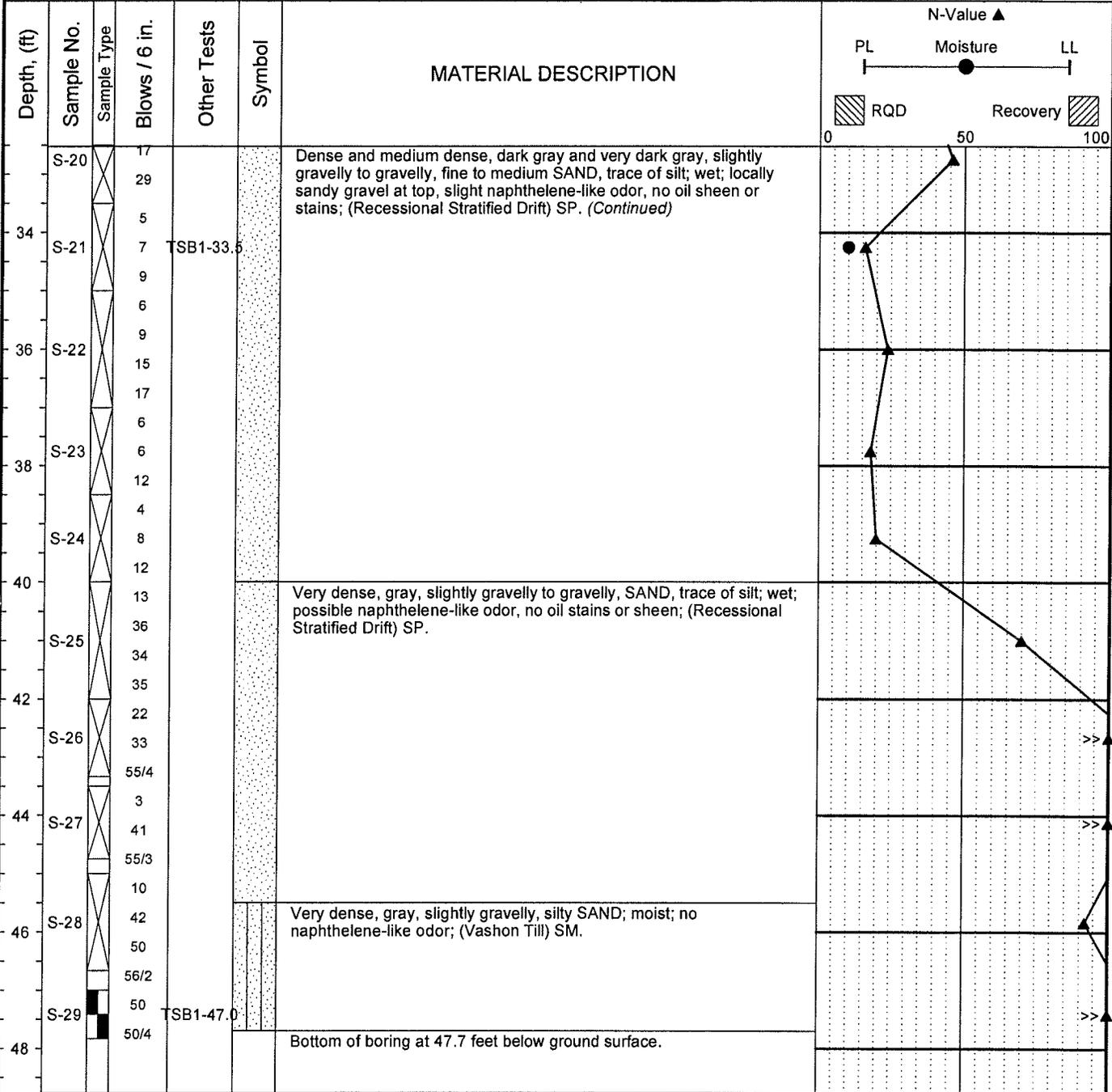
Completion Depth:	47.7ft	Remarks: Standard Penetrations Test (SPT) sampler AND Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started:	9/25/06	
Date Borehole Completed:	9/25/06	
Logged By:	J. Lamanna	
Drilling Company:	Boart Longyear	

**LOG OF TEST BORING TSB-1**

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**Figure 5**

Project:	Gas Works Sediment Cleanup	Surface Elevation:	29.0 ft. (USACE)
Job Number:	06-091	Top of Casing Elev.:	
Location:	Gas Works Park, Seattle Washington	Drilling Method:	HSA
Coordinates:	Northing: 238867.49, Easting: 1269836.89	Sampling Method:	SPT w/ Auto Hammer



Completion Depth: 47.7ft  
Date Borehole Started: 9/25/06  
Date Borehole Completed: 9/25/06  
Logged By: J. Lamanna  
Drilling Company: Boart Longyear

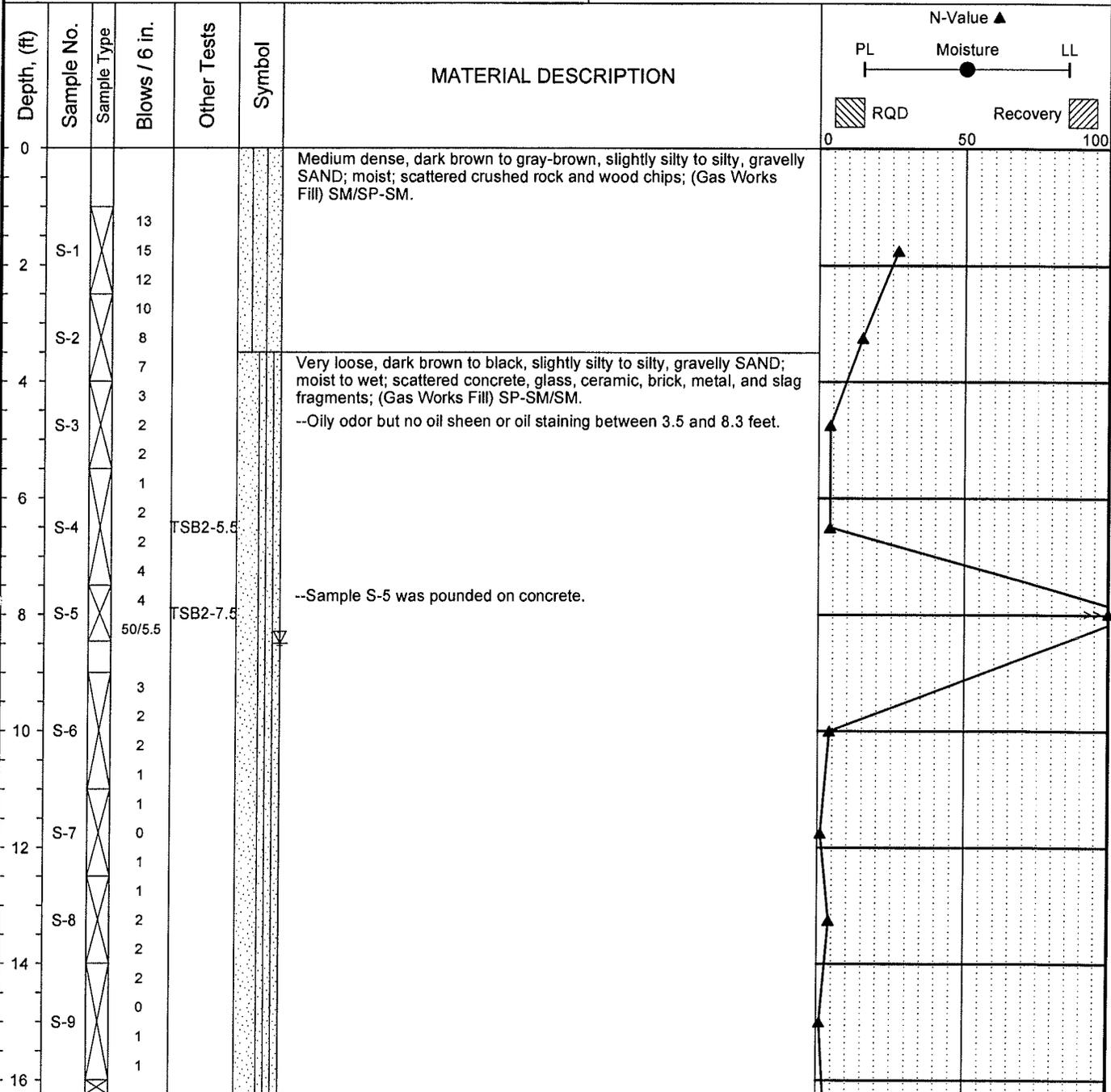
Remarks: Standard Penetrations Test (SPT) sampler AND Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.

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**LOG OF TEST BORING TSB-1**

**Figure 5**

Project:	Gas Works Sediment Cleanup	Surface Elevation:	31.4 ft. (USACE)
Job Number:	06-091	Top of Casing Elev.:	
Location:	Gas Works Park, Seattle Washington	Drilling Method:	HSA
Coordinates:	Northing: 238814.03, Easting: 1269926.06	Sampling Method:	SPT w/ Auto Hammer



Completion Depth: 49.5ft  
 Date Borehole Started: 9/21/06  
 Date Borehole Completed: 9/21/06  
 Logged By: J. Lamanna  
 Drilling Company: Boart Longyear

Remarks: Standard Penetrations Test (SPT) sampler **AND** Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.

### LOG OF TEST BORING TSB-2

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Figure 6

The stratification lines represent approximate boundaries. The transition may be gradual.

Project: Gas Works Sediment Cleanup  
 Job Number: 06-091  
 Location: Gas Works Park, Seattle Washington  
 Coordinates: Northing: 238814.03, Easting: 1269926.06

Surface Elevation: 31.4 ft. (USACE)  
 Top of Casing Elev.:  
 Drilling Method: HSA  
 Sampling Method: SPT w/ Auto Hammer

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION	N-Value ▲	
							PL	Moisture
							0	100
18	S-10	X	1			--Oily odor, oil sheen and staining from 16 to 30.5 feet. Oil content variable and apparently less than saturated. Very loose, dark brown to black, slightly silty to silty, gravelly SAND; moist to wet; scattered concrete, glass, ceramic, brick, metal, and slag fragments; (Gas Works Fill) SP-SM/SM. (Continued)		
	S-11	X	1	TSB2-17.5				
20	S-12	X	1					
22	S-13	X	1	TSB2-21.8				
24	S-14	X	2	TSB2-22.5				
26	S-15	X	3	TSB2-25.7				
28	S-16	X	2					
30	S-17	X	2					
32	S-18	X	1					
	S-19	X	8			Medium dense to dense, dark gray, slightly gravelly to gravelly SAND, trace of silt; wet; slight oil odor and sheen in upper 2 feet of unit; (Recessional Stratified Drift) SP.		
			3			--Wood fragment at 31.5 feet.		
			5					
			11					

Completion Depth: 49.5ft  
 Date Borehole Started: 9/21/06  
 Date Borehole Completed: 9/21/06  
 Logged By: J. Lamanna  
 Drilling Company: Boart Longyear

Remarks: Standard Penetrations Test (SPT) sampler **AND** Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.

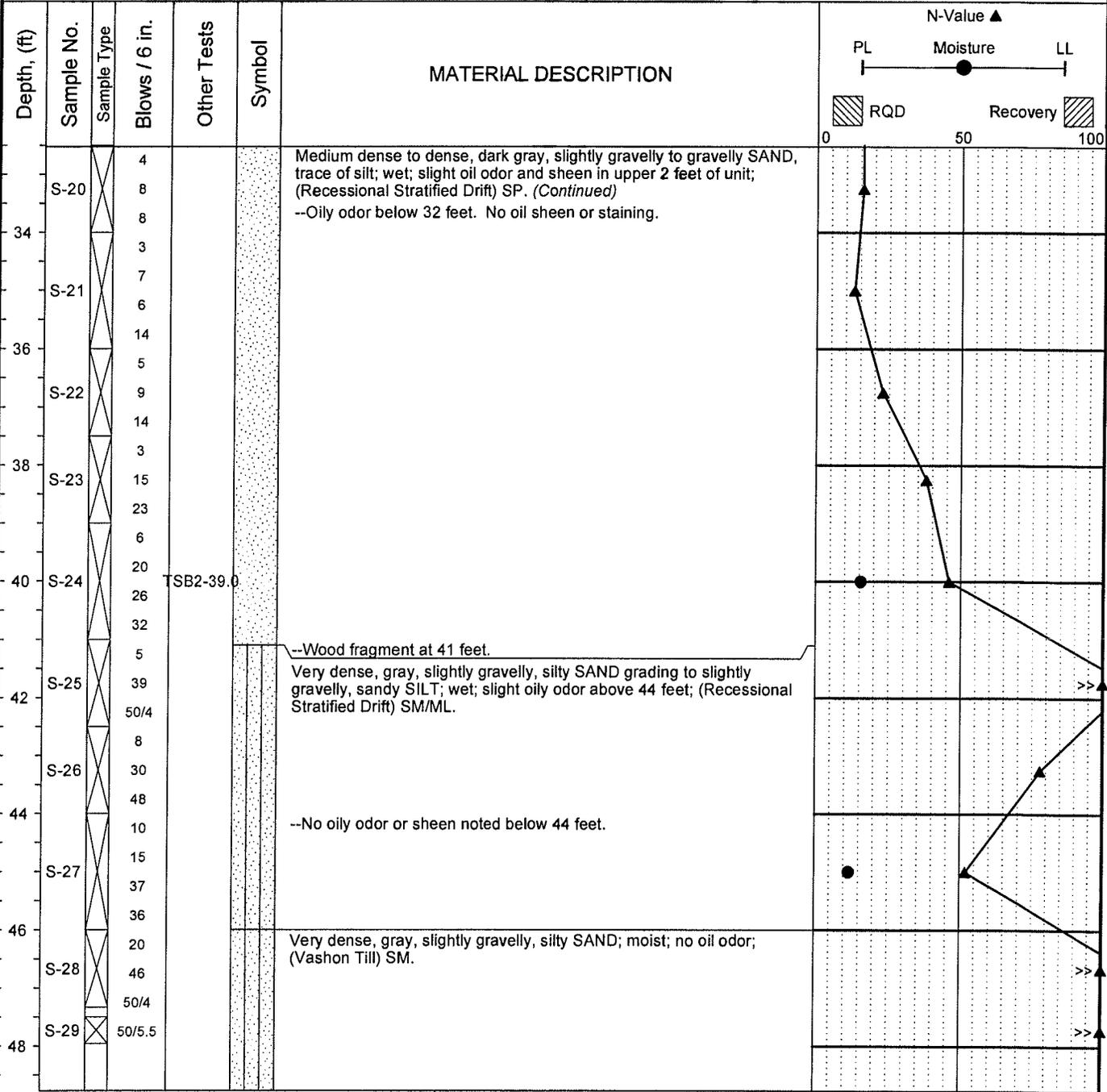
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**LOG OF TEST BORING TSB-2**

**Figure 6**

The stratification lines represent approximate boundaries. The transition may be gradual.

Project: Gas Works Sediment Cleanup	Surface Elevation: 31.4 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: _____
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238814.03, Easting: 1269926.06	Sampling Method: SPT w/ Auto Hammer



Completion Depth: 49.5ft	Remarks: Standard Penetrations Test (SPT) sampler AND Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started: 9/21/06	
Date Borehole Completed: 9/21/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

**LOG OF TEST BORING TSB-2**

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**Figure 6**

Project: Gas Works Sediment Cleanup  
 Job Number: 06-091  
 Location: Gas Works Park, Seattle Washington  
 Coordinates: Northing: 238814.03, Easting: 1269926.06

Surface Elevation: 31.4 ft. (USACE)  
 Top of Casing Elev.:  
 Drilling Method: HSA  
 Sampling Method: SPT w/ Auto Hammer

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION	N-Value ▲		
							PL	Moisture	LL
50	S-30		100/6	TSB2-49.0		Very dense, gray, slightly gravelly, silty SAND; moist; no oil odor; (Vashon Till) SM. (Continued) Bottom of boring at 49.5 feet below ground surface.	0	50	100
52									
54									
56									
58									
60									
62									
64									

Completion Depth: 49.5ft  
 Date Borehole Started: 9/21/06  
 Date Borehole Completed: 9/21/06  
 Logged By: J. Lamanna  
 Drilling Company: Boart Longyear

Remarks: Standard Penetrations Test (SPT) sampler **AND** Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.

### LOG OF TEST BORING TSB-2

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**Figure 6**

The stratification lines represent approximate boundaries. The transition may be gradual.

Project: Gas Works Sediment Cleanup	Surface Elevation: 24.9 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: _____
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238938.34, Easting: 1269758.61	Sampling Method: SPT w/ Auto Hammer

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION	N-Value ▲		
							PL	Moisture	LL
0						Borehole advanced from ground surface to a depth of 13.5 feet without sampling. Therefore, no soil description is presented for the soil interval between 0 and 13.5 feet.	0	50	100
2						-TSB3 is located near TDW2, which was sampled in this depth interval.			
4									
6									
8									
10									
12									
14	S-1		3			Very loose to loose, dark gray, slightly silty to silty, slightly gravelly to gravelly, SAND; wet; scattered reeds and wood (organic-rich); scattered glass fragments; naphthalene-like odor, no free oil; (Gas Works Fill/Old Mudline Horizon) SP-SM/SM.			
16	S-2		8			--Oil stains and colored sheen in soil at the 16.0-foot contact--does not appear to be saturated with oil.			

Completion Depth: 31.1ft	Remarks: Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.
Date Borehole Started: 10/2/06	
Date Borehole Completed: 10/2/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

Project: Gas Works Sediment Cleanup	Surface Elevation: 24.9 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.:
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238938.34, Easting: 1269758.61	Sampling Method: SPT w/ Auto Hammer

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION	N-Value ▲		
							PL	Moisture	LL
18	S-3		31 8 31 34	TSB3-16.5		Medium dense, dark gray, slightly gravelly to gravelly, SAND, trace of silt; wet; (Recessional Stratified Drift) SP-SM. (Continued)	0	50	100
18-29						Borehole advanced from a depth of 18 feet to 29 feet without sampling. Therefore, no soil description is presented for the soil interval between 18 and 29 feet.			
20						-TSB3 is located about 5 feet from TDW2, which was sampled in this depth interval.			
22									
24									
26									
28									
30	S-4		9 34	TSB3-16.5R		--Driller notes significant groundwater heave during sampling of samples S-4 and S-5. Medium dense, gray, slightly gravelly to gravelly, SAND, trace of silt; wet; strong naphthalene-like odor, no sheen or oil drops; (Recessional Stratified Drift) SP.			>>
30	S-5		50/4 50						>>
32			50/2			Bottom of boring at 31.1 feet below ground surface.			

Completion Depth: 31.1ft  
Date Borehole Started: 10/2/06  
Date Borehole Completed: 10/2/06  
Logged By: J. Lamanna  
Drilling Company: Boart Longyear

Remarks: Dames and Moore Sampler (D&M) driven with 140-lb. safety hammer. Therefore, samples obtained with a D&M sampler indicate non-standard N-values.

### LOG OF TEST BORING TSB-3

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Figure 7

The stratification lines represent approximate boundaries. The transition may be gradual.

Project: Gas Works Sediment Cleanup	Surface Elevation: 25.6 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: 25.35 ft. (USACE)
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 239252.34, Easting: 1269586.6	Sampling Method: SPT w/ Auto Hammer

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION	N-Value ▲		Instrument
							PL	Moisture LL	
0						Borehole advanced from ground surface to a depth of 5 feet without sampling. Therefore, no soil description is presented for the soil interval between 0 and 5 feet.			
2						-TSW1 is located near TDW1, which was sampled in this depth interval.			
4									
6	S-1		2	TSW2-5.0		Very loose to medium dense, dark yellow-brown and dark gray-brown, slightly silty SAND to slightly gravelly to gravelly, SAND, trace of silt; wet; scattered wood chips, no oil odor or sheen; (Gas Works Fill) SP.			
8	S-2		0	TSW2-7.0					
10	S-3		11	TSW2-9.0					
10.5			9			Bottom of boring at 10.5 feet below ground surface.			
12									
14									
16									

Completion Depth: 10.5ft	Remarks: Standard Penetrations Test (SPT) sampler driven with 140-lb. safety hammer.
Date Borehole Started: 9/21/06	
Date Borehole Completed: 9/21/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

**LOG OF TEST BORING TSW-1**

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**Figure 8**

Project: Gas Works Sediment Cleanup	Surface Elevation: 27.3 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: 27.06 ft. (USACE)
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238955.42, Easting: 1269762.77	Sampling Method: SPT w/ Auto Hammer

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION	N-Value ▲		Instrument
							PL	Moisture	
0						Borehole advanced from ground surface to a depth of 5.5 feet without sampling. Therefore, no soil description is presented for the soil interval between 0 and 5.5 feet.			
2						-TSW2 is located near TDW2, which was sampled in this interval.			
6	S-1		1			Very loose, yellow, brown, gray to black, slightly silty SAND, trace of gravel to gravelly, silty SAND; wet; scattered brick fragments and burnt wood, no oil odor or sheen; (Gas Works Fill) SP-SM/SM.			
8	S-2		1	No Rec.					
10	S-3		1						
12						Bottom of boring at 12.0 feet below ground surface.			

Completion Depth: 11.5ft	Remarks: Standard Penetrations Test (SPT) sampler driven with 140-lb. safety hammer.
Date Borehole Started: 10/2/06	
Date Borehole Completed: 10/2/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

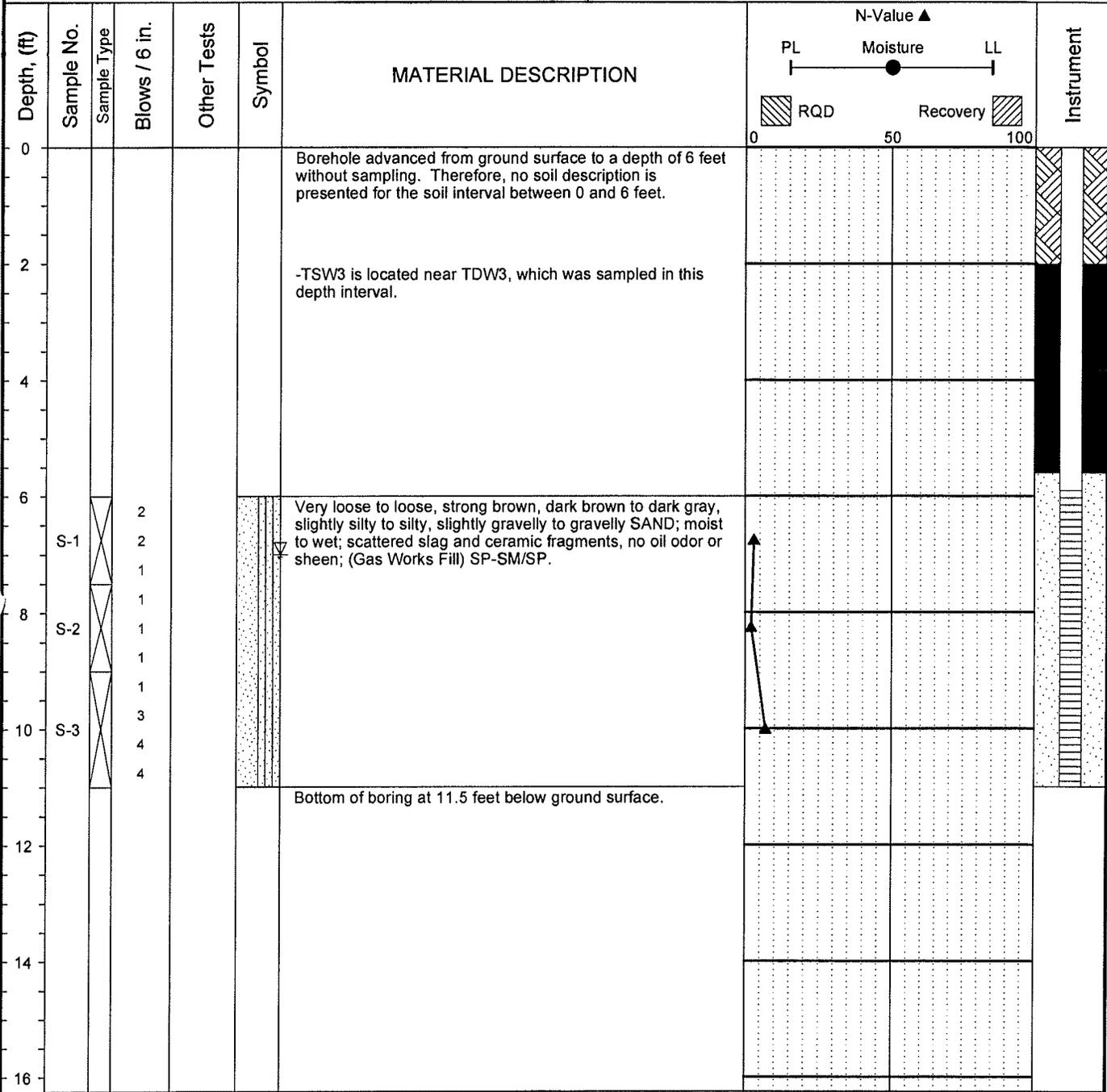
**LOG OF TEST BORING TSW-2**

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**Figure 9**

The stratification lines represent approximate boundaries. The transition may be gradual.

Project: Gas Works Sediment Cleanup	Surface Elevation: 27.3 ft. (USACE)
Job Number: 06-091	Top of Casing Elev.: 26.99 ft. (USACE)
Location: Gas Works Park, Seattle Washington	Drilling Method: HSA
Coordinates: Northing: 238775.84, Easting: 1270000.34	Sampling Method: SPT w/ Auto Hammer



Completion Depth: 11.9ft	Remarks: Standard Penetrations Test (SPT) sampler driven with 140-lb. safety hammer.
Date Borehole Started: 9/27/06	
Date Borehole Completed: 9/27/06	
Logged By: J. Lamanna	
Drilling Company: Boart Longyear	

**LOG OF TEST BORING TSW-3**

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**Figure 10**

**Metro Site Investigation  
(SAIC 2006)**

**2006 Borings**



# SOIL BORING LOG

BORING No: P-10

PAGE 1 of 2

PROJECT: 100-1327  
 LOCATION: Seattle, WA (Metro)  
 CLIENT: Chevron EMC  
 DATE: 06/14/06  
 LOGGED BY: Simon Kline

DRILLER: Cascade Drilling, Inc.  
 DRILL METHOD: Air Knife/Hand Auger  
 SAMPLE METHOD: Hand Auger  
 HOLE DIAMETER: 2 to 10 inches  
 HOLE-DEPTH: 16 feet

WELL DIAMETER: -- n/a  
 WELL DEPTH: -- n/a  
 WELL CASING: -- n/a  
 WELL SCREEN: -- n/a  
 FILTER PACK: -- n/a

CASING ELEVATION: -- n/a

Moisture Content	Analytical Sample Number	FID (ppm)	Water Level	Sample		DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Backfill Material
				Recovery	Interval				
Dry		3.8				0	TS	Top soil and sod.	Top Soil
						1		Geogrid at 1 foot below surface	
Moist		0.0				2	SP	Dark brown SAND (Gasworks Formation) with trace silt. No hydrocarbon odor, no sheen.	Bentonite Chips
						3			
						4		Brownish-gray SAND with trace fine gravel. No hydrocarbon odor, slight sheen.	
						5			
						6		Grades to light brown color and occasional gravel. No hydrocarbon odor, slight sheen	
						7	SW		
						8		very slight sheen, no hydrocarbon odor	
						9			
						10		Increased gravel content. No odor, no sheen.	
		11							

NOTES:



# SOIL BORING LOG

BORING No: P-10

PAGE 2 of 2

PROJECT: 100-1327  
 LOCATION: Seattle, WA (Metro)  
 CLIENT: Chevron EMC  
 DATE: 06/14/06  
 LOGGED BY: Simon Kline

DRILLER: Cascade Drilling, Inc.  
 DRILL METHOD: Air Knife/Hand Auger  
 SAMPLE METHOD: Hand Auger  
 HOLE DIAMETER: 2 to 10 inches  
 HOLE DEPTH: 16 feet

WELL DIAMETER: -- n/a  
 WELL DEPTH: -- n/a  
 WELL CASING: -- n/a  
 WELL SCREEN: -- n/a  
 FILTER PACK: -- n/a

CASING ELEVATION: -- n/a

Moisture Content	Analytical Sample Number	FID (ppm)	Water Level	Sample		DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Backfill Material
				Recovery	Interval				
Moist	P-10-12	0.4				12	SW	Same as above.	Bentonite Chips
						13		Grades to decreasing gravel. No hydrocarbon odor, very slight sheen.	
						14			
Wet	P-10-15	0.3	▽			15		Grades to increasing gravel. No hydrocarbon odor, no sheen.	
	P-10-16	0.4				16		P-10 completed at 16 feet bgs	
						17			
						18			
						19			
						20			
						21			
						22			

NOTES:



# SOIL BORING LOG

BORING No: P-12

PAGE 1 of 2

PROJECT: 100-1327  
 LOCATION: Seattle, WA (Metro)  
 CLIENT: Chevron EMC  
 DATE: 06/14/06  
 LOGGED BY: Simon Kline

DRILLER: Cascade Drilling, Inc.  
 DRILL METHOD: Air Knife/Hand Auger  
 SAMPLE METHOD: Hand Auger  
 HOLE DIAMETER: 2 to 10 inches  
 HOLE DEPTH: 12 feet

WELL DIAMETER: -- n/a  
 WELL DEPTH: -- n/a  
 WELL CASING: -- n/a  
 WELL SCREEN: -- n/a  
 FILTER PACK: -- n/a

CASING ELEVATION: - n/a

Moisture Content	Analytical Sample Number	FID (ppm)	Water Level	Sample		DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Backfill Material	
				Recovery	Interval					
Moist						0	TS	Sod to 6 inches below ground surface. Geogrid at 9 inches below ground surface.		
						1		Light brown silty fine to coarse SAND with a trace of fine gravel.		
			2.9				2			Grades to black color (Gasworks Formation). No hydrocarbon odor, no sheen.
							3	SW		Increasing gravel content. No hydrocarbon odor, slight sheen.
			53.6				4			
							5			Debris layer at 5.5 feet
							6	SM		Very dark brown silty fine to medium SAND with organics and trace fine gravel.
							7			
			0.7				8			Light grayish-brown coarse SAND and occasional gravel, no silt. Slight sheen, hydrocarbonno odor.
							9	SP		
			1.8				10			Grades to medium sand and trace gravel. Harder and more compact at 11.5 feet. No hydrocarbon odor, no sheen.
						11				

NOTES:



# SOIL BORING LOG

BORING No: P-12

PAGE 2 of 2

PROJECT: 100-1327  
 LOCATION: Seattle, WA (Metro)  
 CLIENT: Chevron EMC  
 DATE: 06/14/06  
 LOGGED BY: Simon Kline

DRILLER: Cascade Drilling, Inc.  
 DRILL METHOD: Air Knife/Hand Auger  
 SAMPLE METHOD: Hand Auger  
 HOLE DIAMETER: 2 to 10 inches  
 HOLE DEPTH: 12 feet

WELL DIAMETER: -- n/a  
 WELL DEPTH: -- n/a  
 WELL CASING: -- n/a  
 WELL SCREEN: -- n/a  
 FILTER PACK: -- n/a  
 CASING ELEVATION: -- n/a

Moisture Content	Analytical Sample Number	FID (ppm)	Water Level	Sample		DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Backfill Material
				Recovery	Interval				
Moist						12	SP	Same as above. Refusal at 12 feet bgs. Cobbles up to 8 inches diameter.	Bentonite Chips
						12		P-12 completed at 12 feet bgs (refusal due to cobbles).	
						13			
						14			
						15			
						16			
						17			
						18			
						19			
						20			
						21			
						22			

NOTES:

**GWP Northeast Corner  
Investigation Data Report  
(Floyd|Snider 2008)**

**2007 Borings**

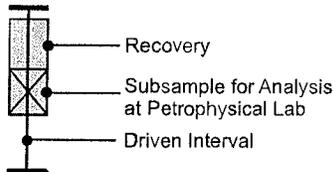
# Log of Soil Boring SB-1

**FLOYD | SNIDER**  
strategy • science • engineering

Boring SB-1 Date 9/17/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Cloudy, 60 degrees, Light Rain  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 15.2' BGS ATD Water Level Depth 9.5'  
 Ground Surface Elevation 31.0' (COE Datum)

Obs. Well Install. Yes

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB1-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		None	SM	Black, (loose), damp to moist, slightly gravelly silty SAND to sandy SILT with organics. No odor. (Topsoil)
SB1-S2	67	0.6	2.5'	4.0'		None	ML	Olive green to gray, stiff to very stiff, moist, slightly sandy, slightly clayey SILT with rounded gravels. No odor. (Gas Works Fill <sub>1</sub> )
SB1-S3	11	0.3	5.0'	6.5'		None	SW-SM	Light gray, medium dense, moist, slightly clayey, slightly silty SAND with rounded and angular gravels, organics, wood debris @5.5' and hydrocarbon odor near bottom. (Gas Works Fill <sub>1</sub> )
SB1-S4	20	161	7.5'	9.0'		Heavy sheen at bottom	ML-SM	Gray to brown, medium stiff, moist, sandy SILT with organics and product (LNAPL?) saturated wood debris. Grades to (medium dense), moist to wet SAND with strong hydrocarbon odor and scattered wood and brick debris. (Gas Works Fill <sub>1</sub> )
SB1-S5	50/6"	0.2	10.0'	10.5'		Heavy sheen with color and blebs	SW	Gray, very dense, wet SAND with angular and rounded gravel and trace organics. Naphthalene odor. (Glacial Deposits)
SB1-S6	50/4"	1.8	12.5'	12.9'		Light sheen	SW	Gray, very dense, moist, slightly silty to silty SAND with rounded gravels and slight hydrocarbon odor. (Glacial Deposits)
SB1-S7	50/2"	0.3	15.0'	15.2'		None	SW	Gray, very dense, moist, slightly silty to silty SAND with rounded gravels and slight odor. Silt content increases at bottom. (Glacial Deposits)
								Bottom of Boring at 15.2 feet BGS.



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

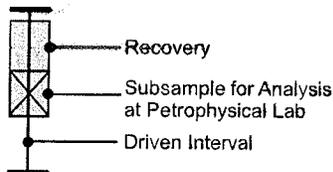
N: 239,409 ft  
E: 1,270,640 ft

# Log of Soil Boring SB-2

**FLOYD | SNIDER**  
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Boring SB-2 Date 9/17/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Cloudy, 60 degrees, Light Rain  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 12.7' BGS ATD Water Level Depth 9.0'  
 Obs. Well Install.  Yes  No  
 Ground Surface Elevation 30.7' (COE Datum)

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB2-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		None	SM	Light to dark brown, (loose), moist, silty SAND to sandy SILT with organics. (Topsoil)
SB2-S2	32	9.0	2.5'	4.0'		None	SM	Gray to black, medium dense, moist, silty, gravelly SAND with abundant wood debris and small chunks asphalt (?) Light to moderate hydrocarbon odor. (Gas Works Fill <sub>1</sub> )
SB2-S3	8	NA	5.0'	6.5'				Soft drive - no recovery Put ring in sampler and sample @ 6.5ft to 8.0 ft BGS
SB2-S4	11	NA	6.5'	8.0'		Heavy sheen w/ colors	SW	Black, medium dense, moist to wet, slightly silty SAND with small gravels between wood debris. Heavy hydrocarbon odor and sheen on sampler. Grade to (medium dense), wet, gray to light brown, silty, clayey SAND. (Gas Works Fill <sub>1</sub> )
SB2-S5	27	137	8.0'	9.5'		Very heavy sheen	SM-SC	Black SILT over gray/brown, silty, gravelly SAND. Heavy hydrocarbon odor and product (LNAPL?) in sample. Orange, heavy stain on bowl. (Gas Works Fill <sub>1</sub> )
SB2-S6	50/1"	17.3	10.0'	10.1'		Light sheen	SW	Gray, very dense, wet, well-graded SAND with light hydrocarbon odor. Carry down? (Glacial Deposits)
SB2-S7	50/2"	NA	12.5'	12.7'		Light sheen	SW	Gray, very dense, moist, slightly silty to silty SAND with scattered gravel and light hydrocarbon odor. Carry down? (Glacial Deposits) Bottom of Boring at 12.7 feet BGS.



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

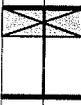
N: 239,455 ft  
E: 1,270,638 ft

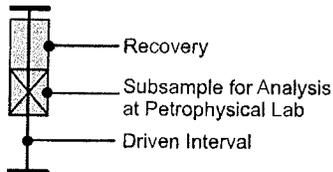
# Log of Soil Boring SB-2A

**FLOYD | SNIDER**  
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Boring SB-2A Date 9/17/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather 65 degrees, Raining  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 9.5' BGS ATD Water Level Depth NA  
 Ground Surface Elevation 30.6' (COE Datum)

Obs. Well Install. Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB2A-S1	37	NA	8.0'	9.5'		Very heavy sheen consistent with SB-2	SM-SC	Boring located adjacent to SB-2. Auger to 8ft BGS and obtain ring sample.  Gray to light brown, medium dense, moist to wet, silty, gravelly SAND with heavy hydrocarbon odor and product (LNAPL?) in sample. Orange, heavy, stain on bowl. (Gas Works Fill)  Bottom of Boring at 9.5 feet BGS.



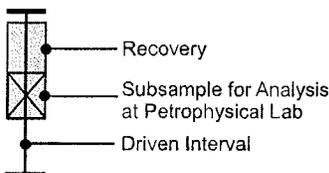
 Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,453 ft  
E: 1,270,639 ft

# Log of Soil Boring SB-3

						Boring <u>SB-3</u> Date <u>9/19/07</u> Sheet <u>1</u> of <u>1</u> Job <u>Gas Works NE Corner Investigation</u> Job No. <u>COS-GWSA (6010)</u> Logged By <u>Matt Woltman</u> Weather <u>Cloudy, 60 degrees</u> Drilled By <u>Cascade Drilling, Curtis</u> Drill Type/Method <u>HSA, Limited Access Rig</u> Sampling Method <u>Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop</u> Bottom of Boring <u>15.5' BGS</u> ATD Water Level Depth <u>9.5'</u> Ground Surface Elevation <u>29.8' (COE Datum)</u>			
						Obs. Well Install.	Yes	<input checked="" type="checkbox"/>	DEPTH
SAMPLE ID	Blow Count	PID (ppm)	From	To	SAMPLE RECOVERY (FT)				
SB3-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		NA	0	SM-ML Light brown, (loose), dry to moist, silty SAND to sandy SILT with scattered gravels and organics. (Topsoil)	
SB3-S2	63	0.0	2.5'	4.0'		None	3	ML Light brown to gray, stiff to very stiff, dry to moist, sandy SILT with rounded gravels and oxidized orange material. (Gas Works Fill <sub>2</sub> )	
SB3-S3	10	0.0	5.0'	6.5'		Light sheen	5	SM Light to dark brown and black, loose, moist, slightly silty to silty SAND with debris (slag, brick fragments, vesicular pieces, angular gravels) and shiny/glassy pieces scattered throughout. (Gas Works Fill <sub>2</sub> )	
SB3-S4	5	0.0	7.5'	9.0'		Light to moderate sheen	8	SM Same as above. (Gas Works Fill <sub>2</sub> )	
SB3-S5	14	14.0	10.0'	11.5'		Heavy sheen	10	SM Same as above. (Gas Works Fill <sub>2</sub> ) Black product (DNAPL?) coats sand and debris with strong hydrocarbon odor and visible sheen. Grades to light gray, wet, slightly silty SAND with gravels.	
SB3-S6	50/6"	1.8	12.5'	13.0'		Very light broken sheen	12	SP Light gray, very dense, wet, fine SAND with trace gravels. (Glacial Deposits) Slight hydrocarbon odor. (carry down?)	
SB3-S7	50/5"	1.1	15.0'	15.5'		Moderate to heavy sheen	15	SP-SW Same as above. (Glacial Deposits) Abundant gravels at bottom of sample. Slight to moderate odor. Discontinuous sheen blobs (DNAPL?) on small portions of sample. Bottom of Boring at 15.5 feet BGS.	



 Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,466 ft  
E: 1,270,701 ft

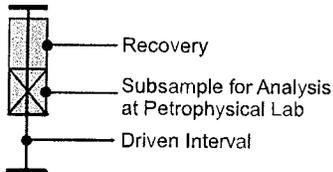
# Log of Soil Boring SB-3A

**FLOYD | SNIDER**  
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Boring SB-3A Date 9/19/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Cloudy, 60 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 10.5' BGS ATD Water Level Depth ~10'  
 Ground Surface Elevation 29.4' (COE Datum)

Obs. Well Install.  Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB3A-S1	20	NA	9.0'	10.5'		NA		<p>Boring located adjacent to SB-3. Auger to 9ft BGS and obtain ring sample.</p> <p>Black, medium dense, moist to wet, slightly silty SAND with debris (Gas Works Fill<sub>2</sub>). Black product (DNAPL?) at bottom of lower ring. Heavy hydrocarbon odor.</p> <p>Bottom of Boring at 10.5 feet BGS.</p>



 Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,464 ft  
E: 1,270,704 ft

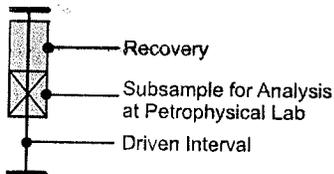
# Log of Soil Boring SB-4

**FLOYD | SNIDER**  
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Boring SB-4 Date 9/19/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Cloudy, 60 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 15.3' BGS ATD Water Level Depth 7'  
 Ground Surface Elevation 29.0' (COE Datum)

Obs. Well Install.  Yes  No

SAMPLE ID	Flow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT: NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB4-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		None	SM-ML	0 Light brown, (loose), dry to moist, sandy SILT to silty SAND with some gravels and organics. No odor. (Topsoil)
								1
SB4-S2	50	0.0	2.5'	4.0'		None	SM	2 Light to dark brown to black, medium dense to dense, wet, silty SAND with silt nodules and charred black cinder (lampblack?) and organics. No odor. Chunk of slag in bottom of sample. (Gas Works Fill <sub>1</sub> )
								3
SB4-S3	12	0.0	5.0'	6.5'		Light sheen	SM-ML	4 Light brown to gray, loose to medium dense, wet grading to moist, silty to very silty SAND with black soot, charred pieces, small brick fragments and occasional gravels. (Gas Works Fill <sub>1</sub> )
								5
SB4-S4	13	1.0	7.5'	9.0'		Moderate sheen	SW	6 Dark brown to black, medium dense, wet, slightly silty SAND with debris - brick fragments, slag pieces. Sandier at top of sample, dark staining at middle and bottom. Moderate hydrocarbon odor at middle to bottom of sample. (Gas Works Fill <sub>2</sub> )
								7
SB4-S5	28	6.7	10.0'	11.5'		Light sheen above and below contact	SM-ML	8 Same as above with increasing silt content. (Gas Works Fill <sub>2</sub> )
								9
SB4-S6	50/5"	NA	12.5'	13.0'		NA	SW	10 Light gray, stiff, moist to wet, sandy SILT with charred pieces and rounded gravels. (Glacial Deposits) Slight hydrocarbon odor throughout.
								11
SB4-S7	50/4"	0.8	15.0'	15.3'		Light Sheen	SW-SP	12 No recovery.
								13
								14 Light gray, very dense, wet, fine SAND with rounded small gravels and trace silt. Slight hydrocarbon odor.
								15 Bottom of Boring at 15.3 feet BGS.
								16
								17
								18
								19
								20



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,386 ft  
E: 1,270,727 ft

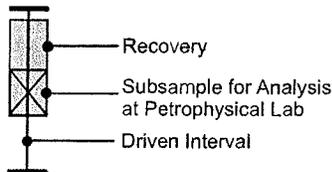
# Log of Soil Boring SB-5

**FLOYD | SNIDER**  
strategy • science • engineering

Boring SB-5 Date 9/18/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Cloudy, 60 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 12.4' BGS ATD Water Level Depth 7'  
 Ground Surface Elevation 27.0' (COE Datum)

Obs. Well Install. Yes

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB5-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		None	SM-ML	Light brown, (loose), dry to damp, silty SAND to sandy SILT with organics (Topsoil) and scattered gravels.
SB5-S2 (Grab Sample)	NA	0.0	1.0'	2.0'		Light sheen	SM-ML	Dark brown to black, loose, dry to moist, silty SAND to sandy SILT with gravels and reflective pieces. No odor. (Gas Works Fill <sub>1</sub> ) Turns water black in sheen test.
SB5-S3	11	0.0	2.5'	4.0'		Light to moderate sheen	SM	Light brown to black, loose, moist, slightly silty fine SAND with lots of debris, brick pieces, coal pieces? and asphalt. (Gas Works Fill <sub>2</sub> )
SB5-S4	6	0.0	5.0'	6.5'		Light sheen	SM	
SB5-S5	20	1.8	7.5'	9.0'		Heavy sheen	SM	Black, loose to medium dense, wet, slightly silty SAND with debris fragments and slag? Black staining. (Gas Works Fill <sub>2</sub> ) Slight hydrocarbon odor.
SB5-S6	50/4"	9.2	10.0'	10.4'		None	SW	Light gray to light brown, very dense, moist to wet, gravelly SAND with some staining at top of sample (carry down?). (Glacial Deposits)
SB5-S7	50/4"	1.4	12.0'	12.4'		None	SW	Gray, very dense, moist to wet, silty SAND with large rounded gravels. (Glacial Deposits) Bottom of Boring at 12.4 feet BGS.



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,436 ft  
E: 1,270,742 ft

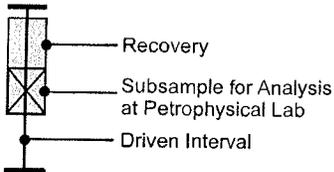
# Log of Soil Boring SB-6

**FLOYD | SNIDER**  
strategy • science • engineering

Boring SB-6 Date 9/18/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Sunny, 65 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 18.0' BGS ATD Water Level Depth 7'  
 Ground Surface Elevation 27.9' (COE Datum)

Obs. Well Install.  Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.	
			From	To					
SB6-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		NA	0	SM-ML Light brown, (loose), dry to damp, silty SAND to sandy SILT with organics and loose piece of slag. No odor. (Topsoil)	
SB6-S2 (Grab Sample)	NA	0.5	1.0'	2.0'		NA	1	GP ~cobbles and gravels in drill cuttings. Napthalene odor. Tar-like material in cuttings. (Gas Works Fill <sub>1</sub> )	
SB6-S3	28	1.4	2.5'	4.0'		Light to moderate sheen	2	SM Light to dark brown, medium dense, moist, slightly silty SAND with debris (slag, brick, etc.) (Gas Works Fill <sub>2</sub> ) Slight hydrocarbon odor. DNAPL-like product at 3ft BGS.	
SB6-S4	12	1.1	5.0'	6.5'		Light to moderate sheen	3		
SB6-S5	8	1.2	7.5'	9.0'		Heavy sheen	4	SM Same as above. (Gas Works Fill <sub>2</sub> )	
SB6-S6	6	3.1	10.0'	11.5'		Heavy sheen	5	SP Dark brown to black, loose, wet, fine SAND with trace silt. Possible shell fragments. Moderate hydrocarbon odor. Sheen on sample tube. (Gas Works Fill <sub>2</sub> )	
SB6-S7	6	1.4	12.5'	14.0'		Moderate sheen	6		
SB6-S8	50/3"	0.0	15.0'	15.7'		Light sheen	7	SM-SM Light gray, very dense, wet to moist, silty SAND to sandy SILT with rounded gravels. Moderate hydrocarbon odor at contact. (Glacial Deposits)	
SB6-S9	50/6"	NA	17.5'	18.0'		NA	8		
								9	Bottom of Boring at 18.0 feet BGS.
								10	
								11	
								12	
								13	Bottom of Boring at 18.0 feet BGS.
								14	
								15	
								16	
								17	
								18	
								19	
								20	



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,414 ft  
E: 1,270,791 ft

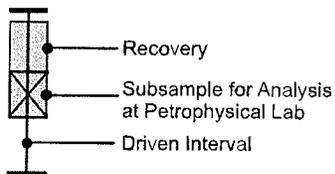
# Log of Soil Boring SB-7

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Boring SB-7 Date 9/18/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Sunny, 65 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 15.5' BGS ATD Water Level Depth 6.5'  
 Ground Surface Elevation 26.0' (COE Datum)

Obs. Well Install.  Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB7-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		NA	0	SM-ML Light brown, (loose), dry, silty SAND to sandy SILT with organics. (Topsoil)
SB7-S2	12	0.0	2.5'	4.0'		NA	3	SM Brown to black, medium dense, dry to moist, silty SAND with brick fragments, asphalt, slag. No odor. (Gas Works Fill <sub>2</sub> )
SB7-S3	7	0.1	5.0'	6.5'		Light sheen with color	5	SM Same as above, with black staining on lower portion of sample. (Gas Works Fill <sub>2</sub> )
SB7-S4	7	1.8	7.5'	9.0'		Heavy sheen	8	SM Same as above. (Gas Works Fill <sub>2</sub> )
SB7-S5	9	2.6	10.0'	11.5'		Heavy sheen	10	SM Same as above. (Gas Works Fill <sub>2</sub> )
SB7-S6	50/5"	10.8	12.5'	13.0'		Light to moderate sheen	13	ML Light gray, very dense, wet, clayey SILT with large, rounded gravels. (Glacial Deposits)
SB7-S7	50/6"	3.3	15.0'	15.5'		None	15	SP Light gray, very dense, wet, slightly silty SAND with rounded gravels. (Glacial Deposits)
							16	Bottom of Boring at 15.5 feet BGS.
							17	
							18	
							19	
							20	



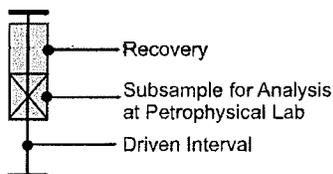
Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,462 ft  
E: 1,270,789 ft

# Log of Soil Boring SB-8

FLOYD   SNIDER strategy • science • engineering						Boring <u>SB-8</u> Date <u>9/18/07</u> Sheet <u>1</u> of <u>1</u> Job <u>Gas Works NE Corner Investigation</u> Job No. <u>COS-GWSA (6010)</u> Logged By <u>Matt Woltman</u> Weather <u>Sunny, 65 degrees</u> Drilled By <u>Cascade Drilling, Curtis</u> Drill Type/Method <u>HSA, Limited Access Rig</u> Sampling Method <u>Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop</u> Bottom of Boring <u>12.7' BGS</u> ATD Water Level Depth <u>9.0'</u> Ground Surface Elevation <u>28.7' (COE Datum)</u>			
Obs. Well Install.		Yes	<input checked="" type="checkbox"/>						
SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.	
			From	To					
SB8-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		NA	SM-ML	Light to dark brown, (loose), dry to damp, slightly sandy to sandy SILT with scattered gravels and organics. No odor. (Topsoil)	
SB8-S2 (Grab Sample)	NA	0.0	1.0'	4.5'		None	GW	Rough drilling to ~4.5ft BGS, gravels and cobbles in cuttings. Sand and silt in matrix. Little to no debris. No odor. (Gas Works Fill <sub>1</sub> )	
SB8-S3	27	0.0	5.0'	6.5'		None	ML SM	Light gray to dark brown, medium stiff, moist, sandy, clayey SILT with rounded gravels and organics. No odor. (Gas Works Fill <sub>1</sub> ) Gray to brown, medium dense, moist, slightly silty SAND with gravels. No odor. (Gas Works Fill <sub>1</sub> )	
SB8-S4	12	6.8	7.5'	9.0'		Light to moderate sheen	SM-CL-ML	Gray to light brown, medium dense, moist to wet, slightly silty SAND with rounded gravels and hydrocarbon odor over Brown, medium stiff, moist, silty CLAY to clayey SILT with wood debris and gravels. Hydrocarbon odor. Abundant wood with hydrocarbon odor at bottom.	
SB8-S5	80	10.7 88.7	9.0'	10.5'		Heavy sheen at bottom	SM	Black, very dense, wet, silty, gravelly SAND with wood debris and heavy sheen on sampler. (Gas Works Fill <sub>2</sub> )	
SB8-S6	50/6"	2.4	10.5'	11.0'		Very light sheen (carry down?)	SW	Gray, very dense, wet, slightly silty, gravelly SAND. Slight hydrocarbon odor (carry down?). (Glacial Deposits)	
SB8-S7	50/3"	1.3	12.5'	12.7'		Very light sheen (carry down?)	SP	Same as above. (Glacial Deposits) Bottom of Boring at 12.7 feet BGS.	



∇ Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum Washington State Plane (North)

N: 239,440 ft  
E: 1,270,679 ft

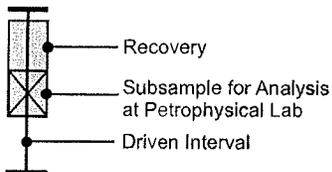
# Log of Soil Boring SB-9

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Boring SB-9 Date 9/19/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Cloudy, 60 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 13.0' BGS ATD Water Level Depth 7.0'  
 Ground Surface Elevation 27.8' (COE Datum)

Obs. Well Install. Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB9-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		NA	SM-ML	Light brown, (loose), dry to moist, silty SAND to sandy SILT with trace gravels and organics. No odor. (Topsoil)
SB9-S2	14	0.0	2.5'	4.0'		No sheen	SM	Light to dark brown to black, loose to medium dense, dry to moist, slightly silty SAND with debris (slag, brick fragments, shiny pieces, vesicular debris, etc.) No odor. (Gas Works Fill <sub>2</sub> )
SB9-S3	8	0.0	5.0'	6.5'		Light sheen	SM	Same material as above (Gas Works Fill <sub>2</sub> ) with more shiny pieces. Large piece of slag at bottom of sampler.
SB9-S4	24	0.0	7.5'	9.0'		Light to moderate sheen	SM	Same material as above. (Gas Works Fill <sub>2</sub> ) Poor recovery. Light sheen on sampler water. Samples stained black. Slight hydrocarbon odor.
SB9-S5	50/6"	1.4	10.0'	11.0'		Moderate sheen at top sample	SM	Same as above - Gas Works Fill <sub>2</sub> (stained black) over ~2", light brown, medium dense, wet, silty SAND with organics.
SB9-S6	50/6"	0.0	12.5'	13.0'		No sheen in RSD	SP	Light gray, very dense, wet, slightly silty SAND with rounded gravels. Slight sheen at top of sampler. Moderate hydrocarbon odor throughout. (Glacial Deposits)
							SP-GP	Light gray, very dense, wet, fine SAND with gravel becoming very gravelly at bottom of sample. (Glacial Deposits)
								Bottom of Boring at 13.0 feet BGS.



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,448 ft  
E: 1,270,718 ft

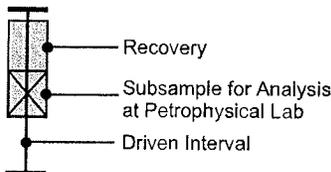
# Log of Soil Boring SB-10

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Boring SB-10 Date 9/20/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Sunny, 60 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 20.4' BGS ATD Water Level Depth 9.0'  
 Ground Surface Elevation 31.0' (COE Datum)

Obs. Well Install.  Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB10-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		NA	SM-ML	Light brown, (loose), dry to moist, silty SAND to sandy SILT with scattered gravels and organics, piece of slag and shiny black rock. No odor. (Topsoil)
SB10-S2	50	0.0	2.5'	4.0'		None	SM-ML	Light brown to gray, very dense, dry to moist, silty SAND to sandy SILT with organics. Angular gravels throughout becoming gravelly. Organic reduced odor. (Compact Topsoil)
SB10-S3	12	0.0	5.0'	6.5'		Light sheen	SM	Dark brown to black, loose to medium dense, moist, slightly silty to silty SAND with debris (slag pieces, brick fragments, shiny pieces, angular gravels. (Gas Works Fill <sub>2</sub> ) Slight hydrocarbon odor at bottom sample.
SB10-S4	13	0.0	7.5'	9.0'		Moderate sheen	SM	Same as above. (Gas Works Fill <sub>2</sub> ) Poor recovery.
SB10-S5	9	0.3	10.0'	11.5'		Light to moderate sheen	SM	Same as above. (Gas Works Fill <sub>2</sub> ) Moderate hydrocarbon odor at bottom of sample.
SB10-S6	7	9.5	12.5'	14.0'		Heavy sheen	SP-SM	Same as above. (Gas Works Fill <sub>2</sub> ) Debris not as abundant as S4 and S5. Strong hydrocarbon odor. Sheen visible on sampler.
SB10-S7	50/5"	7.8	15.0'	15.5'		Heavy sheen	SM	Same as above. (Gas Works Fill <sub>2</sub> ) Debris becomes more abundant with depth. Strong hydrocarbon odor. Product (DNAPL?) at top of sample.
SB10-S8	50/5"	0.9	17.5'	17.9'		Moderate to heavy sheen	SM	Light to dark gray, very dense, wet, slightly silty to silty SAND with abundant rounded gravels (Glacial Deposits). Slight to moderate hydrocarbon odor. Slight broken staining (colored) visible in sand matrix.
SB10-S9	50/5"	2.3	20.0'	20.4'		Light sheen	JP	Light gray, very dense, wet, fine SAND with small rounded gravels and trace silt. (Glacial Deposits) Slight hydrocarbon odor at top of sample. (carry down?) Bottom of Boring at 20.4 feet BGS.



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,386 ft  
E: 1,270,766 ft

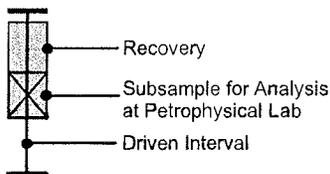
# Log of Soil Boring SB-11

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Boring SB-11 Date 9/20/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Cloudy, 60 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 15.3' BGS ATD Water Level Depth 8.0'  
 Ground Surface Elevation 30.2' (COE Datum)

Obs. Well Install. Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB11-S1 (Grab Sample)	NA	0.0	0.0'	1.0'			SM-ML	Dark brown to black, (loose), dry to moist, silty SAND to sandy SILT with organics. No odor. (Topsoil)
SB11-S2	50/6"	0.0	2.5'	3.0'		Heavy sheen	SM	Light gray to black, (very dense), moist, silty to very silty SAND with gravels. Very strong hydrocarbon odor at bottom of sample. Shiny pieces. (Gas Works Fill,)
SB11-S3	14	3.0	5.0'	6.5'		Top sample-heavy sheen Bottom sample-light sheen	SM	Light brown to gray, medium dense, moist, silty to very silty SAND with scattered gravels and organics. Moderate hydrocarbon odor in top 1/2 sample grading to slight odor at bottom. Becoming more silty at bottom of sample. (Gas Works Fill,)
SB11-S4	40	14.2	7.5'	9.0'		Slight to moderate at top and bottom	SP	Light gray, dense, wet, slightly silty SAND with rounded gravels. (Glacial Deposits) Moderate hydrocarbon odor at contact.
SB11-S5	50/5"	0.0	10.0'	10.4'		None	SP-SM	Light gray to dark gray/black, very dense, wet, slightly silty fine SAND with scattered organics? Slight hydrocarbon odor. Rounded gravels at bottom of sample. (Glacial Deposits)
SB11-S6	50/3"	0.0	12.5'	12.7'		None	SP-SM	Light gray, very dense, moist to wet, slightly silty to silty SAND with rounded gravels. (Glacial Deposits)
SB11-S7	50/3"	0.0	15.0'	15.3'		None	SP-SM	Same as above. (Glacial Deposits) Bottom of Boring at 15.3 feet BGS.



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,433 ft  
E: 1,270,642 ft

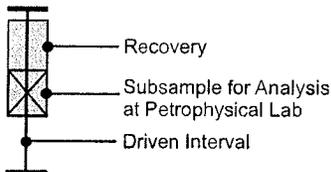
# Log of Soil Boring SB-12

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Boring SB-12 Date 9/20/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Cloudy, 60 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 3.5' BGS ATD Water Level Depth NA  
 Ground Surface Elevation 31.6' (COE Datum)

Obs. Well Install.  Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB12-S1 (Grab Sample)	NA	0.1	0.0'	1.0'			SM-ML	Light brown, (loose), dry to moist, silty SAND to sandy SILT with organics and scattered gravels. No odor. (Topsoil)
SB12-S2	50/6"	78.2	2.5'	3.0'		Light sheen	SM	Light brown to black, very dense, moist, slightly gravelly, silty, SAND with trace organics, plastic pieces, and debris. Heavy naphthalene odor on sample. Very hard drilling. (Gas Works Fill.) Bottom of Boring at 3.5 feet BGS.  Refusal at 3.5ft BGS. Driller indicates auger is on steel or rock.



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,472 ft  
E: 1,270,643 ft

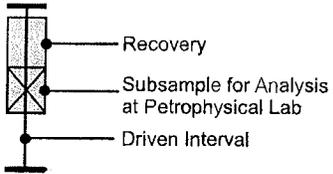
# Log of Soil Boring SB-12A

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Boring SB-12A Date 9/20/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Cloudy, 60 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 11.0' BGS ATD Water Level Depth 8.0'  
 Ground Surface Elevation 33.9' (COE Datum)

Obs. Well Install.  Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB12A-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		NA	SM-ML	Light brown to gray, (loose), dry to moist, silty SAND to sandy SILT with angular gravels, concrete debris and organics. No odor. Very hard drilling. (Topsoil)
SB12A-S2	50/4"	NA	2.5'	2.8'		NA		No recovery-rock in sampler. No sample taken. Very hard drilling.
SB12A-S3	17	82.1	5.0'	6.5'		Heavy sheen	CL	Light to dark gray, medium stiff to stiff, moist, silty CLAY with brick fragments and soft pilable tar in sample. Strong to very strong naphthalene odor on sample. (Gas Works Fill <sub>1</sub> )
SB12A-S4	17	NA	6.5'	8.0'		Heavy sheen		Same as above. Heavy naphthalene odor-product in sample. Heavy sheen on sampler.
SB12A-S5	50/6"	NA	8.0'	9.0'		Moderate sheen	ML	Dark gray to black, very stiff to very dense, wet, clayey sandy SILT to clayey silty SAND with rounded gravels. Strong naphthalene odor, tar on auger plug at 10ft BGS. (Gas Works Fill <sub>1</sub> )
SB12A-S6	50/3"	58.4 10.6	10.0'	10.2'				10.0 to 10.3ft BGS: Tar sample in ring.
								Bottom of Boring at 11.0 feet BGS.
								Attempt to drive SPT sample at 11.0ft BGS - refusal



Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)  
N: 239,488 ft  
E: 1,270,657 ft

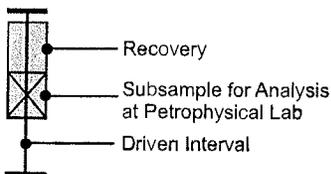
# Log of Soil Boring SB-13

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Boring SB-13 Date 9/20/07 Sheet 1 of 1  
 Job Gas Works NE Corner Investigation Job No. COS-GWSA (6010)  
 Logged By Matt Woltman Weather Sunny, 65 degrees  
 Drilled By Cascade Drilling, Curtis  
 Drill Type/Method HSA, Limited Access Rig  
 Sampling Method Dames and Moore Split Spoon Sampler, 140 lb Hammer, 30" Drop  
 Bottom of Boring 15.4' BGS ATD Water Level Depth 7.5'  
 Ground Surface Elevation 31.1' (COE Datum)

Obs. Well Install. Yes  No

SAMPLE ID	Blow Count	PID (ppm)	DEPTH		SAMPLE RECOVERY (FT)	SHEEN TEST	ft CSST Symbs	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
			From	To				
SB13-S1 (Grab Sample)	NA	0.0	0.0'	1.0'		NA	0	Dark brown to black, (loose), dry to moist, silty SAND to sandy SILT with organics and scattered gravel. No odor. (Topsoil)
SB13-S2	37	0.0	2.5'	4.0'		None	2-3	Dark brown to black, medium dense to dense, dry to moist, slightly silty SAND with scattered debris (brick fragments, vesicular pieces, slag). No odor. Piece of coal at ~2.7ft BGS? (Gas Works Fill <sub>1</sub> )
SB13-S3	36	0.0	5.0'	6.5'		None	5	Same as above. (Gas Works Fill <sub>1</sub> )
SB13-S4	25	0.0	7.5'	9.0'		None	7-8	Dark brown to light gray, medium dense, wet, silty to very silty SAND with organics and rounded gravels (4") over light gray, medium dense, wet, slightly clayey, silty SAND with trace gravels and scattered organics. Larger sand grains at bottom sample. (Gas Works Fill <sub>1</sub> )
SB13-S5	75	0.0	10.0'	11.5'		None	10-11	Same as above. (Gas Works Fill <sub>1</sub> ) Light gray, very dense, wet, fine SAND, with rounded gravels and trace silt. (Glacial Deposits) Slight hydrocarbon odor.
SB13-S6	50/6"	0.0	12.5'	13.0'		None	13	Same as above. (Glacial Deposits)
SB13-S7	50/5"	0.0	15.0'	15.4'		None	15	Same as above. (Glacial Deposits) Bottom of Boring at 15.4 feet BGS.



∇ Groundwater Observed At Time of Drilling

Boring Location in NAD 83 Datum  
Washington State Plane (North)

N: 239,396 ft  
E: 1,270,649 ft

**GWP Eastern Shoreline Investigation  
Data Report  
(Retec 2008)**

**2007 Borings**



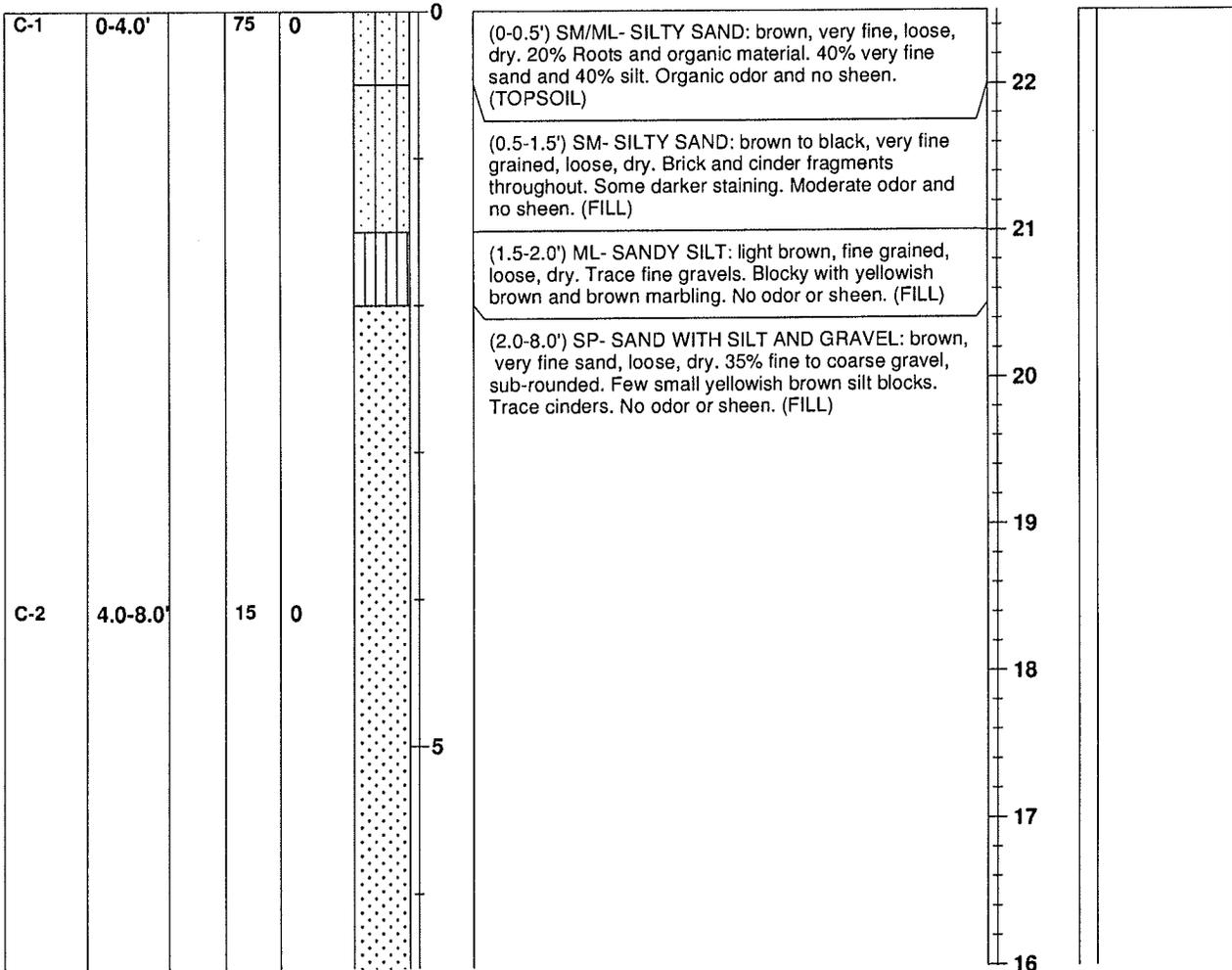
# Boring Log

Boring #: GP-01

Sheet 1 of 3

Project: Gas Works Park	Operator: Kasey Gable	Location: Eastern Shore Line
Project #: 05570-028-360	Drill Rig Type: Geoprobe	Northing: 239485.52 Easting: 1270791.24
Client: PSE	Method: Geoprobe	Ground Elevation: 25.743'
Contractor: Cascade Drilling	Casing ID: 1.75"	Total Depth: 17.0'
Start Date & Time: 09/17/2007 1117	Bit Type: 2" Geoprobe shoe	Seal: 1.0-17' bentonite, 0-1.0' top soil.
Finish Date & Time: 09/17/2007 1235	Boring ID: 2"	Logged By: A. Jambrosic

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: USACE		Date	Time	Depth (ft.)
	Headspace collection follows RETEC's SOP 310				
	Bobcat mounted limited access Geoprobe				



# Boring Log

Boring #: GP-01  
Sheet 2 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239485.52</b> Easting: <b>1270791.24</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.743'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>17.0'</b>
Start Date & Time: <b>09/17/2007 1117</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>1.0-17' bentonite, 0-1.0' top soil.</b>
Finish Date & Time: <b>09/17/2007 1235</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

C-3	8.0-12.0'	25	0			<p>@ 7.5' Wet.</p> <p>@ 8.0' Large 2.5" gravel.</p> <p>(8.0-13.0') SW- SAND: salt and pepper with red and yellow grains, very fine grading to coarse, angular to subrounded, loose, wet. Very fine sand grades to a coarse sand and fine gravel. Angular agglomerate with vesicles and woody material. Very little resistance to probe. Slight odor and slight broken rainbow sheen. (FILL)</p>	16 15 14 13 12 11 10	
C-4	12.0-16.0'	100	0			<p>@ 13.0' Rainbow sheen at lower contact. Trace NAPL on water surface. Slight odor.</p>		

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collection follows RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-01  
Sheet 3 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239485.52</b> Easting: <b>1270791.24</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.743'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>17.0'</b>
Start Date & Time: <b>09/17/2007 1117</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>1.0-17' bentonite, 0-1.0' top soil.</b>
Finish Date & Time: <b>09/17/2007 1235</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

C-5	16.0-17.0'	100	0		15	(13.0-17.0') SM- SILTY SAND: grey, very fine to medium grained, subrounded, dense, wet. 15% silt. Trace gravel, fine to coarse. Some small lenses of gravel, and some finer grained lenses. No odor or sheen. (GLACIAL DEPOSIT)	9 8 7 6	
						@ 17.0' Refusal.		

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collection follows RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)

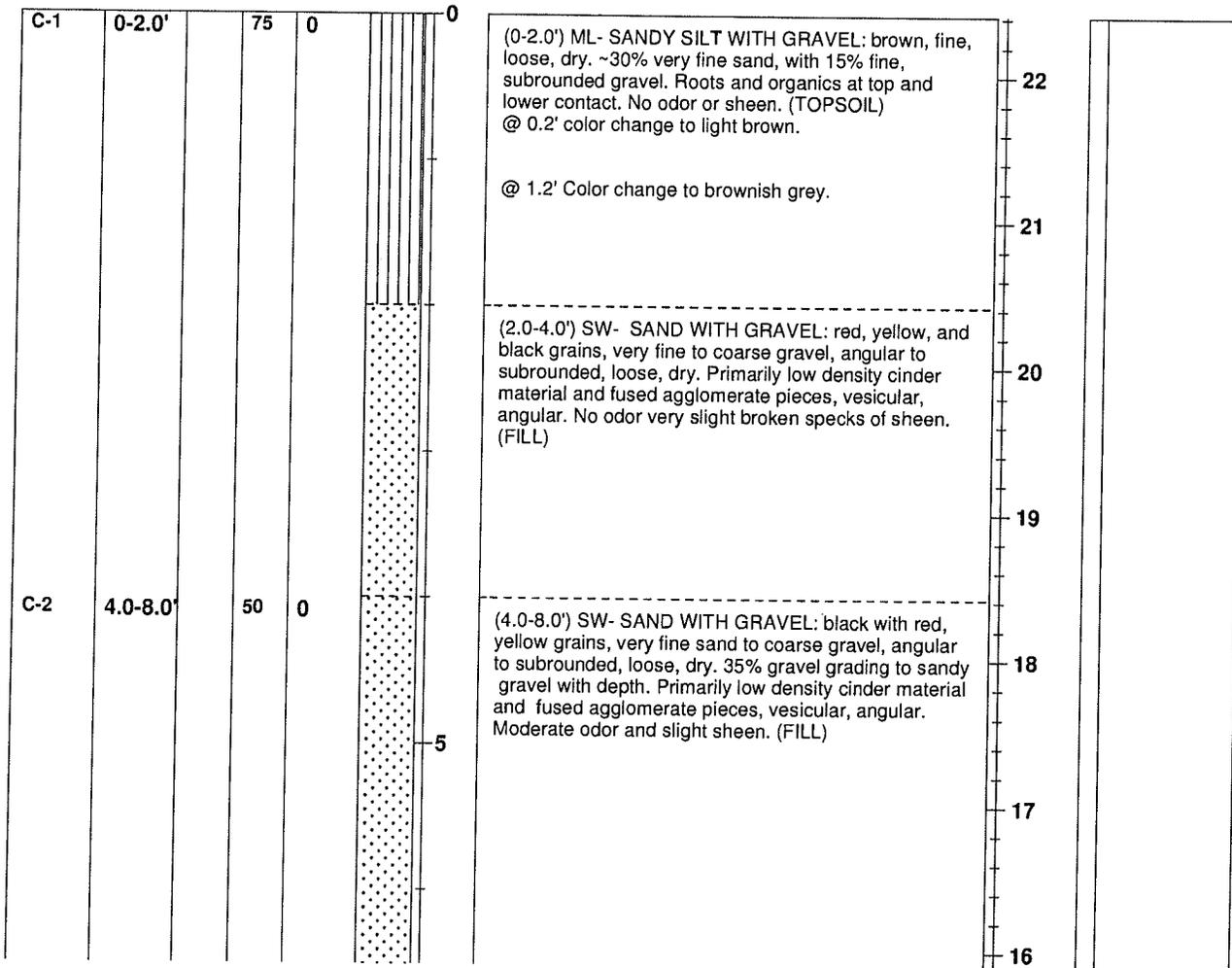


# Boring Log

Boring #: GP-02  
Sheet 1 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239464.71</b> Easting: <b>1270793.65</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.658'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>15.0'</b>
Start Date & Time: <b>09/17/2007 1240</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>15.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/17/2007 1320</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USCAE</b>		Date	Time	Depth (ft.)
	Headspace collection follows <b>RETEC's SOP 310</b>				
	Bobcat mounted limited access <b>Geoprobe</b>				

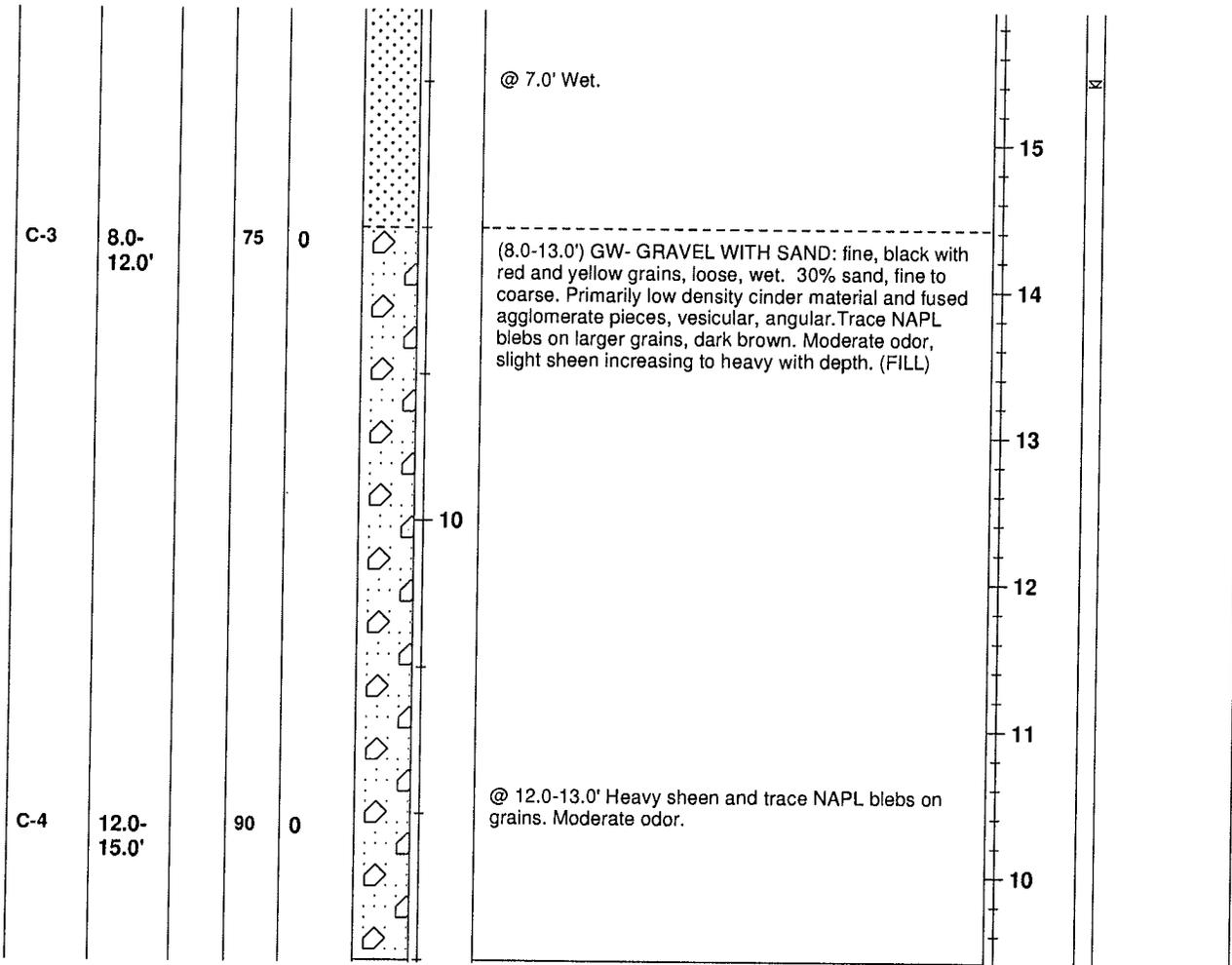


# Boring Log

Boring #: GP-02  
Sheet 2 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239464.71</b> Easting: <b>1270793.65</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.658'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>15.0'</b>
Start Date & Time: <b>09/17/2007 1240</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>15.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/17/2007 1320</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USCAE</b> <b>Headspace collection follows RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)



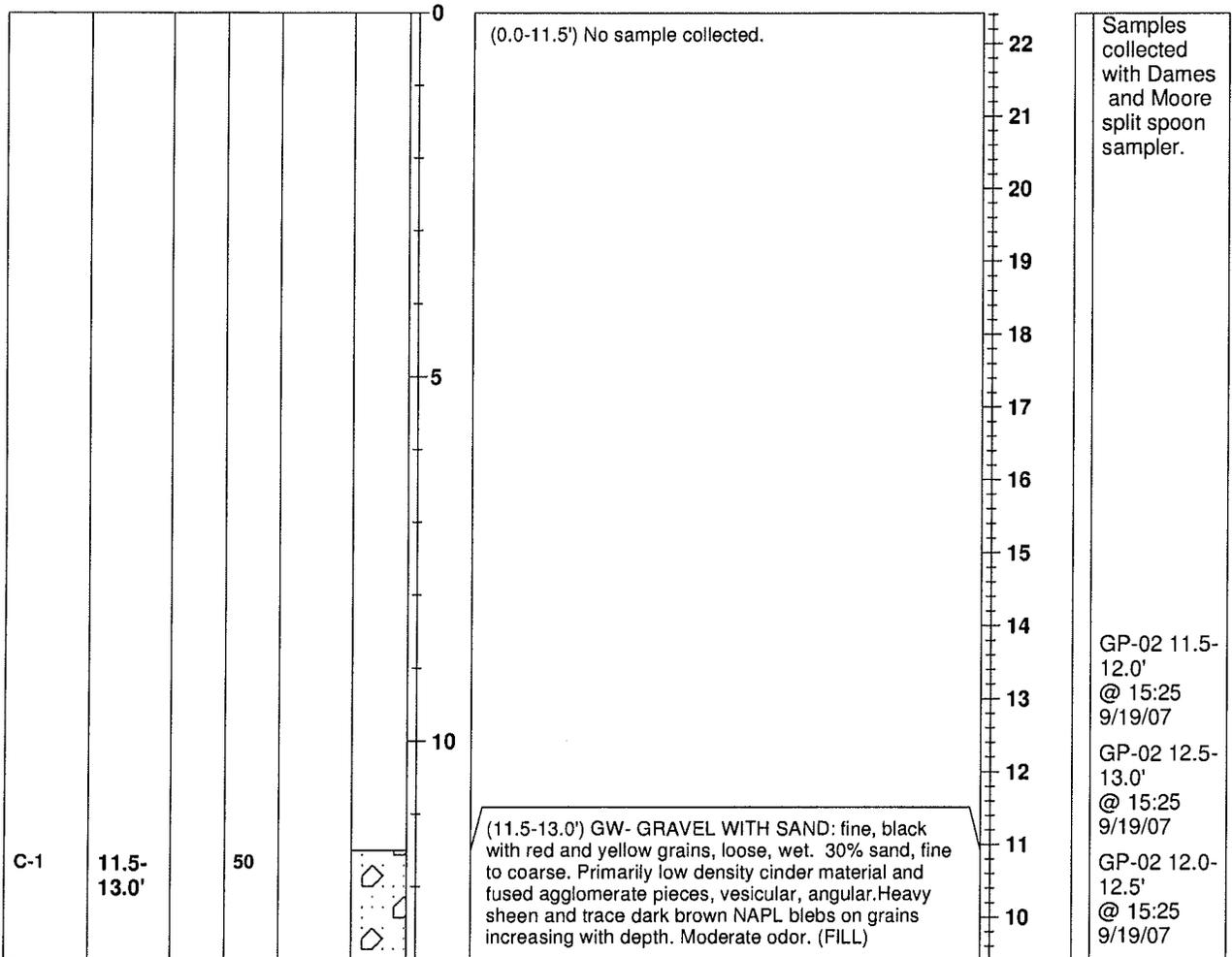


# Boring Log

Boring #: GP-02 HSA  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>Steve Choate</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239464.71</b> Easting: <b>1270793.65</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>25.658'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>13.0'</b>
Start Date & Time: <b>09/19/2007 1451</b>	Bit Type: <b>4.25" ID HSA</b>	Seal: <b>13.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/19/2007 1535</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USCAE</b>		Date	Time	Depth (ft.)

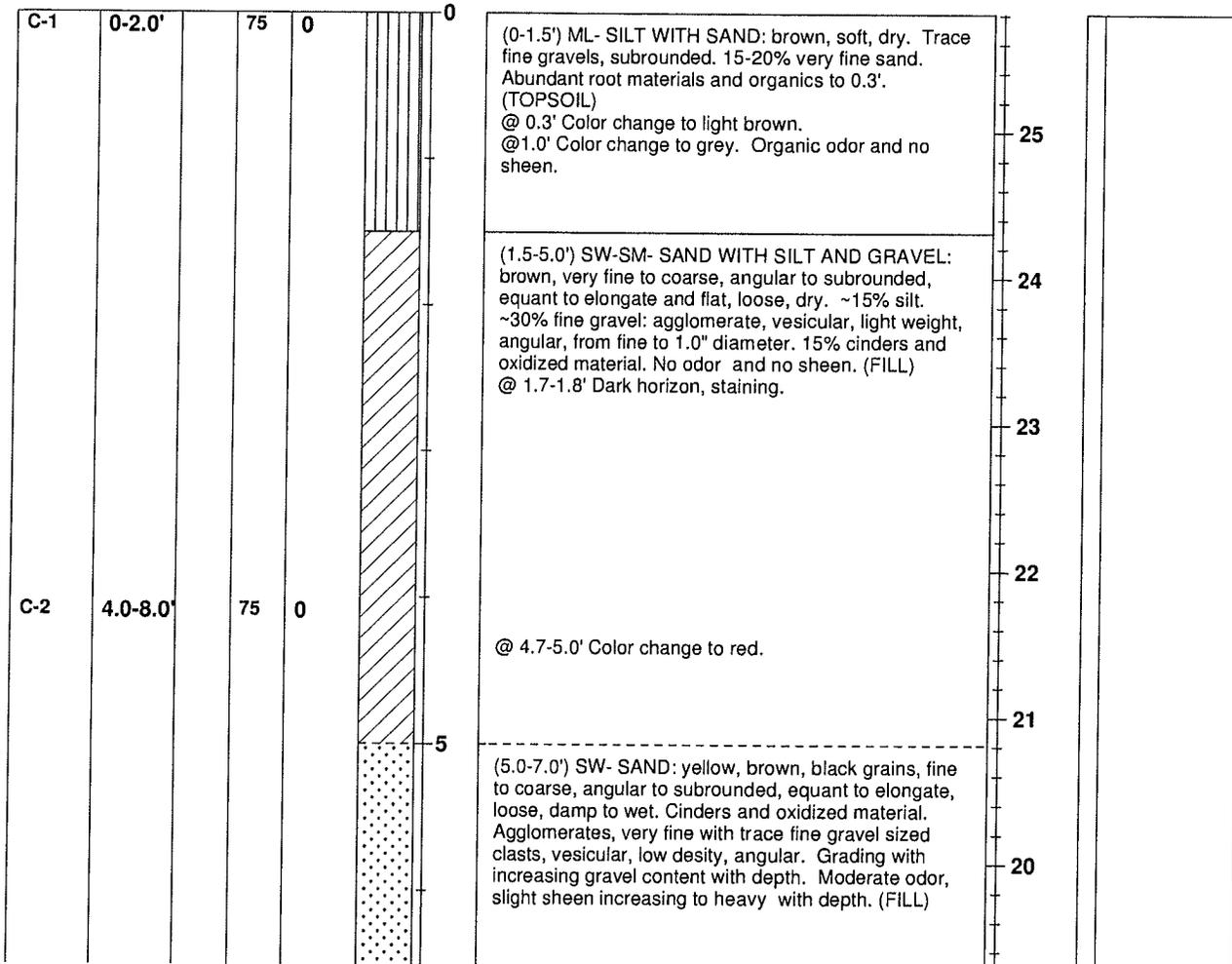


# Boring Log

Boring #: GP-03  
Sheet 1 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239449.59</b> Easting: <b>1270801.66</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.811'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>14.0'</b>
Start Date & Time: <b>09/17/2007 1337</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>14.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/17/2007 1410</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USCAE</b> <b>Head space collection follows RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-03  
Sheet 2 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239449.59</b> Easting: <b>1270801.66</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.811'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>14.0'</b>
Start Date & Time: <b>09/17/2007 1337</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>14.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/17/2007 1410</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
C-3	8.0-12.0'	75	0			7 10	(7.0-8.0') SW - SAND WITH GRAVEL. yellow, brown, black grains, fine to coarse, angular to subrounded, equant to elongate, loose, wet. 15% fine to very fine sand, Grading with increasing gravel content with depth up to 45% fine gravel. Cinders and oxidized material. Agglomerates, fine sand to fine gravel sized clasts, vesicular, low desity, angular. Moderate odor, heavy sheen. (FILL)	19 18	
C-4	12.0-14.0'	100	0			10	(8.0-13.0') GW- GRAVEL WITH SAND: black yellow, brown grains, fine to coarse, angular to subrounded, loose, wet. 20% sand, 80% fine to coarse gravel. Primarily agglomerate material, light weight, vesicular, grey, and shiny weathered coating on grains. Slight odor and slight sheen. (FILL)	17 16 15 14 13	@ 12.0-13.0' Slight odor, slight to moderate sheen at lower contact.

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: USCAE		Date	Time	Depth (ft.)
	Head space collection follows RETEC's SOP 310				
	Bobcat mounted limited access Geoprobe				



# Boring Log

Boring #: GP-03  
Sheet 3 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239449.59</b> Easting: <b>1270801.66</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.811'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>14.0'</b>
Start Date & Time: <b>09/17/2007 1337</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>14.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/17/2007 1410</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

						(13.0-14.0') SW-SM- SAND WITH SILT AND GRAVEL: grey, very fine to coarse, subrounded, dense, wet. 35% fine to coarse gravel, subrounded, equant. 10% silt. No odor and no sheen. (GLACIAL DEPOSIT) Refusal @ 14.0'	12	
--	--	--	--	--	--	---	----	--

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USCAE</b>		Date	Time	Depth (ft.)
	<b>Head space collection follows RETEC's SOP 310</b>				
	<b>Bobcat mounted limited access Geoprobe</b>				



# Boring Log

Boring #: GP-04  
Sheet 1 of 3

Project: <b>Gas Works Park</b>		Operator: <b>Kasey Gable</b>		Location: <b>Eastern Shore Line</b>					
Project #: <b>05570-028-360</b>		Drill Rig Type: <b>Geoprobe</b>		Northing: <b>239433.82</b> Easting: <b>1270811.42</b>					
Client: <b>PSE</b>		Method: <b>Geoprobe</b>		Ground Elevation: <b>28.202'</b>					
Contractor: <b>Cascade Drilling</b>		Casing ID: <b>1.75"</b>		Total Depth: <b>16.0'</b>					
Start Date & Time: <b>09/17/2007 1448</b>		Bit Type: <b>2" Geoprobe shoe</b>		Seal: <b>16.0-1.0' bentonite, 1.0-0' top soil</b>					
Finish Date & Time: <b>09/17/2007 1519</b>		Boring ID: <b>2"</b>		Logged By: <b>A.Jambrosic</b>					
Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

C-1	0-2.0'	75	0		<p>(0-0.7') ML- SILT WITH SAND: brown, fine, subrounded to subangular, loose, soft, dry. 25% very fine sand, roots and organic material. Organic odor, no sheen. (TOPSOIL)</p>	0		
					<p>(0.7-4.0') ML-SANDY SILT WITH GRAVEL: black, fine, angular to subrounded, loose, soft, dry. 35% very fine sand. 15% gravel, fine, angular, trace, coarse. (FILL) @ 0.7-1.7' Agglomerate light vesicular. Soot and black tar-like pieces, streaks black. Strong odor. @ 1.7-2.7' Grey and orangish brown color. Fine gravel-sized pieces of black amorphous glass material, cinders, agglomerate. @ 1.7-4.0' Moderate odor. No sheen.</p>	24		
C-2	4.0-8.0'	75	0	5	<p>(4.0-6.0') ML-SANDY SILT WITH GRAVEL: brownish grey, fine, angular to subrounded, loose, soft, dry. 35% very fine sand, 15% fine gravels, agglomerate and black glass-like material, trace cinders. Slight odor, no to slight sheen. (FILL)</p>	21		
						20		
						19		

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Head space collection follows <b>RETEC's SOP 310</b>				
	Bobcat mounted limited access Geoprobe				

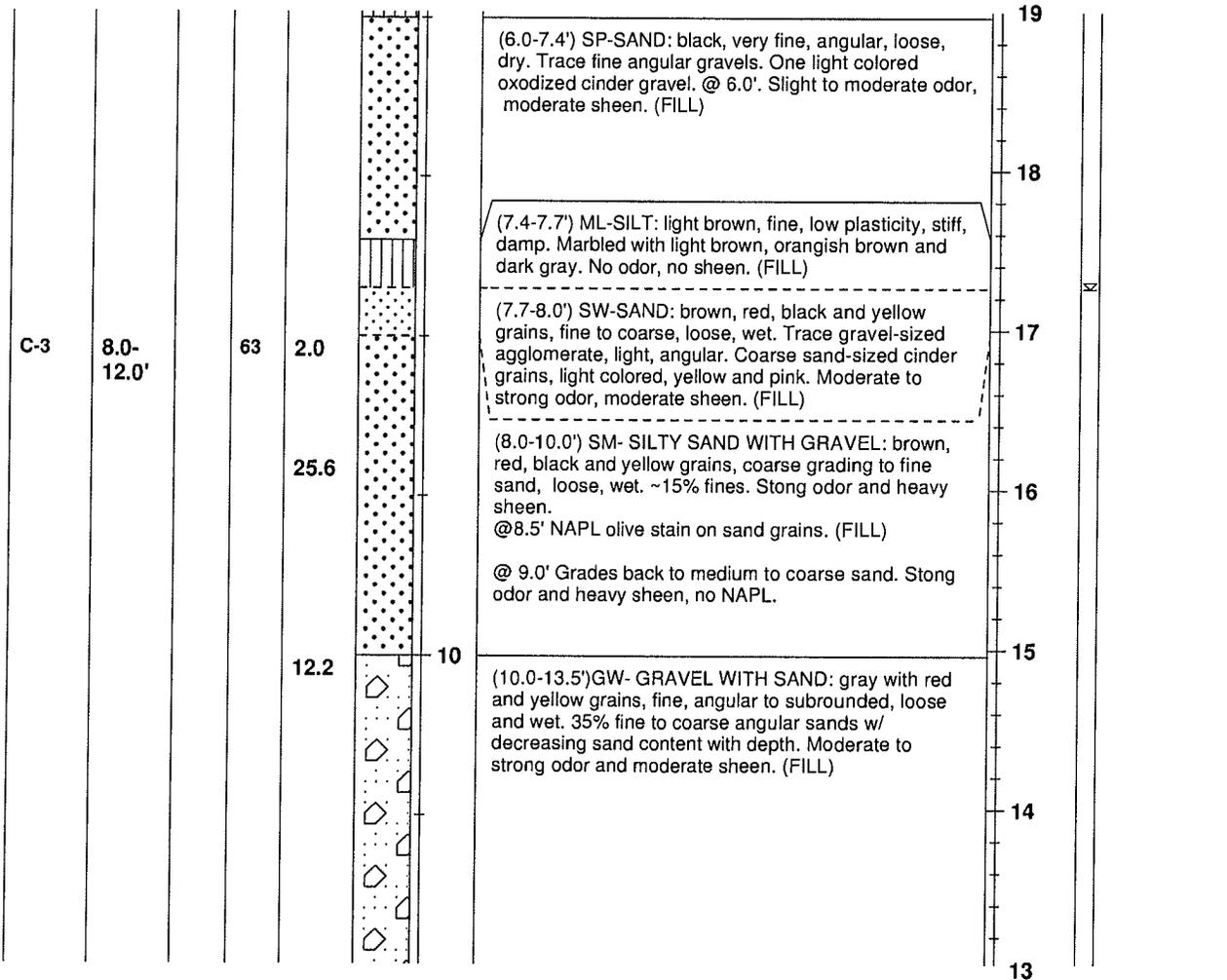


# Boring Log

Boring #: GP-04  
Sheet 2 of 3

Project: Gas Works Park	Operator: Kasey Gable	Location: Eastern Shore Line
Project #: 05570-028-360	Drill Rig Type: Geoprobe	Northing: 239433.82 Easting: 1270811.42
Client: PSE	Method: Geoprobe	Ground Elevation: 28.202'
Contractor: Cascade Drilling	Casing ID: 1.75"	Total Depth: 16.0'
Start Date & Time: 09/17/2007 1448	Bit Type: 2" Geoprobe shoe	Seal: 16.0-1.0' bentonite, 1.0-0' top soil
Finish Date & Time: 09/17/2007 1519	Boring ID: 2"	Logged By: A.Jambrosic

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	Groundwater		
	Vertical Datum: USACE		Date	Time	Depth (ft.)
	Head space collection follows RETEC's SOP 310				
	Bobcat mounted limited access Geoprobe				



# Boring Log

Boring #: GP-04  
Sheet 3 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239433.82</b> Easting: <b>1270811.42</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>28.202'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/17/2007 1448</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/17/2007 1519</b>	Boring ID: <b>2"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
C-4	12.0-16.0'	75				13.2	(13.5-16.0') SW-SM- SAND WITH SILT: gray, fine to coarse, subrounded, equant, dense, wet. 10-15% fines, sand fine to coarse, black, white and gray grains. Trace fine gravels. No odor and no sheen. Refusal @ 16', cobbles in shoe. (GLACIAL DEPOSIT)	13	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Head space collection follows RETEC's SOP 310				
	Bobcat mounted limited access Geoprobe				

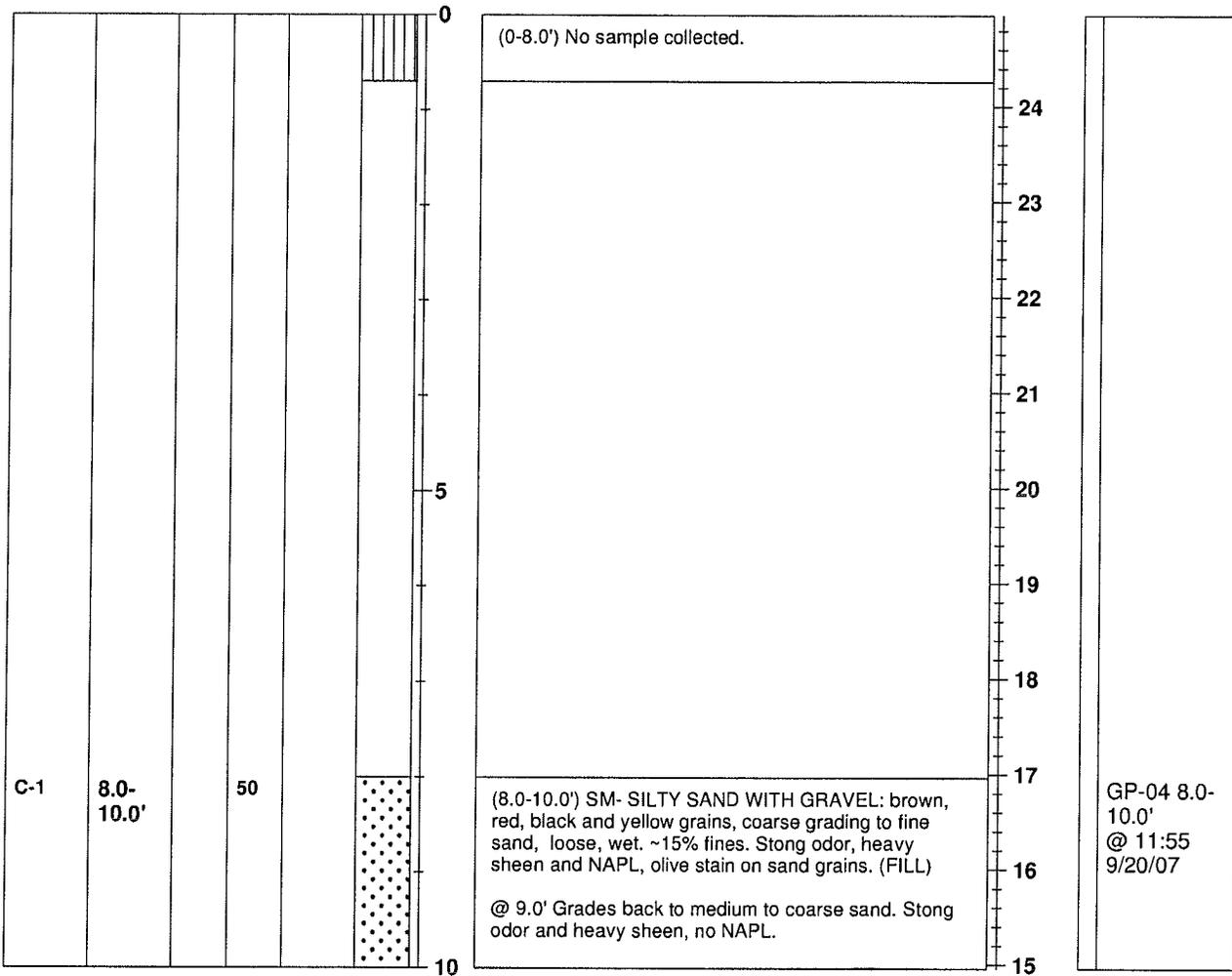


# Boring Log

Boring #: GP-04-R2  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239433.82</b> Easting: <b>1270811.42</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>28.202'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>10.0'</b>
Start Date & Time: <b>09/20/2007 1142</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>10.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1157</b>	Boring ID: <b>2"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b>		Date	Time	Depth (ft.)

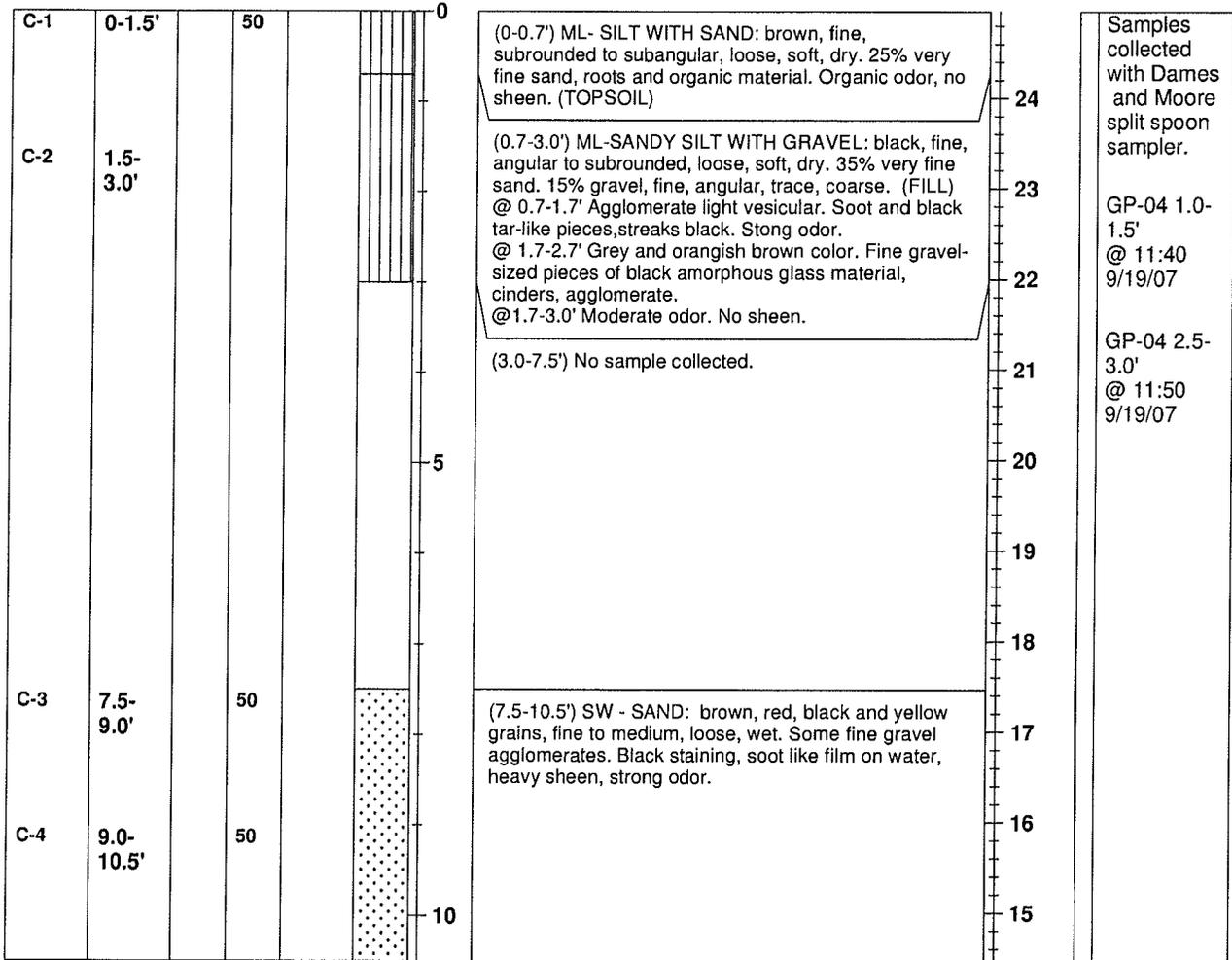


# Boring Log

Boring #: GP-04 HSA  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>Steve Choate</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239433.82</b> Easting: <b>1270811.42</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>28.202'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>10.5'</b>
Start Date & Time: <b>09/19/2007 1114</b>	Bit Type: <b>4.25" ID HSA</b>	Seal: <b>10.5'-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/19/2007 1330</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)

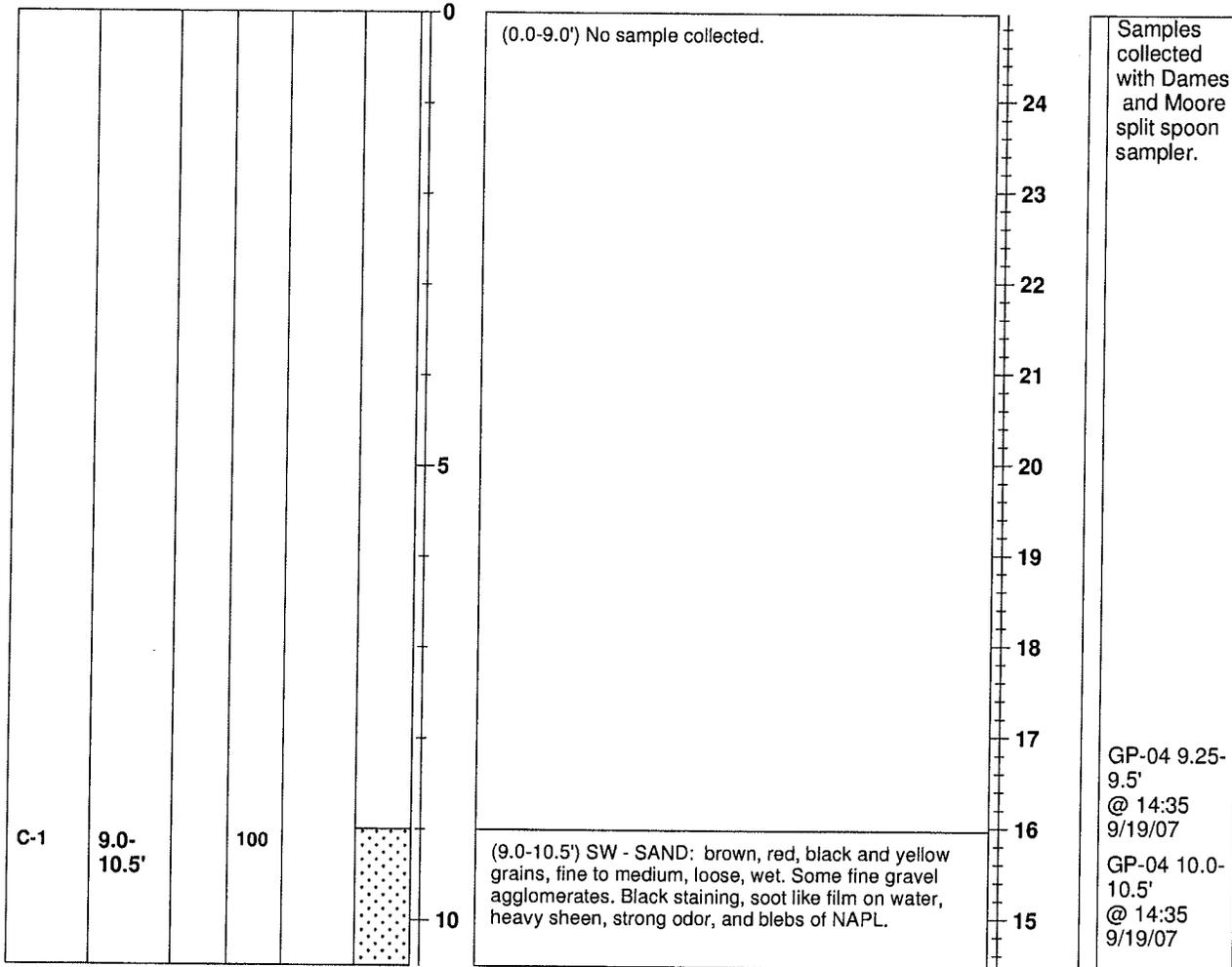


# Boring Log

Boring #: GP-04 HSA-R2  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>Steve Choate</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239433.82</b> Easting: <b>1270811.42</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>28.202'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>10.5'</b>
Start Date & Time: <b>09/19/2007 1330</b>	Bit Type: <b>4.25" ID HSA</b>	Seal: <b>10.5'-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/19/2007 1435</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-05  
Sheet 1 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239422.23</b> Easting: <b>1270813.58</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>27.506'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>15.0'</b>
Start Date & Time: <b>09/17/2007 1600</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>15.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/17/2007 1620</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					
C-1	0-2.0'	60			10.1	(0-1.5') ML- SANDY SILT WITH GRAVEL: black, fine, angular to subrounded, loose, dry. 35% very fine sand. 15% fine gravel, subrounded. Black amorphous glass particles. Agglomerate, black light, with vesicular, likely hardened tar pieces up 1.5". Black soot streaks gloves. Strong odor and slight sheen. (FILL)	27		
						(1.5-2.0') ML- SANDY SILT: black, fine, subangular, loose, dry. 35% very fine sand. 10% fine to coarse gravel, subrounded. Brick material (man made, flat surface). No odor and no sheen. (FILL)	26		
					8.8	(2.0-4.0') ML- SANDY SILT: black, fine, sub-angular, loose, dry. 45% sand mostly very fine, 15% fine to coarse sand. 10% fine gravel, trace coarse gravel, angular. Soot - streaks black. No odor and no sheen. (FILL)	25		
C-2	4.0-8.0'	75				(4.0-5.3') ML- SANDY SILT: black, fine, subangular, loose, dry. 35% sand mostly very fine. Trace coarse sand and gravels. Trace agglomerate material. No odor and no sheen. (FILL)	23		
					3.9	(5.3-5.5') ML- SANDY SILT: black, fine, angular, loose, dry. 35-45% very fine sand. 10% fine gravel, angular. Trace cinder grains. Soot - streaks black. No odor and no sheen. (FILL)	22		
						(5.5-5.7') SW- SILTY SAND: yellowish brown, very fine, subrounded to subangular, loose, dry. 30% silt. Soft soil peds. No odor and no sheen. (FILL)			

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Head space collection follows <b>RETEC's SOP 310</b>				
	Bobcat mounted limited access <b>Geoprobe</b>				

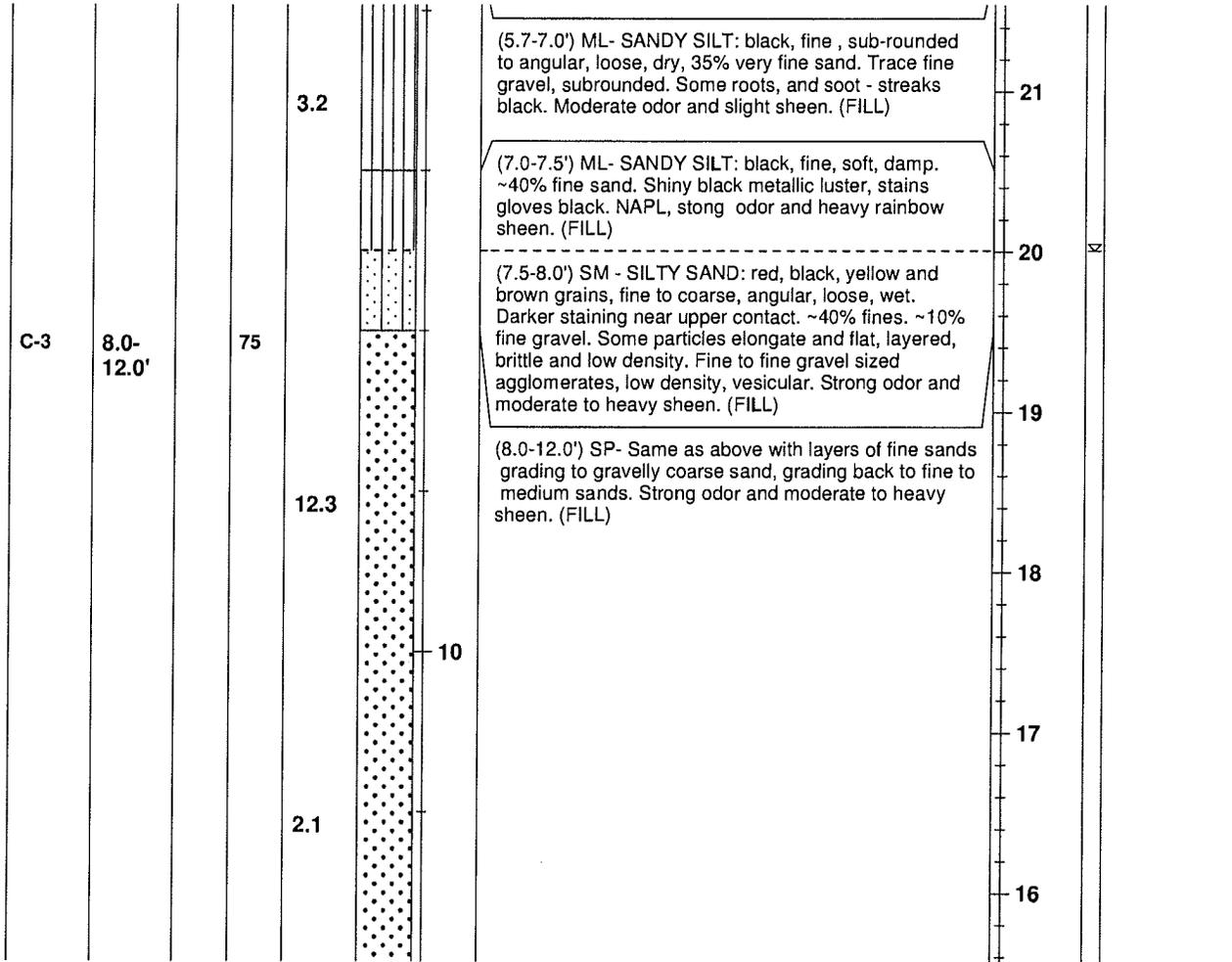


# Boring Log

Boring #: GP-05  
Sheet 2 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239422.23</b> Easting: <b>1270813.58</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>27.506'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>15.0'</b>
Start Date & Time: <b>09/17/2007 1600</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>15.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/17/2007 1620</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample				Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Head space collection follows RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)

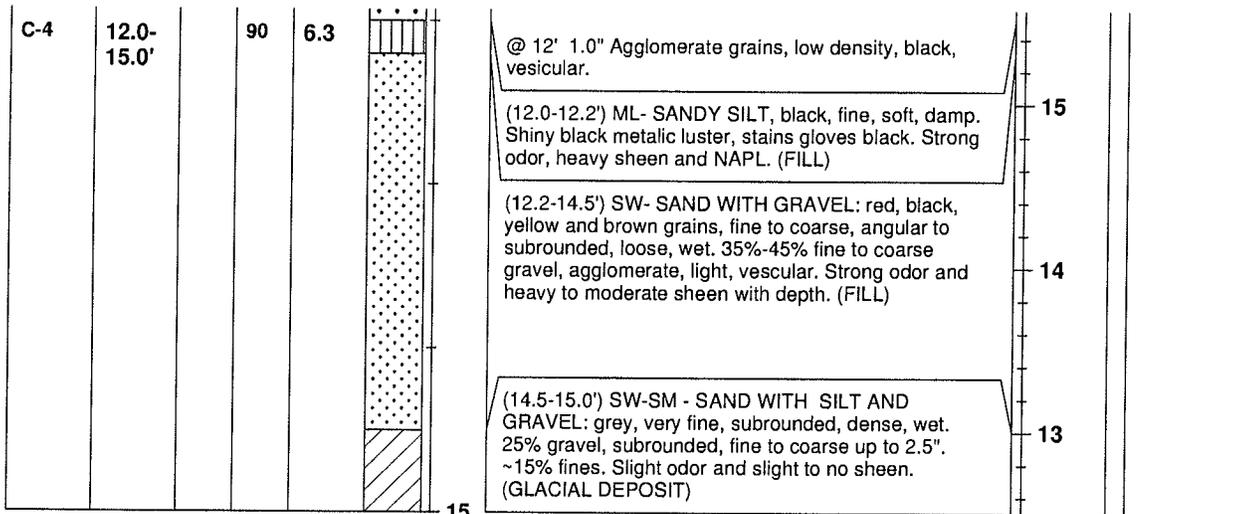


# Boring Log

Boring #: GP-05  
Sheet 3 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239422.23</b> Easting: <b>1270813.58</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>27.506'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>15.0'</b>
Start Date & Time: <b>09/17/2007 1600</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>15.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/17/2007 1620</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Head space collection follows RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)

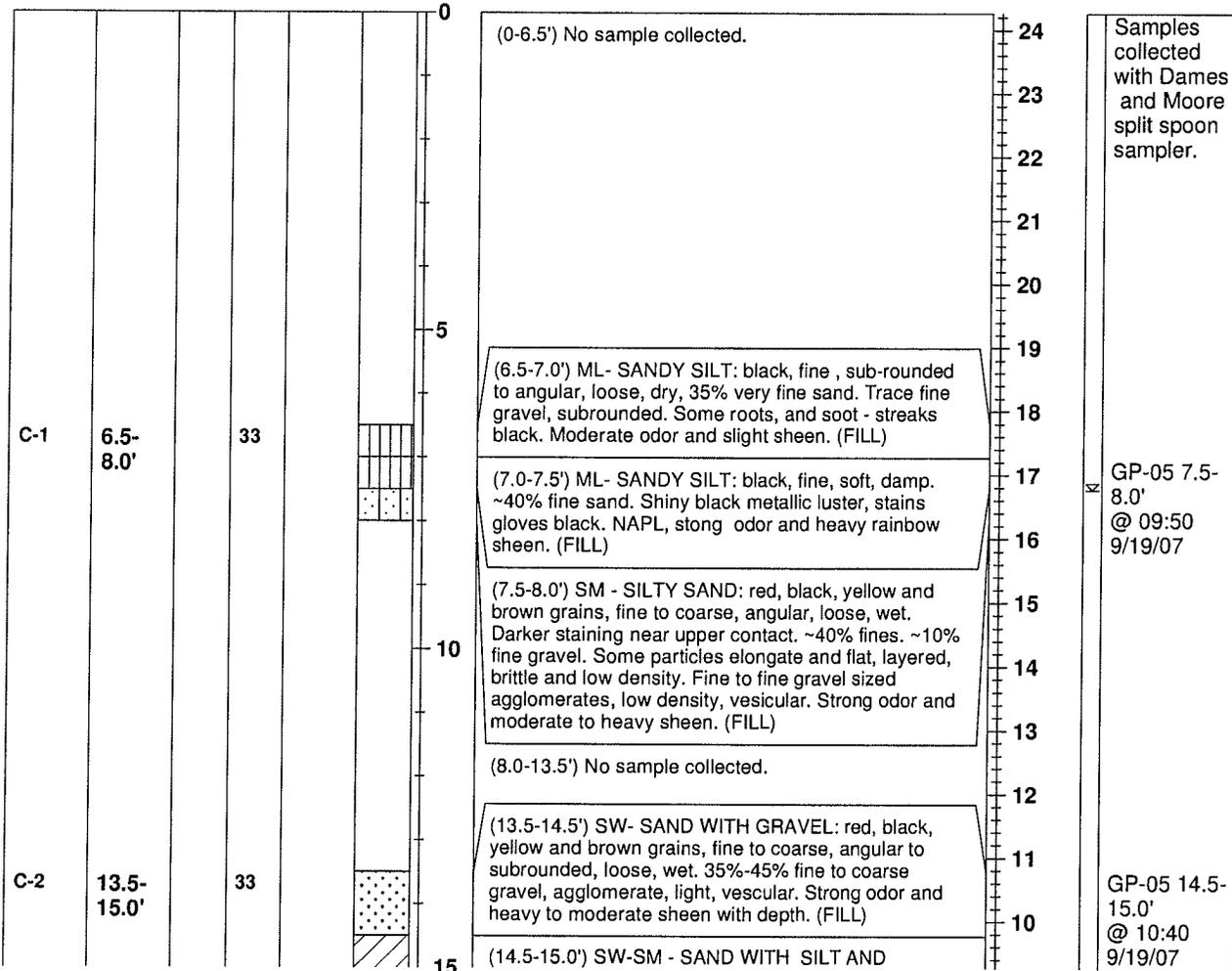


# Boring Log

Boring #: GP-05 HSA  
Sheet 1 of 2

Project: <b>Gas Works Park</b>	Operator: <b>Steve Choate</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239422.23</b> Easting: <b>1270813.58</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>27.466'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>15.0'</b>
Start Date & Time: <b>09/19/2007 0906</b>	Bit Type: <b>4.25 ID HSA</b>	Seal: <b>15.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/19/2007 1109</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-05 HSA  
Sheet 2 of 2

Project: <b>Gas Works Park</b>	Operator: <b>Steve Choate</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239422.23</b> Easting: <b>1270813.58</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>27.466'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>15.0'</b>
Start Date & Time: <b>09/19/2007 0906</b>	Bit Type: <b>4.25 ID HSA</b>	Seal: <b>15.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/19/2007 1109</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A. Jambrosic</b>

Sample				Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec					

15

GRAVEL: grey, very fine, subrounded, dense, wet. 25% gravel, subrounded, fine to coarse up to 2.5". ~15% fines. Slight odor and slight to no sheen. (GLACIAL DEPOSIT)

<b>Remarks and Datum Used:</b>  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-06  
Sheet 1 of 2

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239402.32</b> Easting: <b>1270815.19</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>26.91'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>15.5'</b>
Start Date & Time: <b>09/18/2007 0855</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>15.5-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/18/2007 0933</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
C-1	0-2.0'		50	0		0	(0-5.0') ML- SANDY SILT: black, fine, subangular to subrounded, equant, loose, dry. 40% very fine sand, ~15% gravel, fine, subround to subangular. Some of the gravel is agglomerate, grey vesicular, low density, angular, with a vitreous luster. Roots and organics. Organic odor and no sheen. (FILL)	26	
							@ 2.0' Thin iron oxidized layer 0.02' thick.	25	
							@ 2.5 to 3.0' Brick/cinder block debris with agglomerate pieces as above, very hard.	24	
C-2	4.0-8.0'		75	0		5	(5.0-8.0') SW- SAND WITH GRAVEL: brown with black, yellow, and red grains, fine to coarse, angular to subrounded, irregular shape, loose, damp. ~25% gravel, fine to coarse upto 1" diameter, most angular, flat fused laminated pieces and agglomerate, low density, grey to black, angular and vesicular. No to slight odor and slight sheen.	22	
							@ 7.0' Wet.	20	
								19	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Headspace collection follows <b>RETEC's SOP 310</b>				
	Bobcat mounted limited access <b>Geoprobe</b>				



# Boring Log

Boring #: GP-06  
Sheet 2 of 2

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239402.32</b> Easting: <b>1270815.19</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>26.91'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>15.5'</b>
Start Date & Time: <b>09/18/2007 0855</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>15.5-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/18/2007 0933</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

C-3	8.0-12.0'	50	0			<p>(8.0-13.0') GW- GRAVEL WITH SAND: brown with black, yellow, and red grains, fine to coarse, angular to subrounded, irregular shape, loose, wet. 40% sand, fine to coarse, angular. Some of the gravels are flat, laminated, and light colored, most are black hard, low density, angular vesicular agglomerate material. Some brick fragments. Grains coarsen with depth. No odor and no sheen.</p>	19	<p>No resistance in this interval. First run no recovery. Moved over and pushed second boring. 50% recovery on second attempt.</p>
C-4	12.0-15.5'	75	0					

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Headspace collection follows RETEC's SOP 310				
	Bobcat mounted limited access Geoprobe				

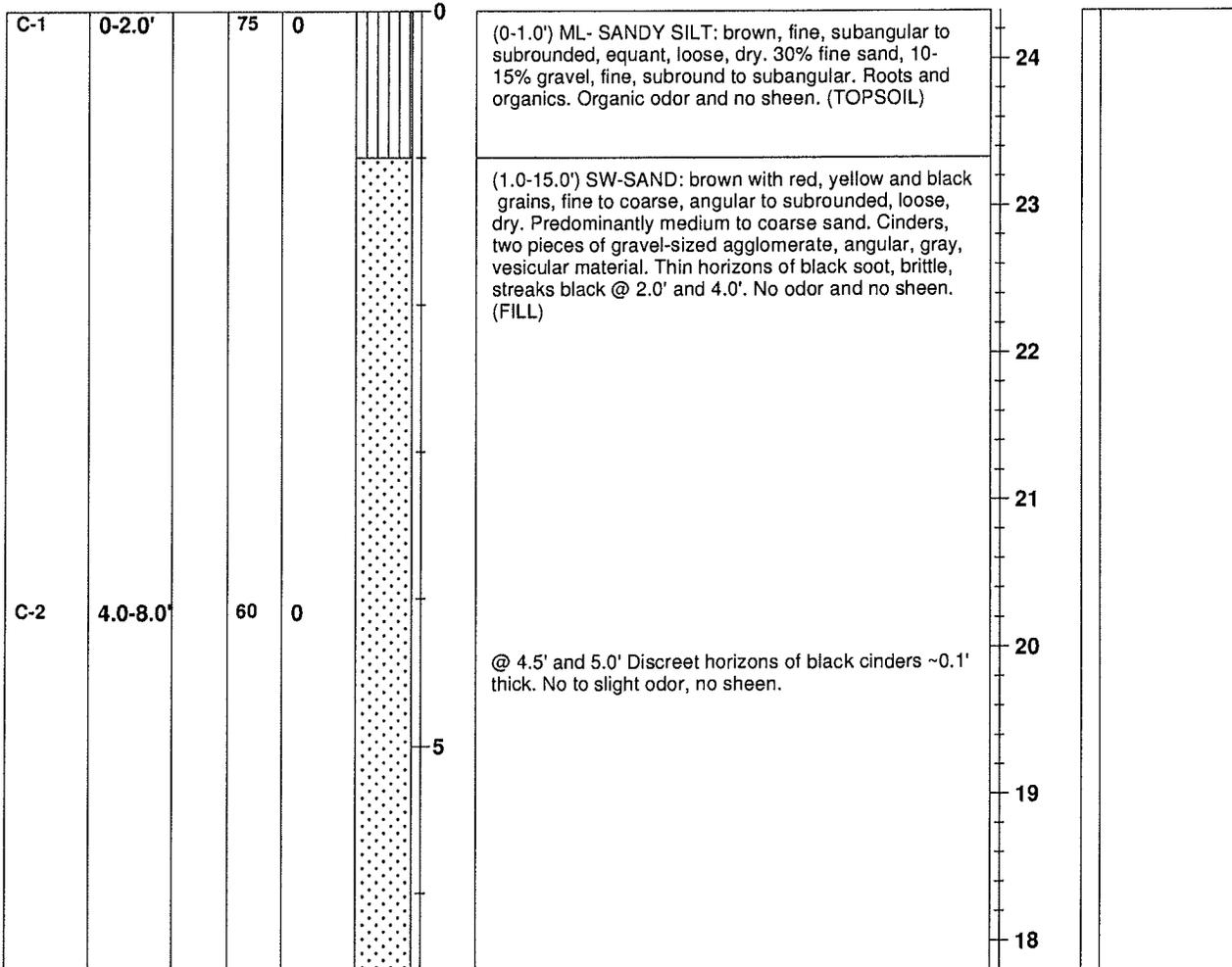


# Boring Log

Boring #: GP-07  
Sheet 1 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239367.61</b> Easting: <b>1270815.79</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>27.569'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/18/2007 1006</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1024</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample				Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collection follows RETEC's SOP310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)

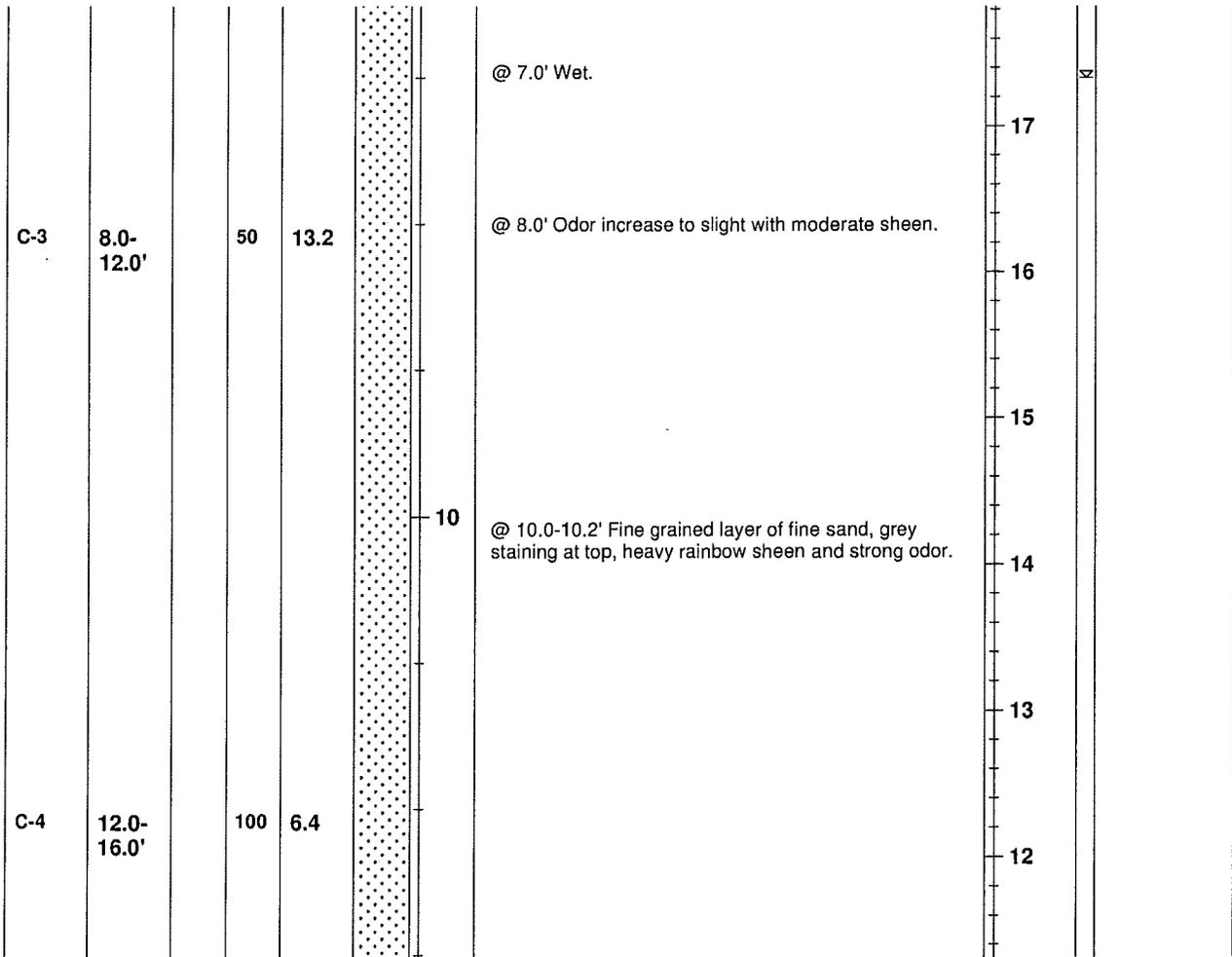


# Boring Log

Boring #: GP-07  
Sheet 2 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239367.61</b> Easting: <b>1270815.79</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>27.569'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/18/2007 1006</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1024</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample				Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum:</b> USACE <b>Headspace collection follows RETEC's SOP310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)

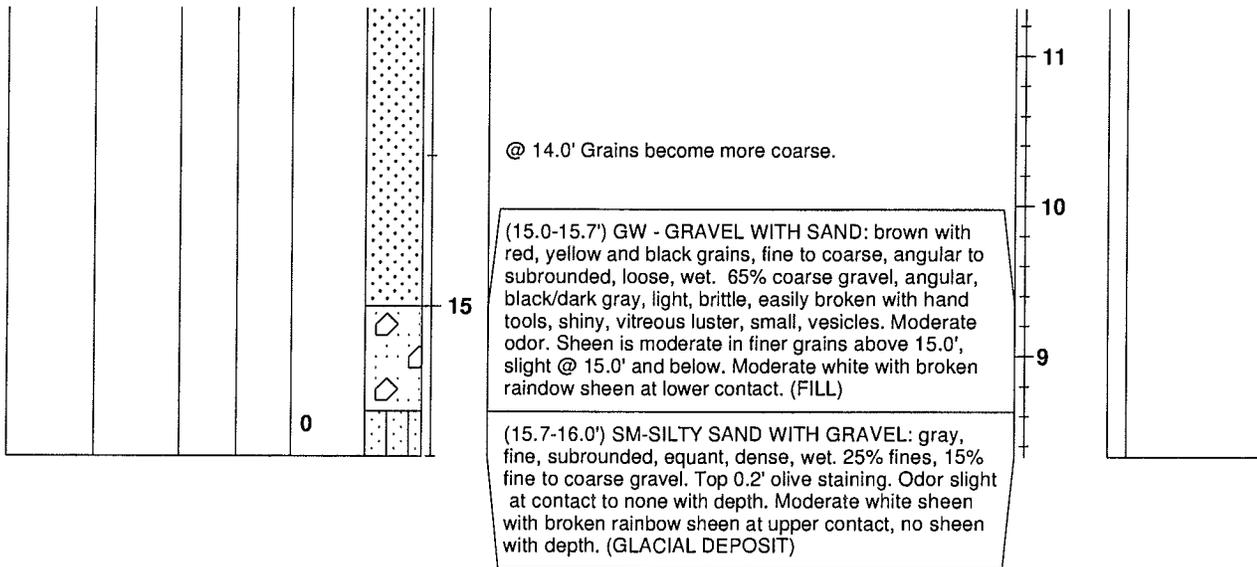


# Boring Log

Boring #: GP-07  
Sheet 3 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239367.61</b> Easting: <b>1270815.79</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>27.569'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/18/2007 1006</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1024</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collection follows RETEC's SOP310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)

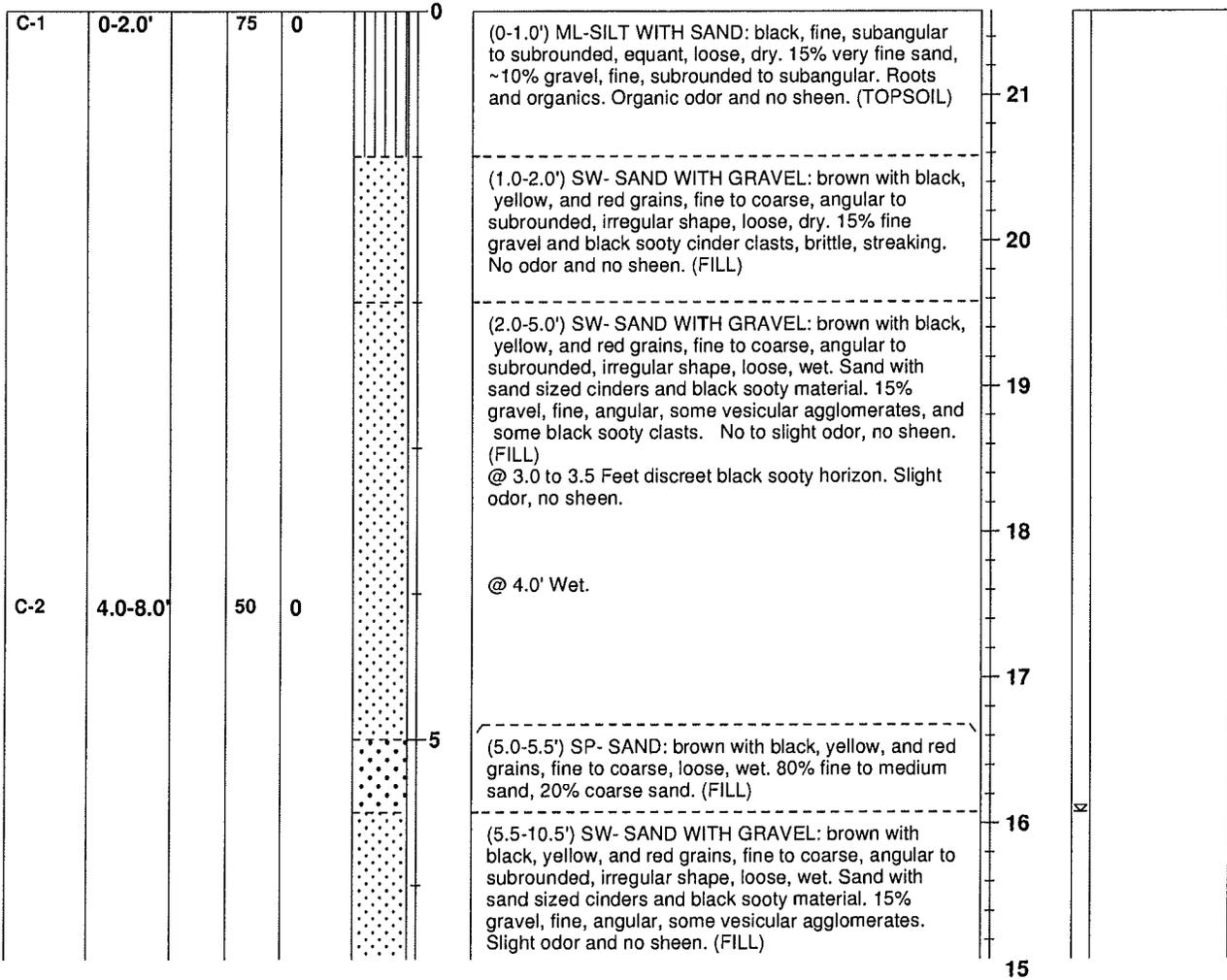


# Boring Log

Boring #: GP-08  
Sheet 1 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239310.21</b> Easting: <b>1270825.26</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>24.819'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/18/2007 1110</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/18/2007 1128</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)

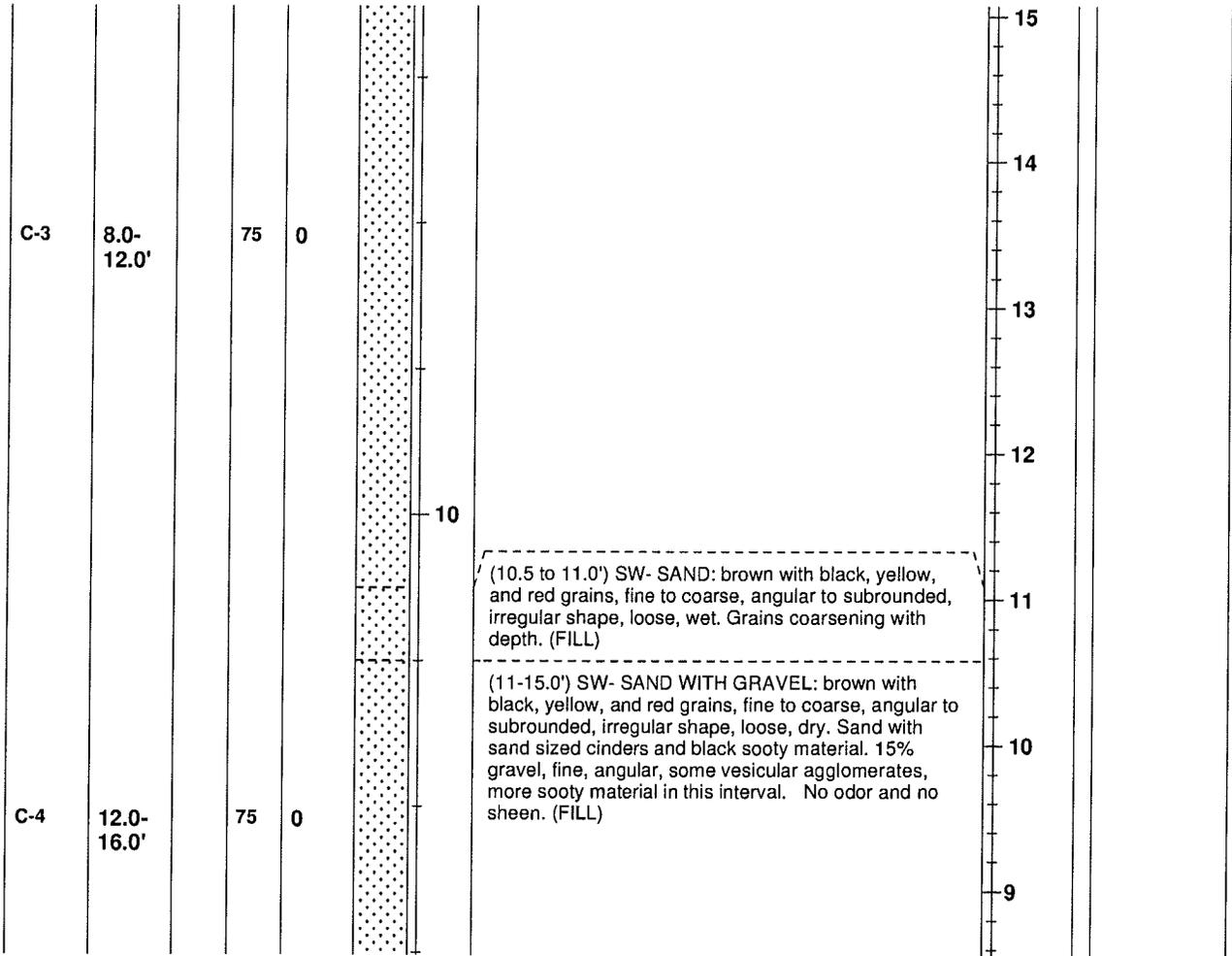


# Boring Log

Boring #: GP-08  
Sheet 2 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239310.21</b> Easting: <b>1270825.26</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>24.819'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/18/2007 1110</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/18/2007 1128</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)

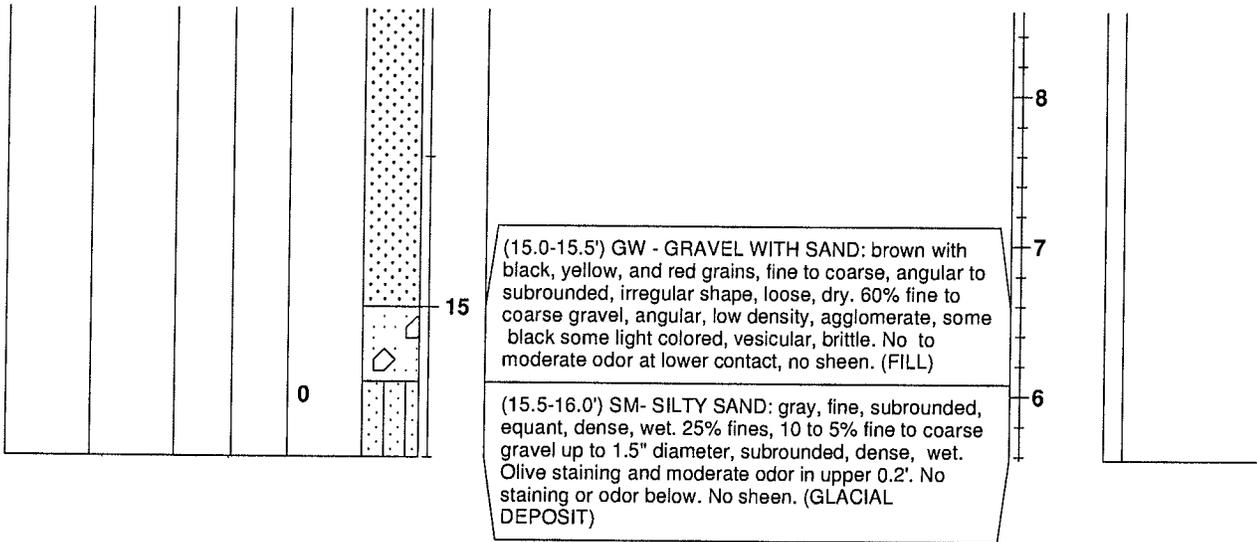


# Boring Log

Boring #: GP-08  
Sheet 3 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239310.21</b> Easting: <b>1270825.26</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>24.819'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/18/2007 1110</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/18/2007 1128</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b>		Date	Time	Depth (ft.)
	<b>Headspace collected following RETEC's SOP 310</b>				
	<b>Bobcat mounted limited access Geoprobe</b>				

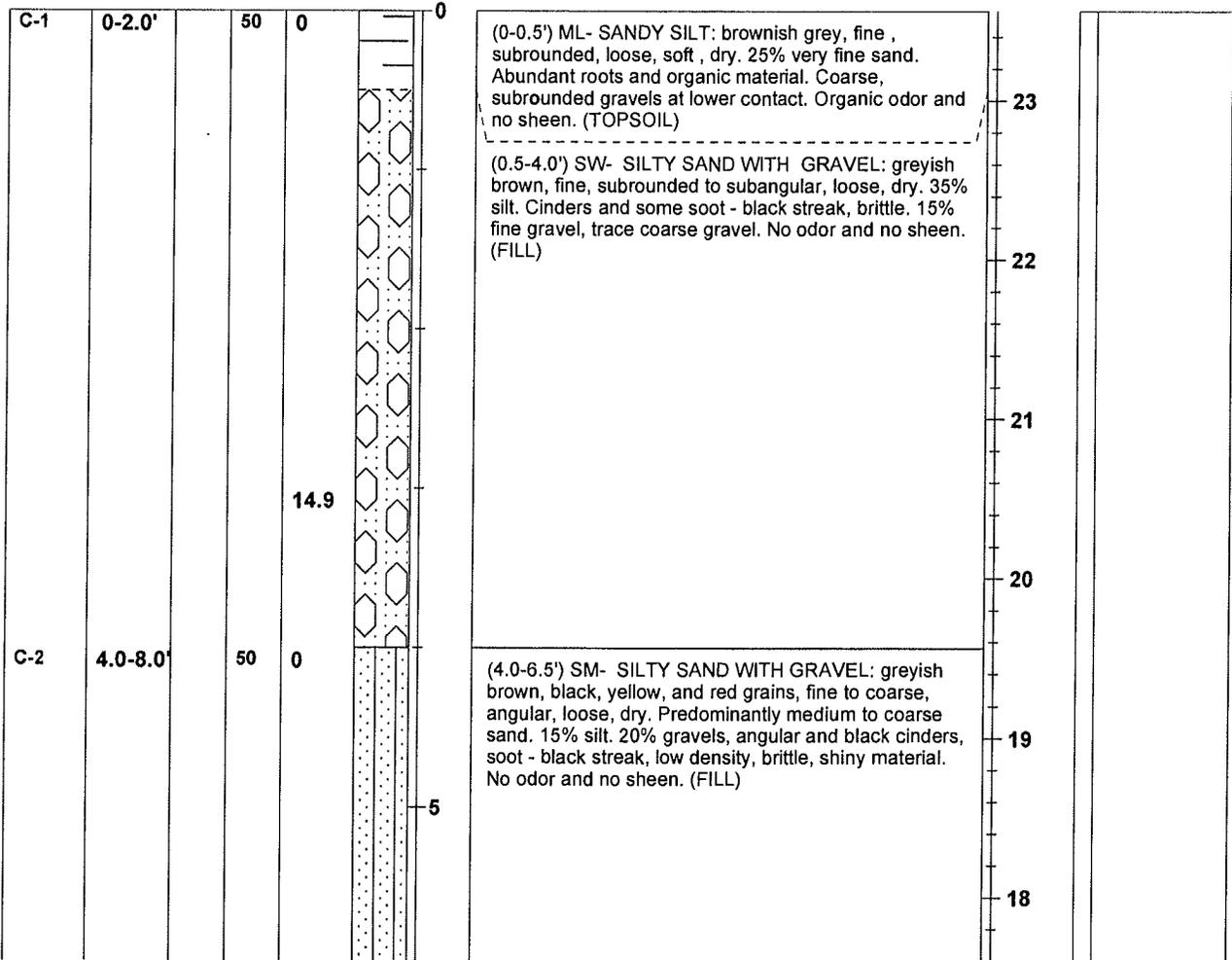


# Boring Log

Boring #: GP-09  
Sheet 1 of 4

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239228.80</b> Easting: <b>1270815.12</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>26.803'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>20.0'</b>
Start Date & Time: <b>09/18/2007 1250</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>20.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/18/2007 1317</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



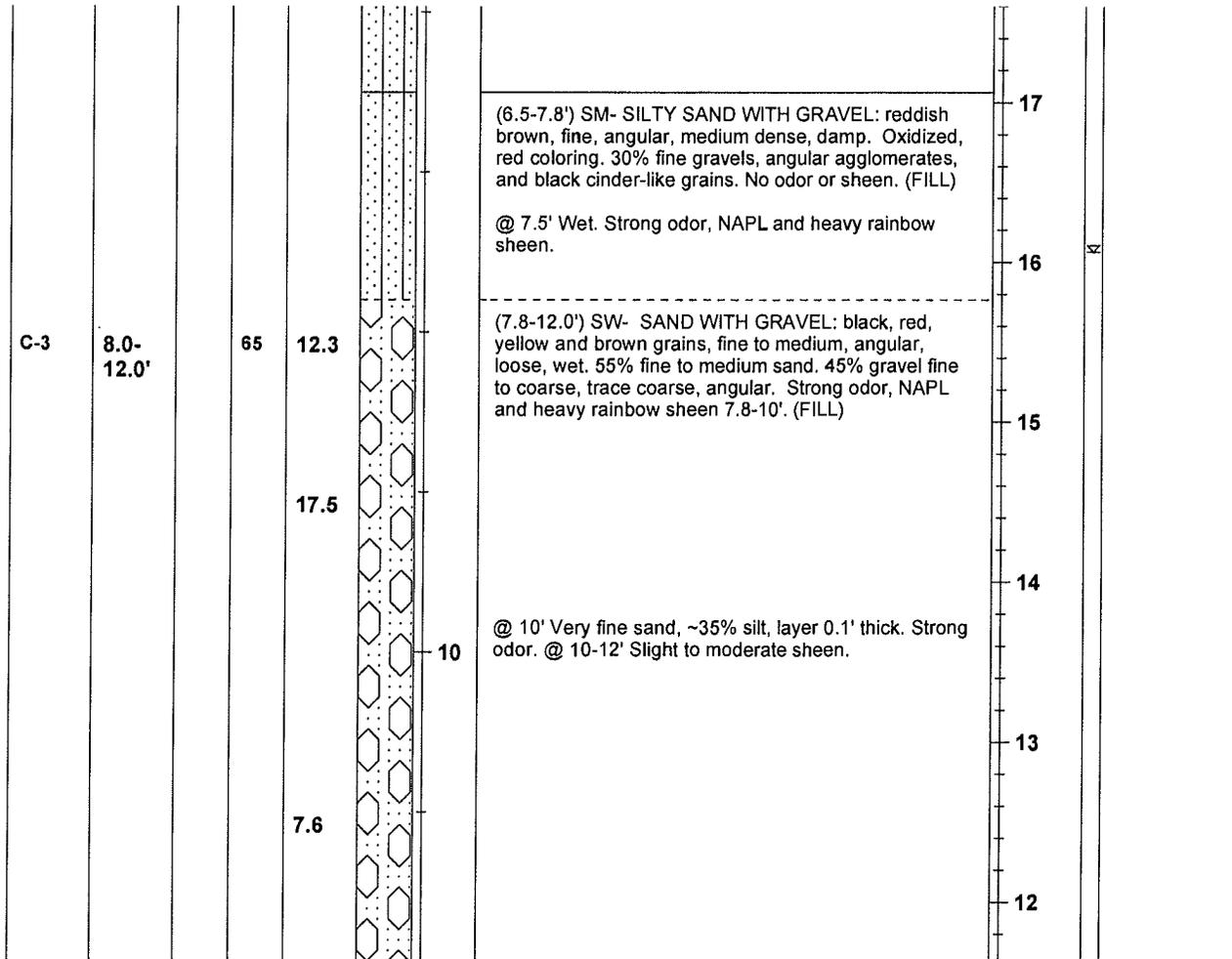
<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace colled following RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-09  
Sheet 2 of 4

Project: <b>Gas Works Park</b>		Operator: <b>Kasey Gable</b>		Location: <b>Eastern Shore Line</b>				
Project #: <b>05570-028-360</b>		Drill Rig Type: <b>Geoprobe</b>		Northing: <b>239228.80</b> Easting: <b>1270815.12</b>				
Client: <b>PSE</b>		Method: <b>Geoprobe</b>		Ground Elevation: <b>26.803'</b>				
Contractor: <b>Cascade Drilling</b>		Casing ID: <b>1.75"</b>		Total Depth: <b>20.0'</b>				
Start Date & Time: <b>09/18/2007 1250</b>		Bit Type: <b>2" Geoprobe shoe</b>		Seal: <b>20.0-1.0' bentonite, 1.0-0 top soil</b>				
Finish Date & Time: <b>09/18/2007 1317</b>		Boring ID: <b>2"</b>		Logged By: <b>A. Jambrosic</b>				
Sample				Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace colled following RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-09  
Sheet 3 of 4

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239228.80</b> Easting: <b>1270815.12</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>26.803'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>20.0'</b>
Start Date & Time: <b>09/18/2007 1250</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>20.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/18/2007 1317</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

C-4	12.0-16.0'	50				(12.0-14.0') SW- SAND WITH GRAVEL: black, red, yellow and brown grains, fine to coarse, angular, loose, wet. 35-40% gravel, 40% fine and very fine sand. 5% silt. 15% medium to coarse sand. Grading to gravel with sand with depth. NAPL and sheen 12-13', heavy sheen below. (FILL)	11	
						(14.0-19.0') GW- GRAVEL WITH SAND: black, with yellow and red grains, fine to coarse, angular, loose, wet. Black, low density, brittle, cinder material and agglomerate. 40% fine to coarse sand. Strong odor and heavy rainbow sheen. (FILL)	9	
C-5	16.0-20.0'	50	0.6			@16.0-19.0' Strong odor and light to moderate sheen.	7	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace colled following RETEC's SOP 310</b> <b>Bobcat mounted limited access Geoprobe</b>		Date	Time	Depth (ft.)

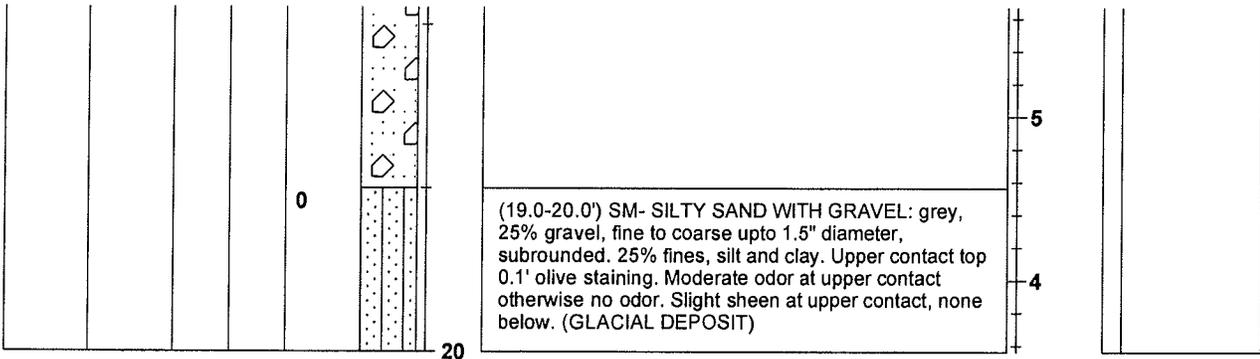


# Boring Log

Boring #: GP-09  
Sheet 4 of 4

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239228.80</b> Easting: <b>1270815.12</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>26.803'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>20.0'</b>
Start Date & Time: <b>09/18/2007 1250</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>20.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/18/2007 1317</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Headspace colled following <b>RETEC's SOP 310</b>				
	Bobcat mounted limited access <b>Geoprobe</b>				

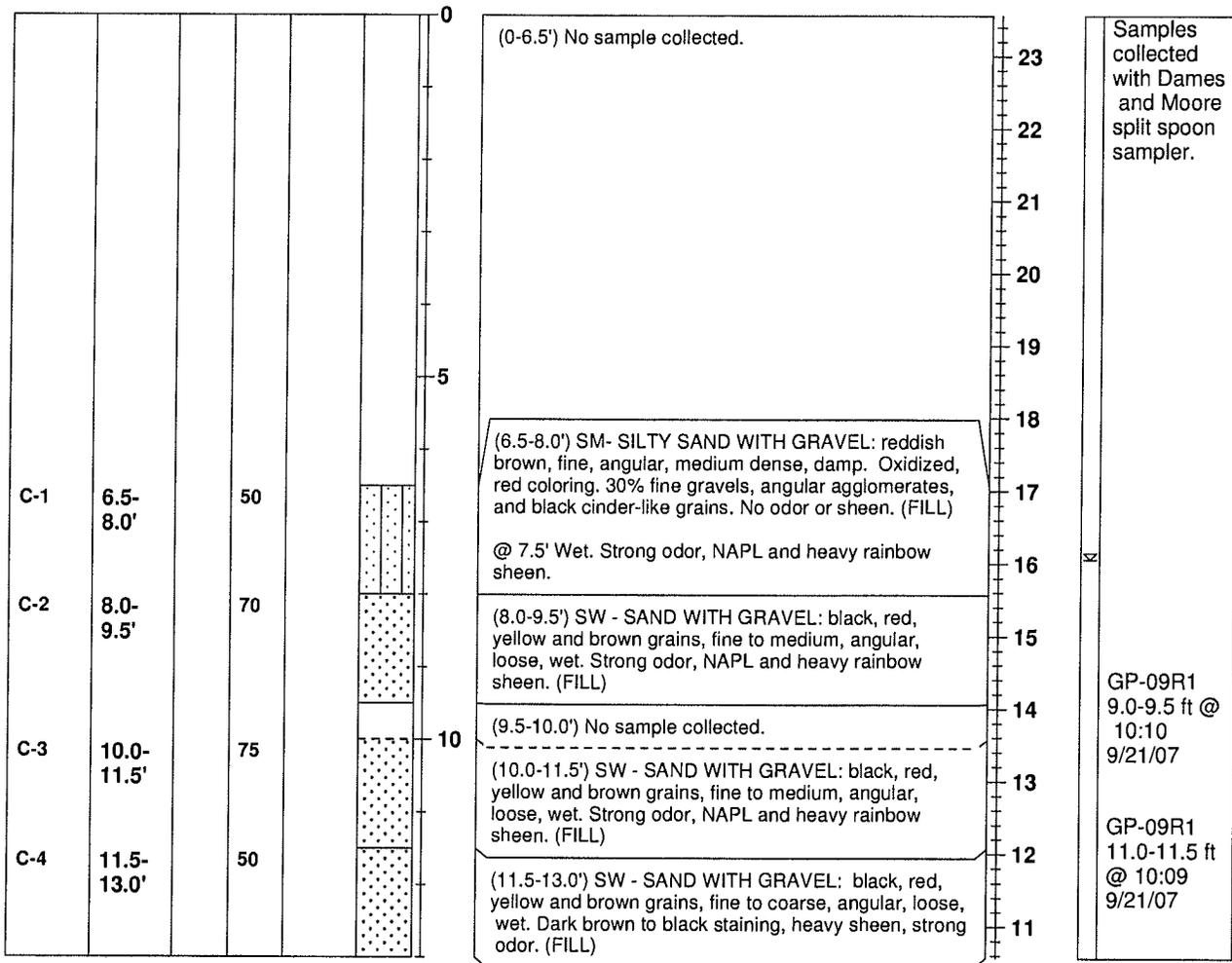


# Boring Log

Boring #: GP-09 HSA  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>Curtis Askew</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239228.80</b> Easting: <b>1270815.12</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>26.803'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>13.0'</b>
Start Date & Time: <b>09/21/2007 0941</b>	Bit Type: <b>4.25" ID HSA</b>	Seal: <b>13.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/21/2007 1027</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b>		Date	Time	Depth (ft.)

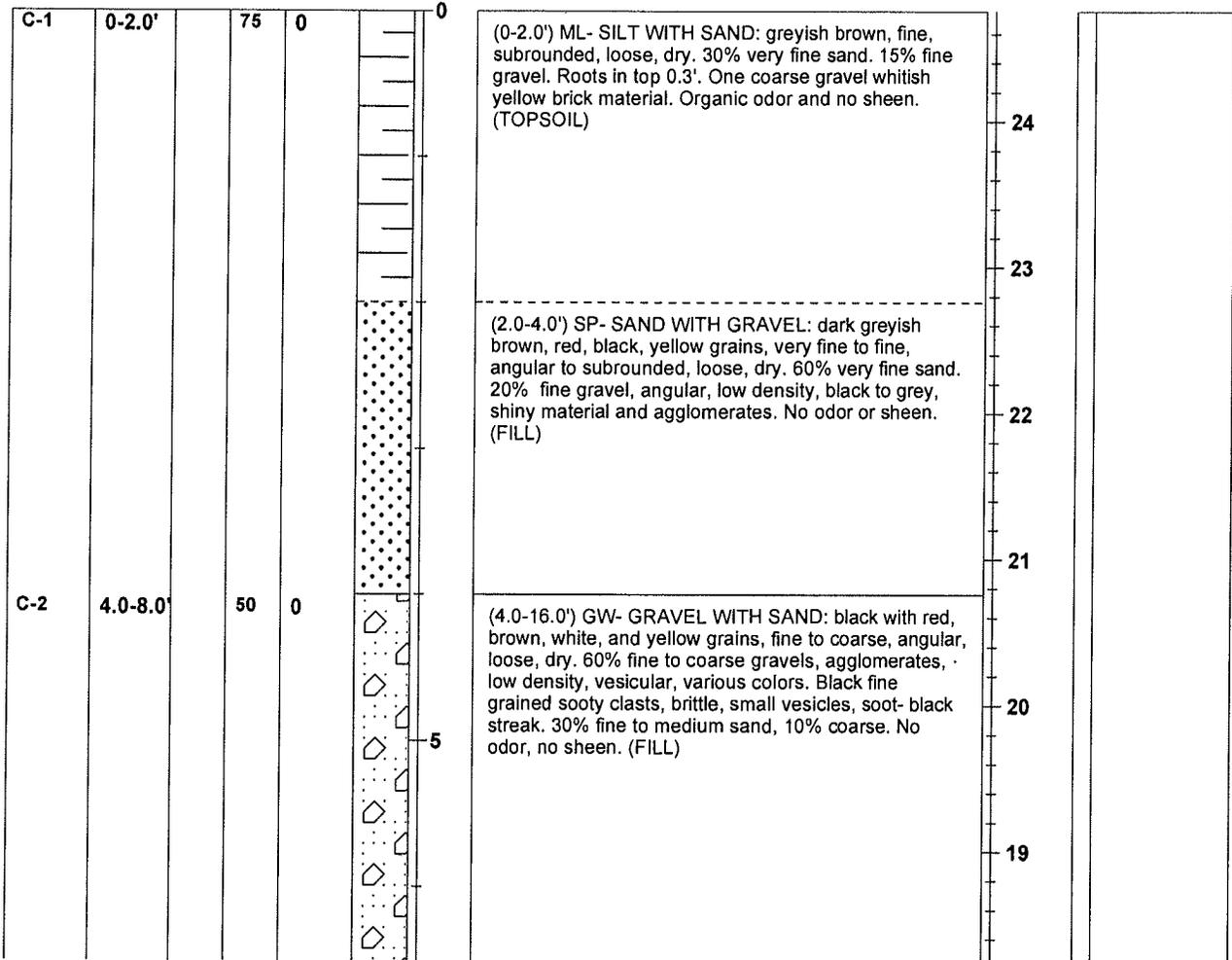


# Boring Log

Boring #: GP-10  
Sheet 1 of 4

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239171.10</b> Easting: <b>1270806.48</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>27.998'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>24.0'</b>
Start Date & Time: <b>09/18/2007 1410</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>24.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1448</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-10  
Sheet 2 of 4

Project: Gas Works Park	Operator: Kasey Gable	Location: Eastern Shore Line
Project #: 05570-028-360	Drill Rig Type: Geoprobe	Northing: 239171.10 Easting: 1270806.48
Client: PSE	Method: Geoprobe	Ground Elevation: 27.998'
Contractor: Cascade Drilling	Casing ID: 1.75"	Total Depth: 24.0'
Start Date & Time: 09/18/2007 1410	Bit Type: 2" Geoprobe shoe	Seal: 24.0-1.0' bentonite, 1.0-0' top soil
Finish Date & Time: 09/18/2007 1448	Boring ID: 2"	Logged By: A. Jambrosic

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
C-3	8.0-12.0'	50		16.4			@ 7.5' Wet. Moderate odor and sheen.  @ 8.0-12.0' Strong odor and heavy sheen.		
C-4	12.0-16.0'	25		0.1			@ 12.0-16.0' Less black staining on grains than previous interval. Moderate odor and moderate broken white sheen.		

<b>Remarks and Datum Used:</b>  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	Groundwater		
	Vertical Datum: USACE		Date	Time	Depth (ft.)
	Headspace collected following RETEC's SOP 310				

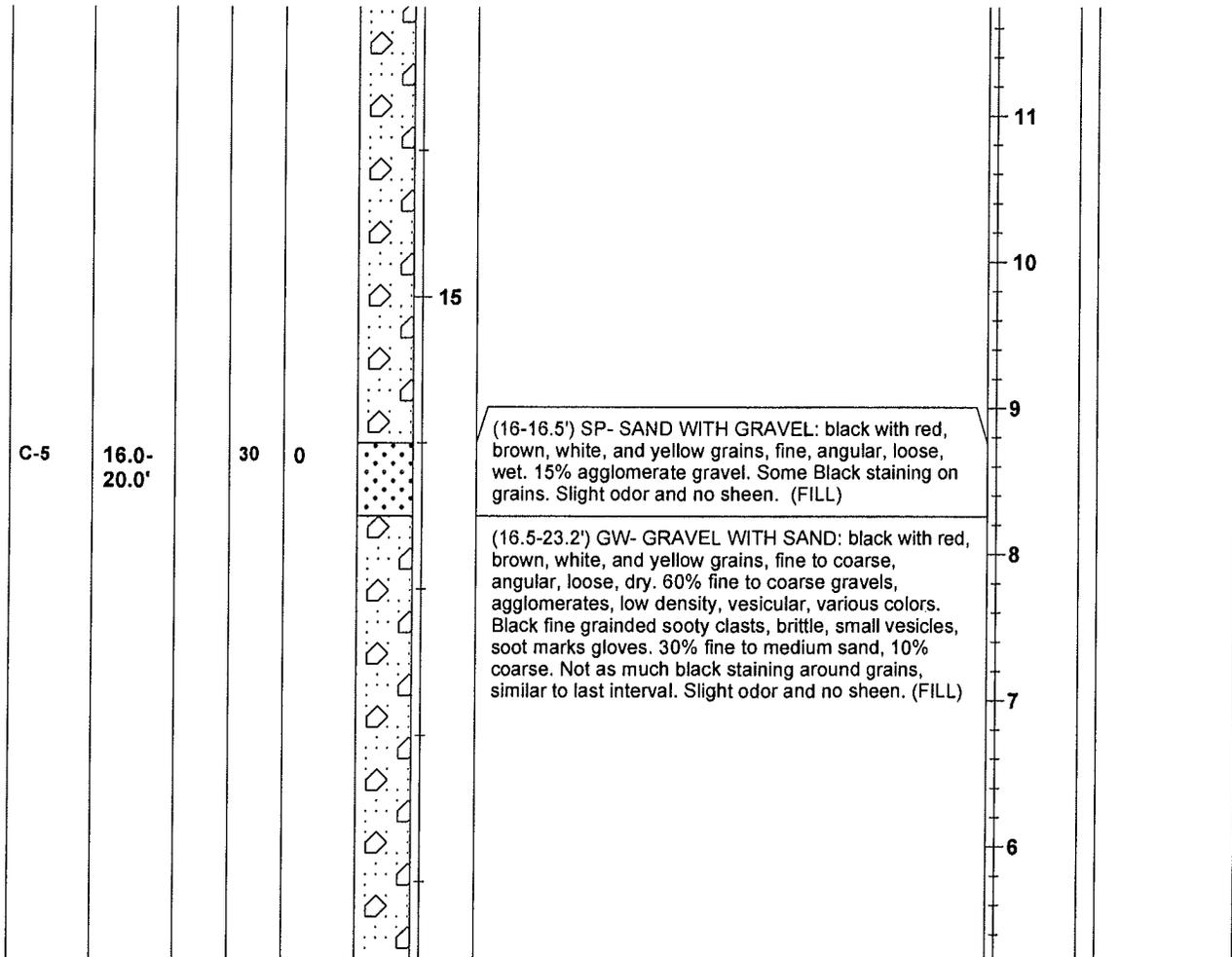


# Boring Log

Boring #: GP-10  
Sheet 3 of 4

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239171.10</b> Easting: <b>1270806.48</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>27.998'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>24.0'</b>
Start Date & Time: <b>09/18/2007 1410</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>24.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1448</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum:</b> USACE <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

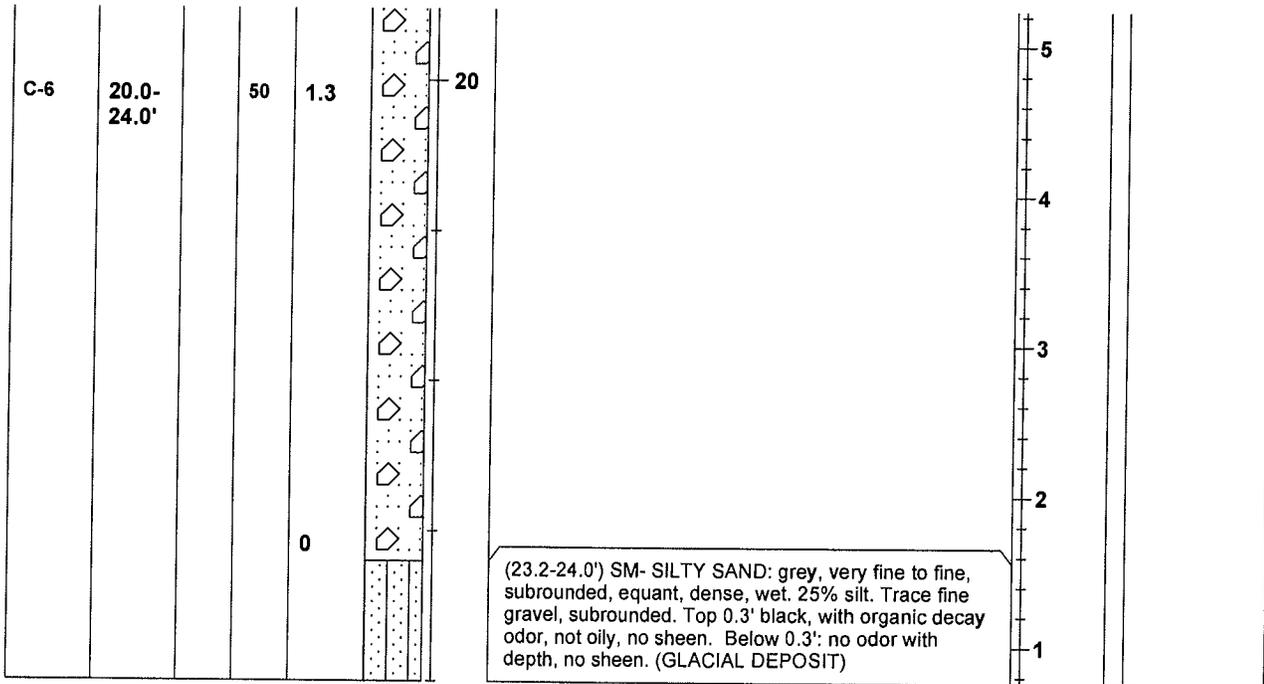


# Boring Log

Boring #: GP-10  
Sheet 4 of 4

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239171.10</b> Easting: <b>1270806.48</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>27.998'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>24.0'</b>
Start Date & Time: <b>09/18/2007 1410</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>24.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1448</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-11  
Sheet 1 of 5

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239086.39</b> Easting: <b>1270780.38</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>30.017'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>32.0'</b>
Start Date & Time: <b>09/18/2007 1520</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>32.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1633</b>	Boring ID: <b>2"</b>	Logged By: <b>A.Jambrosic</b>

Sample				Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
C-1	0-2.0'		75	0		0	(0-0.5') ML- SILT WITH SAND AND GRAVEL: greyish brown, fine, subrounded, loose, dry. 15-20% gravel, fine to coarse, subrounded. Abundant roots. Organic odor. (TOPSOIL)	26	
							(0.5-3.5') ML- SILT WITH SAND AND GRAVEL: greyish brown, fine, subrounded, loose, dry. 15-20% gravel, fine to coarse, subrounded. @ 0.5' yellow oxidized rock material. (FILL)	25	
								24	
C-2	4.0-8.0'		75	0		5	(3.5-4.5') SP- SAND, light greyish brown, very fine, loose, dry to damp. Trace fine gravel. Small area of increased silt content, reddish brown. No odor and no sheen. (TOPSOIL)	23	
							(4.5-8.0') SW- SAND WITH GRAVEL, black, fine to coarse, angular, loose, dry. 40% fine to coarse gravel, angular, sooty cinders, black, brittle, small vesicles, and agglomerates. Slight odor and no sheen. (FILL)	22	
								21	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-11  
Sheet 2 of 5

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239086.39</b> Easting: <b>1270780.38</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>30.017'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>32.0'</b>
Start Date & Time: <b>09/18/2007 1520</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>32.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1633</b>	Boring ID: <b>2"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

								20	
							@ 7.0-7.3' Reddish brown, less soot and cinders.		
								19	
C-3	8.0-12.0'	70		10.5			(8.0-9.5') GM- SILTY GRAVEL WITH SAND, black, fine to coarse, angular, loose, wet. Cinder and agglomerate material. Black soot coats surface of water and grains. Soot streaks on gloves and paper. Strong odor. (FILL)		
								18	
								17	
				289		10	(9.5-16.0') GW- GRAVEL WITH SAND, black, fine to coarse, angular to subrounded, loose, wet. 45% fine to coarse sand. Some soot on grains. Agglomerate and cinder gravels. Silt sized soot forms thin layer on water surface. Slight lustrous sheen 11.0-12.0'. Strong odor and heavy sheen.		
								16	
								15	
C-4	12.0-16.0'	50		83.7			@ 12.0-16.0' Vitreous luster and heavy sheen throughout, grains coated black, NAPL. Strong odor. (FILL)		(12.0-16.0') Presence of NAPL added based on UV core photography and petrophysical testing
								14	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-11  
Sheet 3 of 5

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239086.39</b> Easting: <b>1270780.38</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>30.017'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>32.0'</b>
Start Date & Time: <b>09/18/2007 1520</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>32.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1633</b>	Boring ID: <b>2"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 inch	% Rec	PID (ppm)					

C-5	16.0-20.0'	30	13.7		15	<p>(16.0-23.0') GW- GRAVEL WITH SAND, black with red, yellow, brown and white grains, fine to coarse, angular to subrounded, equant to flattened and elongate, loose, wet. Agglomerates, low density, vesicular, light colored to black. Cinders with metallic luster, low density, and small vesicles. Some soot near top of interval, not as heavily impacted. Moderate odor and no sheen. (FILL)</p>		results.

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-11  
Sheet 4 of 5

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239086.39</b> Easting: <b>1270780.38</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>30.017'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>32.0'</b>
Start Date & Time: <b>09/18/2007 1520</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>32.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1633</b>	Boring ID: <b>2"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

C-6	20.0-24.0'	50				@ 20.0-23.0'- Brown NAPL. Strong odor and heavy rainbow sheen.	7	
			14.3			(23.0-32.0') SM- SILTY SAND WITH GRAVEL: very dark grey, very fine, subrounded, equant and elongate, dense, wet. 25% fines, silt and clay. 15% fine to coarse gravel, subrounded. Stained very dark grey. Moderate odor and slight broken sheen. (GLACIAL DEPOSIT)	6	
C-7	24.0-28.0'	75		11.7		@ 24.0-32.0' Less staining, dark grey. No odor and no sheen.	5	
							4	
							3	
							2	
							1	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

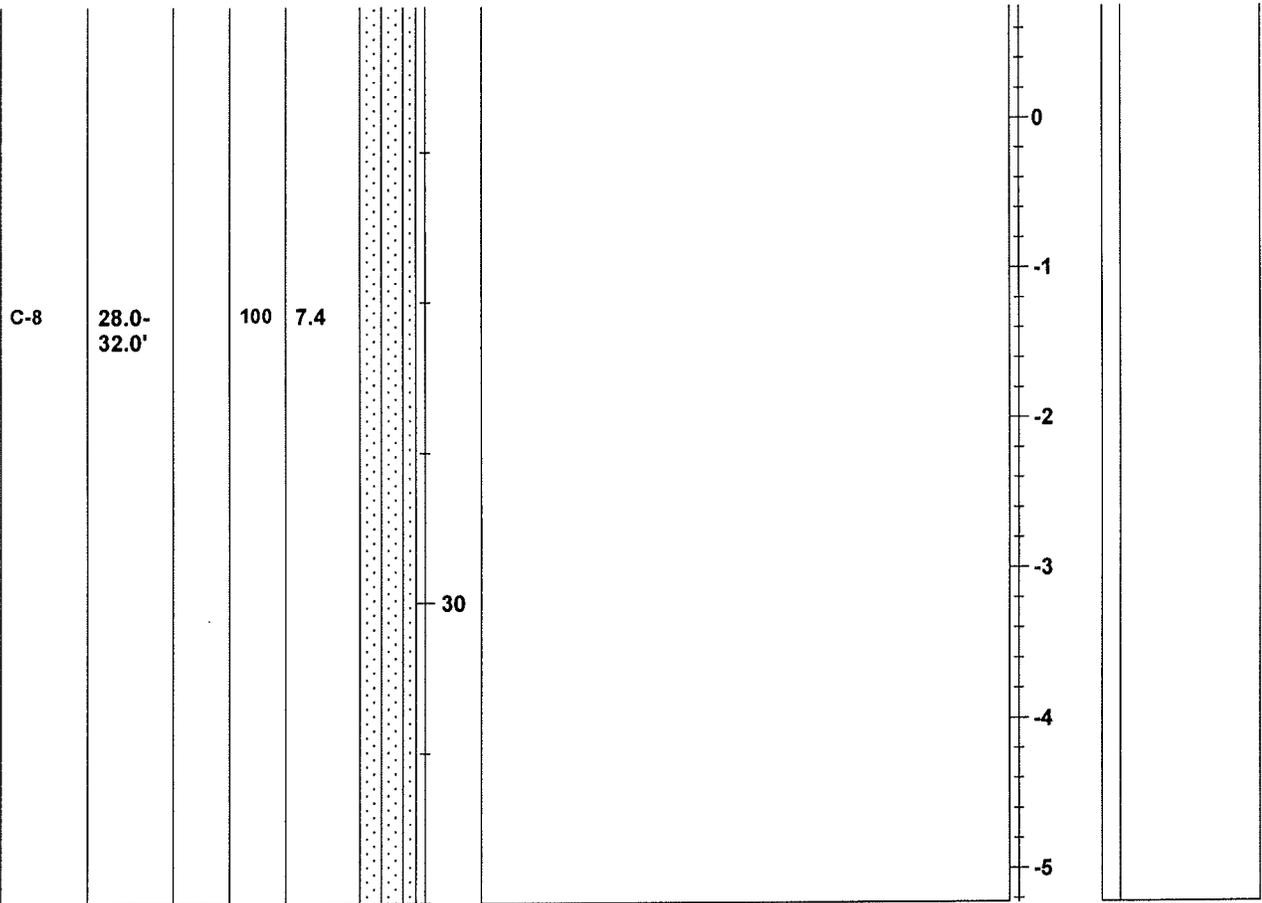


# Boring Log

Boring #: GP-11  
Sheet 5 of 5

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239086.39</b> Easting: <b>1270780.38</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>30.017'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>32.0'</b>
Start Date & Time: <b>09/18/2007 1520</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>32.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/18/2007 1633</b>	Boring ID: <b>2"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

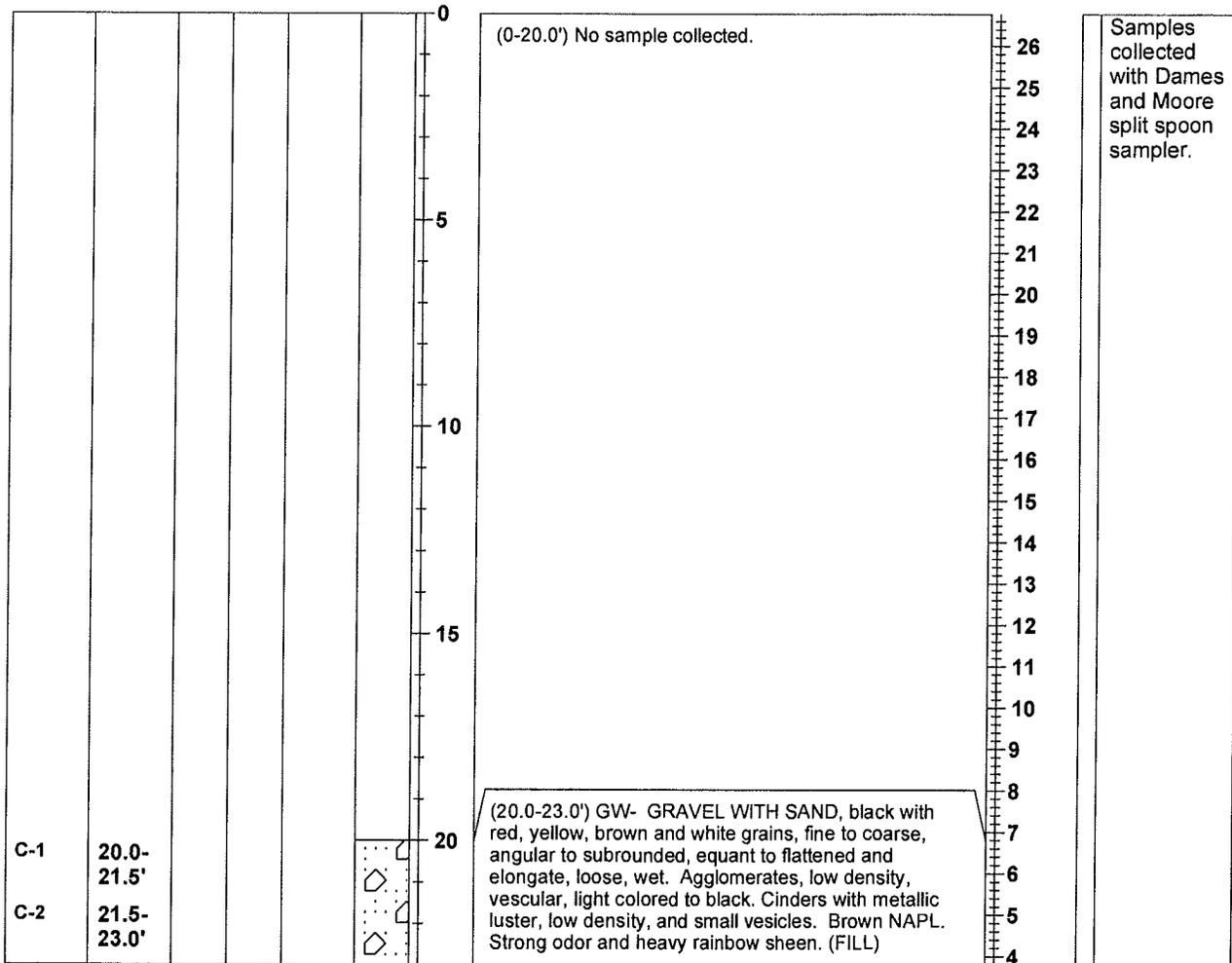


# Boring Log

Boring #: GP-11 HSA  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>Curtis Askew</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239086.39</b> Easting: <b>1270780.38</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>30.017'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>23.0'</b>
Start Date & Time: <b>09/20/2007 1249</b>	Bit Type: <b>4.25" ID HSA</b>	Seal: <b>23.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1340</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b>		Date	Time	Depth (ft.)

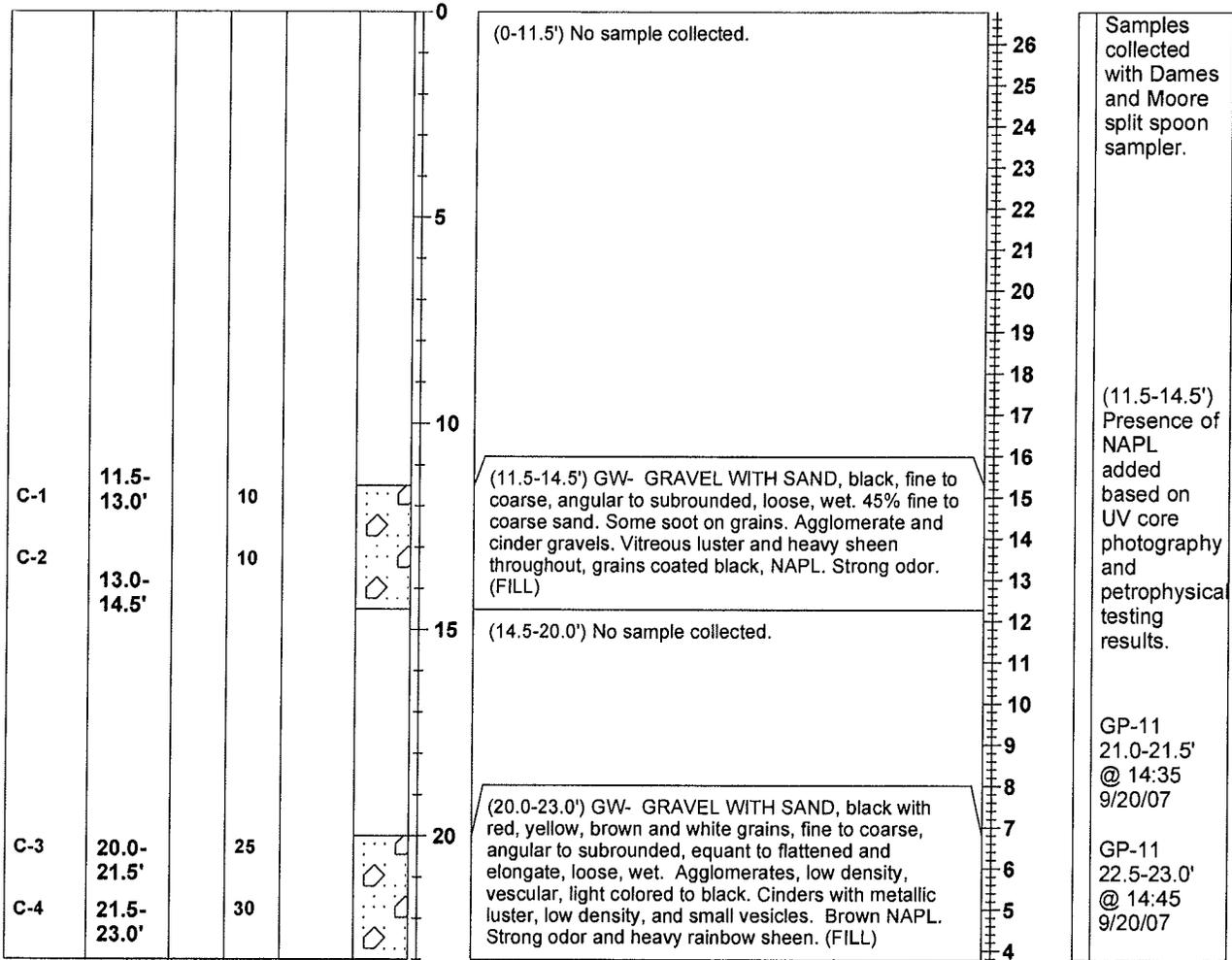


# Boring Log

Boring #: GP-11 HSA-R2  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>Curtis Askew</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239086.39</b> Easting: <b>1270780.38</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>30.017'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>23.0'</b>
Start Date & Time: <b>09/20/2007 1340</b>	Bit Type: <b>4.25" ID HSA</b>	Seal: <b>23.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1445</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum:</b> USACE		Date	Time	Depth (ft.)

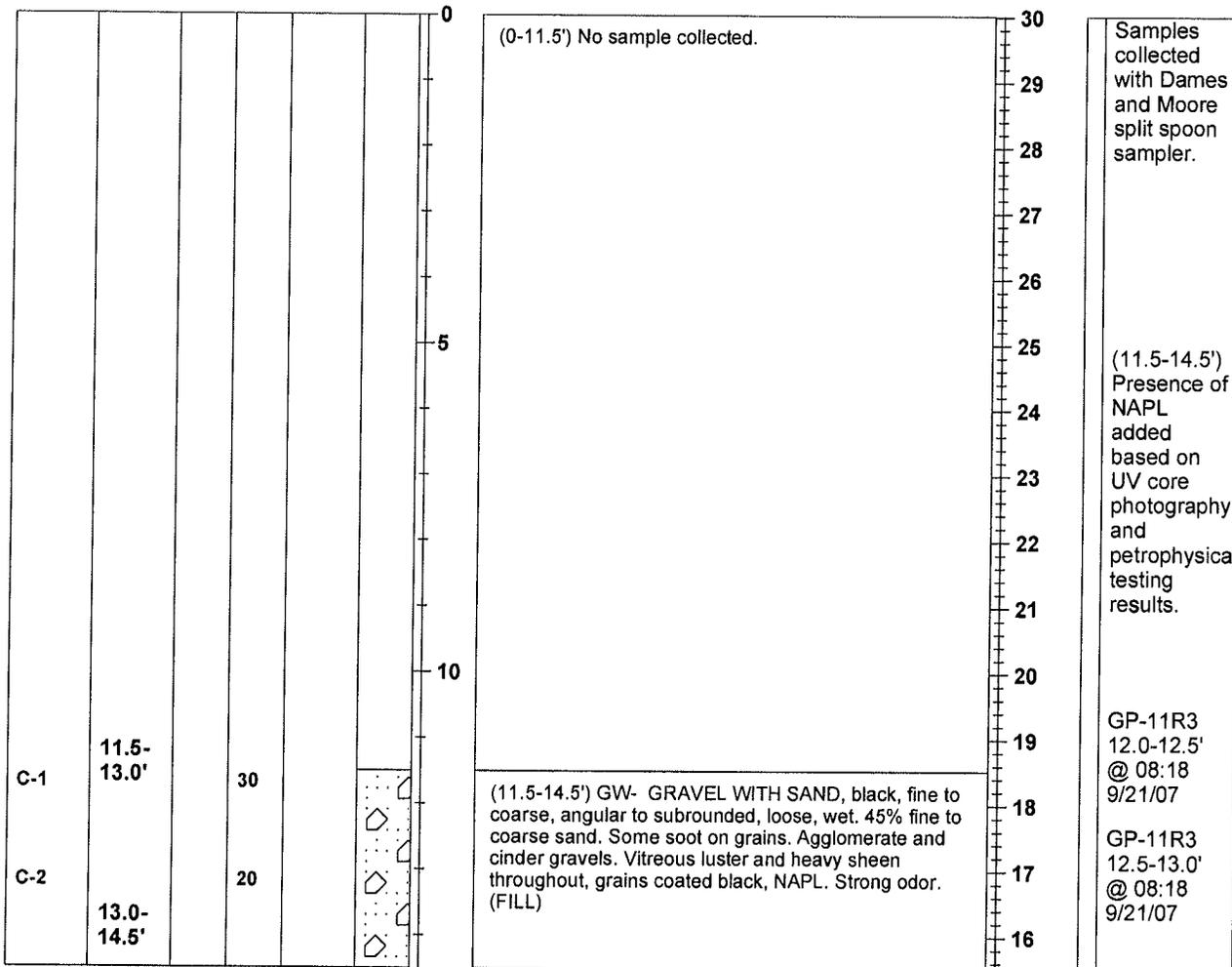


# Boring Log

Boring #: GP-11 HSA-R3  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>Curtis Askew</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239086.39</b> Easting: <b>1270780.38</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>30.017'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>14.5'</b>
Start Date & Time: <b>09/21/2007 0810</b>	Bit Type: <b>4.25" ID HSA</b>	Seal: <b>14.5-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/21/2007 0830</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A.Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-12  
Sheet 1 of 5

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239133.72</b> Easting: <b>1270796.18</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>28.473'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>32.0'</b>
Start Date & Time: <b>09/20/2007 0751</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>32.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/20/2007 0848</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample				Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
C-1	0-2.0'	65	0			0	(0-0.5') ML- SILT WITH SAND: brown to light brown, fine, subrounded, equant to elongate, loose, dry. 20% very fine sand. ~10% gravel, fine to coarse, and coarse sand, subrounded. Roots and organics top 0.5'. Organic odor to 0.5'. No sheen. (TOPSOIL)	28	
							(0.5-3.0') ML- SANDY SILT: black/very dark grey, red, yellow, and brown grains, fine, loose, dry. ~30% fine to medium sand. 10% gravels, fine to coarse up to 0.1' diameter, angular to subrounded agglomerates. Brick debris. Cinders, black, metallic luster, with small vesicles. Slight odor and no sheen. (FILL)	27	
							(3.0-4.3') ML-SILT: black, fine, loose, soft, dry. Trace fine gravel, subrounded to angular. Soil is sooty, streaks black. Slight odor and no sheen. (FILL)	25	
C-2	4.0-8.0'	50	0			5	@ 4.0-4.3' Wet.		
							(4.3-8.0') SM- SILTY SAND WITH GRAVEL: black with red, brown, yellow, grains, fine to coarse, angular, irregular shape, loose, dry to wet at 7.0'. ~35 to 45% gravel agglomerates, fine to coarse, angular, irregular shape, low density, fused material, multiple colors, large vesicles. Black fine gravels, angular, brittle, vitreous luster, and small vesicles. ~20 to 30% fines. Moderate odor. Slight broken sheen above water table, heavy at and below. (FILL)	24	
								23	
								22	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>													
	<b>Vertical Datum:</b> USACE <b>Headspace collected following RETEC's SOP 310</b>		<table border="1"> <thead> <tr> <th>Date</th> <th>Time</th> <th>Depth (ft.)</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	Date	Time	Depth (ft.)										
Date	Time	Depth (ft.)														

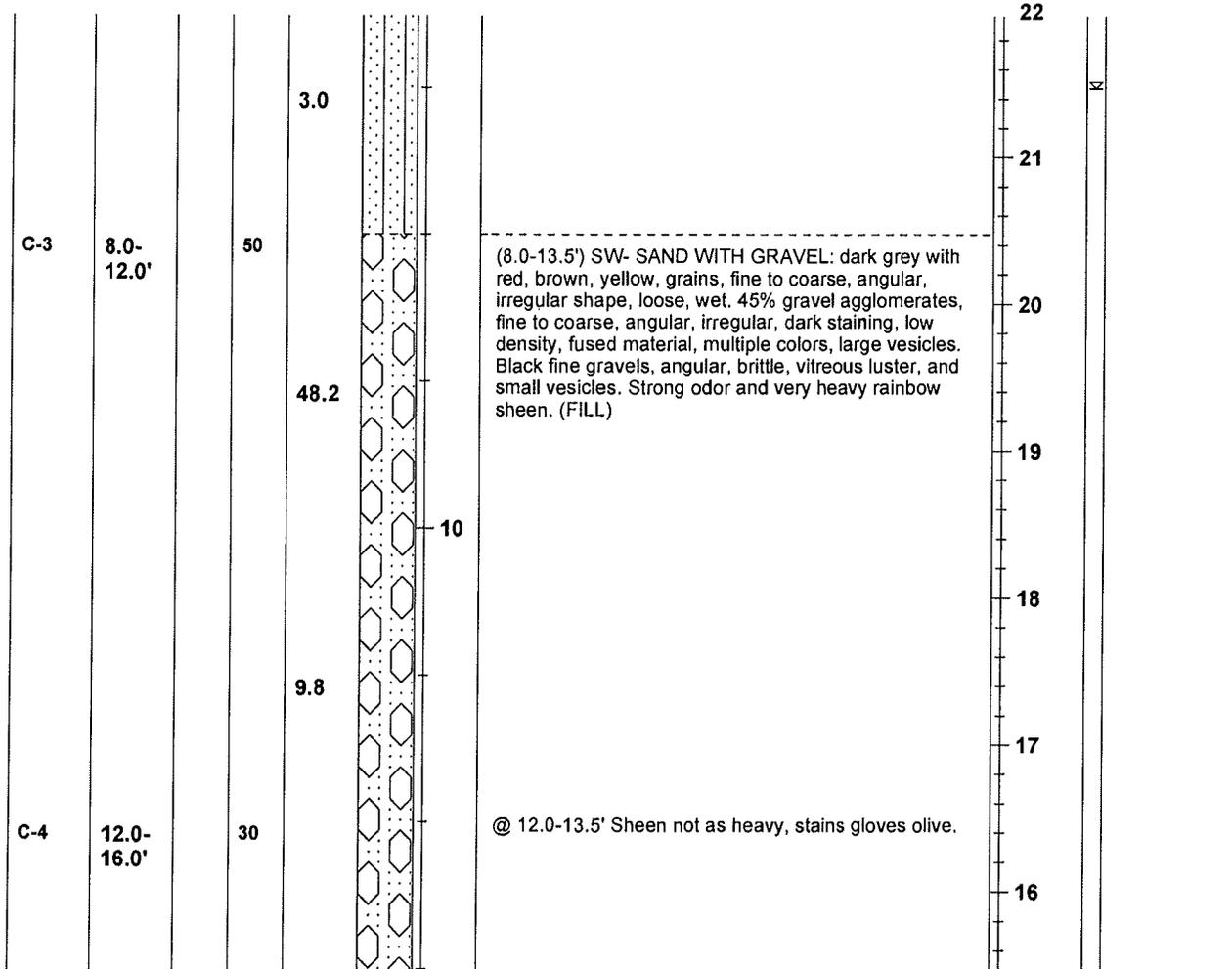


# Boring Log

Boring #: GP-12  
Sheet 2 of 5

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239133.72</b> Easting: <b>1270796.18</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>28.473'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>32.0'</b>
Start Date & Time: <b>09/20/2007 0751</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>32.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/20/2007 0848</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

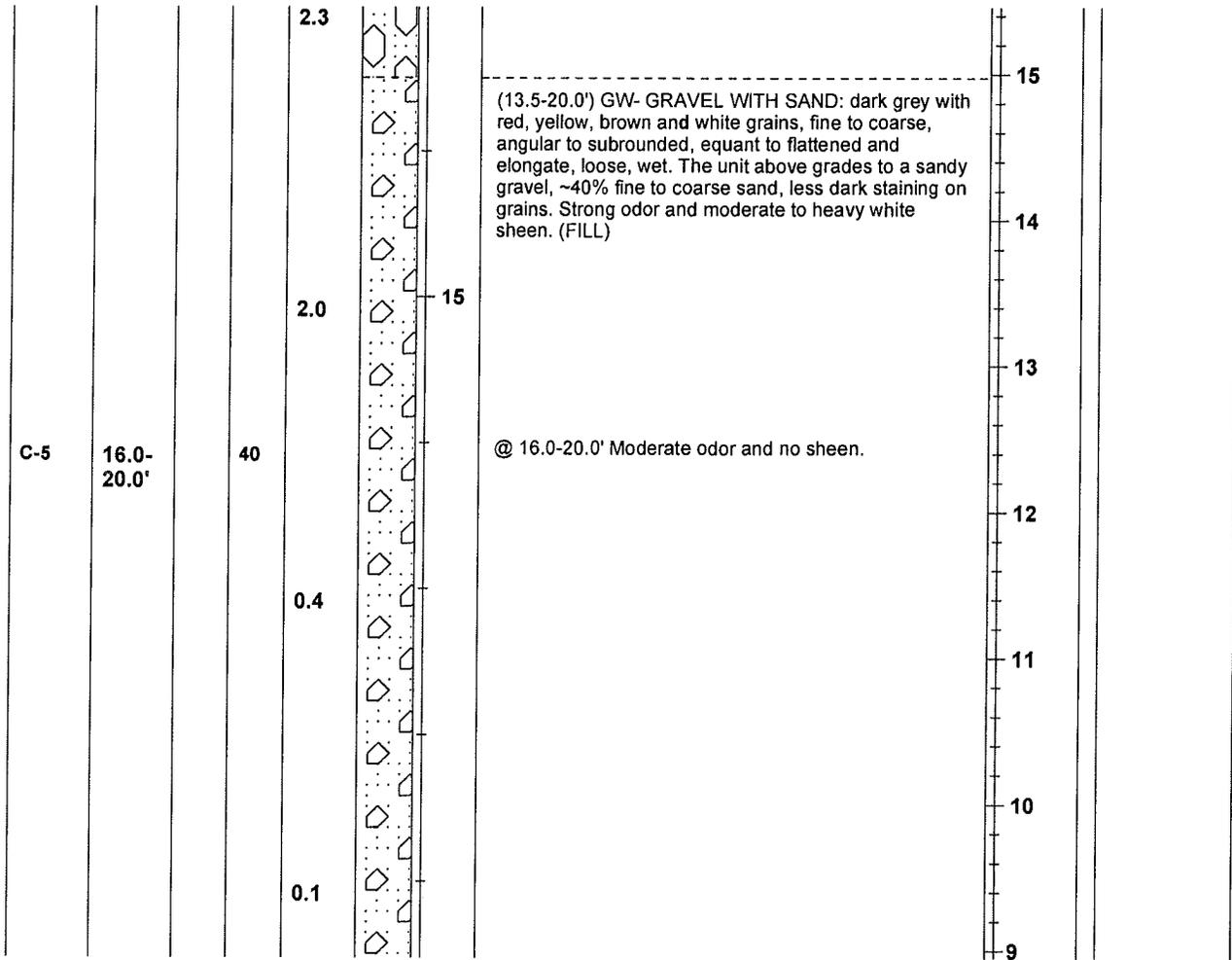


# Boring Log

Boring #: GP-12  
Sheet 3 of 5

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239133.72</b> Easting: <b>1270796.18</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>28.473'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>32.0'</b>
Start Date & Time: <b>09/20/2007 0751</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>32.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/20/2007 0848</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum:</b> USACE <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

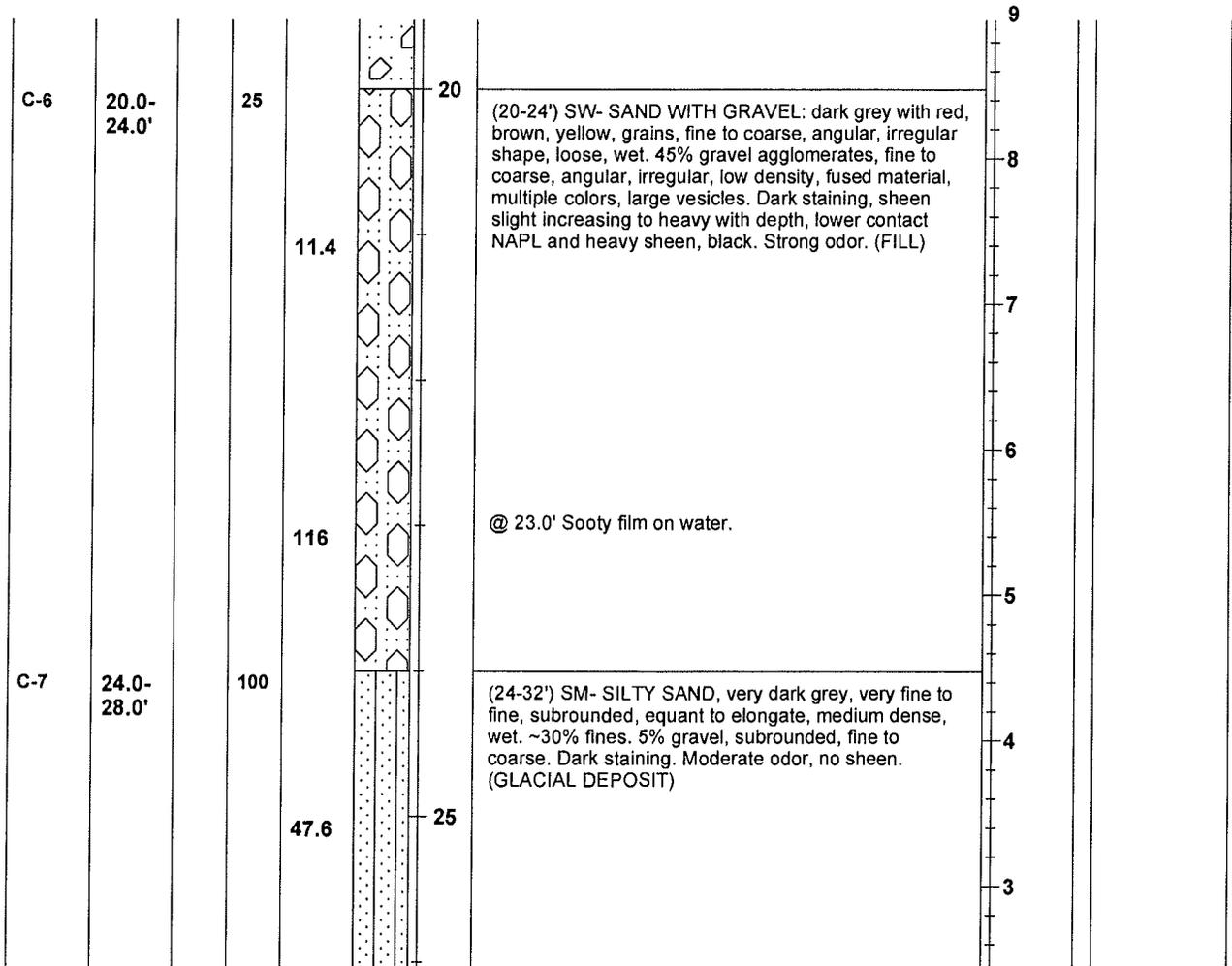


# Boring Log

Boring #: GP-12  
Sheet 4 of 5

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239133.72</b> Easting: <b>1270796.18</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>28.473'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>32.0'</b>
Start Date & Time: <b>09/20/2007 0751</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>32.0-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/20/2007 0848</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



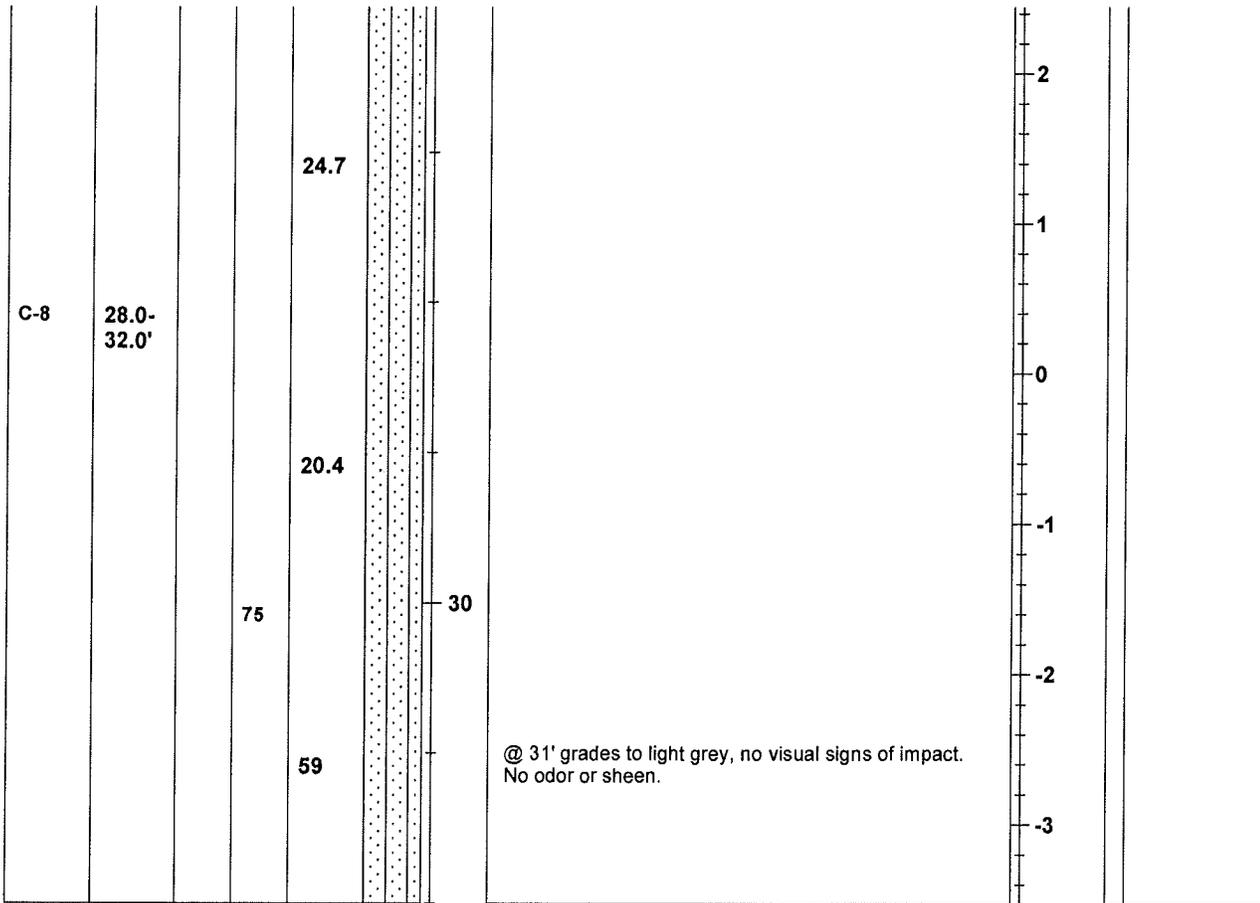
<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-12  
Sheet 5 of 5

Project: <b>Gas Works Park</b>		Operator: <b>Kasey Gable</b>		Location: <b>Eastern Shore Line</b>					
Project #: <b>05570-028-360</b>		Drill Rig Type: <b>Geoprobe</b>		Northing: <b>239133.72</b> Easting: <b>1270796.18</b>					
Client: <b>PSE</b>		Method: <b>Geoprobe</b>		Ground Elevation: <b>28.473'</b>					
Contractor: <b>Cascade Drilling</b>		Casing ID: <b>1.75"</b>		Total Depth: <b>32.0'</b>					
Start Date & Time: <b>09/20/2007 0751</b>		Bit Type: <b>2" Geoprobe shoe</b>		Seal: <b>32.0-1.0' bentonite, 1.0-0 top soil</b>					
Finish Date & Time: <b>09/20/2007 0848</b>		Boring ID: <b>2"</b>		Logged By: <b>A. Jambrosic</b>					
Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

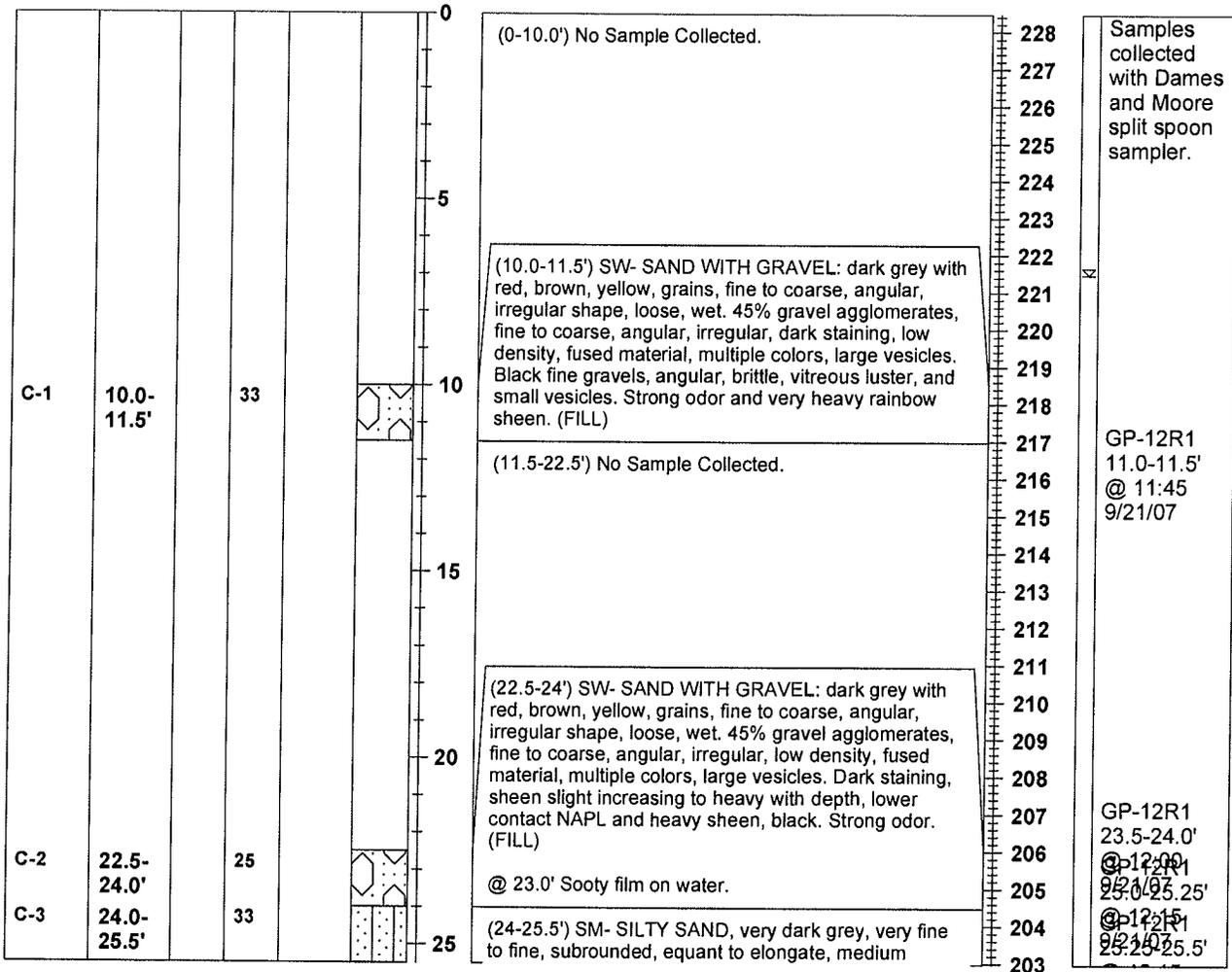


# Boring Log

Boring #: GP-12 HSA  
Sheet 1 of 2

Project: <b>Gas Works Park</b>	Operator: <b>Curtis Askew</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239133.72</b> Easting: <b>1270796.18</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>28.473'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>25.5'</b>
Start Date & Time: <b>09/21/2007 1129</b>	Bit Type: <b>4.25" ID HSA</b>	Seal: <b>25.5-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/21/2007 1210</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-12 HSA  
Sheet 2 of 2

Project: <b>Gas Works Park</b>	Operator: <b>Curtis Askew</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>CME55 Track Rig</b>	Northing: <b>239133.72</b> Easting: <b>1270796.18</b>
Client: <b>PSE</b>	Method: <b>Hollow Stem Auger</b>	Ground Elevation: <b>28.473'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>4.25"</b>	Total Depth: <b>25.5'</b>
Start Date & Time: <b>09/21/2007 1129</b>	Bit Type: <b>4.25" ID HSA</b>	Seal: <b>25.5-1.0' bentonite, 1.0-0 top soil</b>
Finish Date & Time: <b>09/21/2007 1210</b>	Boring ID: <b>9.0"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

dense, wet. ~30% fines. 5% gravel, subrounded, fine to coarse. Dark staining. Moderate odor, no sheen.  
(GLACIAL DEPOSIT)

203 @ 12:15  
9/21/07

<b>Remarks and Datum Used:</b>  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)

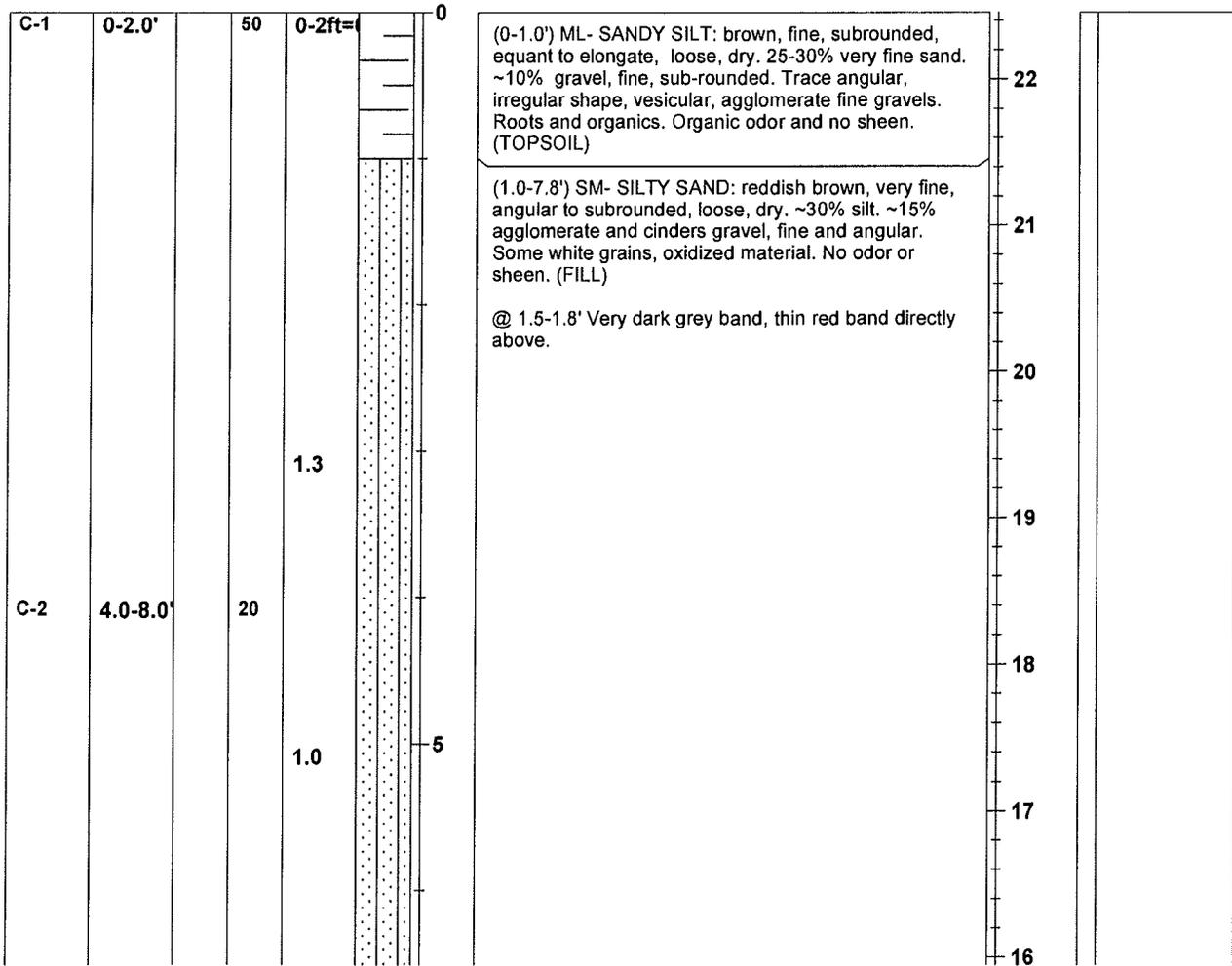


# Boring Log

Boring #: GP-13  
Sheet 1 of 4

Project: Gas Works Park	Operator: Kasey Gable	Location: Eastern Shore Line
Project #: 05570-028-360	Drill Rig Type: Geoprobe	Northing: 239207.28 Easting: 1270820.54
Client: PSE	Method: Geoprobe	Ground Elevation: 25.695'
Contractor: Cascade Drilling	Casing ID: 1.75"	Total Depth: 26.0'
Start Date & Time: 09/20/2007 0932	Bit Type: 2" Geoprobe shoe	Seal: 26.0-1.0' bentonite, 1.0-0' top soil
Finish Date & Time: 09/20/2007 1039	Boring ID: 2"	Logged By: A. Jambrosic

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS/ASTM	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum:</b> USACE <b>Head space collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

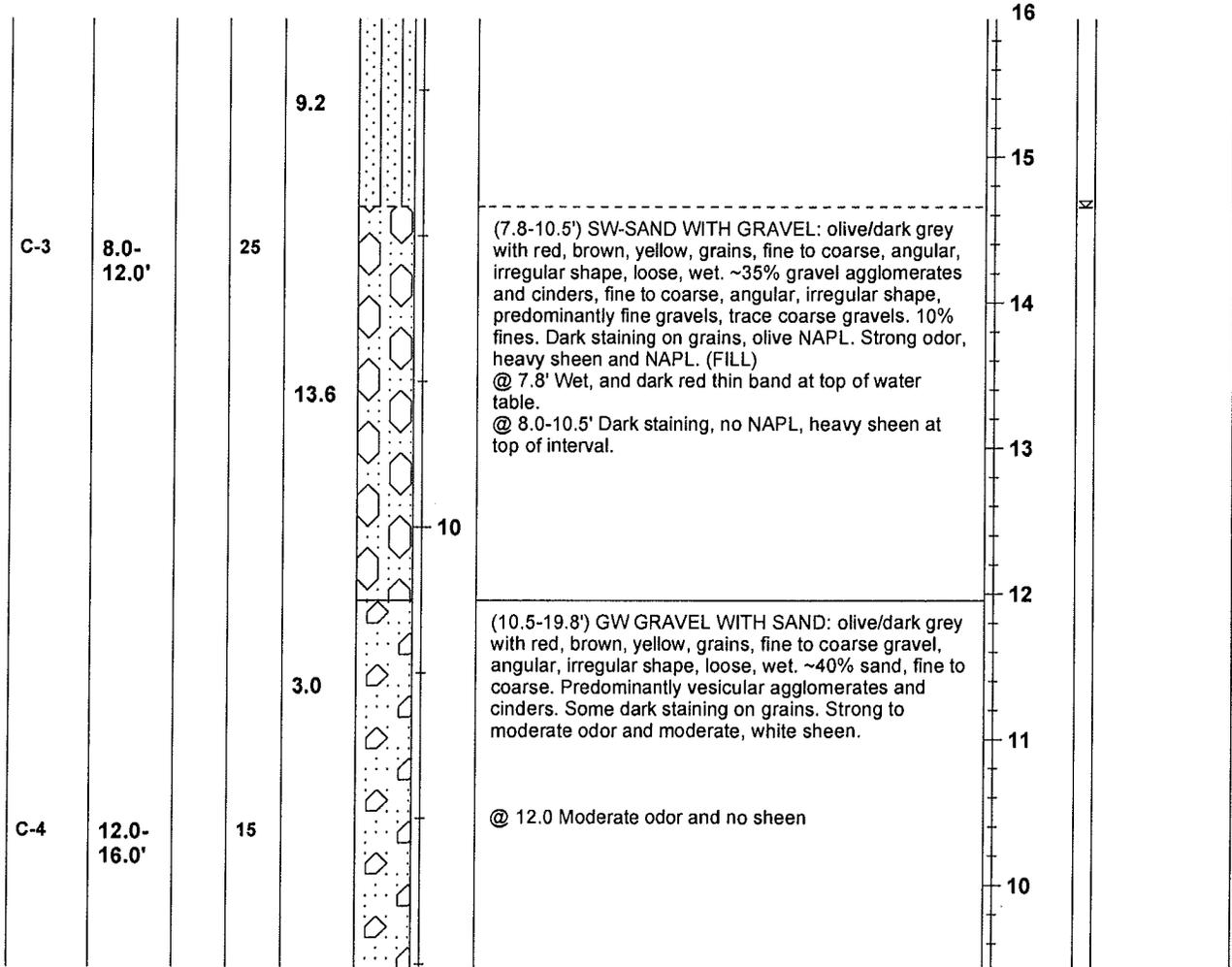


# Boring Log

Boring #: GP-13  
Sheet 2 of 4

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239207.28</b> Easting: <b>1270820.54</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.695'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>26.0'</b>
Start Date & Time: <b>09/20/2007 0932</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>26.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1039</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Head space collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

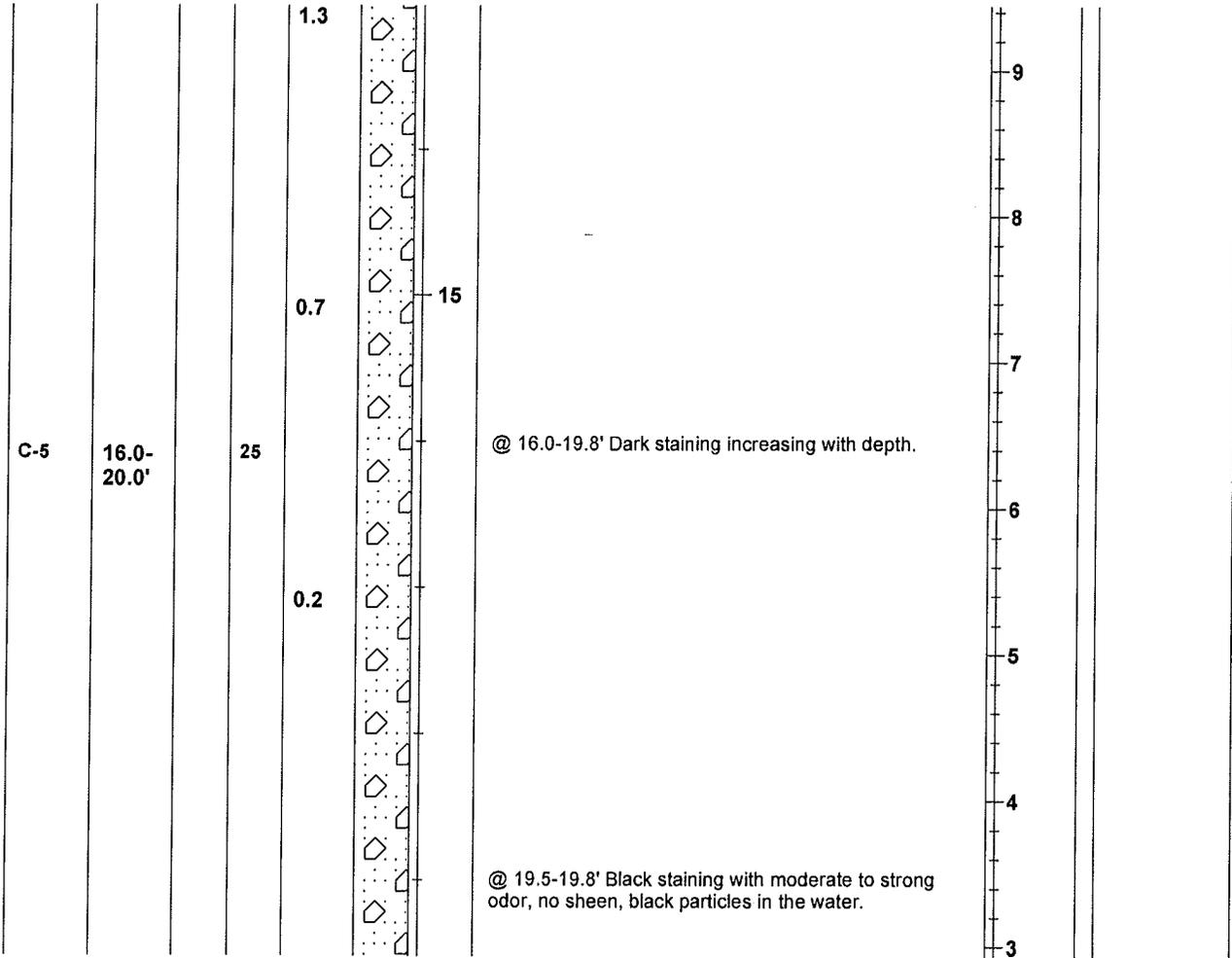


# Boring Log

Boring #: GP-13  
Sheet 3 of 4

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239207.28</b> Easting: <b>1270820.54</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.695'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>26.0'</b>
Start Date & Time: <b>09/20/2007 0932</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>26.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1039</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Head space collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

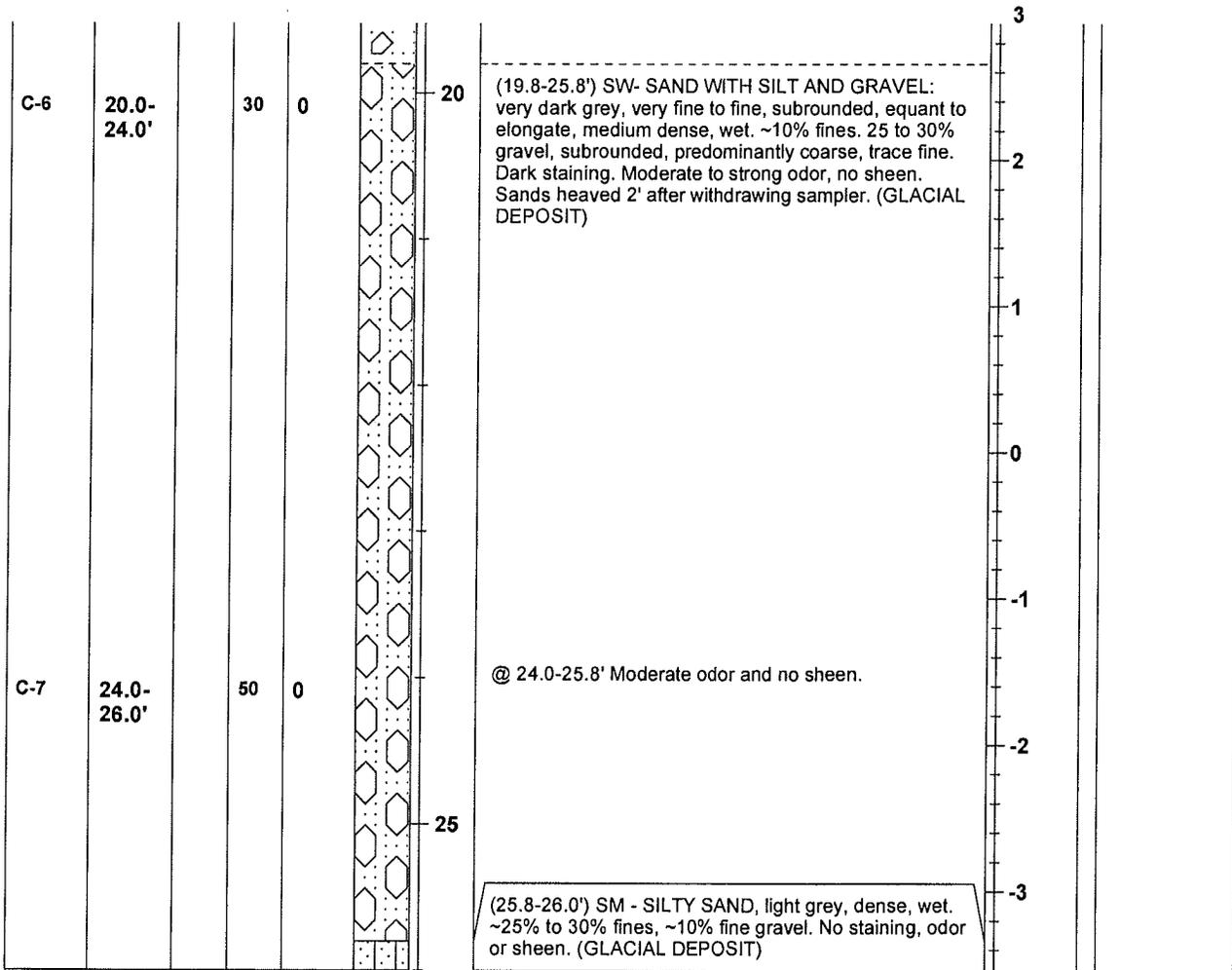


# Boring Log

Boring #: GP-13  
Sheet 4 of 4

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239207.28</b> Easting: <b>1270820.54</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>25.695'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>26.0'</b>
Start Date & Time: <b>09/20/2007 0932</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>26.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1039</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Head space collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

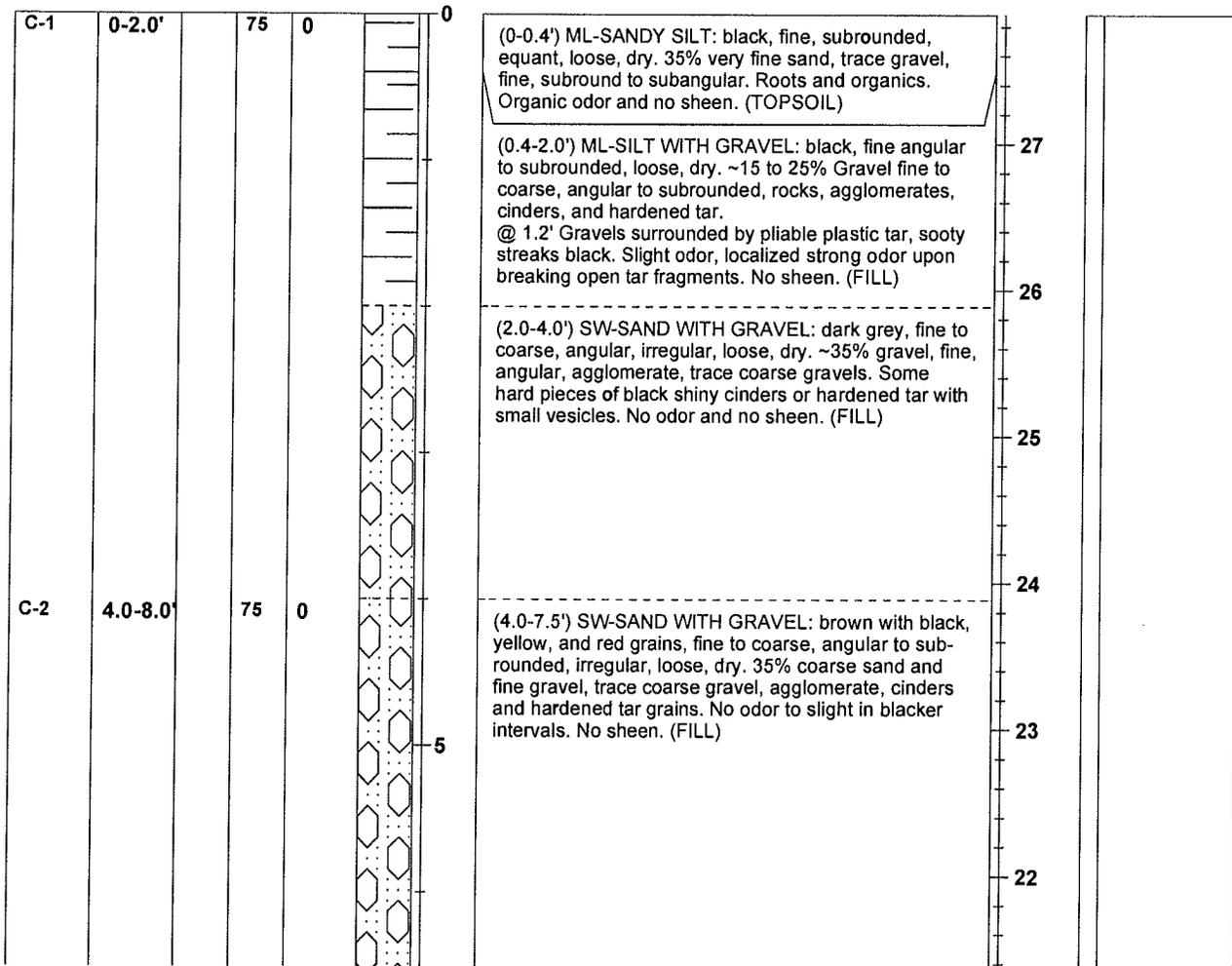


# Boring Log

Boring #: GP-14  
Sheet 1 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239380.16</b> Easting: <b>1270788.66</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>31.124'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/20/2007 1106</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1130</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum:</b> USACE <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)

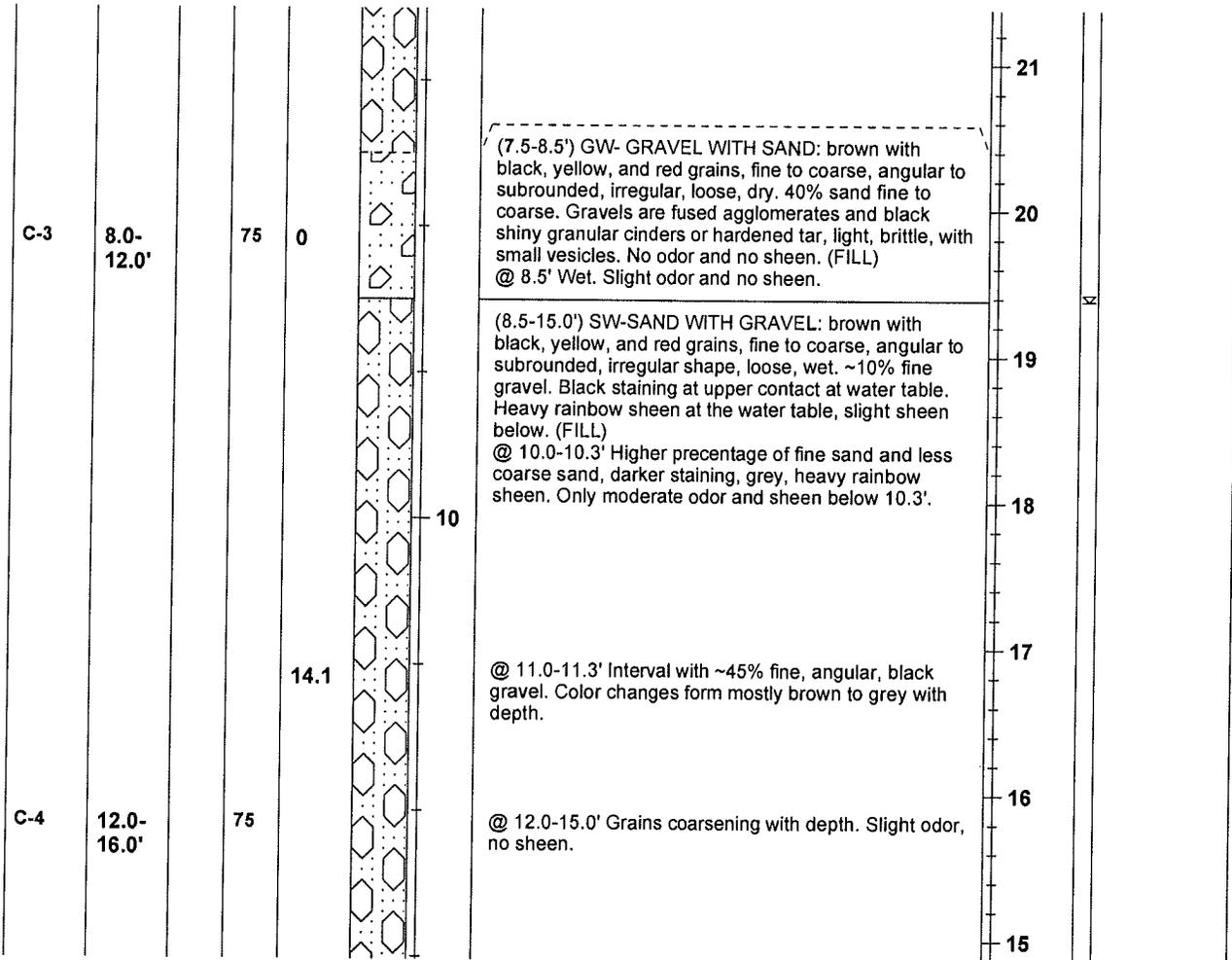


# Boring Log

Boring #: GP-14  
Sheet 2 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239380.16</b> Easting: <b>1270788.66</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>31.124'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/20/2007 1106</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1130</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Headspace collected following RETEC's SOP 310				

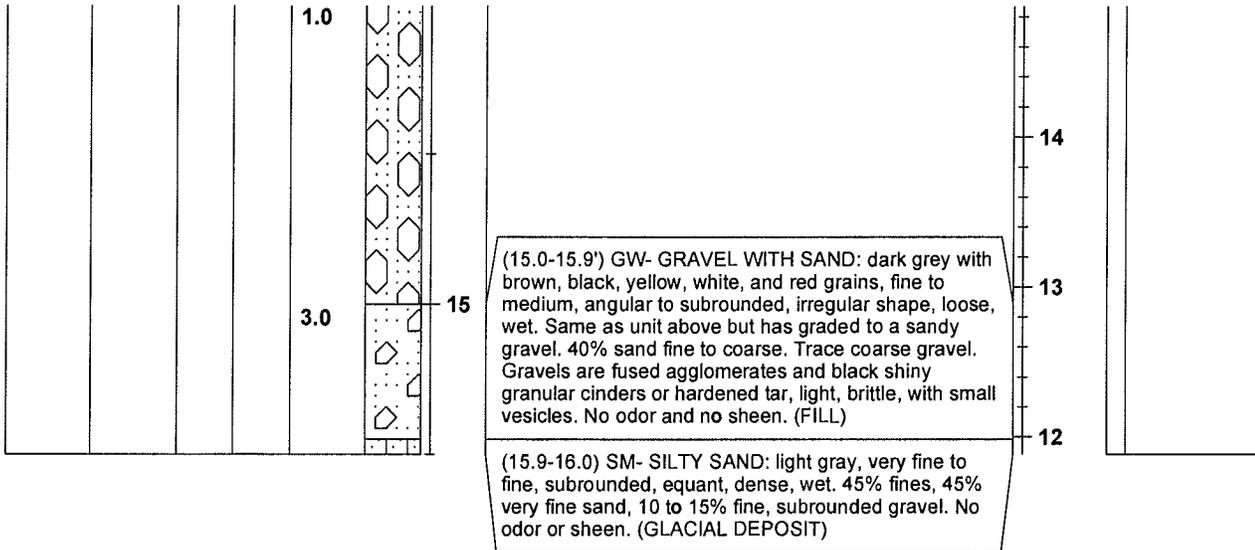


# Boring Log

Boring #: GP-14  
Sheet 3 of 3

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239380.16</b> Easting: <b>1270788.66</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>31.124'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>16.0'</b>
Start Date & Time: <b>09/20/2007 1106</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>16.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1130</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b> <b>Headspace collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: GP-14-R2  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>Kasey Gable</b>	Location: <b>Eastern Shore Line</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>Geoprobe</b>	Northing: <b>239380.16</b> Easting: <b>1270788.66</b>
Client: <b>PSE</b>	Method: <b>Geoprobe</b>	Ground Elevation: <b>31.124'</b>
Contractor: <b>Cascade Drilling</b>	Casing ID: <b>1.75"</b>	Total Depth: <b>2.0'</b>
Start Date & Time: <b>09/20/2007 1130</b>	Bit Type: <b>2" Geoprobe shoe</b>	Seal: <b>2.0-1.0' bentonite, 1.0-0' top soil</b>
Finish Date & Time: <b>09/20/2007 1140</b>	Boring ID: <b>2"</b>	Logged By: <b>A. Jambrosic</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: <b>USCS/ASTM</b>	Elevation (ft.)	Comments
C-1	0-2.0'	75				0	(0-0.4') ML-SANDY SILT: black, fine, subrounded, equant, loose, dry. 35% very fine sand, trace gravel, fine, subround to subangular. Roots and organics. Organic odor and no sheen. (TOPSOIL)		Sample collected with Geoprobe acetate liner.  GP-14 0-2.0' @ 11:40 9/20/07
						27	(0.4-2.0') ML-SILT WITH GRAVEL: black, fine angular to subrounded, loose, dry. ~15 to 25% Gravel fine to coarse, angular to subrounded, rocks, agglomerates, cinders, and hardened tar. Some gravels surrounded by pliable plastic tar, sooty streaks black. Slight odor, localized strong odor upon breaking open tar fragments. No sheen. (FILL)	26	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: HA-1  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>A. Jambrosic</b>	Location: <b>downslope of GP-11</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>N/A</b>	Northing: <b>239085.49</b> Easting: <b>1270799.57</b>
Client: <b>PSE</b>	Method: <b>Core barrel with slide hammer</b>	Ground Elevation: <b>23.058'</b>
Contractor: <b>N/A</b>	Casing ID: <b>N/A</b>	Total Depth: <b>1.8'</b>
Start Date & Time: <b>09/26/07 0811</b>	Bit Type: <b>2" core barrel</b>	Seal: <b>1.8-1.0' bentonite 1.0-0' topsoil</b>
Finish Date & Time: <b>09/26/07 0920</b>	Boring ID: <b>2"</b>	Logged By: <b>K. Nichols</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
C-1	0.0-0.6	100				0	(0-1.3') SM- SILTY SAND: dark brown - black, fine to very fine, subrounded, loose, dry. ~45% fines, silt. 5-10% fine to coarse gravel sized agglomerate and hardened tar material with slight odor. Organic odor and no sheen. (FILL)	23	
C-2	0.6-1.2	100				0		22	
C-3	1.2-1.8	100				63.6 328	(1.3-1.8') GW- GRAVEL WITH SAND: dark brown to black, fine to coarse, angular to subrounded, loose, moist to wet. 20% fine to coarse sand. Gravels are predominantly agglomerates: low density, vesicular, cinder-type particles, lustrous, with small vesicles. Black, sticky "tarry" NAPL coating, entraining and binding grains. Strong odor, heavy rainbow sheen and NAPL. (FILL)		

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum:</b> USACE		<b>Head space collected following RETEC's SOP 310</b>	Date	Time



# Boring Log

Boring #: HA-2  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>A. Jambrosic</b>	Location: <b>downslope of GP-12</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>N/A</b>	Northing: <b>239123.60</b> Easting: <b>1270808.69</b>
Client: <b>PSE</b>	Method: <b>Core barrel with slide hammer</b>	Ground Elevation: <b>22.636'</b>
Contractor: <b>N/A</b>	Casing ID: <b>N/A</b>	Total Depth: <b>2.4'</b>
Start Date & Time: <b>09/26/07 0938</b>	Bit Type: <b>2" core barrel</b>	Seal: <b>2.4-1.0' bentonite 1.0-0.0' topsoil</b>
Finish Date & Time: <b>09/26/07 1020</b>	Boring ID: <b>2"</b>	Logged By: <b>K. Nichols</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
C-1	0.0-0.6		100	0		0	(0-1.0') SM- SILTY SAND: dark brown to black, fine to medium, loose, dry. ~40% silt. Roots and organic debris in top of interval. Organic odor in top of interval and no sheen. (TOPSOIL)		
C-2	0.6-1.2		100					22	
C-3	1.2-1.8		10	0			(1.0-1.2') SM- SILTY SAND: dark brown, fine to medium, loose, dry. Organic debris decreasing with depth, ~5-10% cinders. Trace fine gravel - agglomerate. Slight odor, slight sheen. (FILL) (1.2-1.8') SM- SILTY SAND: dark brown, fine to coarse, loose, dry. ~5-10% fine to coarse gravel. Moderate odor and no sheen. Drove rock, 10% recovery. (FILL)	21	
C-4	1.8-2.4		30	0			(1.8-2.4') SM- SILTY SAND: dark brown to black, fine to coarse, loose, moist. ~40% silt. ~5-10% gravel. Strong odor, heavy sheen, trace NAPL. Drove piece of brick ~30% recovery. (FILL)		

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Head space collected following <b>RETEC's SOP 310</b>				



# Boring Log

Boring #: HA-3  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>A. Jambrosic</b>	Location: <b>downslope of GP-13</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>N/A</b>	Northing: <b>239187.42</b> Easting: <b>1270825.28</b>
Client: <b>PSE</b>	Method: <b>Core barrel with slide hammer</b>	Ground Elevation: <b>22.31'</b>
Contractor: <b>N/A</b>	Casing ID: <b>N/A</b>	Total Depth: <b>2.4'</b>
Start Date & Time: <b>09/26/07 1030</b>	Bit Type: <b>2" Core barrel</b>	Seal: <b>2.4-1.0' bentonite 1.0-0.0' topsoil</b>
Finish Date & Time: <b>09/26/07 1121</b>	Boring ID: <b>2"</b>	Logged By: <b>K. Nichols</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

C-1	0.0-0.6	0	0		0	(0-0.6') SM- SILTY SAND: dark brown to black, fine to medium, loose, dry. ~40% silt. Roots and organic debris top. Organic odor and no sheen. No recovery, soil classification made from surface observations. (TOPSOIL)	22	
C-2	0.6-1.2	100	0			(0.6-1.2') SP- SAND: dark brown, fine to medium, loose, dry. Trace fines and fine to coarse gravels. 25% organic material and wood debris. Trace broken glass. No odor or sheen. (TOPSOIL)		
C-3	1.2-1.8	100	0			(1.2-1.7') SP- SAND: dark brown, fine to medium, loose, moist. Trace fines and fine to coarse gravels, 25% organic material and wood debris. Moist with depth. No odor or sheen. (TOPSOIL)	21	
			0			(1.7-1.8') SW- SAND: brown to dark brown, fine to medium, loose, moist. ~5-10% fine to coarse gravels, cinders and asphaltic tar pieces. Moderate to strong odor, heavy sheen. (FILL)		
C-4	1.8-2.4	100	5.1			(1.8-2.4') SW- SAND: brown to dark brown, fine to medium, loose, moist. 10-15% fine to coarse gravel. Strong odor, heavy sheen, blebs of NAPL. (FILL) @ 2.0' Wet.	20	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b>		Date	Time	Depth (ft.)
	<b>Head space collected following RETEC's SOP 310</b>				



# Boring Log

Boring #: HA-4  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>A. Jambrosic</b>	Location: <b>downslope of GP-9</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>N/A</b>	Northing: <b>239218.87</b> Easting: <b>1270831.68</b>
Client: <b>PSE</b>	Method: <b>Core barrel with slide hammer</b>	Ground Elevation: <b>21.892'</b>
Contractor: <b>N/A</b>	Casing ID: <b>N/A</b>	Total Depth: <b>2.4'</b>
Start Date & Time: <b>09/26/07 1131</b>	Bit Type: <b>2" core barrel</b>	Seal: <b>2.4-1.0' bentonite, 1.0-0.0' topsoil</b>
Finish Date & Time: <b>09/26/07 1218</b>	Boring ID: <b>2"</b>	Logged By: <b>K. Nichols</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
C-1	0.0-0.6		100	0		0	(0-0.6') SW- SAND WITH GRAVEL: dark brown, fine to med, loose, dry. Organic debris. ~30-40% fine gravels. Slight odor, no sheen. (TOPSOIL)		
C-2	0.6-1.2		100	0			(0.6-1.8') GW- GRAVEL WITH SAND: dark brown, fine to coarse, loose, moist. No odor or sheen. ~45% Fine to medium sand. Wood pieces and organic debris.(FILL)  @ 1.0' - 1" Thick zone of light yellow, wafer-shaped material.	21	
C-3	1.2-1.8		100				@ 1.2-1.8' Black staining, slight odor and slight sheen.		
C-4	1.8-2.4		100	0			(1.8-2.4') SP- SAND WITH GRAVEL: dark brown, fine to medium, loose, wet. NAPL visible on sand particles. Very strong odor, heavy sheen. (FILL).	20	@ 1.8' - NAPL leaves greenish sheen on nitrile gloves, sheen visible on water in borehole.

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Head space collected following RETEC's SOP 310		<b>09/26/07</b>	<b>1218</b>	<b>1.5'</b>





# Boring Log

Boring #: HA-6  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>A. Jambrosic</b>	Location: <b>15' downslope of HA-5</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>N/A</b>	Northing: <b>239423.75</b> Easting: <b>1270829.13</b>
Client: <b>PSE</b>	Method: <b>Core barrel with slide hammer</b>	Ground Elevation: <b>22.506'</b>
Contractor: <b>N/A</b>	Casing ID: <b>N/A</b>	Total Depth: <b>1.2'</b>
Start Date & Time: <b>09/26/07 1449</b>	Bit Type: <b>2" core barrel</b>	Seal: <b>1.2-1.0' bentonite, 1.0-0.0 topsoil</b>
Finish Date & Time: <b>09/26/07 1500</b>	Boring ID: <b>2"</b>	Logged By: <b>K. Nichols</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
C-1	0-0.6		100	0	[Dotted pattern]	0	(0-1.2') SM- SAND: brown to black, fine to medium, loose, dry. Organic material, leaves, roots, etc. 1 large piece of hard, glassy, vesicular, black, hardened tar. Moderate odor, no sheen. (FILL)		
C-2	0.6-1.2		100	36.2	[Dotted pattern]		@ 0.6-1.2' 50% of recovered material was pliable tar, black. Strong odor, heavy sheen.	22	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum:</b> USACE		<b>Head space collected following RETEC's SOP 310</b>	Date	Time



# Boring Log

Boring #: HA-7  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>A. Jambrosic</b>	Location: <b>15' south of HA-6</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>N/A</b>	Northing: <b>239408.97</b> Easting: <b>1270830.10</b>
Client: <b>PSE</b>	Method: <b>Core barrel with slide hammer</b>	Ground Elevation: <b>22.694'</b>
Contractor: <b>N/A</b>	Casing ID: <b>N/A</b>	Total Depth: <b>3.4'</b>
Start Date & Time: <b>09/26/07 1506</b>	Bit Type: <b>2" core barrel</b>	Seal: <b>3.4-1.0' bentonite, 1.0-0.0' topsoil</b>
Finish Date & Time: <b>09/26/07 1550</b>	Boring ID: <b>2"</b>	Logged By: <b>K. Nichols</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

C-1	0.0-0.6	100	0		0	(0-1.2) SM- SILTY SAND: dark brown, fine, loose, dry. ~30% silt. Organic material, roots, wood fragments, leaves, large tree roots. No odor or sheen. (TOPSOIL)		
C-2	0.6-1.2	100					22	
C-3	1.2-1.5	0				(1.2-1.8') NO RECOVERY		
C-4	1.5-2.0	0				(1.8-2.2') NO RECOVERY	21	
C-5	2.0-2.6	100	0			(2.2-3.4') SM- SILTY SAND: dark brown, fine to medium, dense, dry to moist. ~30% silt. Trace rounded gravel. Many roots, organic material, large wood fragments. No odor or sheen. (TOPSOIL)		
C-6	2.6-3.2	100				@ 2.8' Wet.	20	
C-7	3.2-3.4							

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Horizontal Datum: <b>NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	Vertical Datum: <b>USACE</b>		Date	Time	Depth (ft.)
	Head space collected following RETEC's SOP 310				



# Boring Log

Boring #: HA-8  
Sheet 1 of 1

Project: <b>Gas Works Park</b>	Operator: <b>A. Jambrosic</b>	Location: <b>15' north of HA-5</b>
Project #: <b>05570-028-360</b>	Drill Rig Type: <b>N/A</b>	Northing: <b>239448.53</b> Easting: <b>1270815.18</b>
Client: <b>PSE</b>	Method: <b>Core barrel with slide hammer</b>	Ground Elevation: <b>23.69'</b>
Contractor: <b>N/A</b>	Casing ID: <b>N/A</b>	Total Depth: <b>1.8'</b>
Start Date & Time: <b>09/26/07 1554</b>	Bit Type: <b>2" core barrel</b>	Seal: <b>1.8-1.0' bentonite, 1.0-0.0' topsoil</b>
Finish Date & Time: <b>09/26/07 1557</b>	Boring ID: <b>2"</b>	Logged By: <b>K. Nichols</b>

Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
C-1	0-0.6	100	0		[Dotted pattern]	0	(0-1.8') SM- SILTY SAND: dark brown, fine to medium, loose, dry. ~30% silt. Organic material, wood fragments, roots. ~5% hardened tar at 0.5'. Slight odor, no sheen. (FILL)		
C-2	0.6-1.4	100			[Dotted pattern]		@ 0.6-1.8' Hard, black, vesicular, glassy, hardened tar throughout ~30%. Strong odor, no sheen.	23	
C-3	1.4-1.8	100	0		[Dotted pattern]			22	Hole sloughed in completely when core barrel was removed.

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum: NAD83/91</b>	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum: USACE</b>  <b>Head space collected following RETEC's SOP 310</b>		Date	Time	Depth (ft.)



# Boring Log

Boring #: HA-9  
Sheet 1 of 1

Project: Gas works Park		Operator: A. Jambrosic		Location: 15' north of HA-8					
Project #: 05570-028-360		Drill Rig Type: N/A		Northing: 239460.70 Easting: 1270804.54					
Client: PSE		Method: Core barrel with slide hammer		Ground Elevation: 23.166					
Contractor: N/A		Casing ID: N/A		Total Depth: 1.8'					
Start Date & Time: 09/26/07 1559		Bit Type: 2" core barrel		Seal: 1.8-1.0' bentonite, 1.0-0.0' topsoil					
Finish Date & Time: 09/26/07 1620		Boring ID: 2"		Logged By: K. Nichols					
Sample					Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)					

Sample ID	Depth Range (ft.)	Blows Per 6 Inch	% Rec	PID (ppm)	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
C-1	0-0.6		100	0		0	(0-1.2') SM- SILTY SAND WITH GRAVEL: dark brown, fine to medium, loose, dry. ~20% fine to coarse gravels and gravel sized brick fragments. No odor or sheen. (FILL)	23	
C-2	0.6-1.4		100				@ 0.6-1.2' Many roots and ~5-10% fine to coarse gravel.		
C-3	1.4-1.8		100	0			(1.2-1.8') SM- SILTY SAND WITH GRAVEL: dark brown, fine to medium, loose, dry. Leaves, roots, wood fragments. ~25% fine to coarse gravel sized, vesicular, low density, porous, agglomerate with slight metallic luster, one blue hued and one yellow hued gravel. No odor or sheen. (FILL).	22	Hole sloughed in completely when core barrel was removed.

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Horizontal Datum:</b> NAD83/91	<b>Sample Type</b> N = SPT DP = Direct Push GS = Grab Sample C = Core	<b>Groundwater</b>		
	<b>Vertical Datum:</b> USACE		<b>Head space collected following RETEC's SOP 310</b>	Date	Time

**Hydrogeologic Investigation  
(GeoEngineers, Inc. 2010)**

**2012 Borings**

## SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS <small>(LITTLE OR NO FINES)</small>		<b>GW</b>	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES	
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>GP</b>	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES	
	SAND AND SANDY SOILS	CLEAN SANDS <small>(LITTLE OR NO FINES)</small>	SILT GRAVELS, GRAVEL - SAND - SILT MIXTURES		<b>GM</b>	SILT GRAVELS, GRAVEL - SAND - SILT MIXTURES
			CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES		<b>GC</b>	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>	WELL-GRADED SANDS, GRAVELLY SANDS		<b>SW</b>	WELL-GRADED SANDS, GRAVELLY SANDS
			POORLY-GRADED SANDS, GRAVELLY SAND		<b>SP</b>	POORLY-GRADED SANDS, GRAVELLY SAND
FINE GRAINED SOILS	SILTS AND CLAYS	SANDY SILTS, SAND - SILT MIXTURES		<b>SM</b>	SANDY SILTS, SAND - SILT MIXTURES	
		CLAYEY SANDS, SAND - CLAY MIXTURES		<b>SC</b>	CLAYEY SANDS, SAND - CLAY MIXTURES	
		LIQUID LIMIT LESS THAN 50		<b>ML</b>	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY	
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		<b>CL</b>	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		<b>OL</b>	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS		<b>MH</b>	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS	
SILTS AND CLAYS	INORGANIC CLAYS OF HIGH PLASTICITY		<b>CH</b>	INORGANIC CLAYS OF HIGH PLASTICITY		
	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY		<b>OH</b>	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY		
HIGHLY ORGANIC SOILS		PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS		<b>PT</b>	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

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

### Sampler Symbol Descriptions

	2.4-inch I.D. split barrel
	Standard Penetration Test (SPT)
	Shelby tube
	Piston
	Direct-Push
	Bulk or grab

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

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

## ADDITIONAL MATERIAL SYMBOLS

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



Measured groundwater level in exploration, well, or piezometer



Groundwater observed at time of exploration



Perched water observed at time of exploration



Measured free product in well or piezometer

### Graphic Log Contact



Distinct contact between soil strata or geologic units



Approximate location of soil strata change within a geologic soil unit

### Material Description Contact



Distinct contact between soil strata or geologic units



Approximate location of soil strata change within a geologic soil unit

### Laboratory / Field Tests

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

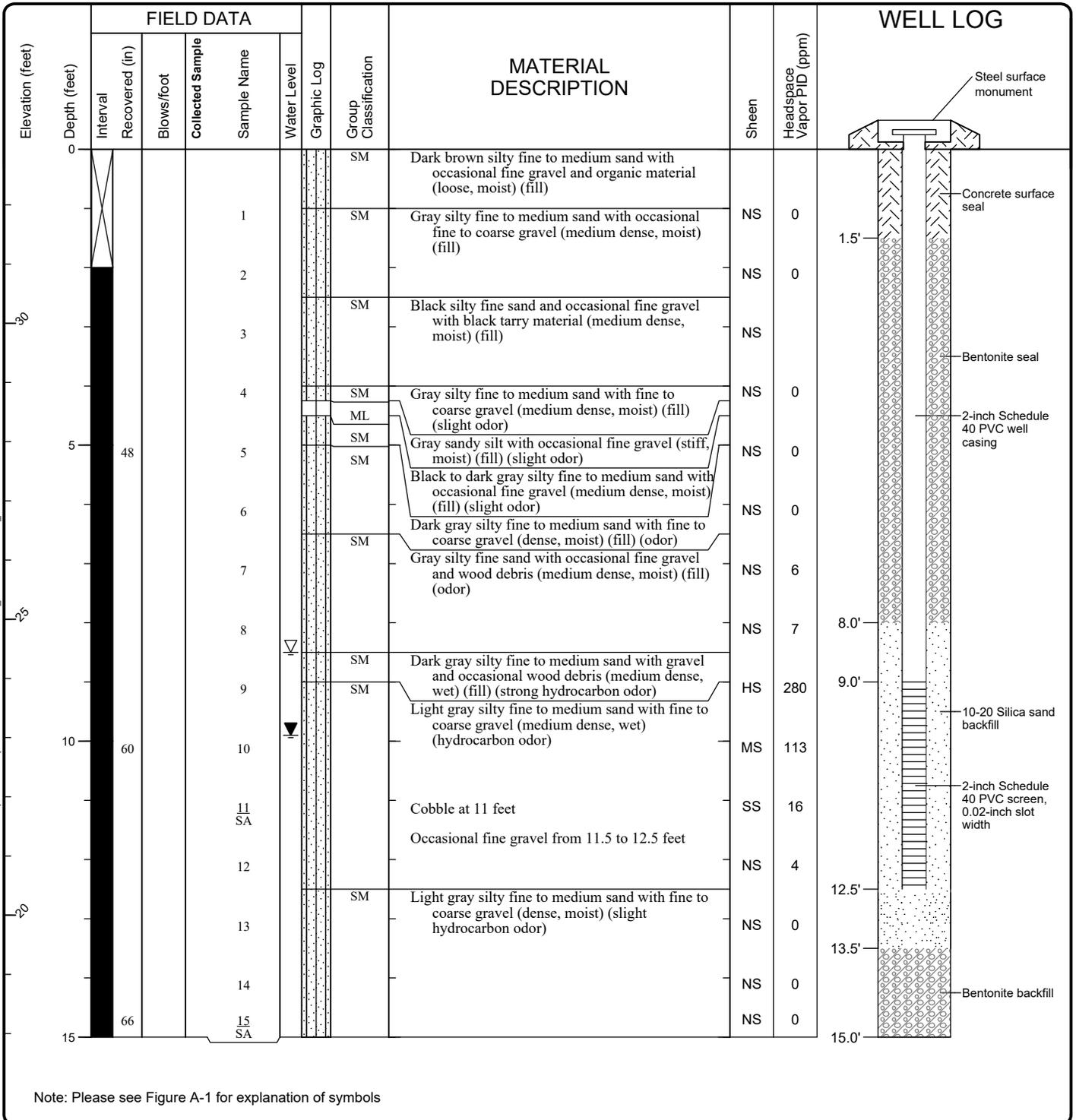
### Sheen Classification

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

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

## KEY TO EXPLORATION LOGS

Start Drilled 9/29/2010	End 9/29/2010	Total Depth (ft)	15	Logged By RNM	Checked By JGR	Driller Boart Longyear	Drilling Method	Sonic (continuous core)
Hammer Data		Drilling Equipment		Rubber Track-Mounted Spider 3 Sonic Drill Rig			A 2 (in) well was installed on 9/29/2010 to a depth of 12.5 (ft).	
Surface Elevation (ft) Vertical Datum		32.94 USACE (Locks)		Top of Casing Elevation (ft)		32.43		
Easting (X) Northing (Y)		1270609.479 239413.962		Horizontal Datum		NAD83 WA State Plane North		
		Groundwater Date Measured		10/7/2010		Depth to Water (ft)		Elevation (ft)
						9.9		23.04
Notes: NE corner of Park, approximately 80 feet north of restrooms								



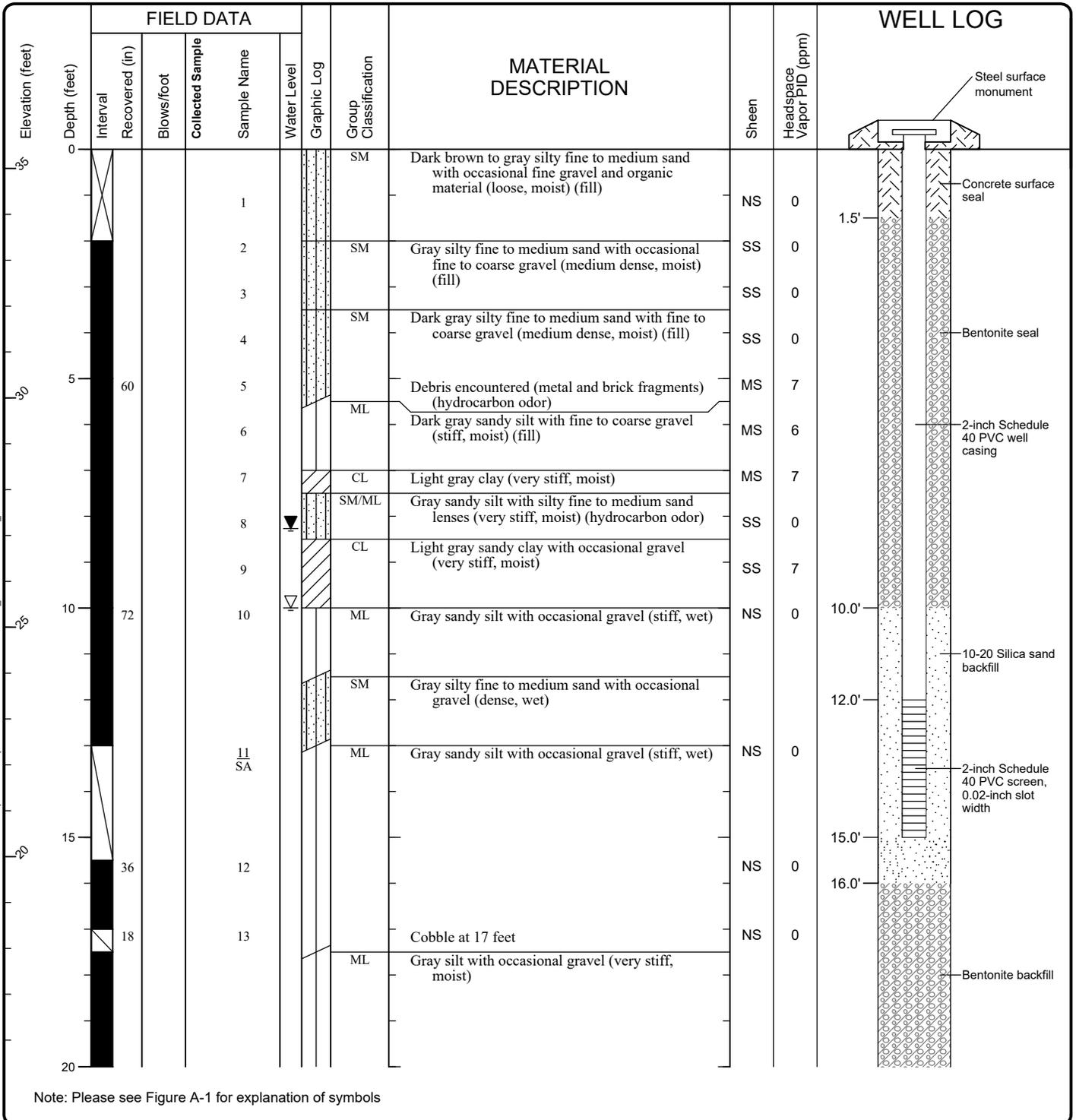
### Log of Monitoring Well MW-26



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\CV\SS\DESKTOP\1018684600.GPJ DBT\template\LIB\template\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

Start Drilled 9/28/2010	End 9/28/2010	Total Depth (ft) 25	Logged By RNM Checked By JGR	Driller Boart Longyear	Drilling Method Sonic (continuous core)
Hammer Data		Drilling Equipment Rubber Track-Mounted Spider 3 Sonic Drill Rig		A 2 (in) well was installed on 9/28/2010 to a depth of 15 (ft).	
Surface Elevation (ft) Vertical Datum USACE (Locks) 35.42		Top of Casing Elevation (ft) 35.15		Groundwater Date Measured 10/1/2010	
Easting (X) Northing (Y) 1270426.364 239268.165		Horizontal Datum NAD83 WA State Plane North		Depth to Water (ft) 8.3 Elevation (ft) 27.15	
Notes: Approximately 200 feet west of playbarn					



### Log of Monitoring Well MW-27



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\CV\SS\DESKTOP\018684600.GPJ\_DBTemplate\lib\template\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\VIC\SS\DESKTOP\18684600.GPJ\_DBTemplate\libTemplate\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	WELL LOG
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level				
20	30			14						 Bentonite backfill
				15						
25	54			16 SA						

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

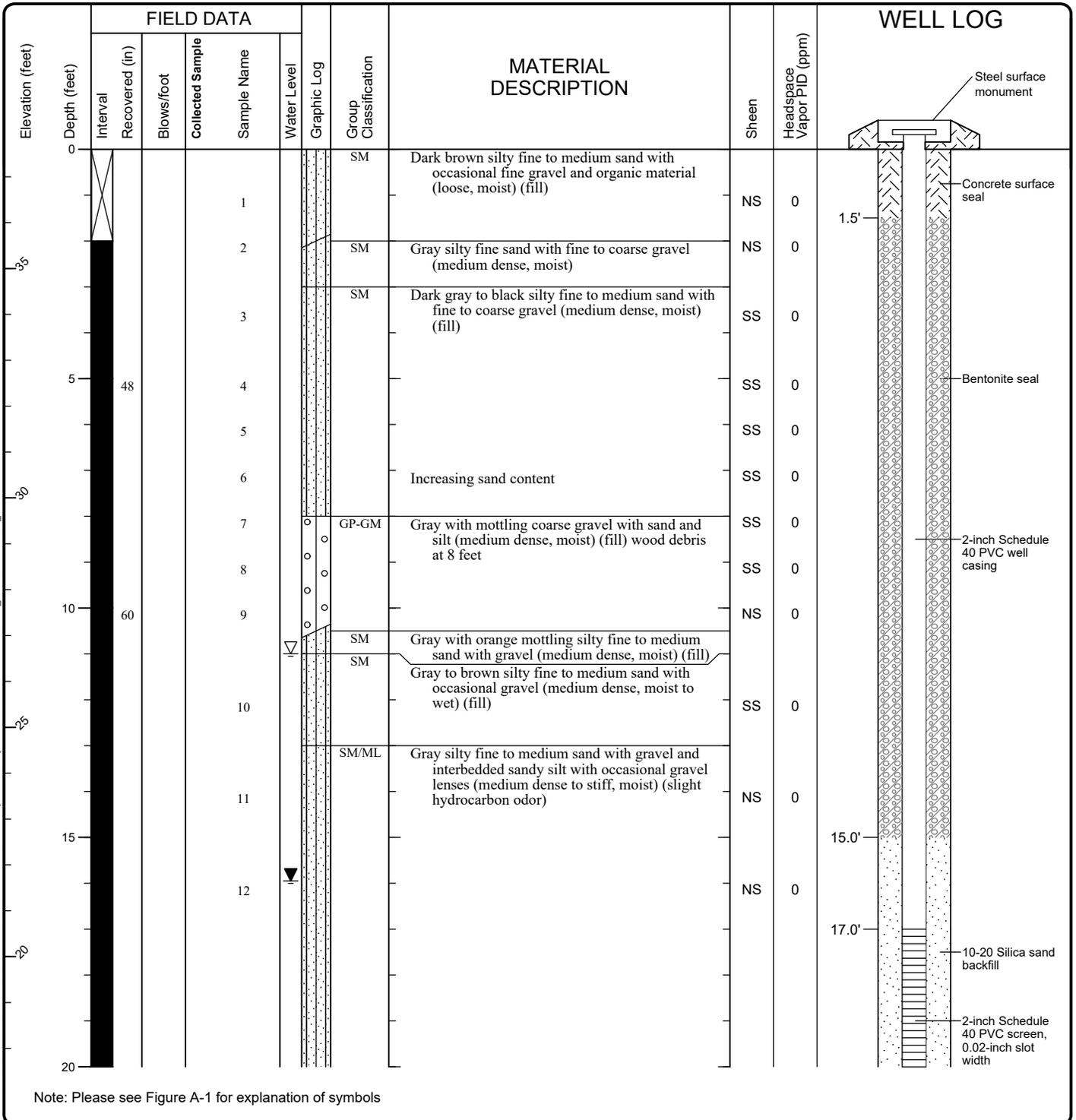
**Log of Monitoring Well MW-27 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Figure A-3  
 Sheet 2 of 2

Start Drilled 9/29/2010	End 9/29/2010	Total Depth (ft)	30	Logged By RNM	Checked By JGR	Driller Boart Longyear	Drilling Method	Sonic (continuous core)
Hammer Data				Drilling Equipment			Rubber Track-Mounted Spider 3 Sonic Drill Rig	
Surface Elevation (ft) Vertical Datum				Top of Casing Elevation (ft)			A 2 (in) well was installed on 9/29/2010 to a depth of 27 (ft).	
Easting (X) Northing (Y)				Horizontal Datum			Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
1270457.835 238800.114				NAD83 WA State Plane North			10/1/2010	16.0 21.65
Notes: Approximately 60 feet east of SE corner Cracking Tower fence								



### Log of Monitoring Well MW-28



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\CV\SS\DESKTOP\018684600.GPJ\_DBT\template\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	WELL LOG
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level				
20		126			13 SA		Slight hydrocarbon odor	NS	0	<p>2-inch Schedule 40 PVC screen, 0.02-inch slot width</p> <p>10-20 Silica sand backfill</p> <p>27.0'</p> <p>28.0'</p> <p>Bentonite backfill</p> <p>30.0'</p>
15						6-inch lense of fine sand with silt and occasional gravel at 22 to 22.5 feet bgs (slight hydrocarbon odor)	NS	0		
25						Becomes wet at 25 feet bgs (slight hydrocarbon odor)	NS	0		
10						5-inch lense of fine to medium sand with silt and occasional gravel at 27 to 27.5 feet bgs (wet)	NS	0		
30		114			17	4-inch lense of fine to medium sand with silt and occasional gravel at 29 to 29.4 feet bgs (wet) (slight hydrocarbon odor)	NS	0		

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

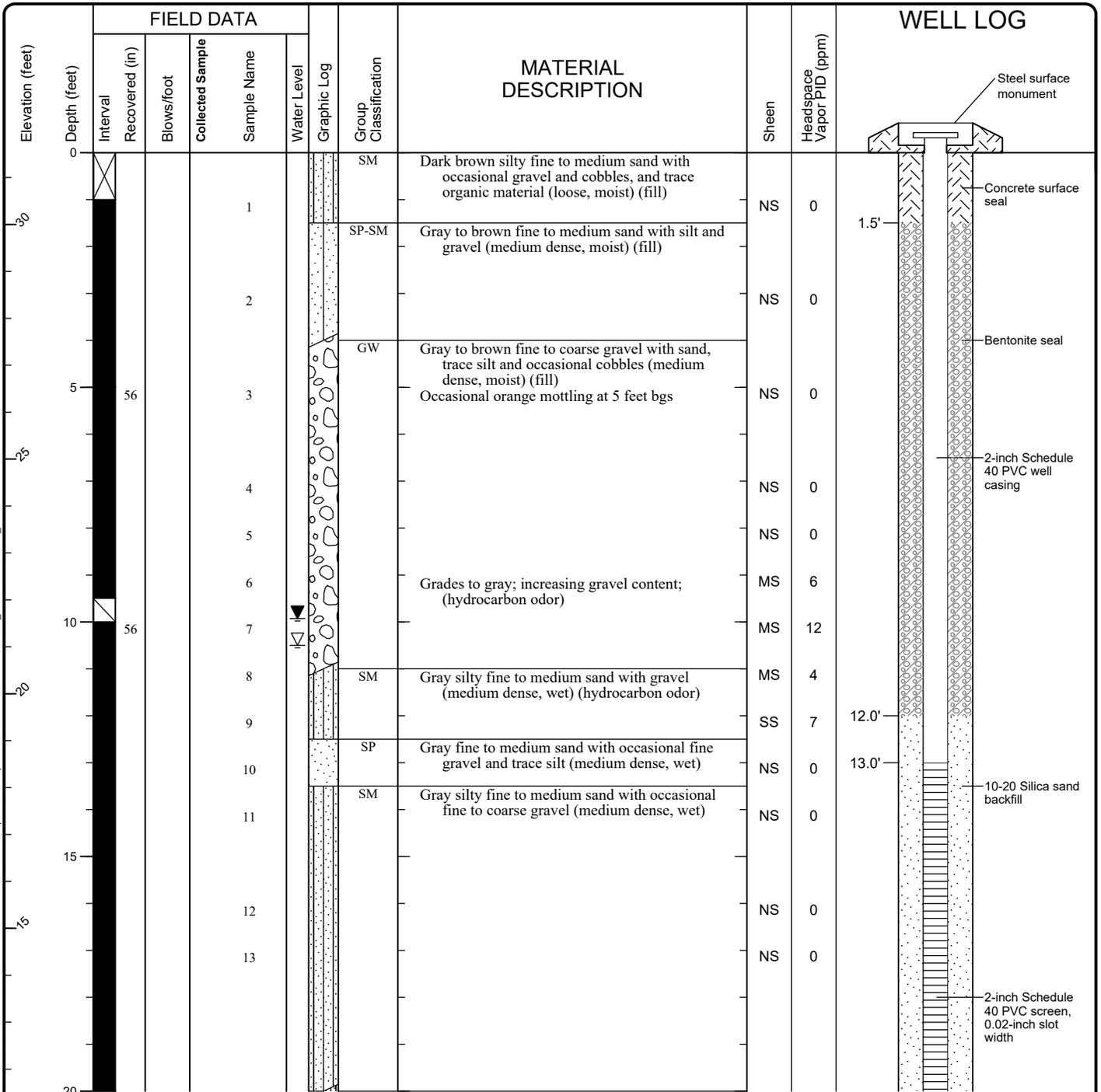
### Log of Monitoring Well MW-28 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Figure A-4  
 Sheet 2 of 2

Start Drilled 9/30/2010	End 9/30/2010	Total Depth (ft) 25	Logged By RNM Checked By JGR	Driller Boart Longyear	Drilling Method Sonic (continuous core)
Hammer Data		Drilling Equipment Rubber Track-Mounted Spider 3 Sonic Drill Rig		A 2 (in) well was installed on 9/30/2010 to a depth of 23 (ft).	
Surface Elevation (ft) Vertical Datum USACE (Locks) 31.53		Top of Casing Elevation (ft) 31.31		Groundwater Date Measured 10/7/2010	
Easting (X) Northing (Y) 1270119.016 238995.775		Horizontal Datum NAD83 WA State Plane North		Depth to Water (ft) 9.9 Elevation (ft) 21.60	
Notes: Approximately 90 feet west of Cracking Tower fence					



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

### Log of Monitoring Well MW-29



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Figure A-5  
 Sheet 1 of 2

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\CV\SS\DESKTOP\PI018684600.GPJ\_DBT\template\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\VIC\SS\DESKTOP\018684600.GPJ\_DBTemplate\libTemplate\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	WELL LOG
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level				
20	123			14			SM	NS	0	<p>2-inch Schedule 40 PVC screen, 0.02-inch slot width</p> <p>10-20 Silica sand backfill</p> <p>Bentonite backfill</p>
20.5				15 SA			SM	NS	0	
21							SM	NS	0	
22							SM	NS	0	
25	67			16			SM	NS	0	

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

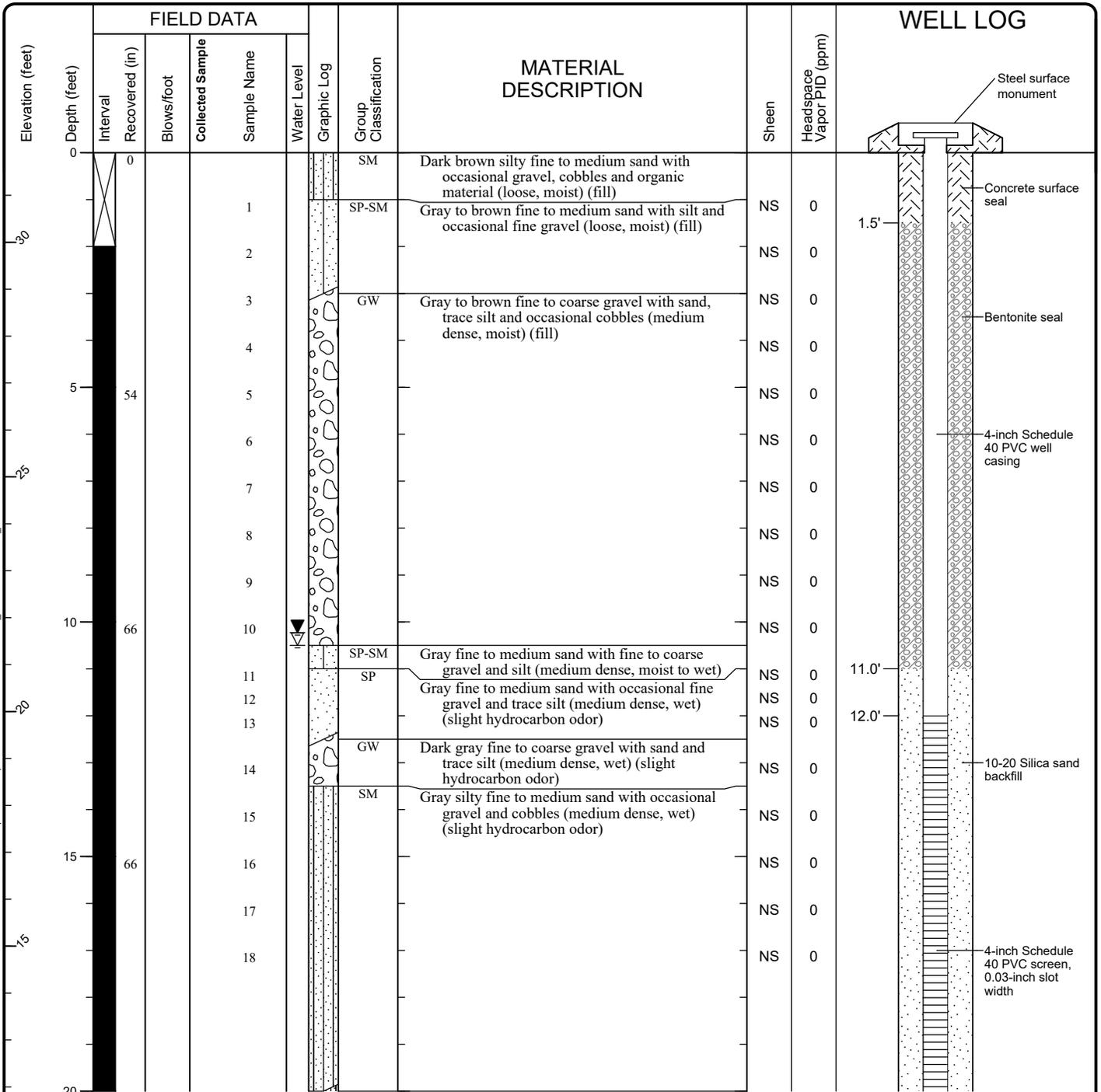
### Log of Monitoring Well MW-29 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Figure A-5  
 Sheet 2 of 2

Start Drilled 9/30/2010	End 9/30/2010	Total Depth (ft)	25	Logged By RNM	Checked By JGR	Driller Boart Longyear	Drilling Method	Sonic (continuous core)
Hammer Data		Drilling Equipment		Rubber Track-Mounted Spider 3 Sonic Drill Rig		A 4 (in) well was installed on 9/30/2010 to a depth of 22 (ft).		
Surface Elevation (ft) Vertical Datum		31.91 USACE (Locks)		Top of Casing Elevation (ft)		31.68		
Easting (X) Northing (Y)		1270114.888 238986.52		Horizontal Datum		NAD83 WA State Plane North		
		Groundwater Date Measured		10/1/2010		Depth to Water (ft)		Elevation (ft)
						10.2		21.68
Notes: Approximately 90 feet west of Cracking Tower fence								



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

### Log of Monitoring Well MW-30



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Figure A-6  
 Sheet 1 of 2

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\CV\SS\DESKTOP\18684600.GPJ\_DBTemplate\lib\template\GEOENGINEERS\GDT\GER\_ENVIRONMENTAL\_WELL

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\VIC\SS\DESKTOP\018684600.GPJ\_DBTemplate\libTemplate\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	WELL LOG
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level				
20	72			19		SM	Gray silty fine to medium sand with fine to coarse gravel and cobbles (medium dense, wet)	NS	0	<p>4-inch Schedule 40 PVC screen, 0.03-inch slot width</p> <p>10-20 Silica sand backfill</p> <p>Bentonite backfill</p>
20				20			6-inch lense of gray sandy silt with occasional fine to coarse gravel from 22 to 22.5 feet bgs (very stiff, wet)	NS	0	
25	66			21				NS	0	

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

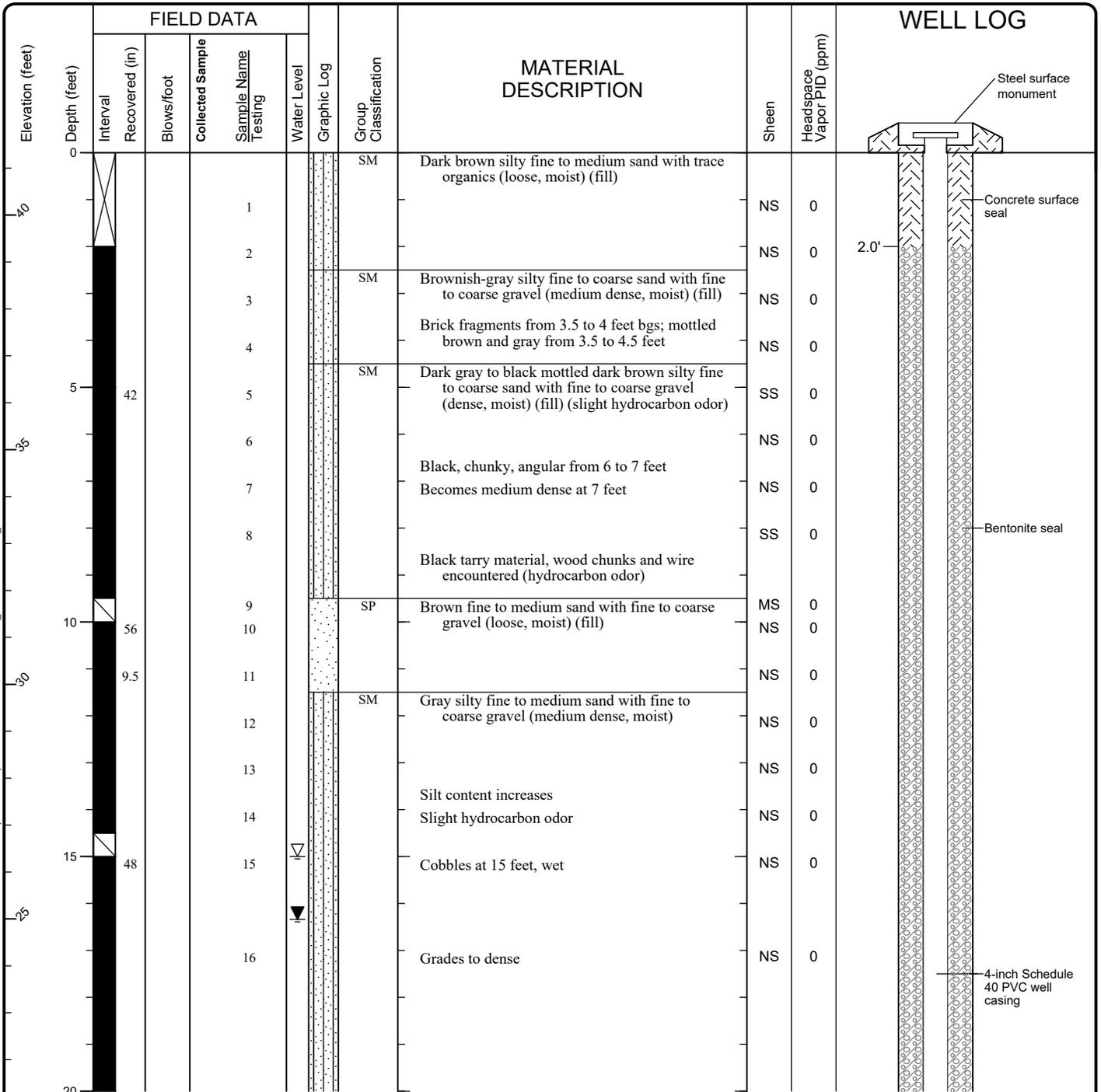
**Log of Monitoring Well MW-30 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Figure A-6  
Sheet 2 of 2

Start Drilled 10/4/2010	End 10/6/2010	Total Depth (ft) 90	Logged By ZAS Checked By JGR	Driller Boart Longyear	Drilling Method Sonic (continuous core)
Hammer Data		Drilling Equipment Rubber Track-Mounted Spider 3 Sonic Drill Rig		A 4 (in) well was installed on 10/6/2010 to a depth of 45 (ft).	
Surface Elevation (ft) Vertical Datum USACE (Locks) 41.33		Top of Casing Elevation (ft) 40.88		Groundwater Date Measured 10/8/2010	
Easting (X) Northing (Y) 1269783.775 239409.421		Horizontal Datum NAD83 WA State Plane North		Depth to Water (ft) 16.3 Elevation (ft) 24.99	
Notes: NW corner of Park, approximately 120 feet NW of well RW-01. Temporary conductor casing (12-inch diameter) used from 0 to 25 feet bgs, with bentonite seal from 20 to 25 feet bgs.					



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

### Log of Monitoring Well MW-31



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\CIVSOSS\DESKTOP\PI018684600.GPJ\_DBTemplate\lib\template\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	WELL LOG	
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					Graphic Log
20	60			17			SM	Slight hydrocarbon odor	NS	0	<p>Bentonite seal (12-inch seal to 25 feet, 8-inch seal 25 to 32 feet)</p> <p>10-20 Silica sand backfill</p> <p>4-inch Schedule 40 PVC screen, 0.03-inch slot width</p>
18				18				Gray silty fine to medium sand with fine to coarse gravel (dense, moist to wet)	NS	0	
				19				Brown occasional cobbles (very dense, moist)	NS	0	
25	60			20					NS	0	
15				21				Wet; sand content increases from 29 to 30 feet	NS	0	
				22					NS	0	
30				23					NS	0	
10				24					NS	0	
				25				Lense of silty sand with lower silt content from 40 to 41 feet (loose, wet)	NS	0	
35	120			26				Brown silty fine to medium sand with fine to coarse gravel (very dense, moist)	NS	0	
5				SA					NS	0	
40	44			27					NS	0	

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

### Log of Monitoring Well MW-31 (continued)

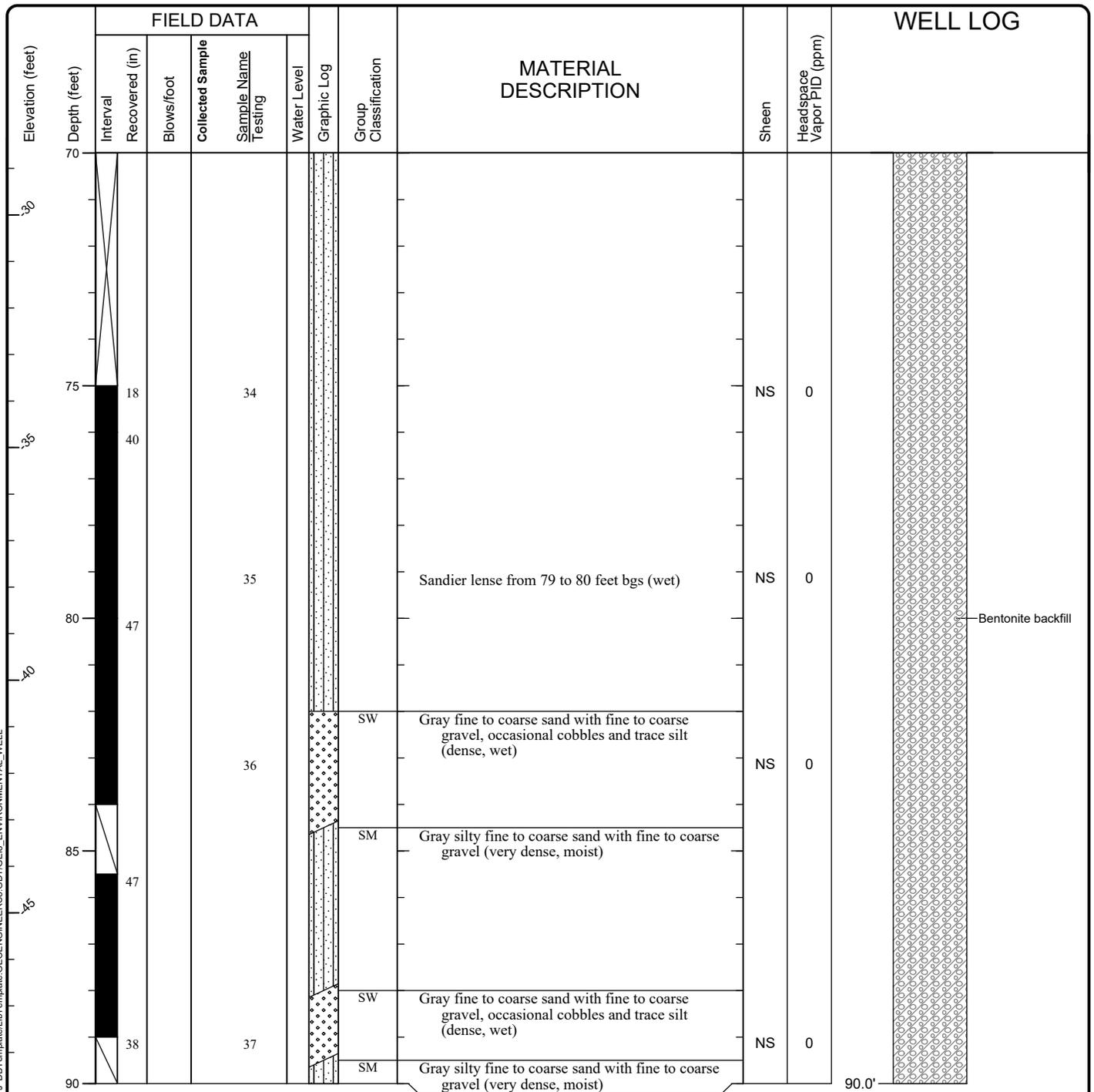


Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Figure A-7  
 Sheet 2 of 4

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\CV\SS\DESKTOP\18684600.GPJ\_DBT\template\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL





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

### Log of Monitoring Well MW-31 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-00

Figure A-7  
 Sheet 4 of 4

Seattle: Date: 12/20/10 Path: C:\DOCUMENTS AND SETTINGS\VIC\SS\DESKTOP\018684600.GPJ\_DBTemplate\lib\template\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

**Play Area Investigation  
(amec 2012)**

**2012 Borings**

PROJECT: Gas Works Park Children's Play Area Investigation Gas Works Park		<b>Log of Boring No. GWP-PA-01</b>	
BORING LOCATION: Gas Works- Play Area		ELEVATION AND DATUM:	
DRILLING CONTRACTOR: Cascade Drilling, LP		DATE STARTED: 9/18/12	DATE FINISHED: 9/18/12
DRILLING METHOD: Hand auger		TOTAL DEPTH (ft.): 7.0	MEASURING POINT: Ground
DRILLING EQUIPMENT: Hand		DEPTH TO WATER (ft.) 5.5	FIRST 5.5
SAMPLING METHOD: Hand auger		LOGGED BY: D. O'Reilly	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: G. Dupuy	REG. NO. L.Hg. 2261

DEPTH (feet)	SAMPLES			OVM READING (ppm)	DESCRIPTION	REMARKS
	Sample No.	Sample	Blows/ Foot		NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	
					Surface Elevation:	
					play sand	OVM = Minirae 2000 PID calibrated with 100 ppm isobutylene gas. Headspace readings collected from ziploc bags filled with soil.
1					POORLY-SORTED SAND (SP): brown (7.5YR 5/2), moist, 60% coarse sand, 40% medium sand	
					POORLY-SORTED SAND with GRAVEL (SP): brown (7.5YR 5/2), moist, 15% subrounded coarse gravel, 30% coarse sand, 55% medium sand	
2	GWP-PA-01-02			0.0	POORLY-SORTED SAND with SILT (SP-SM): dark brown (7.5YR 3/3), moist to wet, 10% fine gravel, 25% coarse sand, 40% medium sand, 25% silt	Collected GWP-PA-01-02 (3x40 mL, 1x8 oz, 1x4 oz for BTEX/8260, 8270/PAHs, and metals).
					POORLY-SORTED SAND with GRAVEL and SILT (SP-SM): dark brown (7.5YR 3/3), moist, 20% fine gravel, 25% coarse sand, 40% medium sand, 15% silt	
3					black staining, no odor, chunks of concrete	
					POORLY-SORTED SAND (SP): brown (7.5YR 5/2), moist, 10% fine gravel, 20% coarse sand, 60% medium sand, 5% fine sand, 5% fines	
4				0.0	large concrete chunks	
					black staining, odor, no standoff reading with PID	
5					POORLY-GRADED GRAVEL with SAND (GP): brown (7.5YR 4/2), moist, slight odor, 10% coarse subrounded gravel, 45% fine subrounded gravel, 30% coarse sand, 15% medium sand	
					large concrete chunks, metal debris (wire?)	
6				0.0	wet	
					many chunks of concrete— backfill? Hard augering, lots of slough	
7					refusal from sloughing hole/ unable to advance through concrete chunks	
8						

PROJECT: Gas Works Park Children's Play Area Investigation Gas Works Park		<b>Log of Boring No. GWP-PA-02</b>	
BORING LOCATION: Gas Works- Play Area		ELEVATION AND DATUM:	
DRILLING CONTRACTOR: Cascade Drilling, LP		DATE STARTED: 9/18/12	DATE FINISHED: 9/18/12
DRILLING METHOD: Hand auger		TOTAL DEPTH (ft.): 4.0	MEASURING POINT: Ground
DRILLING EQUIPMENT: Hand		DEPTH TO WATER (ft.)	FIRST NA   COMPL. NA
SAMPLING METHOD: Hand auger		LOGGED BY: D. O'Reilly	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: G. Dupuy	REG. NO. L.Hg. 2261

DEPTH (feet)	SAMPLES			OVM READING (ppm)	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	REMARKS
	Sample No.	Sample	Blows/ Foot			
					Surface Elevation:	
					play sand	
1					POORLY-GRADED SAND (SP): brown (7.5YR 4/2), moist, 5% fine gravel, 40% coarse sand, 40% medium sand, 15% fine sand more gravel, 10% fine gravel, 40% coarse sand, 40% medium sand, 10% fine sand	OVM = Minirae 2000 PID calibrated with 100 ppm isobutylene gas. Headspace readings collected from ziploc bags filled with soil.
2	GWP-PA-02-02			15.7	POORLY-GRADED SAND with GRAVEL (SP): brown (7.5YR 4/2), moist, slight odor, 15% fine gravel, 35% coarse sand, 40% medium sand, 10% fine sand	
3					POORLY-GRADED GRAVEL with SAND and SILT (GP-GM): dark brown (7.5YR 3/3), moist, odor, 10% coarse subrounded gravel, 40% fine subrounded gravel, 10% coarse sand, 30% medium sand, 10% fines large interconnected chunks of concrete	Collected GWP-PA-02-02 (3x40 mL, 1x8 oz, 1x4 oz for BTEX/8260, 8270/PAHs, and metals).
4	GWP-PA-02-04			12.8	refusal from stitched-together angular concrete chunks	Collected GWP-PA-02-04 (3x40 mL, 1x8 oz, 1x4 oz for BTEX/8260, 8270/PAHs, and metals).
5						
6						
7						
8						

PROJECT: Gas Works Park Children's Play Area Investigation Gas Works Park		<b>Log of Boring No. GWP-PA-03</b>	
BORING LOCATION: Gas Works- Play Area		ELEVATION AND DATUM:	
DRILLING CONTRACTOR: Cascade Drilling, LP		DATE STARTED: 9/18/12	DATE FINISHED: 9/18/12
DRILLING METHOD: Hand auger		TOTAL DEPTH (ft.): 3.0	MEASURING POINT: Ground
DRILLING EQUIPMENT: Hand		DEPTH TO WATER (ft.)	FIRST NA COMPL. NA
SAMPLING METHOD: Hand auger		LOGGED BY: D. O'Reilly	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: G. Dupuy	REG. NO. L.Hg. 2261

DEPTH (feet)	SAMPLES			OVM READING (ppm)	DESCRIPTION	REMARKS
	Sample No.	Sample	Blows/ Foot		NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	
					Surface Elevation:	
					red bricks	
1					POORLY-GRADED SAND with GRAVEL and SILT (SP-SM): brown (7.5YR 5/2), moist, 5% coarse subrounded gravel, 20% fine subrounded gravel, 55% coarse sand, 20% silt as darker colored peds brown (7.5YR 4/2), occasional rounded cobble, more grayish brown silt, fewer gravel, finer sand, 10% coarse gravel, 10% fine gravel, 20% coarse sand, 30% medium sand, 30% fines	OVM = Minirae 2000 PID calibrated with 100 ppm isobutylene gas. Headspace readings collected from ziploc bags filled with soil.
2	GWP-PA-03-02			0.0	POORLY-GRADED GRAVEL with SAND and SILT (GP-GM): dark brown (7.5YR 3/3), moist, 20% coarse subrounded gravel, 30% fine subrounded gravel, 25% medium sand, 25% silt as gray (7.5YR 5/1) peds black staining	Collected GWP-PA-03-02 (3x40 mL, 1x8 oz, 1x4 oz for BTEX/8260, 8270/PAHs, and metals).
3					refusal from large, flat continuous piece of machined wood— porch or patio?	
4				0.0		
5						
6						
7						
8						

PROJECT: Gas Works Park Children's Play Area Investigation Gas Works Park		<b>Log of Boring No. GWP-PA-04</b>	
BORING LOCATION: Gas Works- Play Area		ELEVATION AND DATUM:	
DRILLING CONTRACTOR: Cascade Drilling, LP		DATE STARTED: 9/18/12	DATE FINISHED: 9/18/12
DRILLING METHOD: Hand auger		TOTAL DEPTH (ft.): 6.0	MEASURING POINT: Ground
DRILLING EQUIPMENT: Hand		DEPTH TO WATER (ft.)	FIRST 5      COMPL. NA
SAMPLING METHOD: Hand auger		LOGGED BY: D. O'Reilly	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: G. Dupuy	REG. NO. L.Hg. 2261

DEPTH (feet)	SAMPLES			OVM READING (ppm)	DESCRIPTION	REMARKS
	Sample No.	Sample	Blows/ Foot		NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	
					Surface Elevation:	
1					POORLY-GRADED SAND with GRAVEL (SP): brown (7.5YR 4/2), moist, some black staining, 5% coarse subrounded to subangular gravel, 15% fine subrounded to subangular gravel, 30% coarse sand, 40% medium sand, 10% fine sand ↓ more black staining, 10% coarse gravel, 25% fine gravel, 25% coarse sand, 40% medium sand	OVM = Minirae 2000 PID calibrated with 100 ppm isobutylene gas. Headspace readings collected from ziploc bags filled with soil.
2	GWP-PA-04-02			0.0	POORLY-GRADED SAND with GRAVEL and SILT (SP-SM): black (7.5YR 2.5/1), moist, odor, 5% coarse subrounded to subangular gravel, 15% fine subrounded to subangular gravel, 10% coarse sand, 55% medium sand, 15% fines shreds of wood ↓ chunks of wood, 10% coarse gravel, 15% fine gravel, 10% coarse sand, 50% medium sand, 20% fines ↓ less wood	Collected GWP-PA-04-02 (3x40 mL, 1x8 oz, 1x4 oz for BTEX/8260, 8270/PAHs, and metals).
3					↓ less odor, dark brown (7.5YR 3/3)	
4	GWP-PA-04-04			0.0	almost no wood, still occasional shred (<5%)	Collected GWP-PA-04-04 (3x40 mL, 1x8 oz, 1x4 oz for BTEX/8260, 8270/PAHs, and metals).
5					↓ wet, still black SP-SM, slight odor	
6				0.0	refusal from caving hole/ flowing wet gravelly sand	
7						
8						

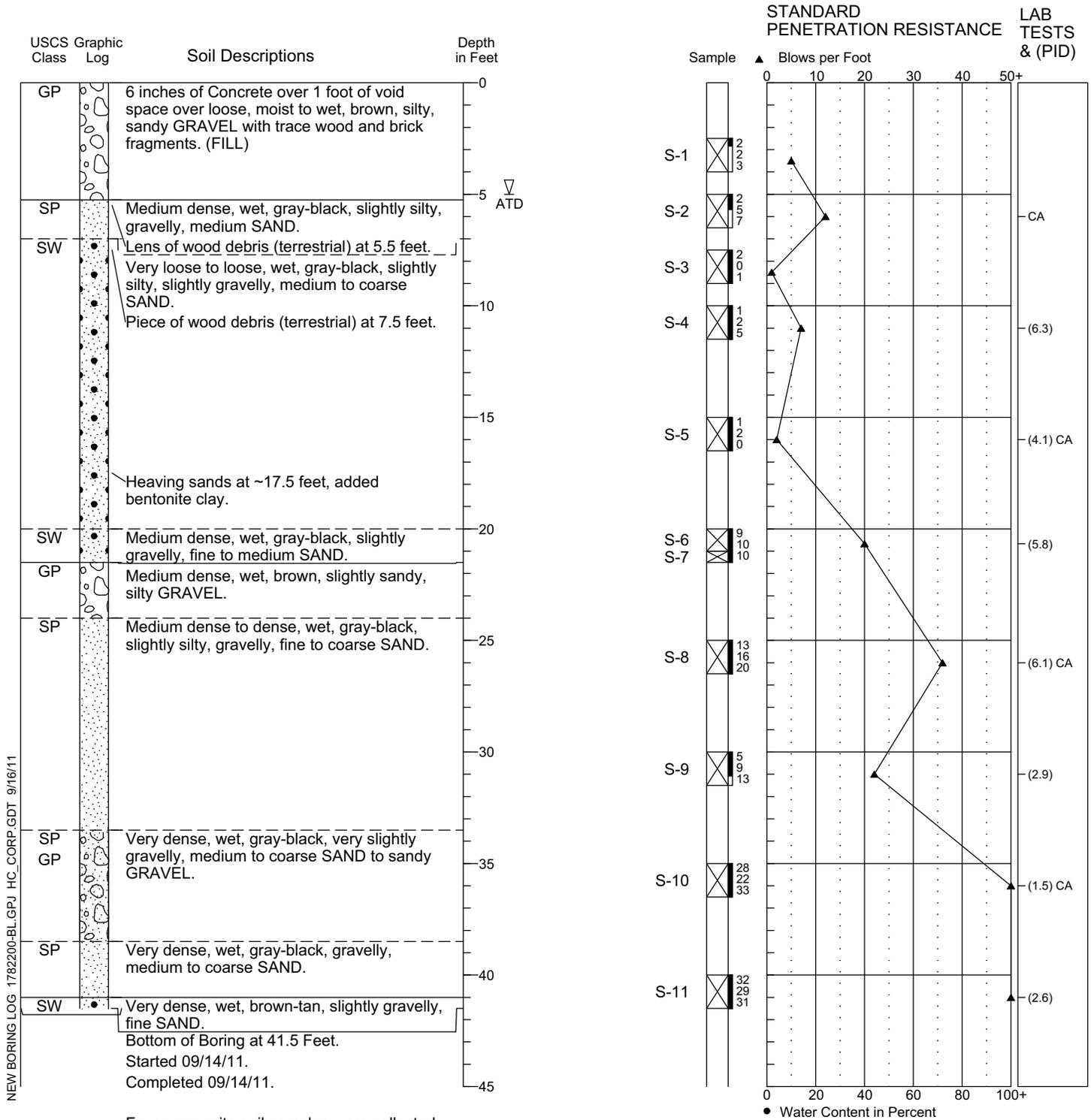
**Harbor Patrol Investigation  
(Hart Crowser 2012)**

**2012 Borings**

# Boring Log B-1

Location: N 239183.707 E 1269586.5238  
 Approximate Ground Surface Elevation: 22 Feet  
 Horizontal Datum: NAD83/91 Washington State Plane North  
 Vertical Datum: NA

Drill Equipment: Hollow Stem Auger  
 Hammer Type: SPT  
 Hole Diameter: 4 inches  
 Logged By: C. Rust Reviewed By: A. Goodwin



Four composite soil samples were collected from 0 to 10 feet (CA-1), 10 to 20 feet (CA-2), 20 to 30 feet (CA-3), and 30 to 41.5 feet (CA-4) for chemical analyses.

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

**Supplemental Investigation  
(GeoEngineers, Inc. 2013)**

**2013 Borings**

## SOIL CLASSIFICATION CHART

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

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

### Sampler Symbol Descriptions

	2.4-inch I.D. split barrel
	Standard Penetration Test (SPT)
	Shelby tube
	Piston
	Direct-Push
	Bulk or grab

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

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

## ADDITIONAL MATERIAL SYMBOLS

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

### Groundwater Contact



Measured groundwater level in exploration, well, or piezometer



Measured free product in well or piezometer

### Graphic Log Contact



Distinct contact between soil strata or geologic units



Approximate location of soil strata change within a geologic soil unit

### Material Description Contact



Distinct contact between soil strata or geologic units



Approximate location of soil strata change within a geologic soil unit

### Laboratory / Field Tests

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

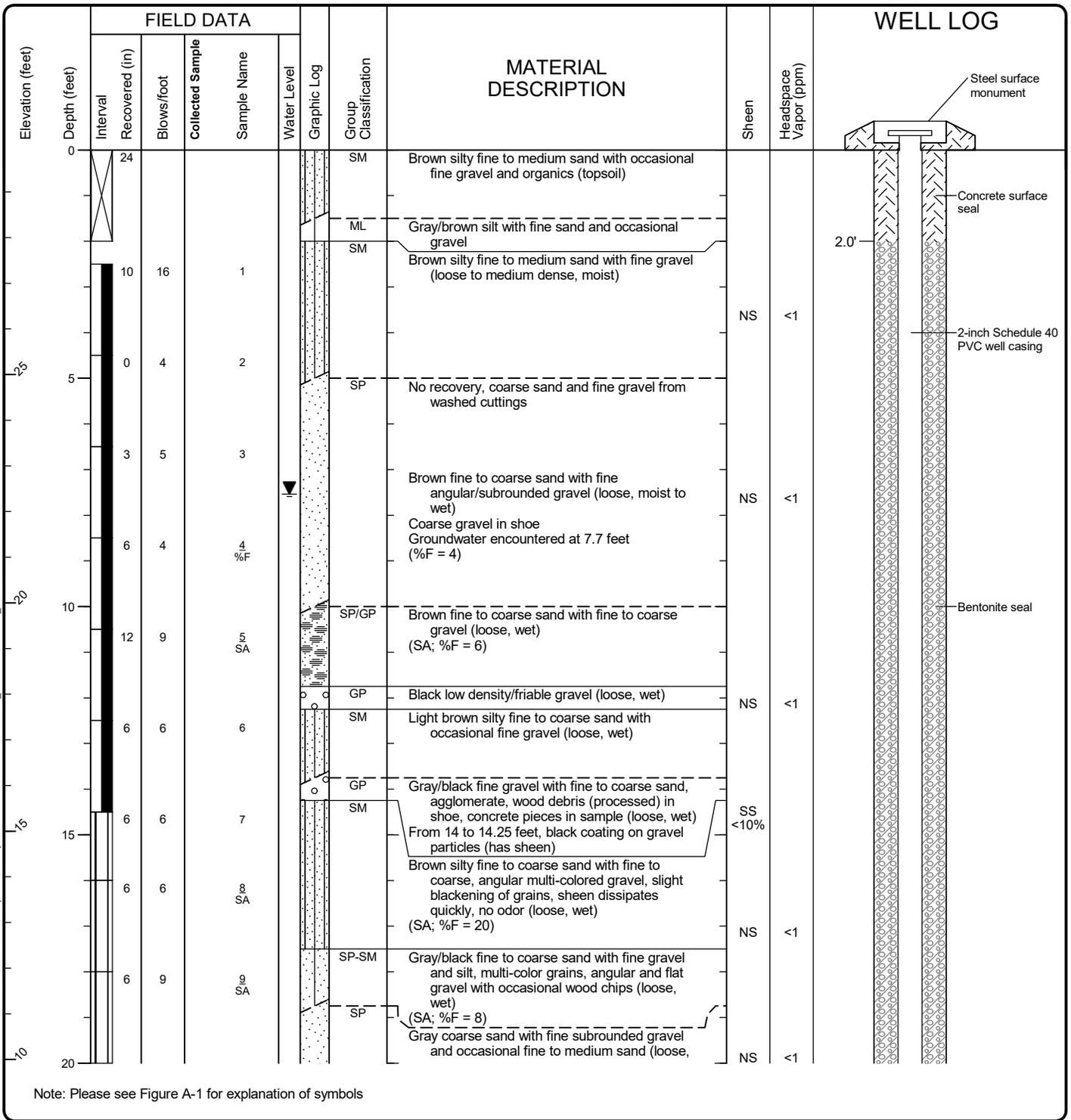
### Sheen Classification

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

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

## KEY TO EXPLORATION LOGS

Start Drilled 4/10/2013	End 4/12/2013	Total Depth (ft) 47	Logged By PDR Checked By ZAS/TB	Driller Boart Longyear	Drilling Method Mud Rotary/Sonic (continuous core)
Hammer Data Auto 140 (lbs) / 30 (in) Drop	Drilling Equipment CME-850 Tracked Rig; Rubber Track-Mounted Spider 3 Sonic Rig		A 2 (in) well was installed on 4/12/2013 to a depth of 47 (ft).		
Surface Elevation (ft) Vertical Datum 29.92 USACE (Locks)	Top of Casing Elevation (ft) 29.43		Groundwater Date Measured 4/22/2013		
Easting (X) Northing (Y) 1269843.3 238868.03	Horizontal Datum NAD83 WA State Plane North		Depth to Water (ft) 7.5 Elevation (ft) 22.4		
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs; mud Rotary 2 to 18.5 feet; hollow-stem auger 18.5 to 41 feet, sonic 41 to 47 feet. Temporary conductor casing (10-inch diameter) used from 0 to 41 feet bgs with bentonite seal from 38 to 41 feet bgs.					

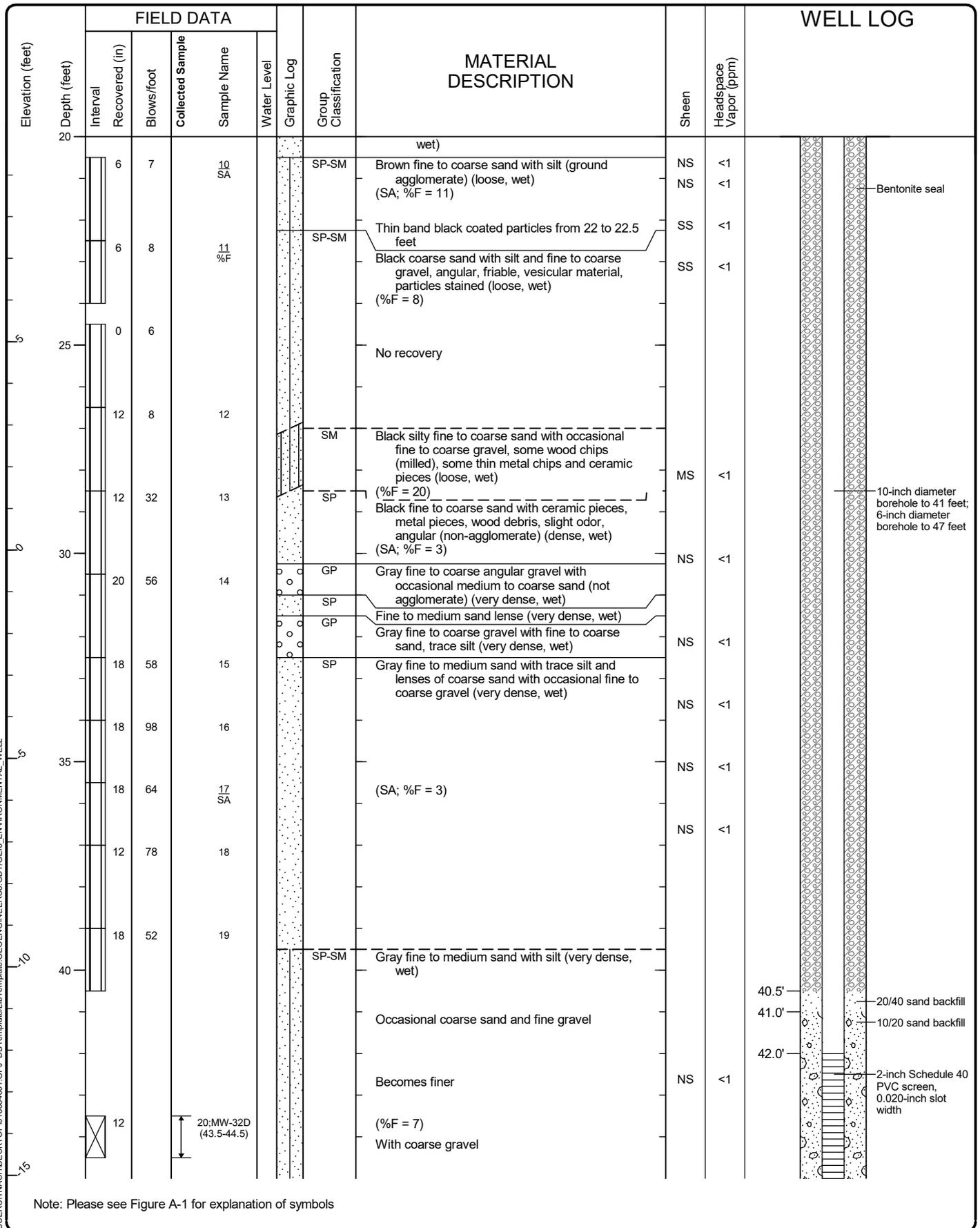


### Log of Monitoring Well MW-32D/GEO-1



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Seattle: Date: 5/14/13 Path: C:\USER\ST\TNA\SH\DESK\TOP\018684601.GPJ\_DB\Template\lib\Template\GEOENGINEERS\GDT\GEIB\_ENVIRONMENTAL\_WELL



### Log of Monitoring Well MW-32D/GEO-1 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\01884601.GPJ\_DB\Template\GEOENGINEERS\GDT\GEB\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level				
45	12	81		21			SM			
							NS	<1		

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

**Log of Monitoring Well MW-32D/GEO-1 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled	4/11/2013	End	4/11/2013	Total Depth (ft)	49.5	Logged By	ARJ	Checked By	ZAS/TB	Driller	Boart Longyear	Drilling Method	Hollow-stem Auger
Surface Elevation (ft)	30.17			Hammer Data	Autohammer	140 (lbs) / 30 (in) Drop		Drilling Equipment	CME-850 Tracked Rig				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North					Groundwater	Depth to Water (ft)	Elevation (ft)	
Easting (X)	1269972.23			Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.									
Northing (Y)	238799.4												

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0						SM	Brown silty fine to medium sand with occasional fine gravel, trace brick and asphalt fragments (loose, moist)	NS	<1	
5	10	22		1			Black at 5.5 feet Rock and crushed concrete from 5.5 to 6 feet, one piece of tan friable agglomerate	NS	<1	Concrete and rock in base of sampler Hard drilling
10	17	6		2 SA			With white soft silt (bentonite like)			Groundwater encountered at 8 feet SA (%F = 17)
15	22	7		3:GEO-2 14-16 SA		SP-SM	Gravelly fine sand with mostly decayed wood fragments and glass shards	NS	<1	Bentonite layer, pea gravel layer (1-inch thick), geomembrane at 10 feet
							Black fine to coarse sand with gravel and silt; gravel is agglomerate red, white, friable, occasional glass fragments and rubber fragments, occasional fine gravel, trace mostly decayed wood, one ceramic piece with filigree (loose, wet)	SS	<1	SA (%F = 7)
20	9	10		4 %F		SP-SM	Black fine to medium sand; sand particles tan, white, brown, friable agglomerate, shell fragments?, occasional rubber, one piece thin metal highly corroded, trace wood fragments highly decayed, one piece of white ceramic with filigree (medium dense,	NS	<1	%F = 11

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

### Log of Boring GEO-2



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-3  
 Sheet 1 of 3

Seattle, Date: 7/30/13 Path: P:\0018684601\GINT\018684601.GPJ DBT\template\lbt\template\GEOENGINEERS.GDT\GEB ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
20									wet)			
25	4	*50/5"		5 SA			SM	Black silty fine to medium sand with trace rubber fragments, one piece of white fine gravel friable agglomerate (medium dense, wet)	NS	<1	SA (%F = 23) *Possibly poor blowcount data (heave?)	
30	18	50/4"		6			SP	Gray fine to medium sand with trace wood fragments (2-inch bark strand?) (medium dense, wet)	NS	<1	Heave in hole Possibly poor blowcount data	
35	18	26		7 SA			GP	Occasional fine gravel, one piece of ceramic (slough from above?) Gray fine to coarse gravel with fine to medium sand (medium dense, wet)	NS	<1	SA (%F = 2) Add water to prevent heave	
40	18	52		8 SA			GP	Gray fine to coarse gravel with medium to coarse sand (very dense, wet)			SA (%F = 2) Rough drilling	

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

### Log of Boring GEO-2 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-3  
 Sheet 2 of 3

Seattle, Date: 7/30/13 Path: P:\0018894601\GINT\018894601.GPJ.DBT\template\lib\template\GEOENGINEERS.GDT\GEB\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
45	5	50/5"		SA			SM			SA (%F = 2)
	4	50/4"		10						

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

**Log of Boring GEO-2 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled	4/12/2013	End	4/12/2013	Total Depth (ft)	31.5	Logged By	ARJ	Checked By	ZAS/TB	Driller	Boart Longyear	Drilling Method	Hollow-stem Auger
Surface Elevation (ft) Vertical Datum	40.18 USACE (Locks)			Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	CME-75 Truck-Mounted Rig				
Easting (X) Northing (Y)	1270009.66 239157.27			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.													

Elevation (feet)	FIELD DATA						Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					
0	0	24					SM	Dark brown silty fine sand (topsoil)			
							SM	Tan silty fine to medium sand with occasional gravel, occasional concrete and trace brick fragments (loose, moist)	NS	<1	Strong odor
							SM	Black silty fine to medium sand with gravel, trace wood fragments, partially decayed (medium dense, moist)	NS	<1	
5	5	10	*50/5"		1		SS			<1	Large rock in sampler shoe *Blowcount not representative
							SP	Brown fine to medium sand with fine to coarse gravel, trace silt (medium dense, moist)			
10	10	14			2		NS			<1	
							GP	Tan with gray mottling fine to coarse gravel with medium to coarse sand (medium dense, moist)			
15	15	20			3	SA	NS			<1	SA (%F = 1)
							SP	Tan medium sand with occasional fine gravel (dense, wet)			

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

### Log of Boring GEO-3



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-4  
 Sheet 1 of 2

Seattle: Date: 8/11/13 Path: P:\01\86846\01\GINT\018684601\GPJ\_DBT\template\LIB\template\GEOENGINEERS.GDT\GEOENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20		16	53		SA			SP	Gray medium to coarse sand with fine gravel (dense, wet)	SA (%F = 5)
25		24	50/6"		5			GP	Gray fine to coarse gravel with medium to coarse sand (very dense, wet)	Heave in hole
30		17	50/5"		6			SM	Gray silty medium to coarse sand with fine gravel, layered with occasional medium to coarse sand with fine gravel (very dense, wet)	

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

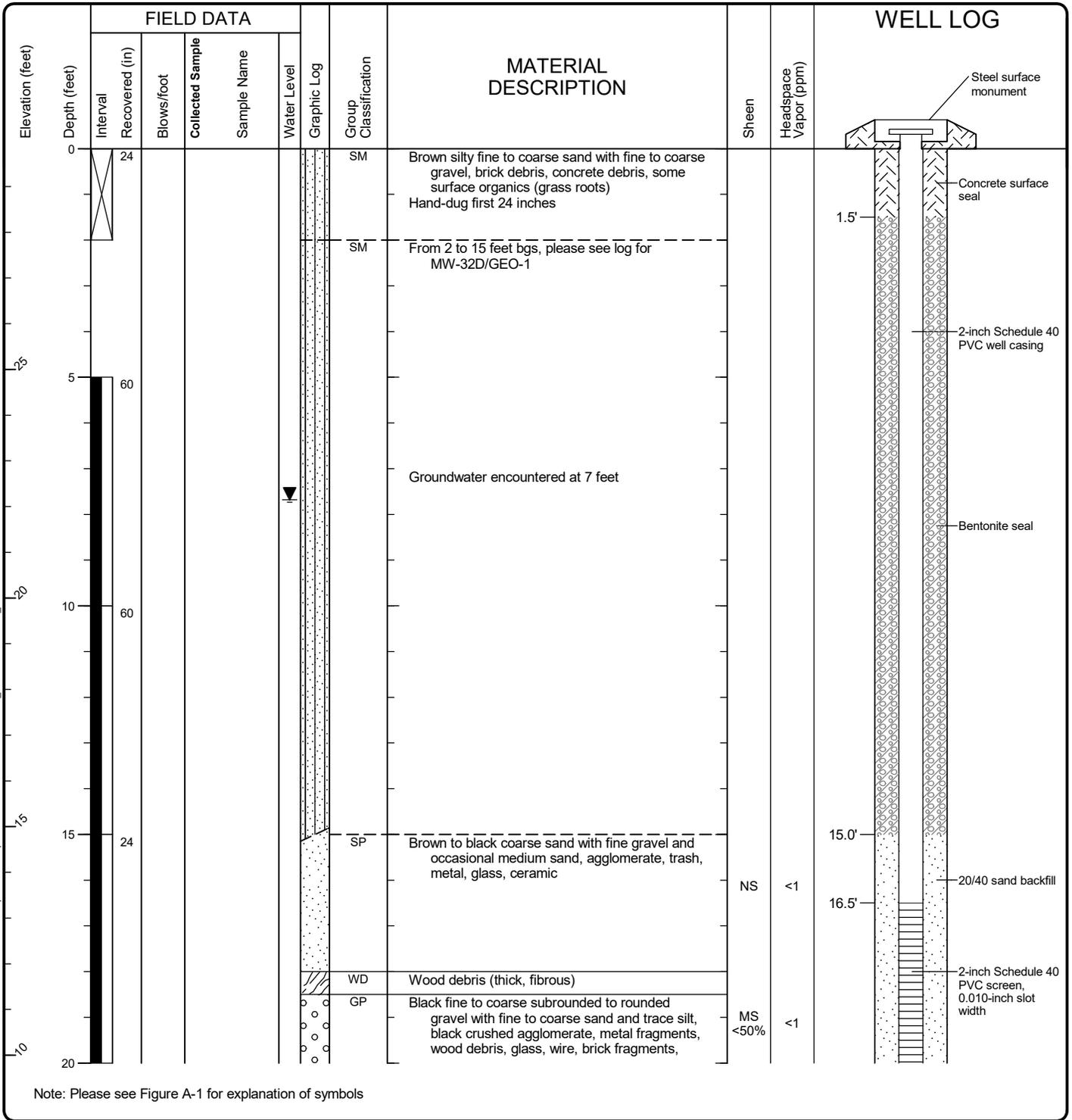
### Log of Boring GEO-3 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-4  
 Sheet 2 of 2

Drilled	Start 4/12/2013	End 4/12/2013	Total Depth (ft)	35	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)	
Hammer Data					Drilling Equipment	Rubber Track-Mounted Spider 3 Sonic Drill Rig		A 2 (in) well was installed on 4/12/2013 to a depth of 31.3 (ft).			
Surface Elevation (ft)	29.83		Top of Casing Elevation (ft)	29.29		Groundwater Date Measured		Depth to Water (ft)	Elevation (ft)		
Vertical Datum	USACE (Locks)				Horizontal Datum		NAD83 WA State Plane North		4/22/2013	7.7	22.2
Easting (X)	1269847.34										
Northing (Y)	238864.97										
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.											



### Log of Monitoring Well MW-32S



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Seattle: Date: 5/14/13 Path: C:\USER\STNASH\DESKTOP\01884601.GPJ\_DB\Template\GeoENGINEERS\GDT\GEIR\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name							
20	60								nails, and ceramic, sheen is rainbow color, hydrocarbon odor			
25	60									SS	<1	
30	60									SS	<1	
								SP	Gray fine to coarse sand with trace silt	NS	<1	31.0' 31.3'
									With occasional fine gravel			32.0'
35												35.0'

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

**Log of Monitoring Well MW-32S (continued)**

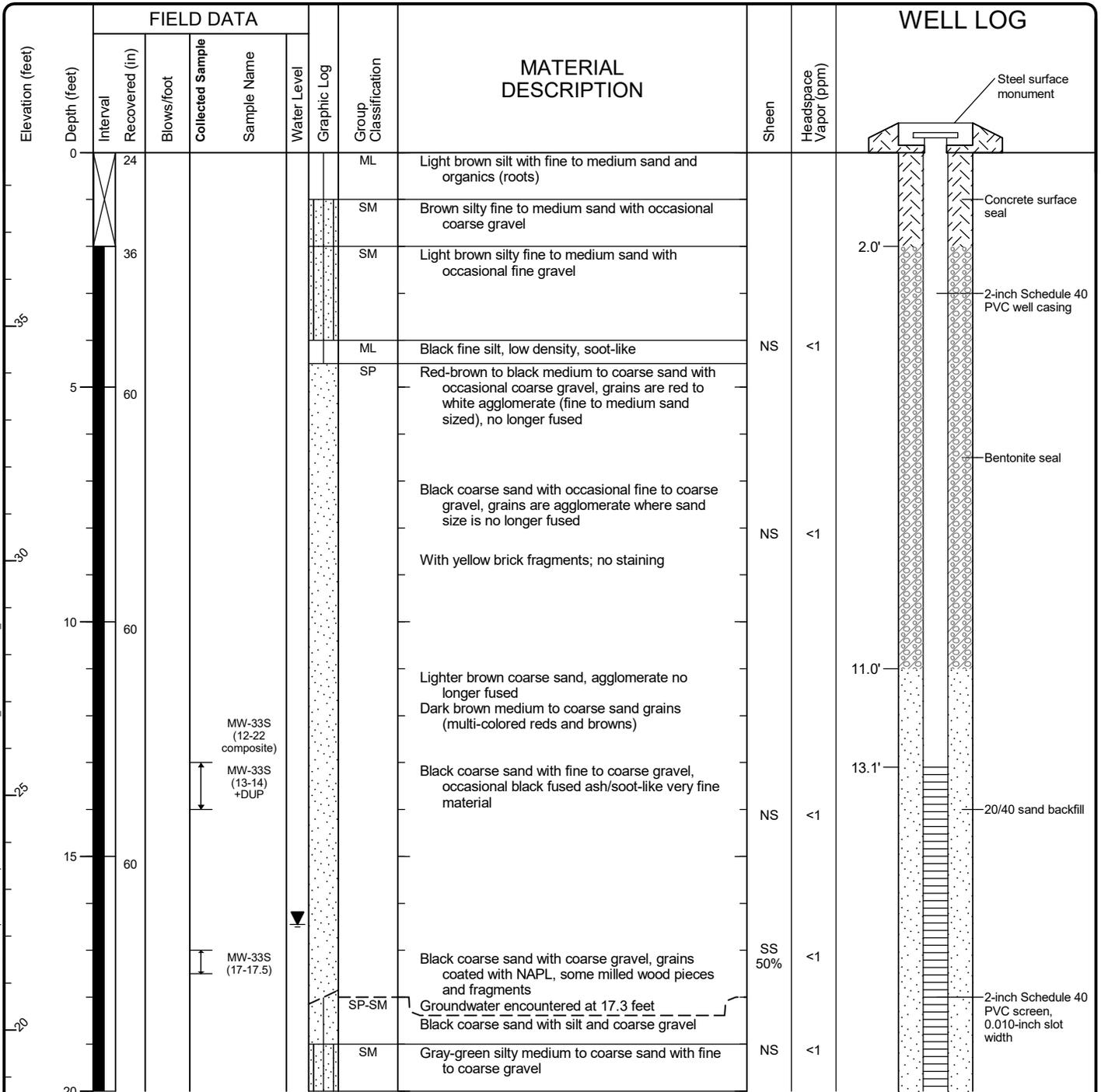


Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-5  
 Sheet 2 of 2



Drilled	Start 3/28/2013	End 3/28/2013	Total Depth (ft)	30	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)	
Hammer Data					Drilling Equipment	Rubber Track-Mounted Spider 3 Sonic Drill Rig			A 2 (in) well was installed on 3/28/2013 to a depth of 22.5 (ft).		
Surface Elevation (ft)	38.7				Top of Casing Elevation (ft)	38.26			Groundwater Date Measured	4/22/2013	
Vertical Datum	USACE (Locks)						Depth to Water (ft)	16.5		Elevation (ft)	21.8
Easting (X)	1270318.67				Horizontal Datum	NAD83 WA State Plane North					
Northing (Y)	238748.97										
Notes: Second attempt. Hand-dug with posthole digger from 0 to 2 feet bgs.											



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

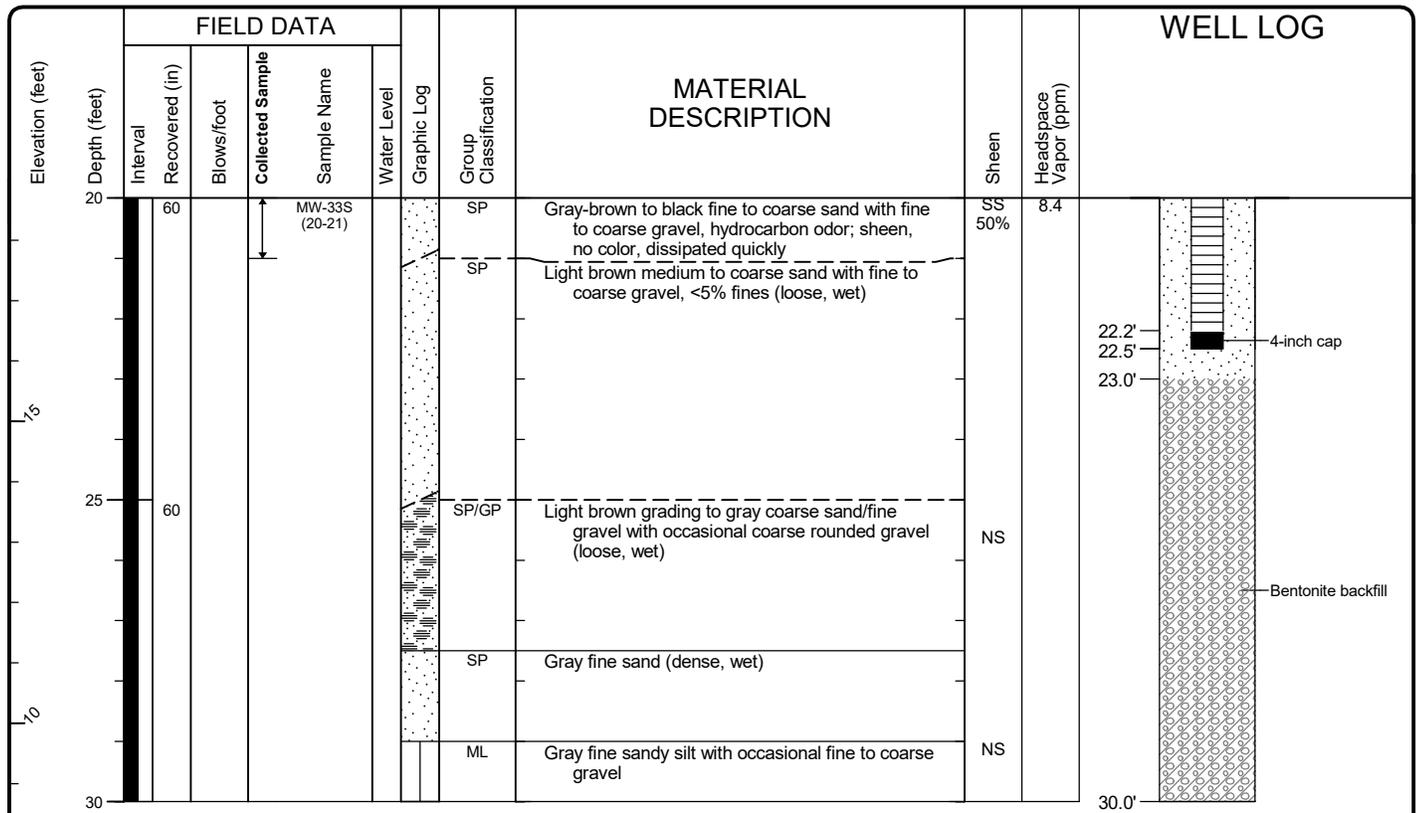
### Log of Monitoring Well MW-33S(b)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-7  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\0186-846-01\_GPJ\_DB\Template\GeoENGINEERS\GDT\GEIB\_ENVIRONMENTAL\_WELL



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

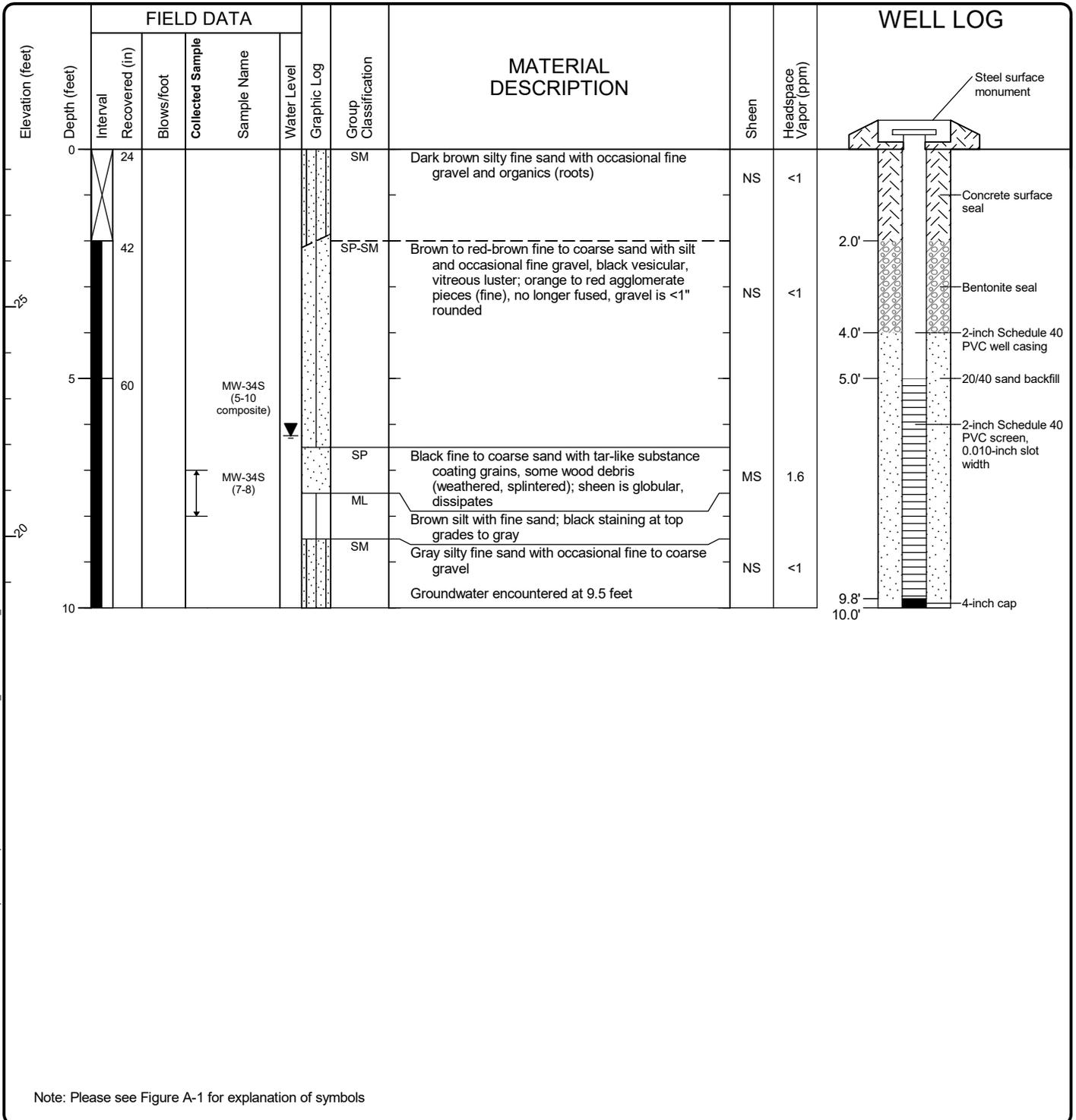
### Log of Monitoring Well MW-33S(b) (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-7  
 Sheet 2 of 2

Drilled	Start 3/27/2013	End 3/27/2013	Total Depth (ft)	10	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)	
Hammer Data					Drilling Equipment	Rubber Track-Mounted Spider 3 Sonic Drill Rig		A 2 (in) well was installed on 3/27/2013 to a depth of 10 (ft).			
Surface Elevation (ft)	28.44		Top of Casing Elevation (ft)	28.05		Groundwater Date Measured		Depth to Water (ft)	Elevation (ft)		
Vertical Datum	USACE (Locks)				Horizontal Datum		NAD83 WA State Plane North		4/22/2013	6.3	22.2
Easting (X)	1270501.78										
Northing (Y)	238734.93										
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.											



### Log of Monitoring Well MW-34S



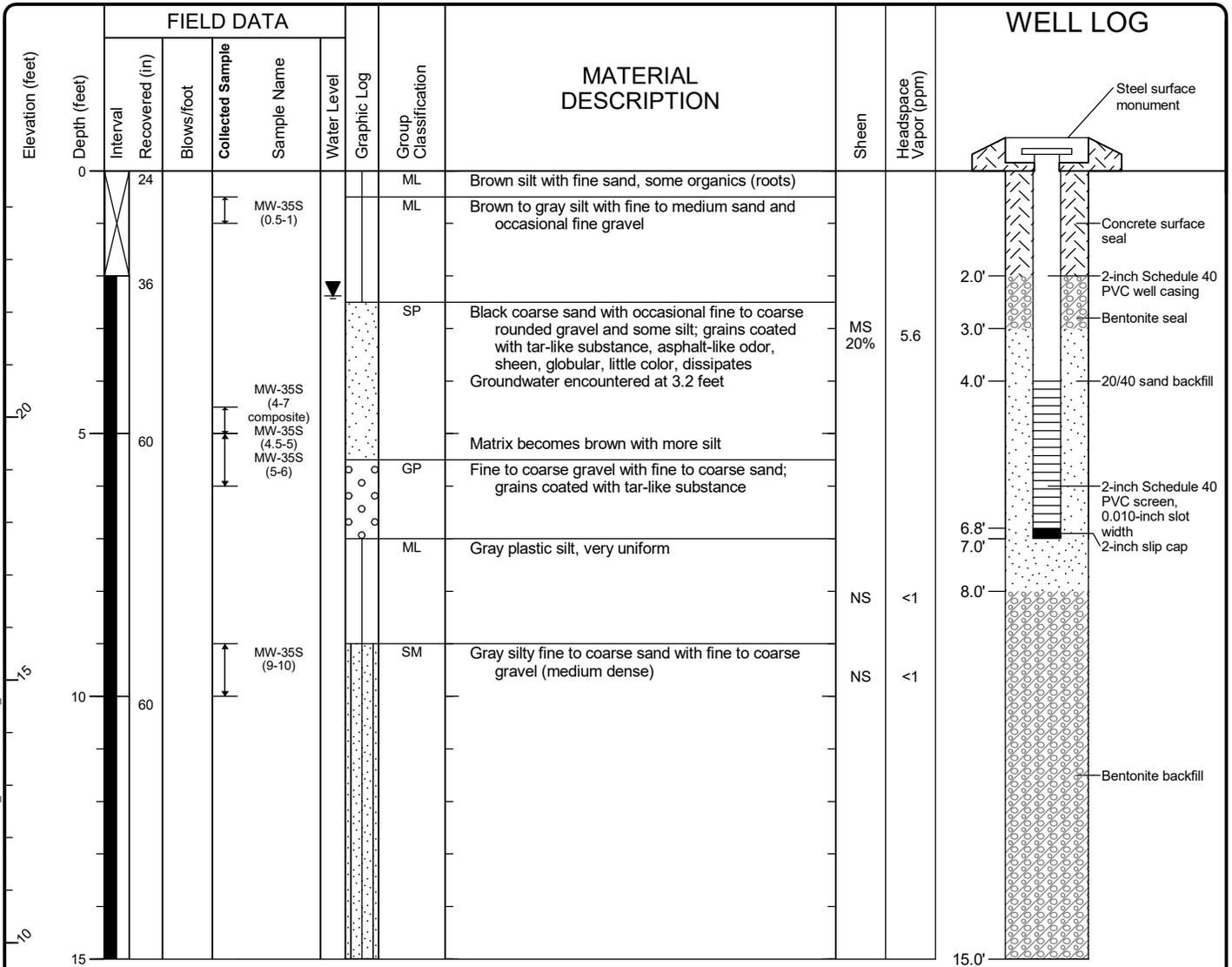
Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-8  
 Sheet 1 of 1

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\0186-846-01.GPJ\_DBTemplate\env\GEOENGINEERS\GDT\GEI\ENVIRONMENTAL\_WELL

Drilled	Start 3/27/2013	End 3/27/2013	Total Depth (ft)	15	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)	
Hammer Data					Drilling Equipment	Rubber Track-Mounted Spider 3 Sonic Drill Rig			A 2 (in) well was installed on 3/27/2013 to a depth of 7 (ft).		
Surface Elevation (ft)	24.69				Top of Casing Elevation (ft)	24.15			Groundwater Date Measured	4/22/2013	
Vertical Datum	USACE (Locks)						Depth to Water (ft)	2.4		Elevation (ft)	22.3
Easting (X)	1270634.86				Horizontal Datum	NAD83 WA State Plane North					
Northing (Y)	238807.89										

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.



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

### Log of Monitoring Well MW-35S



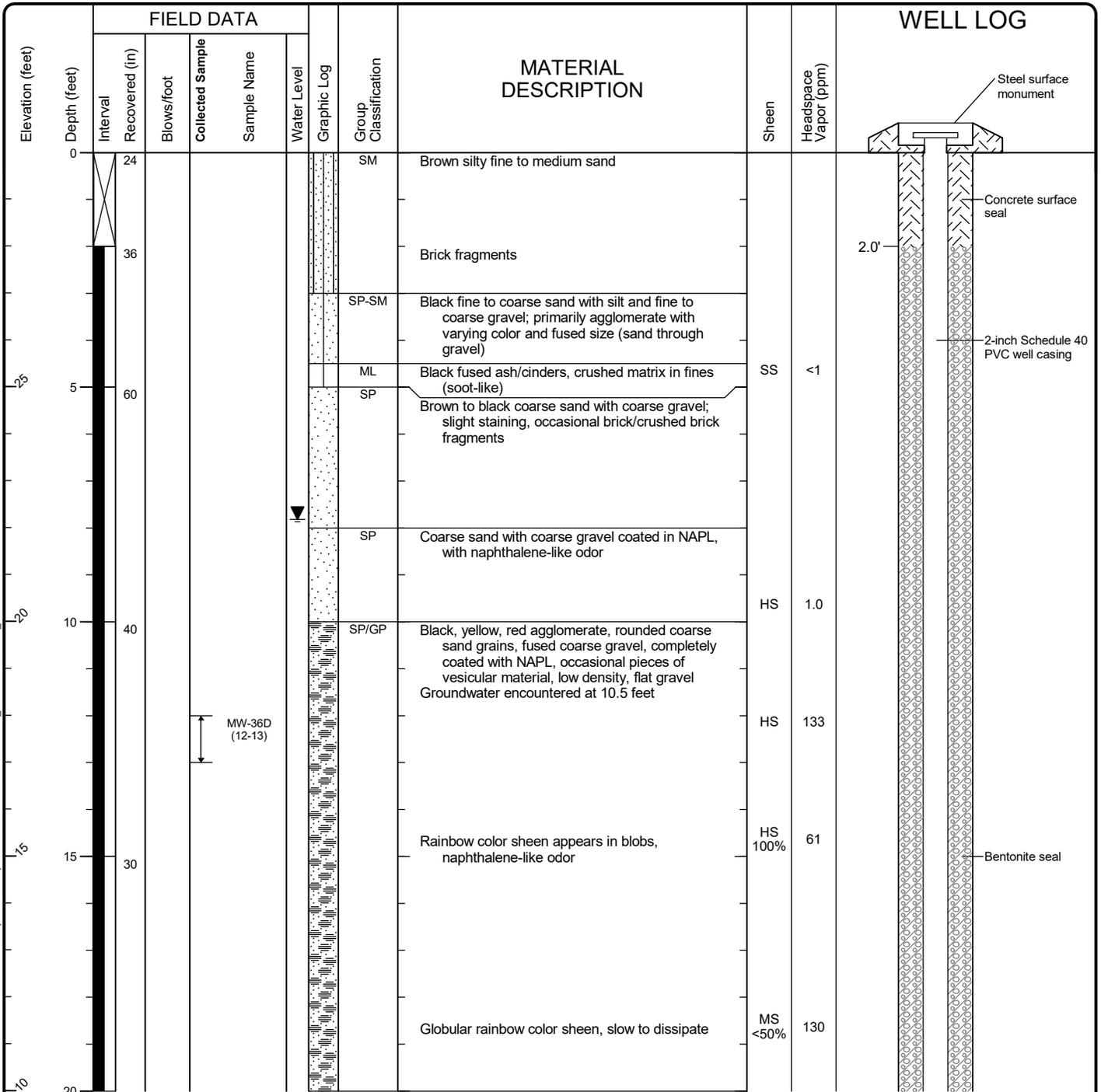
Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-9  
 Sheet 1 of 1

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\0186-846-01.GPJ\_DB\Template\GeoENGINEERS\GDT\GEIR\_ENVIRONMENTAL\_WELL

Drilled	Start 3/28/2013	End 3/29/2013	Total Depth (ft)	35	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)	
Hammer Data					Drilling Equipment	Rubber Track-Mounted Spider 3 Sonic Drill Rig			A 2 (in) well was installed on 3/29/2013 to a depth of 34.1 (ft).		
Surface Elevation (ft)	29.99				Top of Casing Elevation (ft)	29.55			Groundwater Date Measured	4/22/2013	
Vertical Datum	USACE (Locks)							Depth to Water (ft)	7.8	Elevation (ft)	22.2
Easting (X) Northing (Y)	1270785.63 239091.49				Horizontal Datum	NAD83 WA State Plane North					

Notes: Hand-dug with poshole digger from 0 to 2 feet bgs. Temporary conductor casing (10-inch diameter) used from 0 to 28 feet bgs. with bentonite seal from 25 to 28 feet bgs.



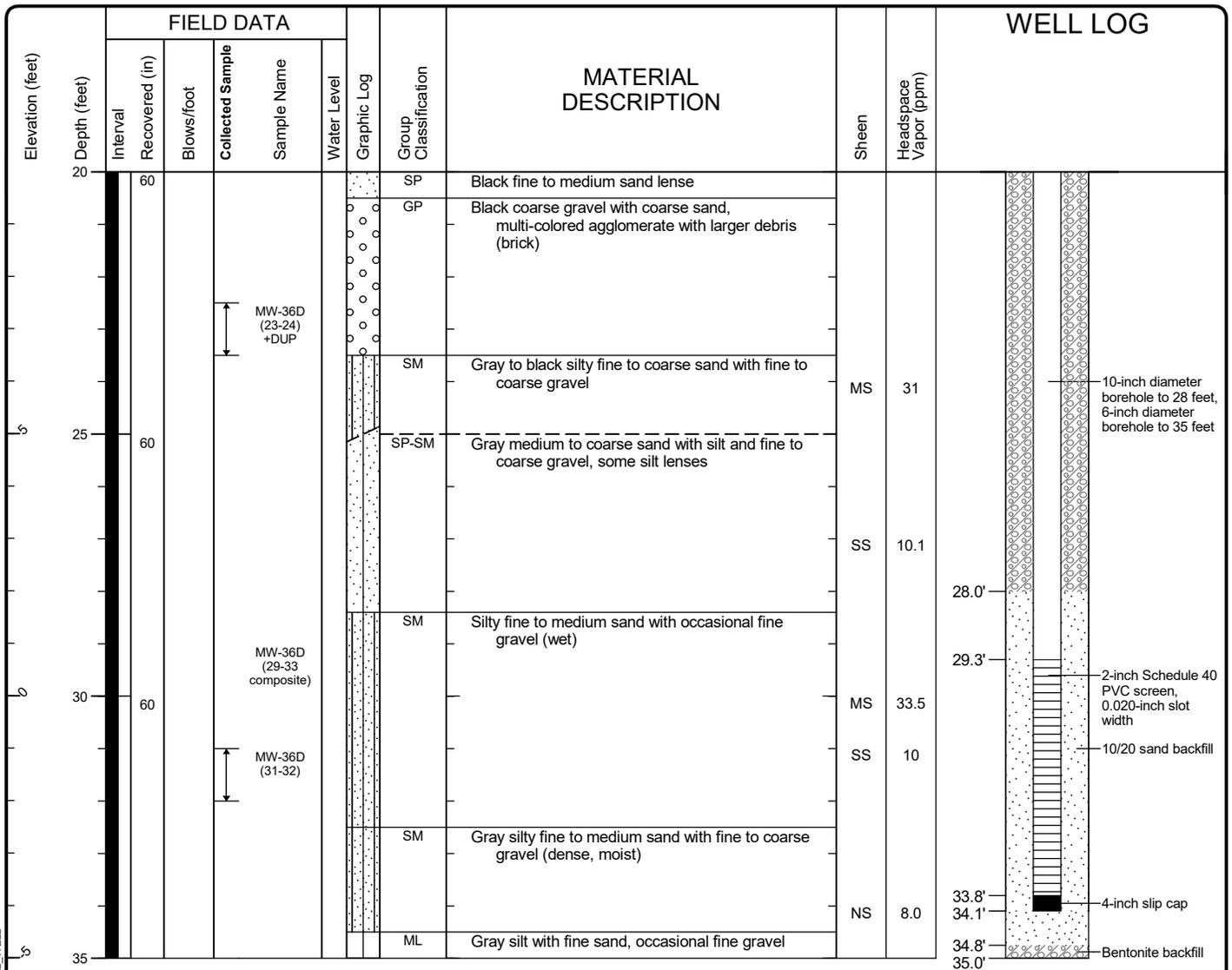
Note: Please see Figure A-1 for explanation of symbols

### Log of Monitoring Well MW-36D



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-10  
 Sheet 1 of 2



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

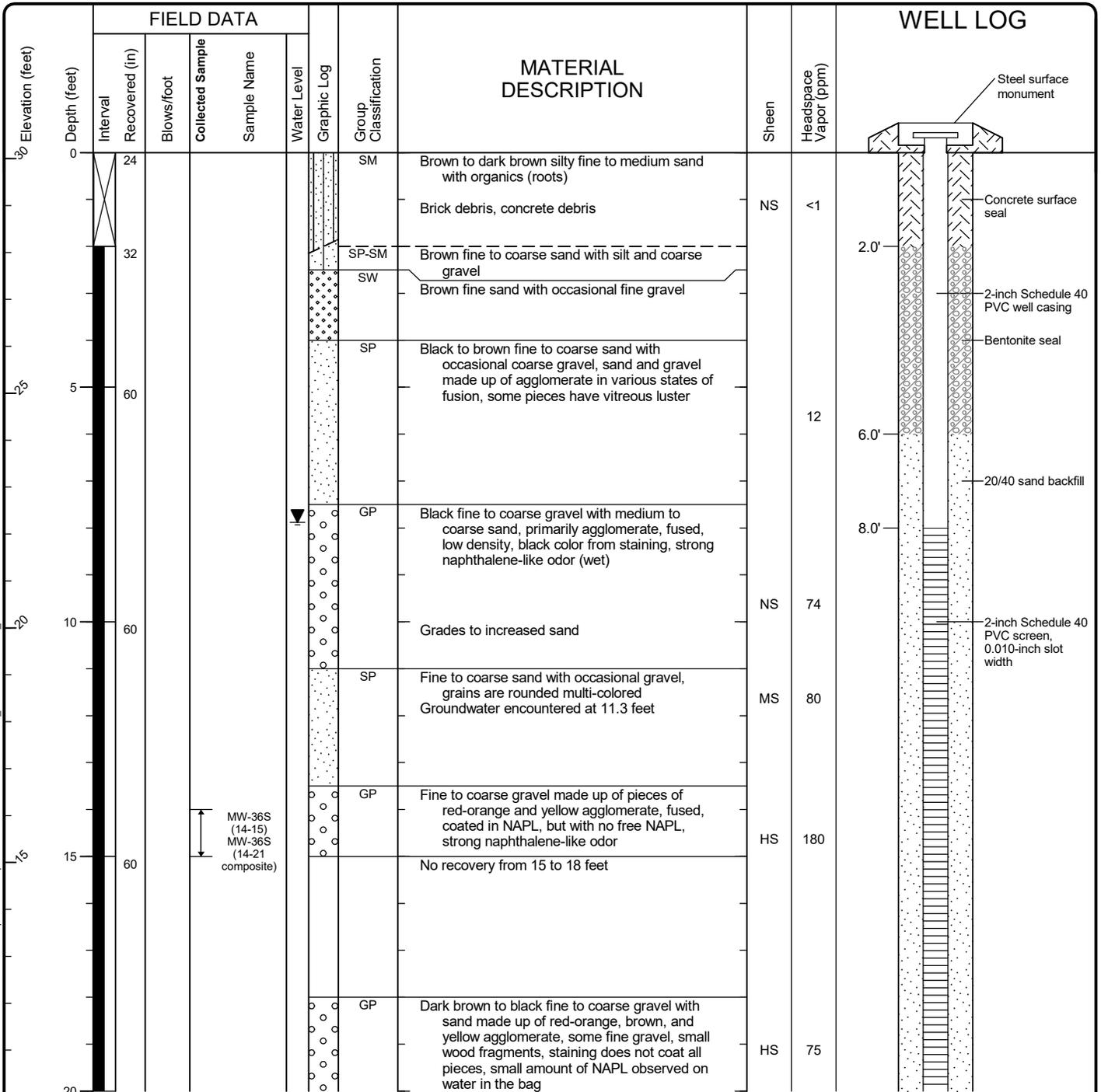
### Log of Monitoring Well MW-36D (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-10  
 Sheet 2 of 2

Start Drilled 3/29/2013	End 3/29/2013	Total Depth (ft) 24	Logged By Checked By PDR ZAS	Driller Boart Longyear	Drilling Method Sonic (continuous core)
Hammer Data		Drilling Equipment Rubber Track-Mounted Spider 3 Sonic Drill Rig		A 2 (in) well was installed on 3/29/2013 to a depth of 23 (ft).	
Surface Elevation (ft) Vertical Datum USACE (Locks) 30.13		Top of Casing Elevation (ft) 29.62		Groundwater Date Measured 4/22/2013	
Easting (X) Northing (Y) 1270783.61 239086.77		Horizontal Datum NAD83 WA State Plane North		Depth to Water (ft) 7.9 Elevation (ft) 22.3	
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.					



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

### Log of Monitoring Well MW-36S



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-11  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\01884601.GPJ\_DBTemplate\libTemplate\GEOENGINEERS\GDT\GEIR\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level				
20		48								
				MW-36S (22.5-23)						
						SM	Black coarse gravel (1/2"), smaller pieces are broken up agglomerate, heavily coated with free NAPL	HS	62	
							Silty fine to medium sand with occasional fine gravel	HS	88	
								SS	13	22.8' 23.0' 23.5' 24.0'

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

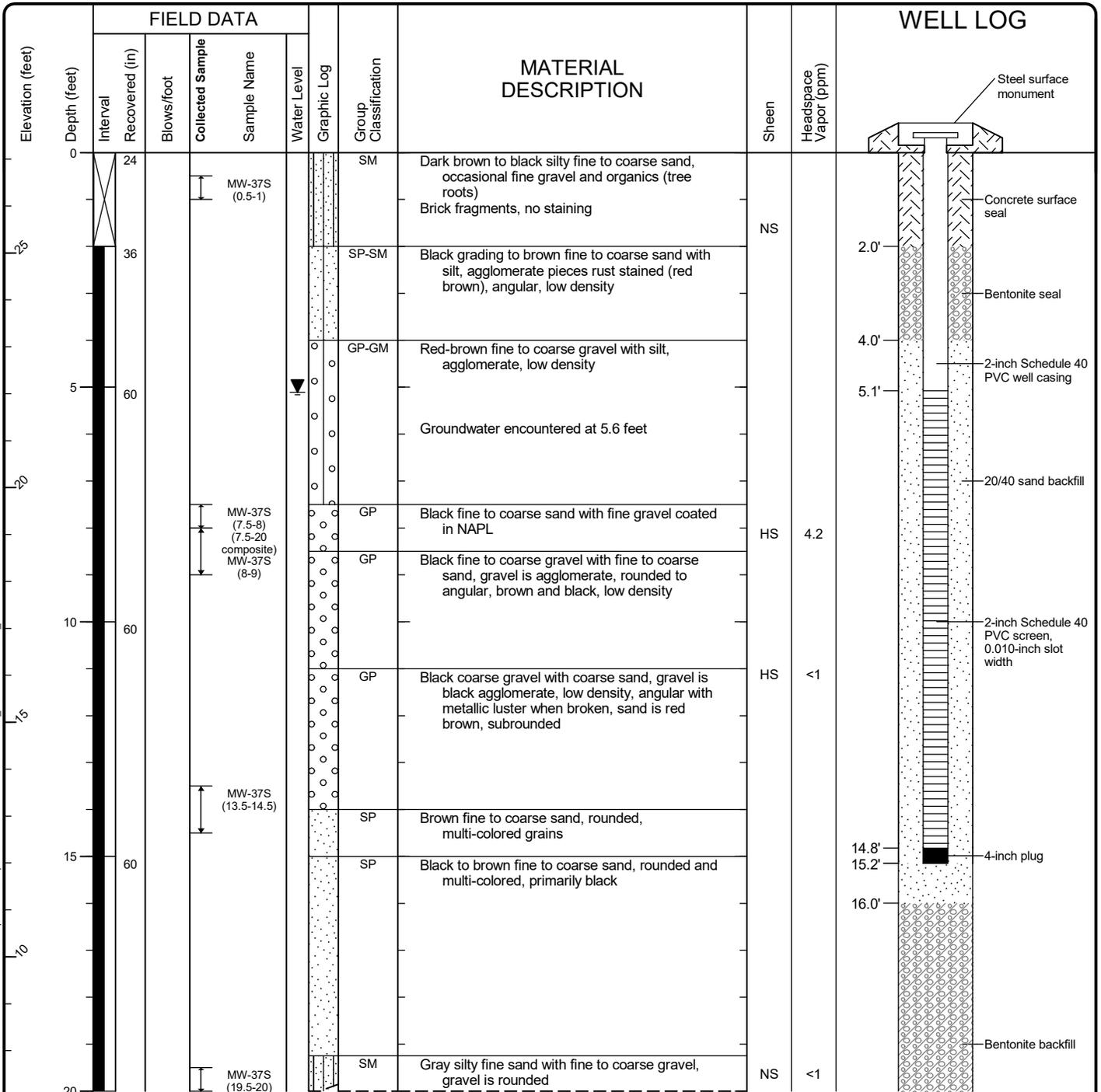
### Log of Monitoring Well MW-36S (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-11  
 Sheet 2 of 2

Start Drilled 3/26/2013	End 3/26/2013	Total Depth (ft) 22	Logged By Checked By PDR ZAS	Driller Boart Longyear	Drilling Method Sonic (continuous core)
Hammer Data		Drilling Equipment Rubber Track-Mounted Spider 3 Sonic Drill Rig		A 2 (in) well was installed on 3/26/2013 to a depth of 15.15 (ft).	
Surface Elevation (ft) Vertical Datum 27.14 USACE (Locks)		Top of Casing Elevation (ft) 26.85		Groundwater Date Measured 4/22/2013	
Easting (X) Northing (Y) 1270816.75 239231.18		Horizontal Datum NAD83 WA State Plane North		Depth to Water (ft) 5.1 Elevation (ft) 22.0	
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.					



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

### Log of Monitoring Well MW-37S



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-12  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\018684601.GPJ\_DB\Template\GeoENGINEERS\GDT\GEI\ENVIRONMENTAL\_WELL

Seattle: Date: 5/14/13 Path: C:\USER\STNASH\DESKTOP\01884601.GPJ\_DBTemplate\GeoENGINEERS\GDT\GEIR\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level				
20	24						SM	Gray silty fine to medium sand with occasional fine to coarse rounded gravel (dense, wet)		22.0'

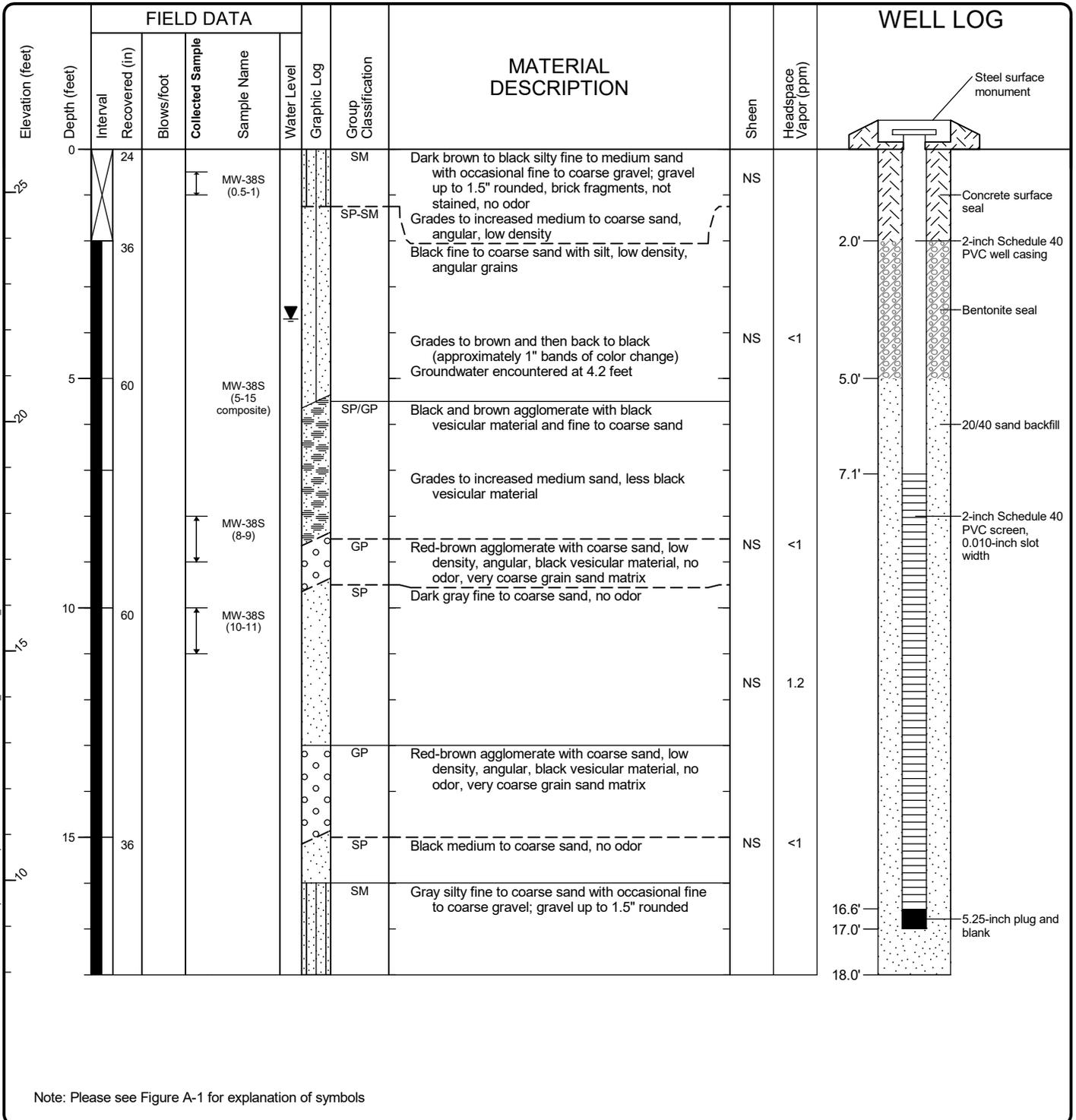
Note: Please see Figure A-1 for explanation of symbols

**Log of Monitoring Well MW-37S (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled	3/26/2013	End	3/26/2013	Total Depth (ft)	18	Logged By	PDR ZAS	Checked By	ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)		
Hammer Data						Drilling Equipment	Rubber Track-Mounted Spider 3 Sonic Drill Rig			A 2 (in) well was installed on 3/26/2013 to a depth of 17 (ft).					
Surface Elevation (ft)	25.94		Vertical Datum		USACE (Locks)	Top of Casing Elevation (ft)	25.42			Groundwater Date Measured	4/22/2013	Depth to Water (ft)	3.7	Elevation (ft)	22.2
Easting (X)	1270820.88		Northing (Y)		239318.1	Horizontal Datum	NAD83 WA State Plane North								
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.															



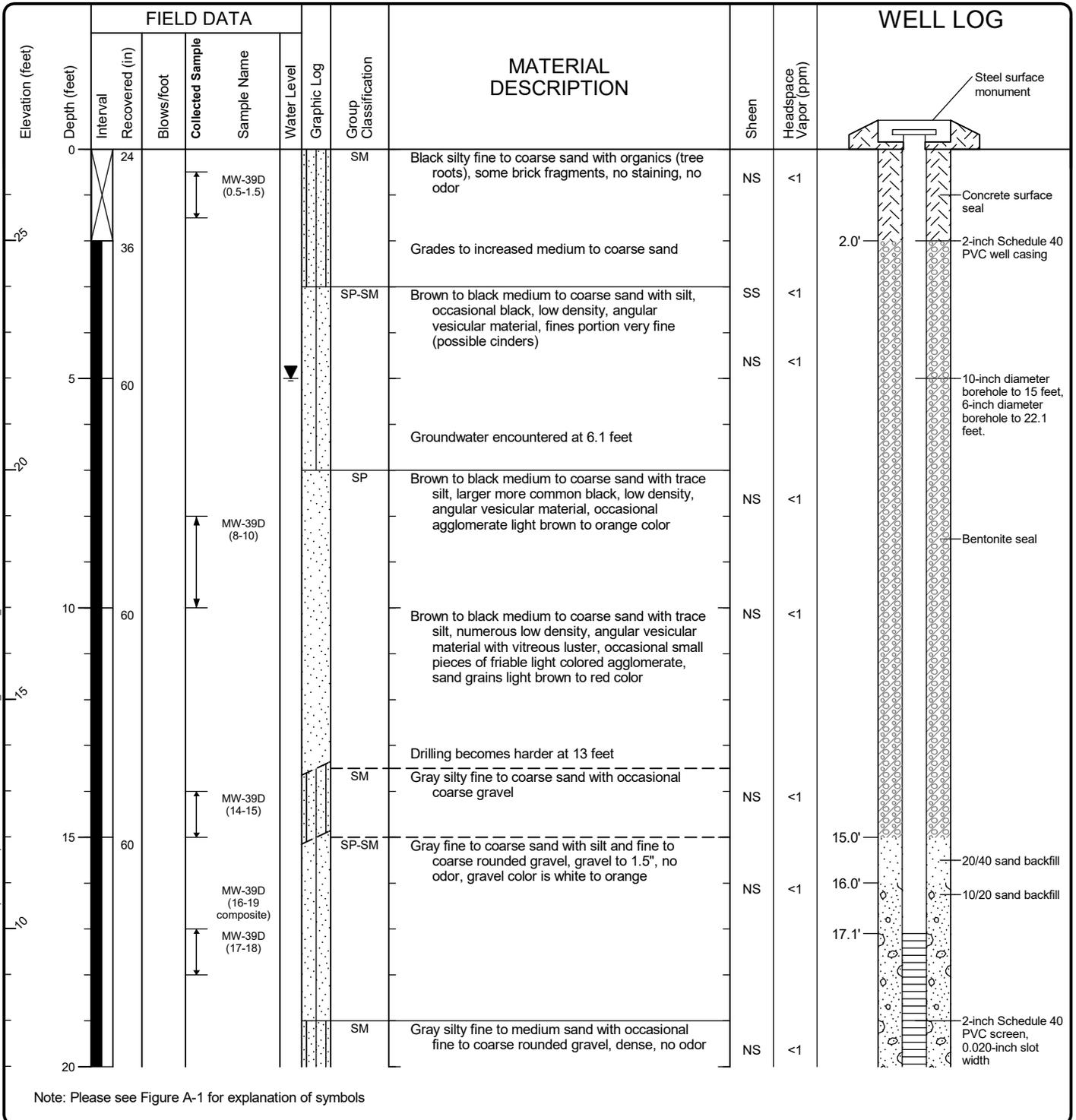
### Log of Monitoring Well MW-38S



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\0186-846-01.GPJ\_DBTemplate\lib\template\GEOENGINEERS\GDT\GEIB\_ENVIRONMENTAL\_WELL

Start Drilled	3/25/2013	End	3/26/2013	Total Depth (ft)	22	Logged By	PDR ZAS	Checked By	ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)		
Hammer Data						Drilling Equipment	Rubber Track-Mounted Spider 3 Sonic Drill Rig			A 2 (in) well was installed on 3/26/2013 to a depth of 22.1 (ft).					
Surface Elevation (ft)	26.99		Vertical Datum		USACE (Locks)	Top of Casing Elevation (ft)	26.74			Groundwater Date Measured	4/22/2013	Depth to Water (ft)	5.0	Elevation (ft)	22.0
Easting (X)	1270814.56		Northing (Y)		239391.05	Horizontal Datum	NAD83 WA State Plane North								
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs. Temporary conductor casing (10-inch diameter) used from 0 to 15 feet bgs. with bentonite seal from 12 to 15 feet bgs.															



### Log of Monitoring Well MW-39D



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-14  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STNASH\DESKTOP\01884601.GPJ\_DB\Template\GEOENGINEERS\GDT\GEI\ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level				
20	24									
5										

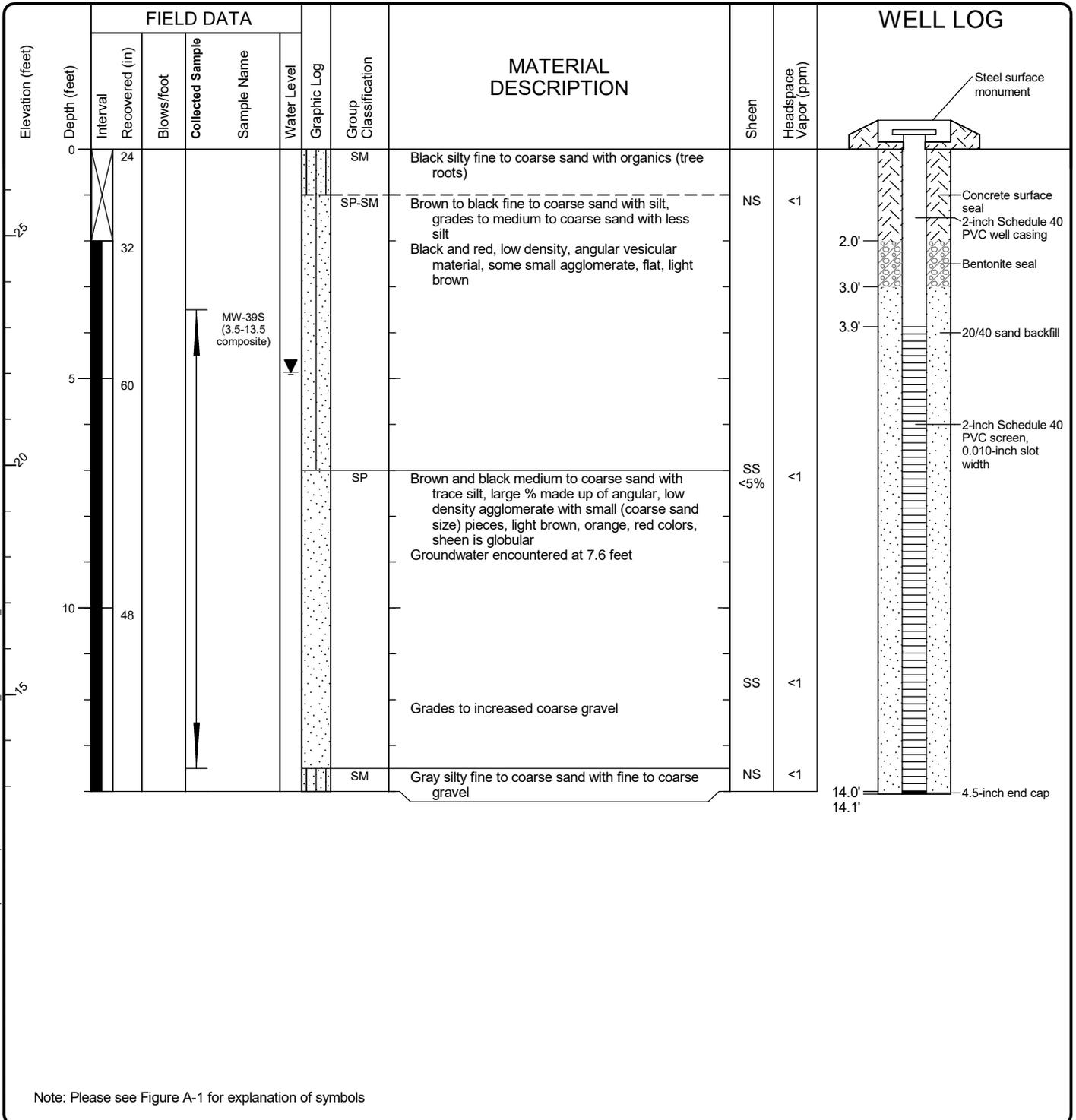
Note: Please see Figure A-1 for explanation of symbols

**Log of Monitoring Well MW-39D (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Drilled	Start 3/25/2013	End 3/25/2013	Total Depth (ft)	14	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)
Hammer Data					Drilling Equipment	Rubber Track-Mounted Spider 3 Sonic Drill Rig		A 2 (in) well was installed on 3/25/2013 to a depth of 14.1 (ft).		
Surface Elevation (ft)	26.89		Top of Casing Elevation (ft)	26.61		Groundwater Date Measured		Depth to Water (ft)	Elevation (ft)	
Vertical Datum	USACE (Locks)				4/22/2013		4.9	22.0		
Easting (X) Northing (Y)	1270814.09 239397.29		Horizontal Datum	NAD83 WA State Plane North						
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.										



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

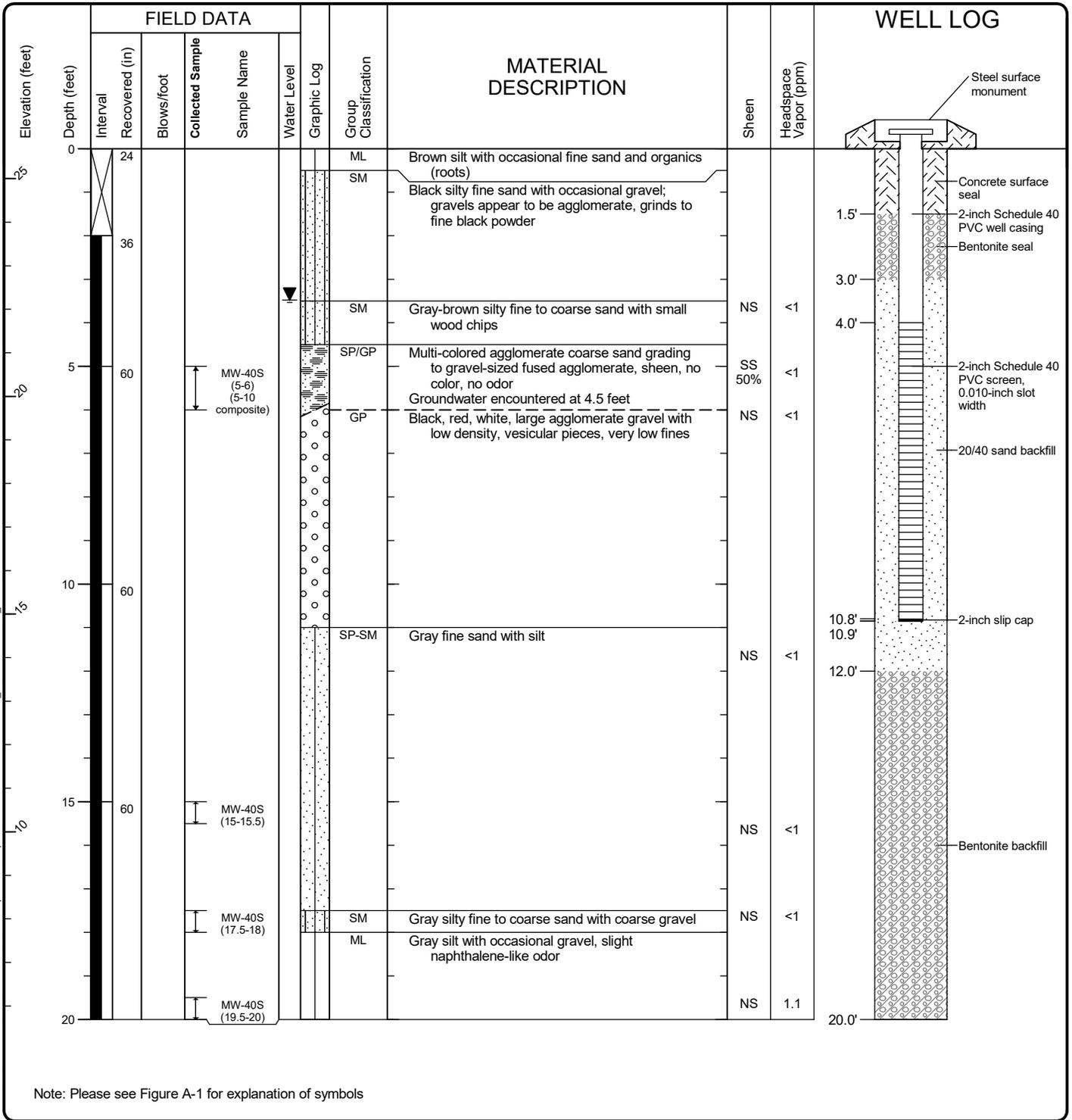
### Log of Monitoring Well MW-39S



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-15  
 Sheet 1 of 1

Drilled	Start 4/1/2013	End 4/1/2013	Total Depth (ft)	20	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)	
Hammer Data					Drilling Equipment	Rubber Track-Mounted Spider 3 Sonic Drill Rig			A 2 (in) well was installed on 4/1/2013 to a depth of 10.9 (ft).		
Surface Elevation (ft)	25.69				Top of Casing Elevation (ft)	25.18			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Vertical Datum	USACE (Locks)							4/22/2013	3.5	22.2	
Easting (X) Northing (Y)	1270790.39 239491.03				Horizontal Datum	NAD83 WA State Plane North					
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.											



### Log of Monitoring Well MW-40S



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-16  
 Sheet 1 of 1

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\0186-846-01\_GPJ\_DB\Template\GeoENGINEERS\GDT\GEIB\_ENVIRONMENTAL\_WELL

Drilled	Start 4/1/2013	End 4/1/2013	Total Depth (ft)	27	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	35.42 USACE (Locks)			Hammer Data	Drilling Equipment			Geoprobe 6620 DT		
Easting (X) Northing (Y)	1270720.37 239526.8			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:										

Elevation (feet)	FIELD DATA						Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					
0	30			GEI-1 (0-3)		SM	Brown silty fine to medium sand with occasional gravel, brick fragments, trace organics (rootlets) one black asphaltic gravel, fused black (medium dense, moist)	NS	<1		
						SM	Dark brown silty fine to medium sand with occasional gravel (medium dense, moist)	NS	<1		
							Grades to black	NS	<1		
5	30						Grades to brown	NS	<1		
				GEI-1 (7-7.5)		SP-SM	Black stained sooty fine to medium sand with silt and fine gravel (medium dense, moist)	NS	<1		
10	36			GEI-1 (12-12.5)		SP	Brown, tan, yellow, black coarse sand with gravel; gravel is agglomerate, fused, low density, vesicular, tan, brown, yellow and black fused low density vesicular, metallic luster (loose, moist)	NS	<1		
							Becomes black stained	SS <5%	<1	White, blocky Groundwater encountered at 13 feet	
15	42			GEI-1 (16.5-17) GEI-1 (17-17.5)		GP	Gray gravel with sand; gravel is agglomerate, red, black, tan, fused low density, vesicular material and black, vesicular, low density, metallic luster (medium dense, wet)	HS	<1	Tar-like, rainbow	
						SP	Gray medium to coarse sand with occasional gravel (dense, wet)	NS	<1		

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

### Log of Boring GEI-1



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-17  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\018684601.GPJ\_DB\Template\GeoENGINEERS\GDT\GEI\ENVIRONMENTAL\_STANDARD



Drilled	Start 4/1/2013	End 4/1/2013	Total Depth (ft)	20	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum		37.87 USACE (Locks)			Hammer Data		Drilling Equipment Geoprobe 6620 DT			
Easting (X) Northing (Y)		1270319.96 238899.51			System Datum		NAD83 WA State Plane North			
Notes:		Groundwater Date Measured		Depth to Water (ft)		Elevation (ft)				

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0		24			GEI-2 (0-3)			AC	Approximately 2 inches asphalt concrete	NS	<1	Gray, blocky
							SM	Brown silty fine sand with gravel, grades to tan fine sand at 0.25 feet	SS <5%	<1		
							SP	Black stained medium to coarse sand with gravel (medium dense, moist)	NS	<1		
5		48			GEI-2 (5-6)			SP	Black stained medium to coarse sand with gravel; faint naphthalene-like odor (medium dense, moist)	NS	<1	
10		50						GP	Gray to black fine to coarse gravel with sand (medium dense, moist)	NS	<1	White, blocky
									Slight naphthalene-like odor	NS	<1	
								SP	Tan medium to coarse sand with gravel (medium dense, moist)	SS <15%	<1	
								SP	Red-brown 1-inch interbedded silt and fine sand Red-brown fine to coarse sand with gravel	NS	<1	
15		40						SP	Brown medium to coarse sand (dense, moist)	NS	<1	Groundwater encountered at 14.5 feet
								SP-SM	Brown gray mottled medium to coarse sand with gravel and silt (dense, wet)	NS	<1	
					GEI-2 (16-17)			SM	Gray silty fine to coarse sand with gravel (dense, wet)	NS	<1	

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

### Log of Boring GEI-2



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-18  
 Sheet 1 of 1

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\018684601.GPJ\_DB\Template\GeoENGINEERS\GDT\GEI\ENVIRONMENTAL\_STANDARD

Drilled	Start 3/27/2013	End 3/27/2013	Total Depth (ft)	29	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum		34.07 USACE (Locks)			Hammer Data		Drilling Equipment Geoprobe 6620 DT			
Easting (X) Northing (Y)		1270730.52 239136.77			System Datum		NAD83 WA State Plane North			
Notes:		Groundwater Date Measured		Depth to Water (ft)		Elevation (ft)				

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0	30						Brick	Approximately 1-inch thick brick paver	SS 5%	<1	Blocky, metallic	
							SP	Brown fine to medium sand (dry to moist) (fill) (paver sand)				
							SM	Dark gray silty fine to medium sand with occasional gravel (silt 30%, gravel 15%), moderate hydrocarbon odor	MS 40%	18.4	Rainbow	
				GEI-3 (2-3)				Brick fragments	SS ~5%	1.5	Florets	
5	30						SM	Brown to dark brown silty fine sand with occasional gravel, trace organics (mulch)	NS	1.3		
							SP	Black medium to coarse sand with gravel and soot, gravel red, tan, black, yellow agglomerate, low density fused and vesicular, irregular, angular, sand black soot stained, medium to coarse fragments, agglomerate, moderate naphthalene-like odor	MS 30%	3.7	Florets, streaks	
				GEI-3 (8-9)								
10	24						GP	Black, tan, red medium to coarse sand with occasional gravel, sand agglomerate fragments and cinders, fused, irregular gravel agglomerate, low density, angular, vesicular, metallic	MS	5.6	Florets, streaks	
				GEI-3 (11.5-12)				Olive green gravel with sand, NAPL present, strong naphthalene-like odor, agglomerate, fused, vesicular, angular to subrounded (wet)	HS	14.2	Groundwater encountered at 12 feet	
							SOOT	Green gray to dark gray soot-like material	NS	93		
							SOOT	Dark gray to black soot-like material with partially decayed light brown wood fragments, strong naphthalene-like odor (wet)	HS	123	Strong naphthalene-like odor	
				GEI-3 (16-17)								
							MH	Gray elastic silt with trace organics (rootlets)			Respirator used	

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

### Log of Boring GEI-3



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-19  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\018684601.GPJ\_DBTemplate\lib\template\GEOENGINEERS\GDT\GEI3\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20		60						MS	15.3	Sheen in small florets on outside of sample core
				GEI-3 (22-23)			1-inch layer silt with medium sand, small blobs black NAPL just below silt layer	HS		
				GEI-3 (24-25)			Gray fine to medium sand with occasional gravel; slight naphthalene-like odor (dense, wet)	NS	14.7	
25		48						NS	8.1	
				GEI-3 (27-28)				NS		
							Gray silty fine to medium sand with gravel; slight naphthalene-like odor (very dense, wet)	NS	6.4	
								NS		

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

### Log of Boring GEI-3 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-19  
 Sheet 2 of 2

Drilled	Start 3/27/2013	End 3/27/2013	Total Depth (ft)	31	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	28.53 USACE (Locks)			Hammer Data	Drilling Equipment			Geoprobe 6620 DT		
Easting (X) Northing (Y)	1270767.86 239174.48			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:										

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level Graphic Log				
0	18			GEI-4 (0.5-1.5)		AC SM	Approximately 2 inches asphalt concrete Dark brown to black silty fine sand with occasional fine gravel, trace brick fragments, asphalt fragments (loose, dry to moist)	<1		Organic sheen
5	24			GEI-4 (5.5-7)		SP	Black to brown fine to medium sand with gravel (red, tan, brown fine to coarse gravel, agglomerate, low density, fused) (black fine grained, low density, metallic luster, vesicular) (loose, moist)			Very loose, almost no hammer action
10	9			GEI-4 (10-11)		GP	Gray to black fine to coarse gravel with sand, gravel is black agglomerate, low density, angular, fused; sand is black, tan to red agglomerate, low density, subrounded to angular	MS 60% MS 15%	18	Florets Florets, olive stained gloves Groundwater encountered at 6 feet
15	12			GEI-4 (15-16)		SP-SM	Sand has soot coated grains, tan, red, black, angular to rounded, low density (wet)	SS 3%	2.8	Streaks
20							Black to dark gray fine sand with gravel and silt, possibly stained (medium dense to dense, wet)	SS 5%	5.0	Mothball-like odor

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

### Log of Boring GEI-4



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-20  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\0186-846-01.GPJ\_DBTemplate\GeoENGINEERS\GDT\GEIB\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
20		42			GEI-4 (20-21)				Moderate mothball-like odor
5									
25		48							Slight mothball-like odor
5									
30		12			GEI-4 (28.5-29)				Slight mothball-like odor Rainbow
					GEI-4 (30-31)				White streaks

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

### Log of Boring GEI-4 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-20  
 Sheet 2 of 2

Drilled	Start 3/28/2013	End 3/28/2013	Total Depth (ft)	24	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	25.87 USACE (Locks)		Hammer Data		Drilling Equipment	Geoprobe 6620 DT				
Easting (X) Northing (Y)	1270823.98 239274.93		System Datum	NAD83 WA State Plane North		Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)		
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.										

Elevation (feet)	FIELD DATA						Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					
0	0	24					SM	Dark brown silty fine to medium sand with organics (rootlets, wood fragments from tree roots) (loose, moist) (topsoil)	NS	<1	
	34			GEI-5 (1.5-2)			SP	Tan, red, gray fine to coarse sand with gravel; 1-inch soft partially decayed wood chip Sand made of angular, low density, agglomerate, friable; Gravel is tan, red agglomerate, low density, fused small vesicles (loose, moist)	NS	<1	
	5	34		GEI-5 (5-7)			SP	Gray to tan fine to coarse sand with occasional gravel (medium dense, wet); Sand is predominantly angular, low density agglomerate, friable, coarse sand includes red-brown fused agglomerate with vitreous luster; Gravel is red-brown fused agglomerate with vitreous luster, black agglomerate, vesicular, low density, slight odor	NS		Groundwater encountered at 5 feet
	10	30		GEI-5 (10-10.5)			GP	Black, tan, brown coarse gravel with medium to coarse sand (medium dense, wet); Gravel is black, tan, red, brown fused agglomerate, angular to small to no vesicles, low density, vitreous luster; Sand is angular, low density, agglomerate, friable, slight odor	NS	3.5	
	15	30		GEI-5 (15-16)			SM	Gray silty medium to coarse sand with gravel, subrounded to rounded gravel, occasional 1/2-inch medium sand lense (dense, wet)  Increasing silt	NS	8.5	
	20						SM	Gray silty fine to coarse sand with coarse rounded gravel (very dense, wet)	NS	1.8	
										1.4	Rock in sampler shoe

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

### Log of Boring GEI-5



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-21  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\0186-846-01.GPJ\_DBTemplate\lib\template\GEOENGINEERS\GDT\GEI5\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Water Level	Graphic Log				
20		48								
5				GEI-5 (22-23)				NS	4.5	
								NS	1.2	

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

**Log of Boring GEI-5 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Drilled	Start 3/28/2013	End 3/28/2013	Total Depth (ft)	31	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	29.63 USACE (Locks)			Hammer Data	Drilling Equipment			Geoprobe 6620 DT		
Easting (X) Northing (Y)	1270789.54 239105.07			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.										

FIELD DATA							MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS	
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					
0	24						SM	Dark brown silty fine sand with organics (rootlets) (medium dense, moist) (topsoil)	NS	<1	
							SM	Brown silty fine sand with gravel			
	30						SP	Black stained sooty fine to coarse sand with gravel, trace tan brick fragments, sand minor component, friable agglomerate, angular, platy (moist)			
5	30				GEI-6 (5.5-6)		SP	Dark brown to tan fine to medium sand with occasional gravel (loose, moist); Sand is friable agglomerate particles;			
							SP	Gravel is tan, red, brown fused agglomerate, angular, vesicular, low density, and black, vesicular, low density agglomerate with metallic luster			Groundwater encountered at 6.5 feet Rainbow streaks
							SP	Black sooty coarse sand with gravel, all particles stained by soot; gravel agglomerate, blocky, vesicular material, strong odor (loose, wet)	HS 50%	80.1	
							SP	Black stained fine to coarse sand with gravel (loose, wet)			
10	30				GEI-6 (10-12.5)		GP	Black agglomerate, highly vesicular, angular (loose, wet) Shake test indicates lack of NAPL			
							GP	Black coarse gravel with sand, heavy odor, naphthalene-like (loose, wet)	HS 50%	105	Metallic
15	12								HS	2.6	Metallic streaks

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

### Log of Boring GEI-6



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-22  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\018684601.GPJ\_DBTemplate\libTemplate\GEOENGINEERS\GDT\GEI6\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
20	24			GEI-6 (20-21)			SM	Black stained fine to coarse gravel with coarse sand; gravel black vesicular agglomerate; sand stained, fused agglomerate, tan, red, brown, platy	HS 60%	90.5	Metallic	
								Dark gray to black silty fine sand with rounded to subrounded gravel (dense, wet)	SS		Streaks	
25	48			GEI-6 (25-26)				Black silty fine sand with rounded gravel	HS	122		
								Grades to gray	SS 5%	15.1	Milky streaks	
								Grades to very dense	NS			
30	12			GEI-6 (30-31)			SM	Gray silty fine sand with gravel	NS	10		
									NS	22.8		

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

### Log of Boring GEI-6 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-22  
 Sheet 2 of 2

Drilled	Start 3/28/2013	End 3/28/2013	Total Depth (ft)	25	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum			32.8 USACE (Locks)		Hammer Data		Drilling Equipment Geoprobe 6620 DT			
Easting (X) Northing (Y)			1270750.22 239356.88		System Datum		NAD83 WA State Plane North			
Notes:					Groundwater Date Measured		Depth to Water (ft)		Elevation (ft)	

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0		34					ASH	NS	<1	
30							ML	NS	<1	
5		24						NS	2.1	
10		24					SP	NS	2.3	
12										Groundwater encountered at 11.5 feet
15		24					SP-SM	NS	<1	
20							SM			

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

### Log of Boring GEI-7



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-23  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\018684601.GPJ\_DB\Template\GeoENGINEERS\GDT\GEI7\_ENVIRONMENTAL\_STANDARD



Drilled	Start 4/1/2013	End 4/1/2013	Total Depth (ft)	15	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push	
Surface Elevation (ft) Vertical Datum	25.32 USACE (Locks)		Hammer Data		Drilling Equipment		Geoprobe 6620 DT				
Easting (X) Northing (Y)	1270602.79 238807.66		System Datum		NAD83 WA State Plane North				Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.											

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0	24						SM			
	30									
	48			GEI-8 (4-4.5)			SP	SS 10%	<1	White streaks Groundwater encountered at 4.5 feet
5				GEI-8 (5-6)			SM	NS	<1	
							SP	SS 10%	<1	White streaks
							CL/ML	NS	<1	
				GEI-8 (8.5-9.5)			SP/SM	NS	<1	Moderate odor
10	50						SM	NS	<1	
15										

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

### Log of Boring GEI-8



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-24  
 Sheet 1 of 1

Drilled	Start 4/1/2013	End 4/1/2013	Total Depth (ft)	25	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum		38.41 USACE (Locks)			Hammer Data		Drilling Equipment Geoprobe 6620 DT			
Easting (X) Northing (Y)		1270345.13 238800.28			System Datum		NAD83 WA State Plane North			
							Groundwater Date Measured		Depth to Water (ft) Elevation (ft)	
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.										

FIELD DATA												
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
0	0	24						SM	Brown silty fine sand with trace gravel (medium dense, moist)	NS	<1	
								SM	Black silty fine sand with gravel (medium dense, moist)	NS	<1	
								CC	Concrete			Hard drilling 2 to 4 feet
				GEI-9 (2-3)				SM	Black silty medium to coarse sand with gravel; Gravel is rounded rock and stained black to tan, agglomerate, fused, vesicular, friable, and trace black agglomerate, vesicular, metallic luster (medium dense, moist)			
	5	48							Black silty fine sand with trace gravel	NS	<1	Metallic streak
									3-inch concrete layer at 5.25 and 6.25 feet	SS <5%	<1	
								SP	Brown fine to medium sand with occasional gravel (loose, moist)	NS	<1	
								SP	Red, tan, brown, black, white medium to coarse sand with gravel (loose, moist); Gravel is red, tan, brown fused agglomerate, friable with vitreous luster, some pieces vesicular; black, vitreous agglomerate with metallic luster Sand is smaller pieces of above	NS	<1	
	10	20							Increase in percentage of black vitreous agglomerate with metallic luster (loose, moist)			Flat metallic streak Groundwater encountered at 11.5 feet
				GEI-9 (11-11.5)				SM	Brown silty medium to coarse sand with gravel (dense, wet)	SS <5%		
								SP	Brown/tan medium sand (dense, wet)			
	15	42							2 inch silt lense	NS	<1	
										NS	<1	
				GEI-9 (16-17)				SM	Gray silty fine to medium sand with gravel (dense, wet)	NS	<1	

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

### Log of Boring GEI-9



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-25  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\0186-846-01.GPJ\_DBTemplate\lib\template\GEOENGINEERS\GDT\GEI9\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20		46								
15										
25										
							Gray silty fine to medium sand with gravel (dense, wet)	NS	<1	
								NS		
								NS	<1	

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

**Log of Boring GEI-9 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Drilled	Start 3/29/2013	End 3/29/2013	Total Depth (ft)	20	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	23.92 USACE (Locks)			Hammer Data	Drilling Equipment			Geoprobe 6620 DT		
Easting (X) Northing (Y)	1270238.07 238714.94			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:										

Elevation (feet)	FIELD DATA						Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log					
0	48						SM	Black to brown silty fine to medium sand with occasional gravel (loose, moist)	NS	<1	Groundwater encountered at 2.5 feet Flat metallic, faint
							GP-GM	Black gravel with silt and sand (medium dense, wet); gravel is black agglomerate, metallic luster, vitreous, sand is smaller particles of the same, moderate hydrocarbon odor	MS 90%	2.5	
							SM	Gray silty fine sand with gravel (medium dense, wet)	NS	<1	
5	30						SP	Gray medium to coarse sand with fine to coarse gravel	NS	<1	
								Increasing gravel	NS	<1	
10	30						SP	Gray fine to medium sand with fine to coarse gravel (dense, wet)	NS	<1	
									NS	<1	
15	48							Fine to medium sand	NS	<1	
								Medium to coarse sand with coarse gravel	NS	<1	
20											

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

### Log of Boring GEI-10



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-26  
 Sheet 1 of 1

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\0186-846-01.GPJ\_DBTemplate\lib\template\GEOENGINEERS\GDT\GEI - ENVIRONMENTAL - STANDARD

Drilled	Start 3/29/2013	End 3/29/2013	Total Depth (ft)	30	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	37.21 USACE (Locks)			Hammer Data	Drilling Equipment			Geoprobe 6620 DT		
Easting (X) Northing (Y)	1270251.2 238857.14			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.										

Elevation (feet)	FIELD DATA						Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log					
0	24						SM	Dark brown silty fine to medium sand with occasional gravel			
3.5	24							Black silty fine to medium sand with occasional gravel, brick fragment	NS	<1	
5	36						SM	Dark gray silty fine to medium sand with gravel and occasional brick fragments (medium dense, moist)	NS	<1	
6.5							GP-GM	Dark brown fine gravel with silt and sand; Gravel is tan, fused, friable agglomerate, and black agglomerate, vesicular, metallic luster (medium dense, wet)	NS	<1	Perched groundwater encountered at 6.5 feet
							SP-SM	Tan to brown and gray silty medium to coarse sand with fine gravel (medium dense, moist)	NS	<1	
10	48							Mottled tan, brown and gray silty fine to coarse sand with fine to coarse gravel (dense, moist)	NS	<1	
15	30						SP-SM	Gray fine to medium sand with silt (dense, wet)	NS	<1	
								3mm black fine to medium sand	SS	<1	Groundwater encountered at 15 feet
							SP	Brown medium to coarse sand with fine gravel (dense, wet)	NS	<1	
20											

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

### Log of Boring GEI-11



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-27  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\0186-846-01.GPJ DBTemplate\lib\template\GEOENGINEERS\GDT\GEIB\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20		36								
15					GEI-11 (21.5-22.5)		Grades to gray Tar-like material between grains at 21.75 feet Gray medium to coarse sand with coarse gravel interbedded with gray medium to coarse sand 2-inch thick band of gray fine to medium sand with tar-like globules	SS 5% NS	2.0 <1	Milky
25		36			GEI-11 (26-26.5)		2-inch black medium to coarse sand with gravel, stained	NS		
10					GEI-11 (27.5-28)		Silty gray fine to medium sand with rounded fine gravel (very dense, wet)	NS	1.4	
30										

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

### Log of Boring GEI-11 (continued)



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-27  
 Sheet 2 of 2

Start Drilled	3/29/2013	End	3/29/2013	Total Depth (ft)	26	Logged By	ARJ	Checked By	ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	35.41 USACE (Locks)			Hammer Data		Drilling Equipment	Geoprobe 6620 DT						
Easting (X) Northing (Y)	1270195.16 239046.6			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.													

FIELD DATA										MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification					
0	0	24						SM	Dark brown silty fine to medium sand with trace organics (rootlets) (moist)	NS	<1		
								SP	Grades to black stained with gravel	NS	<1		
								SM	Gray medium sand (moist)	NS			
								SM	Black silty sand with fine gravel (slight odor)	NS	<1		
								BRICK	Crushed red brick				
								SP	Stained black to dark gray fine to medium sand (moist) (strong odor)	HS 100%	187	Metallic, thick	
								SP	Black to dark gray fine to medium sand with trace brick fragments				
5	48				GEI-12 (5-7)								
								ML/SM	Interbedded gray to dark brown silt to silty fine sand lenses				
								SP	Gray medium sand (moist)				
									With coarse gravel				
									With occasional 2 mm silt lenses	SS <5%	1.7	Milky	
10	54				GEI-12 (11-15)								
								SM	Gray to dark gray	HS >95%		Rainbow	
								SP	Black silty medium sand with brick fragments				
									Gray medium sand (medium dense, wet)			Groundwater encountered at 11.5 feet	
									With fine to coarse gravel	HS >95%	214	Metallic	
									NAPL coated grains				
								SP	Shake test at 14 feet: NAPL surface globules, copper colored NAPL, stained plastic sampler, gloves stained olive color	HS 100%	251	Globules	
15	30				GEI-12 (15-17)				Gray medium to coarse sand with fine to coarse gravel (medium dense, wet)				
									Tar-like black material from 15.5 to 16.5 feet, stringy between grains	HS 70%	30.5	Metallic	
									Shake test at 16 feet: tar-like substance in globules at base of water small globules floating				
								SP-SM	Gray fine sand with silt (dense, wet)				

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

### Log of Boring GEI-12



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-28  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\018684601.GPJ\_DB\Template\env\GEOENGINEERS\GDT\GEI12\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20		34								
25	12			GEI-12 (25-26)			SP			
							With gravel	NS	<1	
							Gray medium to coarse sand with fine to coarse gravel (very dense, wet) Black tar-like between grains (stringy in gloves)	HS	12.4	

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

**Log of Boring GEI-12 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Drilled	Start 4/1/2013	End 4/1/2013	Total Depth (ft)	25.5	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	35.17 USACE (Locks)			Hammer Data	Drilling Equipment			Geoprobe 6620 DT		
Easting (X) Northing (Y)	1270525.65 239143.21			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:										

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0	54					SP	Brown fine sand with trace silt (medium dense, moist) (topsoil)	NS	<1	
						SP	Black to gray sooty stained medium to coarse sand with gravel (medium dense, moist)	NS	<1	
							With occasional red, tan vesicular fused agglomerate, coarse sand to fine gravel sized	NS	<1	
5	30					ML	Gray silt with occasional fine gravel (soft, wet)	SS	<1	Groundwater encountered at 6 feet
						SP	Dark gray to brown fine to medium sand with occasional gravel and trace organics (wood fragments, mostly decayed) Shake test from 8 to 9.5: trace NAPL on surface	HS 95%	25.8	Rainbow
10	52					ML	Gray silt with trace organics (wood fragments) (soft, wet)	NS	<1	
							Occasional 2 mm sandy silt lenses (slight odor)	SS	14	Metallic streaks
						SP-SM	Gray fine sand with silt and gravel (dense, wet) (moderate odor)	MS 40%	25	Rainbow streaks
15	30					SP	Gray fine sand with occasional gravel, NAPL present as dark brown within pore space, very strong odor, hydrocarbon staining on gloves, PID bag copper color, shake test 1 mm of NAPL on surface copper color (dense, wet)	HS 100%	102	Blebs semi-circular, brown
20								HS		
								HS		

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

### Log of Boring GEI-13



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-29  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\0186-846-01.GPJ DBTemplate\lib\template\GEOENGINEERS\GDT\GEI\ ENVIRONMENTAL\_STANDARD

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\01884601.GPJ\_DBTemplate\GeoENGINEERS\GDT\GEI13\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20	60						SP	Gray fine to medium sand with trace silt and occasional gravel, less NAPL saturation (dense, wet) NAPL observed	HS 90%	Rainbow
								NAPL observed	HS	
								NAPL observed	SS	
								NAPL observed	HS 480	
								NAPL observed	SS	
								NAPL observed	HS	
25	6						SM	Gray silty fine to medium sand with gravel (very dense, wet)	SS 2.1	
									SS	

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

**Log of Boring GEI-13 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Drilled	Start 4/2/2013	End 4/2/2013	Total Depth (ft)	39.5	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	27 USACE (Locks)			Hammer Data	Drilling Equipment			Geoprobe 6620 DT		
Easting (X) Northing (Y)	1269745.67 238970.98			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.										

Elevation (feet)	FIELD DATA						Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log					
0	24						SM	Brown to tan silty sand with occasional gravel and trace organics (rootlets) (medium dense, moist)	NS	<1	
2.5	36							With brick fragments	NS	<1	
5	24								HS 70%	24	Florets
7.5							SM	Brown to tan silty fine to medium sand with fine gravel, trace medium sand sized tan agglomerate friable, 1 glass fragment, trace wood fragments up to 1 inch in length possible milled edge With significant NAPL impact; the NAPL is black very strong hydrocarbon odor, shake test: 1 mm NAPL on surface, stained and streaked on sides of jar	NS	5	Florets Groundwater encountered at 8.5 feet
10	12						SP	Dark gray medium to coarse sand stained black, glass pieces, black NAPL blebs within sand	HS 70%	89.9	Stained sampler tube
12.5							SP	Black medium to coarse sand with gravel, wood fibers, 1 inch metal wire and fabric	HS	<1	Florets
15	30						SP	Gray medium to coarse sand with gravel (dense, wet)	MS 40%		Florets
17.5							SP		NS	<1	Florets
20											

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

### Log of Boring GEI-14



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-30  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\ST\NASH\DESKTOP\018684601.GPJ\_DB\Template\GeoENGINEERS\GDT\GEI - ENVIRONMENTAL - STANDARD



Drilled	Start 4/2/2013	End 4/2/2013	Total Depth (ft)	15	Logged By Checked By	ARJ ZAS	Driller	Boart Longyear	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	26.17 USACE (Locks)		Hammer Data				Drilling Equipment	Geoprobe 6620 DT		
Easting (X) Northing (Y)	1270797.85 239445.61		System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)	
Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.										

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS	
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					
0	0	24			GEI-15 (0-2)		SM	Brown to black silty fine sand with gravel and trace organics (roots and rootlets), trace asphaltic grains (loose, moist)	NS	<1	
15	24	24					SP	Increasing black asphaltic grains (hardened tar?)	NS	<1	
							SP	Coarse sand with gravel; black, tan, brown, yellow agglomerate, low density, vesicular, fused; and black agglomerate, low density, finely vesicular, metallic luster	NS	<1	
5	30	30					GP	Brown, tan, yellow, black fine to coarse gravel with coarse sand, gravel is agglomerate, brown, tan, yellow fused vesicular, low density, vitreous luster; and black, low density, vesicular, metallic luster, sand is smaller pieces of above	NS	<1	Groundwater encountered at 4.5 feet
					GEI-15 (6.5-7)		SP	Black coarse sand with gravel	SS 10%	<1	Rainbow streaks
									NS		
10	42	42					SP	Black, tan, yellow medium to coarse sand with gravel, gravel is tan yellow agglomerate fused, low density, vesicular, and black agglomerate, low density, vesicular, metallic luster; sand is smaller particles of above.	NS	<1	
					GEI-15 (12.5-13.5)		GP	Gravel with sand			
							SP	Gray medium to coarse sand with fine gravel (dense, wet)	NS	<1	
15					GEI-15 (14-14.5) + DUP		SM	Gray silty fine to medium sand with gravel (very dense, wet)	NS	<1	

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

### Log of Boring GEI-15



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-31  
 Sheet 1 of 1

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\0186-846-01.GPJ DBTemplate\env\GEOENGINEERS\GDT\GEI\ENVIRONMENTAL\_STANDARD

Drilled	Start 4/17/2013	End 4/17/2013	Total Depth (ft)	25	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)
Surface Elevation (ft) Vertical Datum	33.98 USACE (Locks)			Hammer Data	Drilling Equipment			Rubber Track-Mounted Spider 3 Sonic Drill Rig		
Easting (X) Northing (Y)	1270731.54 239138.15			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Sampling method: 5' by 3/2" ID split spoon with lexan core sleeves.										

Elevation (feet)	FIELD DATA							MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log				
0											Lithology not logged; see GEI-3
5	60										Test sample 5 to 10 feet with 100% recovery
10											
15	24								HS	<1	15 inch recovery on 1st attempt, try 2nd to observe recovery, very poor recovery of mostly water and NAPL Black colored water with strong hydrocarbon odor (will re-drill for this sample in PT-01B)
20											

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

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\01884601.GPJ\_DBTemplate\libTemplate\GEOENGINEERS\GDT\GEI\ENVIRONMENTAL\_STANDARD

### Log of Boring PT-01



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20		58			PT-01 (20-21.1A); PT-01 (21.1-22B); PT-01 (22-25D)					Water and sediment in sampler (approximately 2 inches water in top of sampler), strong hydrocarbon odor
25										

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

**Log of Boring PT-01 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Drilled	Start 4/17/2013	End 4/17/2013	Total Depth (ft)	16	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)
Surface Elevation (ft) Vertical Datum	33.97 USACE (Locks)			Hammer Data	Drilling Equipment			Rubber Track-Mounted Spider 3 Sonic Drill Rig		
Easting (X) Northing (Y)	1270731.21 239140.12			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Sampling method: 5' by 3 1/2" ID split spoon with lexan core sleeves.										

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										Lithology not logged; see GEI-3
5										
10										
11	30			PT-01B (11-13.2A)						No liquid on top of sampler, 30 inches good recovery from 11 to 13.5 feet
15										

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

### Log of Boring PT-01B



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-33  
 Sheet 1 of 1

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESKTOP\0186-846-01.GPJ\_DBTemplate\libTemplate\GEOENGINEERS\GDT\GEI\ENVIRONMENTAL\_STANDARD

Drilled	Start 4/17/2013	End 4/17/2013	Total Depth (ft)	23	Logged By Checked By	PDR ZAS	Driller	Boart Longyear	Drilling Method	Sonic (continuous core)
Surface Elevation (ft) Vertical Datum	30.01 USACE (Locks)			Hammer Data	Drilling Equipment			Rubber Track-Mounted Spider 3 Sonic Drill Rig		
Easting (X) Northing (Y)	1270785.87 239095.16			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand dug with posthole digger from 0 to 2 feet bgs. Sampling method: 5' by 3½" ID split spoon with lexan core sleeves.										

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0	24						Lithology not logged; see GEI-6			
5										
10	54			PT-02 (8.7-10A); PT-02 (10-13B)			Black, strong naphthalene-like odor, staining on core tube, some water on top of sample			Good sample
15										
20	58			PT-02 (20-23)						

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

### Log of Boring PT-02



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-34  
 Sheet 1 of 2

Seattle: Date: 5/14/13 Path: C:\USER\STINA\SHIDESK\TOP\018684601.GPJ\_DB\Template\lib\template\GEOENGINEERS\GDT\GEI\ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20										
								HS		Black, strong odor (GP), staining, observed NAPL in shoe coating particles of gravel, heavy sheen, some water on top of sample

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

**Log of Boring PT-02 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01



Seattle: Date: 5/14/13 Path: C:\USER\STNASH\DESKTOP\01884601.GPJ\_DB\Template\GeoENGINEERS\GDT\GEIR\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20										
25	60			PT-03 (25-28A); PT-03 (28-30B)						100% recovery
30								HS		

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

**Log of Boring PT-03 (continued)**



Project: Puget Sound Energy North Lake Union  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-35  
 Sheet 2 of 2

**Supplemental Investigation  
(GeoEngineers, Inc. 2014)**

**2014 Borings**

## SOIL CLASSIFICATION CHART

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

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

### Sampler Symbol Descriptions

	2.4-inch I.D. split barrel
	Standard Penetration Test (SPT)
	Shelby tube
	Piston
	Direct-Push
	Bulk or grab
	Continuous Coring

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

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

## ADDITIONAL MATERIAL SYMBOLS

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

### Groundwater Contact



Measured groundwater level in exploration, well, or piezometer



Measured free product in well or piezometer

### Graphic Log Contact



Distinct contact between soil strata or geologic units



Approximate location of soil strata change within a geologic soil unit

### Material Description Contact



Distinct contact between soil strata or geologic units



Approximate location of soil strata change within a geologic soil unit

### Laboratory / Field Tests

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

### Sheen Classification

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

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

## KEY TO EXPLORATION LOGS





Start Drilled	12/9/2014	End	12/9/2014	Total Depth (ft)	30	Logged By	RNM	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	28.8			Hammer Data	NA			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North			Groundwater	Date Measured	Depth to Water (ft)	Elevation (ft)		
Easting (X)	1270760.96			Notes: Boring PAI-2B drilled approximately 2 feet away to collect groundwater and soil sequential extraction cores.									
Northing (Y)	239147.16												

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0	48					AC	2 inches asphalt				XRF Readings "As = X ppm"
						GP	Dark gray fine to coarse gravel with sand and trace silt (medium dense, moist) (fill)				
						SM	Dark brown silty fine to medium sand with gravel (medium dense, moist) (fill)	NS	<1		As = ND (<10 ppm)
							Grades to black with occasional buff and orange sand, red brick fragments and soot	NS	<1		As = 151 ppm (±9)
							With gravel-sized black vesicular fused agglomerate from 3 to 5 feet	NS	<1		As = 84 ppm (±5)
5	36			PAI-2 (4.5-5)				NS	<1		As = ND (<10 ppm)
						GM	Black silty fine gravel with sand (medium dense, moist) (fill)	NS	<1		As = 41 ppm (±4)
							Becomes wet	NS	<1		Perched groundwater encountered at 7 feet at time of drilling
							Becomes moist	NS	<1		As = NS (<26 ppm)
							With orange-stained fine to medium sand	SS 10%	<1		As = 10 ppm (±3)
							With black vesicular coarse sand agglomerate	SS 5%	5.8		As = 55 ppm (±5)
10	30					GP	Dark gray fine gravel with sand, trace silt and black fused vesicular agglomerate (medium dense, moist) (fill)				Metallic gray
							Becomes wet	SS	<1		Groundwater encountered at 12 feet at time of drilling
				PAI-2 (12.5-13)				SS	<1		Slight hydrocarbon-like odor
								MS	<1		As = 63 ppm (±4)
								SS	<1		Metallic gray florets
							Grades to black	SS	<1		As = 45 ppm (±3)
15	30							MS	<1		Metallic gray
								MS	<1		As = 86 ppm (±4)
								MS	<1		Metallic gray florets
								NS	<1		As = 2,781 ppm (±42)
				PAI-2 (18-18.5)				NS	<1		As = 14,694 ppm (±22)
				PAI-2 (18-18.5 DUP)				MS	3.9		As = 487 ppm (±17)
				PAI-2 (19.5-20)				MS	3.9		Metallic gray blebs
20	58					ML	With occasional black stained wood fragments	HS	43.6		NAPL present (stained liner)
							Gray sandy silt with occasional gravel (medium stiff, wet)	NS	20.8		Rainbow
						SM	Gray silty fine sand with occasional gravel (medium dense, wet)	NS	2.3		As = 56 ppm (±4)
								NS	2.3		As = 62 ppm (±4)
								NS	9		Moderate hydrocarbon-like odor
								NS	9		As = 67 ppm (±4)
								NS	9		As = 19 ppm (±3)
								NS	10.1		As = ND (<8 ppm)
25				PAI-2 (24-24.5)				NS	10.4		As = 12 ppm (±3)

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

### Log of Boring PAI-2



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-3  
 Sheet 1 of 2

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\_DBT\template\UT\template\GEOENGINEERS.GDT\GEBR\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS	
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					Graphic Log
25	55						GP-GM	Gray fine gravel with sand and silt (medium dense, wet)	NS	5.6	As = ND (<9 ppm)
							SM	Gray silty fine to medium sand with occasional gravel (medium dense, wet)	NS	8.3	As = 13 ppm (±3)
									NS	4.2	As = 12 ppm (±3)
									NS	7.2	As - 31 ppm (±4)
							SM	Gray silty fine to medium sand with occasional gravel (dense, moist)	NS	14.1	As = 32 ppm (±4)
30									NS	9.5	As = 47 ppm (±4)

PAI-2  
(28-28.5)

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

**Log of Boring PAI-2 (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\_DBT\template\LBT\template\GEOENGINEERS.GDT\GEIR\_ENVIRONMENTAL\_STANDARD

Start Drilled 12/12/2014	End 12/12/2014	Total Depth (ft) 20	Logged By Checked By RNM ZAS	Driller Cascade Drilling	Drilling Method Continuous
Surface Elevation (ft) Vertical Datum 28.78 USACE (Locks)		Hammer Data NA		Drilling Equipment Geoprobe 7730 DT	
Easting (X) Northing (Y) 1270758.79 239147.06		System Datum NAD83 WA State Plane North		Groundwater Date Measured 12/12/2014	
Notes:				Depth to Water (ft) 8.5	Elevation (ft) 20.33

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS	
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					Graphic Log
0										See adjacent boring PAI-2 for soil descriptions	XRF Readings "As = X ppm"
5											
10											
15											
17.5					PAI-2B (17.5-18)						As = 5,436 ppm (±105) As = 4,970 ppm (±91) As = 15,455 ppm (±249)
19.5					PAI-2B (19-19.5)						As = 6,132 ppm (±89) As = 346 ppm (±12) As = 119 ppm (±6)
20										Temporary pre-pack well screen installed from 14.79 to 19.79 feet below ground surface; grab groundwater sample PAI-2GW collected	

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

### Log of Boring PAI-2B



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-4  
 Sheet 1 of 1

Seattle: Date: 4/21/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\DBT\template\LT\template\GEOENGINEERS\_GDT\GEIR\_ENVIRONMENTAL\_STANDARD



Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level				
25	48						NS	14	As = ND (<8 ppm)
							NS	<1	As = 25 ppm (±4)
			PAI-3 (27.5-28)			SP-SM	NS	2	As = ND (<8 ppm)
						GP	NS	2	As = ND (<8 ppm)
30	60						NS	<1	As = ND (<8 ppm)
							NS	<1	As = ND (<8 ppm)
							NS	<1	As = ND (<9 ppm)
			PAI-3 (33.5-34)			SM	NS	<1	As = 13 ppm (±3)
						ML	NS	7	As = 35 ppm (±5)
35							NS	5	As = 65 ppm (±5)

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

### Log of Boring PAI-3 (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-5  
 Sheet 2 of 2

Start Drilled 12/12/2014	End 12/12/2014	Total Depth (ft) 35	Logged By Checked By RNM ZAS	Driller Cascade Drilling	Drilling Method Continuous
Surface Elevation (ft) Vertical Datum 30.85 USACE (Locks)		Hammer Data NA		Drilling Equipment Geoprobe 7730 DT	
Easting (X) Northing (Y) 1270760.15 239096.64		System Datum NAD83 WA State Plane North		Groundwater Date Measured Depth to Water (ft) Elevation (ft)	
Notes:					

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS	
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					Graphic Log
0										See adjacent boring PAI-3 for soil descriptions	XRF Readings "As = X ppm"
5											
10											
15											
20											
25											

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

Seattle: Date: 4/21/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\DBT\template\UBT\template\GEOENGINEERS.GDT\GEIR\_ENVIRONMENTAL\_STANDARD

<b>Log of Boring PAI-3B</b>		
	Project:	Puget Sound Energy GWPS
	Project Location:	Gas Works Park, Seattle, Washington
	Project Number:	0186-846-01
		Figure Y-6 Sheet 1 of 2

Seattle: Date: 4/21/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\DBT\template\LBT\template.GEOENGINEERS.GDT\GEB\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
25										
30										
35				PAI-3B (33.5-34)						As = ND (<7 ppm)  As = ND (<8 ppm) As = 26 ppm (±3) As = 41 ppm (±4)

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

### Log of Boring PAI-3B (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled	12/10/2014	End	12/10/2014	Total Depth (ft)	30	Logged By	RNM	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	30.31			Hammer Data	NA			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Easting (X)	1270716.7			Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.									
Northing (Y)	239117.02												

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS	
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing					Water Level
0						SP	Gray fine to medium sand with occasional gravel and trace silt (loose, moist) (fill)	NS	<1	XRF Readings "As = X ppm"
36						SS 5%	Dark brown fine to medium sand with silt and occasional gravel (medium dense, moist) (fill)	SS 5%	<1	As = ND (<9 ppm) Metallic gray
46				PAI-4 (4.5-5)		SP-SM	Dark brown fine to medium sand with silt and occasional gravel (medium dense, moist) (fill)	SS 5%	<1	As = 38 ppm (±6) Metallic gray
55						GM	Black silty fine gravel with sand, silt and occasional red bricks (medium dense, moist) (fill)	SS 5%	<1	As = 18 ppm (±5) Metallic gray
50				PAI-4 (9.5-10)		SS 5%	Black silty fine gravel with sand, silt and occasional red bricks (medium dense, moist) (fill)	SS 5%	<1	As = 258 ppm (±22) Metallic gray
10						SS 5%	With occasional fine roots With brown to black fused vesicular agglomerate	SS 5%	<1	As = 17 ppm (±4) Metallic gray
13.5				PAI-4 (13-13.5)		SS 5%	With occasional fine roots With brown to black fused vesicular agglomerate	SS 5%	<1	As = 13 ppm (±3) Metallic gray
15						SP-SM	Black medium to coarse sand with gravel and silt (medium dense, moist) (fill)	SS 5%	<1	As = ND (<12 ppm) Metallic gray
50				PAI-4 (16-16.5)		SS 5%	Black medium to coarse sand with gravel and silt (medium dense, moist) (fill)	SS 5%	<1	As = ND (<10 ppm) Metallic gray
15						ML	Gray silt (soft, moist)	MS	422	As = 914 ppm (±13) Metallic gray
15						SM	Black silty fine sand with occasional wood fragments (medium dense, moist)	HS	970	As = 1,525 ppm (±31) Metallic gray
15						MS	Black silty fine sand with occasional wood fragments (medium dense, moist)	MS	729	Perched groundwater encountered at 11 feet at time of drilling Metallic gray As = 378 ppm (±12) Metallic gray florets As = 190 ppm (±7) Rainbow
15						MS	Black silty fine sand with occasional wood fragments (medium dense, moist)	MS	731	As = 43 ppm (±3) Metallic gray florets
15						NAPL	Black silty fine sand with occasional wood fragments (medium dense, moist)	NAPL	1,002	Strong hydrocarbon-like odor As = 12 ppm (±3) Groundwater encountered at 15 feet at time of drilling NAPL present
15						ML	Gray silt with occasional sand and gravel (soft to medium stiff, wet)	NAPL	293	As = 21 ppm (±3) Strong hydrocarbon-like odor
15						SM	Dark gray silty fine to medium sand with gravel (medium dense, wet)	SS 10%	273	As = 23 ppm (±3) Rainbow
15						MS	Dark gray silty fine to medium sand with gravel (medium dense, wet)	MS	70.5	As = 26 ppm (±3) Metallic gray
15						SS 5%	Gravel grades out	SS 5%	19.2	As = ND (<9 ppm) Metallic gray blebs
15						SS	Gravel grades out	SS	8.8	As = 10 ppm (±3) Metallic gray
15						NS	Grades to gray with occasional fine gravel	NS	14.3	As = 9 ppm (±3) Metallic gray
15						SP-SM	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	20.6	As = 19 ppm (±3)
15						NS	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	22.3	As = 14 ppm (±3)
15						NS	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	22.3	As = 16 ppm (±3)

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

### Log of Boring PAI-4



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-7  
 Sheet 1 of 2

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\_DBT\template\LBT\template\GEOENGINEERS\_GDT\GEB\_ENVIRONMENTAL\_STANDARD

Seattle: Date: 4/21/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\_GPJ\_DBT\template\LBT\template.GEOENGINEERS.GDT\GEB\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
25	54			(24.5-25)				NS	19.3	As = 11 ppm (±3)
								NS	10	As = 17 ppm (±3)
								NS	8	As = ND (<7 ppm)
				PAL-4 (27.5-28)			SM	NS	15	As = 9 ppm (±3)
								NS	17	As = 18 ppm (±4)
30								NS	5	As = 19 ppm (±4)

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

### Log of Boring PAI-4 (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-7  
 Sheet 2 of 2

Start Drilled	12/8/2014	End	12/8/2014	Total Depth (ft)	15.5	Logged By	RNM	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	34.31			Hammer Data	NA			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Easting (X)	1270706.24			Notes: Hand-dug with posthole digger from 0 to 2 feet bgs. Refusal at 15.5 feet on concrete.									
Northing (Y)	239150.94												

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS				
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing					Water Level	Graphic Log	Group Classification	
0						Pavers			1.5 inches red brick pavers				XRF Readings "As = X ppm"
						SP			Brown fine to medium sand with gravel and trace silt (medium dense, moist) (fill)	NS	<1		
						SP-SM			Brown fine to medium sand with gravel and silt (medium dense, moist) (fill)	NS	<1		As = ND (<9 ppm)
										NS	<1		As = ND (<9 ppm)
										NS	<1		As = ND (<8 ppm)
										NS	<1		Coarse gravel in sampler shoe
5		36							With occasional orange mottling				
									Gravel content increases	SS 5%	<1		As = ND (<11 ppm) Metallic gray
				PAI-5 (6-6.5)						SS 10%	<1		As = ND (<14 ppm) Metallic gray
									Brown to gray silty fine to medium sand with occasion gravel and occasional wood fragments (medium dense, moist) (fill)	SS 5%	<1		As = 26 ppm (±5) Metallic gray
				PAI-5 (8-8.5)						MS	7.2		As = 65 ppm (±7) Metallic gray florets
									Black silty fine sand with black gravel-sized vesicular fused agglomerate, occasional black soot and occasional red brick fragments (medium dense, moist) (fill)	SS	<1		As = 19 ppm (±4) Metallic gray
10		36								MS			As = 30 ppm (±5) Metallic gray florets
									With yellow-orange staining	MS			Moderate hydrocarbon-like odor As = 264 ppm (±10) Metallic gray florets
									Gray silty fine sand with occasional wood fragments (medium dense, moist) (fill)	MS			Moderate naphthalene-like odor As = 344 ppm (±11) Metallic gray florets
				PAI-5 (13.5-14)						SS 5%			Moderate naphthalene-like odor As = 514 ppm (±13) Metallic gray
				PAI-5 (14.5-15)						NS			Slight hydrocarbon-like odor Groundwater encountered at 14.5 feet at time of drilling As = 467 ppm (±23) Slight hydrocarbon-like odor
15		6							Black asphaltic material with a taffy consistency (soft when warm/stiff when cooled, wet) (fill)				

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

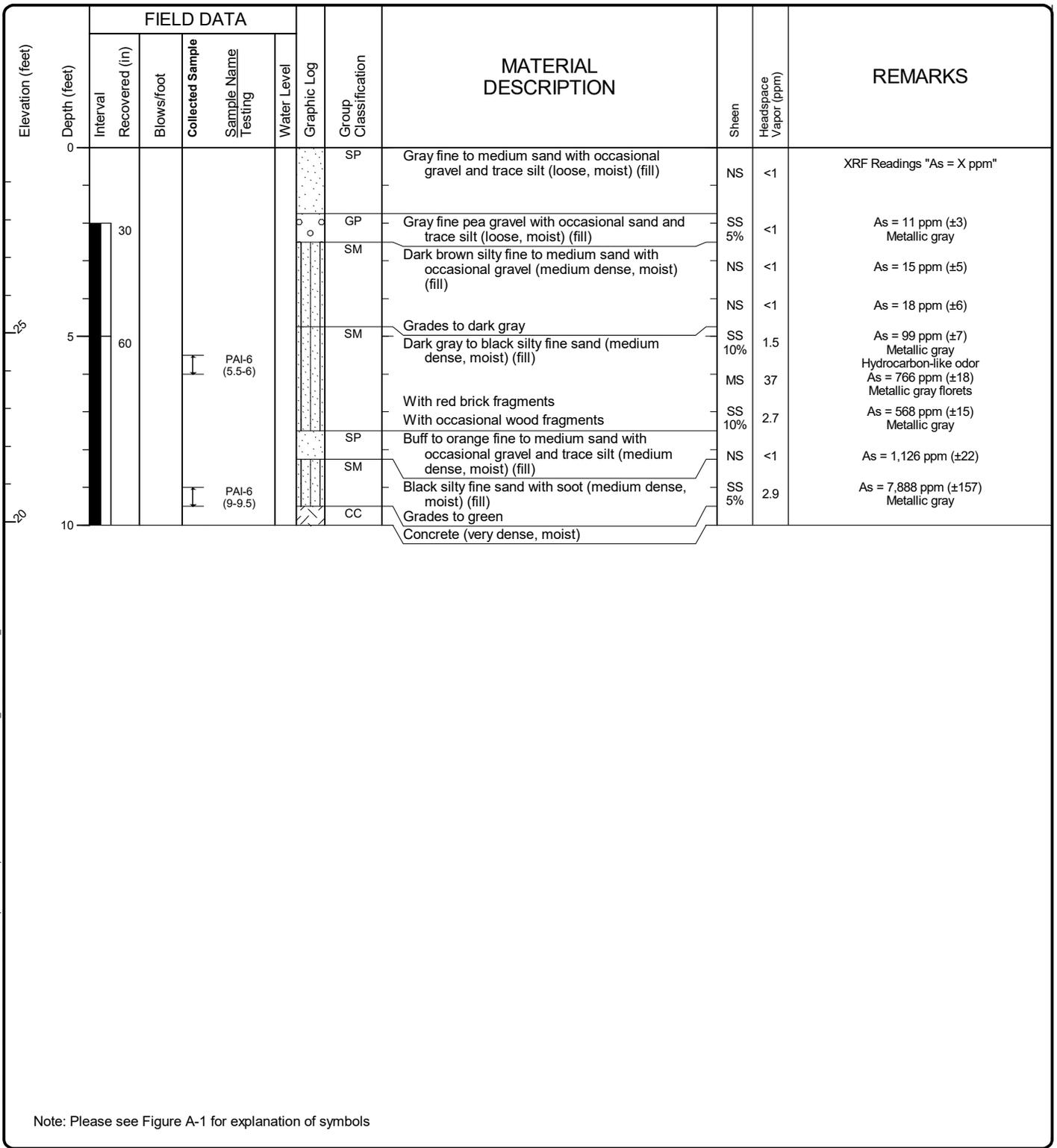
### Log of Boring PAI-5



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\_DBT\template\LBT\template\GEOENGINEERS\_GDT\GEBR\_ENVIRONMENTAL\_STANDARD

Start Drilled	12/9/2014	End	12/9/2014	Total Depth (ft)	10	Logged By	RNM	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	29.91			Hammer Data	NA			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North			Groundwater	Date Measured	Depth to Water (ft)	Elevation (ft)		
Easting (X)	1270674.5			Notes: Hand-dug with posthole digger from 0 to 2 feet bgs. Refusal at 10 feet on concrete. Made second attempt 2 feet away and met refusal at 10 feet again.									
Northing (Y)	239147.86												



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

### Log of Boring PAI-6



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-9  
 Sheet 1 of 1

Start Drilled	12/9/2014	End	12/9/2014	Total Depth (ft)	25	Logged By	RNM	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	30.43			Hammer Data	NA			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Easting (X)	1270635.61			Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.									
Northing (Y)	239120.25												

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0							SP	Gray fine to medium sand with occasional gravel and trace silt (loose, moist) (fill)	NS	<1	XRF Readings "As = X ppm" As = ND (<10ppm)	
6							GP-GM	Brown fine to coarse gravel with sand and silt (medium dense, moist) (fill)	NS	<1	As = 25 ppm (±4)	
54							SM	Gray silty fine to medium sand with gravel and occasional black stained wood fragments (medium dense, wet) (fill)	NS	<1	As = 921 ppm (±19)	
							SM	Black silty fine to medium sand with gravel and soot (medium dense, moist) (fill)	NS	<1	As = 385 ppm (±11) Hydrocarbon-like odor As = 227 ppm (±8) Metallic gray florets	
							SM	Gray silty fine sand (medium dense, moist)	NS	2.6	As = 216 ppm (±8)	
							ML	Dark gray silt with occasional sand (medium stiff, moist)	NS	<1	As = 70 ppm (±5) Groundwater encountered at 10.2 feet at time of drilling	
							SM	Dark gray silty fine to medium sand with gravel (medium dense, wet)	NS	<1	As = 237 ppm (±8)	
							ML	Dark gray silt (medium stiff, wet)	NS	<1	As = 57 ppm (±4)	
							SM	Dark gray silty fine to medium sand with rounded to subrounded gravel (medium dense, wet)	MS	12.5	As = 43 ppm (±4) Metallic gray florets	
							SS		SS	1.5	As = 17 ppm (±3) Metallic gray	
15							NS	Transitional zone to sandy silt	NS	1.4	As = 31 ppm (±3)	
							NS		NS	<1	As = 35 ppm (±4)	
							NS		NS	<1	As = 21 ppm (±3)	
							NS		NS	<1	As = ND (<8 ppm)	
							ML	Gray sandy silt with rounded to subrounded gravel (very stiff, moist)	NS	<1	As = 47 ppm (±4)	
20							SM	Gray silty fine to medium sand (medium dense, wet)	NS	1.7	As = 13 ppm (±3)	
							SM	Gray with orange-brown stained silty fine to medium sand with occasional gravel (medium dense, wet)	SS	3.5	As = 20 ppm (±3) Metallic gray Strong naphthalene-like odor; NAPL present	
							SM	Gray silty fine to medium sand with occasional gravel (dense, moist)	HS 90%	155	As = ND (<7 ppm) Rainbow	
							SM		NAPL	592	As = 18 ppm (±3) Strong naphthalene-like odor; NAPL present	
							NS		NS	8.5	As = ND (<8 ppm)	
25							NS		NS	7.1	As = ND (<8 ppm)	

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

### Log of Boring PAI-7



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-10  
 Sheet 1 of 1

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\_GPJ\_DBT\template\UBT\template\GEOENGINEERS\_GDT\GIBR\_ENVIRONMENTAL\_STANDARD

Start Drilled	12/10/2014	End	12/10/2014	Total Depth (ft)	30	Logged By	RNM	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	30.1			Hammer Data	NA			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Easting (X)	1270673.66			Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.									
Northing (Y)	239165.11												

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0							SP	Gray medium sand with trace silt (loose, moist) (fill)	NS	<1	XRF Readings "As = X ppm"	
									NS	<1	As = 11 ppm (±3)	
									NS	<1	As = ND (<8 ppm)	
							GP	Gray fine to coarse gravel with sand and trace silt (medium dense, moist) (fill)	NS	<1	As = 11 ppm (±3)	
							SM	Gray silty fine to medium sand with occasional gravel (medium dense, moist) (fill)	NS	<1	As = 30 ppm (±4)	
5				PAI-8 (4.5-5)				Becomes black	NS	2	As = 433 ppm (±13)	
								Grades to gray	NS	<1	As = 34 ppm (±5)	
								Becomes wet	NS	<1	Perched groundwater encountered at 6 feet at time of drilling	
								Becomes moist	NS	<1	As = 100 ppm (±6)	
							SM	Black silty fine to medium sand with gravel, soot and wood fragments (medium dense, moist) (fill)	MS	6	As = 310 ppm (±10) Metallic gray blebs NAPL blebs present As = 1,123 ppm (±23) Rainbow	
				PAI-8 (8.5-9)					HS	14	Strong hydrocarbon-like odor	
10				PAI-8 (10-10.5)				Grades to dark gray	HS	63	As = 344 ppm (±10) Rainbow	
								With wood fragments				
							GM	Black with occasional green stained silty fine gravel with silt and soot (medium dense, moist) (fill)	NAPL	27	As = 618 ppm (±15) As = 114 ppm (±6) As = 64 ppm (±4) Rainbow	
									HS	15		
							SM	Dark gray silty fine to medium sand with gravel (medium dense, moist)	SS	12	As = 48 ppm (±4) Metallic gray	
									HS	39	As = 43 ppm (±4) Rainbow	
15				PAI-8 (14.5-15)				Grades to gray	NS	15	As = 13 ppm (±3) Groundwater encountered at 15 feet at time of drilling	
								Becomes wet	MS	5	As = 26 ppm (±3) Metallic gray florets	
				PAI-8 (16-16.5)			SP-SM	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	8	As = 11 ppm (±3)	
									NS	4	As = 44 ppm (±4)	
									NS	2	As = 13 ppm (±3)	
20									NS	2	As = 28 ppm (±3)	
									NS	<1	As = 24 ppm (±7) As = 12 ppm (±3)	
							SM	Gray silty fine to medium sand (medium dense, wet)	NS	8	As = 16 ppm (±3)	
				PAI-8 (22.5-23)					NS	8	As = 10 ppm (±3)	
							SP-SM	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	14	As = 16 ppm (±3)	
25							SM	Gray silty fine sand (dense, moist)				

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

### Log of Boring PAI-8



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-11  
 Sheet 1 of 2

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\_DBT\template\UBT\template\GEOENGINEERS\_GDT\GEBR\_ENVIRONMENTAL\_STANDARD

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Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
25		60								As = 8 ppm (±3)
										As = 207 ppm (±8)
										As = 131 ppm (±6)
				PAI-8 (27.5-28)			SM			As = 46 ppm (±4)
										As = 27 ppm (±3)
30										As = ND (<8 ppm)

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

### Log of Boring PAI-8 (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-11  
 Sheet 2 of 2

Start Drilled	12/11/2014	End	12/11/2014	Total Depth (ft)	25	Logged By	RNM	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	32.5			Hammer Data	NA			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Easting (X)	1270679.39			Notes:									
Northing (Y)	239085.91												

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0	45					AC	2 inches asphalt concrete			XRF Readings "As = X ppm"	
						GP-GM	Dark brown fine gravel with sand and silt (medium dense, moist) (fill)	NS	<1	As = ND (<13 ppm)	
							Grades to tan/brown	SS	<1	As = ND (<9 ppm) Metallic gray	
				PAI-9 (3-3.5)		SM	Black silty sooty fine to medium sand with gravel (medium dense, moist) (fill)	SS	<1	As = 17 ppm (±3) Metallic gray	
								SS	<1	As = 4,245 ppm (±60); As = 2,884 ppm (±46) As = 96 ppm (±9) As = 75 ppm (±6)	
5	48					GM	Black silty fine gravel with sand, soot and occasional red brick fragments (medium dense, moist) (fill)	SS	<1	As = 18 ppm (±5) Metallic gray	
							With wood fragments	SS	<1	As = 24 ppm (±4) Metallic gray	
							Grades to gray with orange mottling	SS	<1	As = 59 ppm (±6) Metallic gray	
						SM	Gray with orange mottling silty fine to medium sand with occasional gravel (medium dense, moist) (fill)	NS	<1	As = ND (<9 ppm)	
10	50			PAI-9 (9.5-10)				NS	<1	As = 11 ppm (±3)	
								NS	<1	As = 219 ppm (±8)	
				PAI-9 (11.5-12)		GP-GM	Dark gray with occasional orange mottling fine gravel with sand and silt (medium dense, moist) (fill)	NS	<1	As = 836 ppm (±16)	
				PAI-9 (12.5-13)			Becomes wet	NS	<1	As = 566 ppm (±12) Groundwater encountered at 12.5 feet at time of drilling	
				PAI-9 (12.5-13 DUP)		ML	Gray sandy silt (soft, wet) (fill)	SS	<1	As = 1,483 ppm (±34) Metallic gray	
						SM	Black silty sooty fine to medium sand with gravel (medium dense, wet)	SS	<1	As = 207 ppm (±7) Metallic gray	
15	50							SS	<1	Slight hydrocarbon-like odor As = 86 ppm (±5)	
						SP-SM	Black sooty fine to medium sand with gravel and silt (medium dense, wet)	NS	<1	As = 60 ppm (±4)	
				PAI-9 (17.5-18)				MS	<1	As = 196 ppm (±8) Slight hydrocarbon-like odor	
								MS	<1	Metallic gray florets As = 214 ppm (±8) Metallic gray florets	
						SM	Dark gray silty fine to medium sand (medium dense, wet)	SS	<1	As = 236 ppm (±9) Metallic gray	
20	60							SS	<1	As = 115 ppm (±7) Metallic gray	
							Grades to black sooty carbon with occasional gravel	NS	<1	As = 124 ppm (±6)	
							With gravel	NS	<1	As = 68 ppm (±4)	
								NS	<1	As = 56 ppm (±4)	
				PAI-9 (23-23.5)			With increasing silt content and density	NS	<1	As = 38 ppm (±4) Sulfur-like odor	
						ML	Gray silt with sand and occasional gravel (hard, moist)	NS	<1	As = 83 ppm (±5)	
25								NS	<1	As = 106 ppm (±6)	

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

### Log of Boring PAI-9



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\_GPJ\_DBT\template\UBT\template\GEOENGINEERS\_GDT\GEIR\_ENVIRONMENTAL\_STANDARD

Start Drilled	12/11/2014	End	12/11/2014	Total Depth (ft)	35	Logged By	RNM	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	28.97			Hammer Data	NA			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North			Groundwater Date Measured	12/11/2014	Depth to Water (ft)	8.9	Elevation (ft)	20.12
Easting (X)	1270796.22			Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.									
Northing (Y)	239139.19												

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0							SM	Dark brown silty fine to medium sand with occasional gravel and roots (loose, moist) (topsoil)				XRF Readings "As = X ppm"
36							SM	Black silty sooty fine to medium sand with gravel (medium dense, moist) (fill)				
42							SP-SM	With occasional red brick fragments Brown medium to coarse sand with silt and gravel (medium dense, moist) (fill)				
5							GP-GM	Grades to black Brown with orange mottling fine gravel with sand and silt (medium dense, moist) (fill)				As = ND (<11 ppm)
10				PAI-10 (9.5-10)			GP-GM	Grades to black	NS	<1		As = ND (<12 ppm)
15				PAI-10 (14.5-15)			GP-GM	Black fused vesicular agglomerate	NS	<1		As = ND (<8 ppm) Hydrocarbon-like odor As = ND (<10 ppm) Groundwater encountered at 9 feet at time of drilling
20				PAI-10 (19.5-20)			GP	Black fine gravel with sand and trace silt (medium dense, wet) (fill)	MS	21		As = ND (<9 ppm) Metallic gray blebs
25				PAI-10			GP	Black fused vesicular agglomerate	SS	3		As = ND (<11 ppm) Metallic gray
							GP	With orange and red gravel	HS	13		As = 9 ppm (±3) Rainbow
							GP	Dark gray fine to medium sand with silt and gravel (medium dense, wet) (fill)	SS	4		As = 15 ppm (±3)
							GP	With orange and red sand and gravel	NS	<1		As = 29 ppm (±3) Metallic gray
							GP	Dark gray fine to medium sand with silt and gravel (medium dense, wet) (fill)	NS	<1		As = 147 ppm (±6)
							GP	With orange and red gravel	NS	<1		As = 82 ppm (±7)
							GP	Dark gray fine to medium sand with silt and gravel (medium dense, wet) (fill)	NS	<1		As = 82 ppm (±5)
							GP	With orange and red sand and gravel	NS	<1		As = 192 ppm (±7)
							GP	Dark gray fine to medium sand with silt and gravel (medium dense, wet) (fill)	NS	<1		As = 65 ppm (±5)
							GP	With orange and red sand and gravel	NS	<1		As = 168 ppm (±6)
							GP	Dark gray fine to medium sand with silt and gravel (medium dense, wet) (fill)	NS	<1		As = 228 ppm (±7)
							GP	With orange and red sand and gravel	NS	<1		

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

### Log of Boring PAI-10



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-13  
 Sheet 1 of 2

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\DBT\template\UBT\template\GEOENGINEERS\_GDT\GEBR\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
25	24			(24.5-25)			MS	<1	As = 224 ppm (±7) Metallic gray blebs
						SP-SM			Dark gray fine to medium sand with gravel and silt (medium dense, wet)
						GP			Dark gray fine gravel with sand and trace silt (medium dense, wet)
30	60			PAI-10 (29.5-30)		SP-SM	NS	2	As = 15 ppm (±3) As = 34 ppm (±4) As = ND (<10 ppm)
				PAI-10 (31.5-32)		ML			Gray sandy silt (medium stiff, wet)
						SM			Gray silty fine sand (medium dense, wet)
						ML			Gray sandy silt with occasional gravel (hard, moist)
35	Temporary pre-pack well screen installed from 19.09 to 24.09 feet below ground surface; grab groundwater sample PAI-10-GW collected								

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

### Log of Boring PAI-10 (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-13  
 Sheet 2 of 2

Start Drilled	12/11/2014	End	12/11/2014	Total Depth (ft)	30	Logged By	RNM	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	27.6			Hammer Data	NA			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	NAD83 WA State Plane North			Groundwater	Date Measured	Depth to Water (ft)	Elevation (ft)		
Easting (X)	1270809.27			Notes: Hand-dug with posthole digger from 0 to 2 feet bgs. Boring PAI-11B drilled approximately 5 feet away to collect groundwater.									
Northing (Y)	239187.48												

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0							SM	Dark brown silty fine to medium sand with occasional gravel and roots (loose, moist) (topsoil)			XRF Readings "As = X ppm"
3	36						SM	Black silty fine to medium sand with occasional gravel and occasional red brick fragments (medium dense, moist) (fill)			
							SP-SM	Gray to brown with orange mottling fine to medium sand with gravel and silt (medium dense, moist) (fill)			
							GP-GM				
5	36						GP	Black fine gravel with sand and silt (medium dense, moist) (fill)			
							GP	With occasional red and orange color			
							GP	Black fine gravel with sand and trace silt (medium dense, moist) (fill)			
10	36			PAI-11 (9.5-10)					NS	<1	As = ND (<7 ppm)
								Black fused vesicular agglomerate	MS	<1	As = ND (<9 ppm) Metallic gray florets As = 178 ppm (±9) Rainbow
									HS	<1	Groundwater encountered at 9 feet at time of drilling Hydrocarbon-like odor Stained liner As = 12 ppm (±3) Rainbow
				PAI-11 (12-12.5)					HS	<1	As = 18 ppm (±4)
15	24										
				PAI-11 (18-18.5) PAI-11 (18.5-19)				Black fused vesicular agglomerate	HS	<1	As = 54 ppm (±5) As = 17 ppm (±4) Rainbow
20	40							Occasional red and tan color	MS	<1	As = 37 ppm (±4) Metallic gray blebs
								Dark gray fine to medium sand (medium dense, wet)	NS	<1	As = 597 ppm (±14) As = 59 ppm (±5)
				PAI-11 (22-22.5)				Gray fine to medium sand with occasional gravel and trace silt (medium dense, wet)	NS	<1	As = 18 ppm (±3)
25									NS	<1	As = 18 ppm (±3)

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

### Log of Boring PAI-11



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-14  
 Sheet 1 of 2

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\_DBT\template\LBT\template\GEOENGINEERS.GDT\GEIR\_ENVIRONMENTAL\_STANDARD

Seattle: Date: 4/27/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\_GPJ\_DBT\template\LBT\template\GEOENGINEERS.GDT\GEIR\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
25		60						NS	<1	As = 18 ppm (±3)
								NS	<1	As = 23 ppm (±3)
							SP-SM			Gray fine to medium sand with silt (medium dense, wet)
							SM			Gray silty fine to medium sand (medium dense, wet)
							SM			Gray silty fine to medium sand with occasional gravel (dense, moist)
30								NS	<1	As = 81 ppm (±5) As = 64 ppm (±5)
								NS	<1	As = 25 ppm (±3)
								NS	<1	As = 20 ppm (±3)

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

### Log of Boring PAI-11 (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-14  
 Sheet 2 of 2

Start Drilled 12/12/2014	End 12/12/2014	Total Depth (ft) 23.09	Logged By Checked By RNM ZAS	Driller Cascade Drilling	Drilling Method Continuous
Surface Elevation (ft) Vertical Datum 28.43 USACE (Locks)		Hammer Data NA		Drilling Equipment Geoprobe 7730 DT	
Easting (X) Northing (Y) 1270804.95 239188.1		System Datum NAD83 WA State Plane North		Groundwater Date Measured 12/12/2014	
Notes:				Depth to Water (ft) 8.3	Elevation (ft) 20.18

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0							See boring PAI-11 for soil descriptions			
5										
10										
15										
20										
							Temporary pre-pack well screen installed from 18.09 to 23.09 feet below ground surface; grab groundwater sample PAI11-GW collected			

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

### Log of Boring PAI-11B



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure Y-15  
 Sheet 1 of 1

Seattle: Date: 4/21/15 Path: \\SEA\PROJECTS\0018684601\GINT\018684601\GP\_J\DBT\template\UBT\template\GEOENGINEERS.GDT\GEBR\_ENVIRONMENTAL\_STANDARD



**Supplemental Investigation  
(GeoEngineers, Inc. 2016)**

**2016 Borings**

## SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS <small>(LITTLE OR NO FINES)</small>		<b>GW</b>	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>GP</b>	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>GM</b>	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
	SAND AND SANDY SOILS	CLEAN SANDS <small>(LITTLE OR NO FINES)</small>		<b>SW</b>	WELL-GRADED SANDS, GRAVELLY SANDS
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>SP</b>	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>SM</b>	SILTY SANDS, SAND - SILT MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		<b>ML</b>	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
		LIQUID LIMIT LESS THAN 50		<b>CL</b>	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		LIQUID LIMIT LESS THAN 50		<b>OL</b>	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		<b>MH</b>	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
		LIQUID LIMIT GREATER THAN 50		<b>CH</b>	INORGANIC CLAYS OF HIGH PLASTICITY
		LIQUID LIMIT GREATER THAN 50		<b>OH</b>	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			<b>PT</b>	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

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

### Sampler Symbol Descriptions

	2.4-inch I.D. split barrel
	Standard Penetration Test (SPT)
	Shelby tube
	Piston
	Direct-Push
	Bulk or grab
	Continuous Coring

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

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

A "WOH" indicates sampler pushed using the weight of the hammer.

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

## ADDITIONAL MATERIAL SYMBOLS

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

### Groundwater Contact



Measured groundwater level in exploration, well, or piezometer



Measured free product in well or piezometer

### Graphic Log Contact



Distinct contact between soil strata



Approximate contact between soil strata

### Material Description Contact



Contact between geologic units



Contact between soil of the same geologic unit

### Laboratory / Field Tests

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

### Sheen Classification

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

## KEY TO EXPLORATION LOGS



FIGURE 1-1

Start Drilled	9/14/2016	End	9/14/2016	Total Depth (ft)	35	Logged By	GRL	Checked By	SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	30.51 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Easting (X) Northing (Y)	1270773.34 239066.13			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Notes: Hand-augered from 0 to 2 feet bgs.								9/14/2016	12.80	17.71			

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0							SM			XRF Readings "As = X ppm"
		36						NS	<1	
								NS	<1	As = 36 ppm (±8)
5		48					ML	NS	1.1	
							SP-SM	NS	<1	As = <51 ppm
								NS	3.9	As = <27 ppm Naphthalene-like odor
							SOOT	NS	2.8	As = <14 ppm
							GP	SS	448	Groundwater encountered at 7.7 feet during drilling
							AC	MS	477.3	As = <27 ppm Patch-like sheen
							GP			As = <12 ppm
										As = <19 ppm
10		44					SOOT	NS	2.7	As = <24 ppm
							SP	NS (SP)	81.1	As = <15 ppm (SP)
								SS (AC)		As = <12 ppm (AC)
							SP	SS	442.3	As = <22 ppm; blocky sheen
									437.9	As = <17 ppm
15		48					SP	SS	189.9	As = <23 ppm; blocky, patch-like sheen
							SP	NS		
								NS	21.8	As = <28 ppm
								NS	13.3	
							GP	NS	22.3	As = 72 ppm (±13)

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

### Log of Boring PAI-13D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GIEE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample							
20		54										As = <48 ppm
							SM	Black stained silty fine to medium sand (very loose, wet) (recessional outwash [Qvr])	SS	36		Blocky sheen
							GP-GM	Gray and black stained fine to coarse gravel with silt and sand (dense, wet) (Qvr)	NS	4.9		As = 46 ppm (±15)
							SM	Black stained silty fine sand with occasional gravel (medium dense, wet) (Qvr)	NS	2.9		As = <40 ppm
									NS	2.1		
25		48					GP-GM	Dark gray to black fine to coarse gravel with silt and sand (dense, wet) (Qvr)	NS	2.8		As = <25 ppm
									NS	2.3		
									NS	1.9		As = <23 ppm
							SP-SM	Dark gray to black fine to medium sand with silt (dense, wet) (advance outwash [Qva])	NS	2		As = <16 ppm
								Grades to gray		6		
30		60							NS			As = 29 ppm (±8)
									NS	2.9		As = 33 ppm (±8)
									NS	4.2		
									NS	<1		As = <25 ppm Sulfur-like odor
									NS	2.9		As = 77 ppm (±9)
35												

PAI-13-28-33 CA

Temporary pre-pack well screen installed from 28 to 33 feet below ground surface (bgs); grab groundwater sample PAI-13D-160914 collected.

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

**Log of Boring PAI-13D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 6/30/17 File: P:\00186846\GINT\0186846\01.GPJ D:\Library\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBE\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/14/2016	End	9/14/2016	Total Depth (ft)	35	Logged By	GRL	Checked By	SBS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	28.89			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	9/14/2016	Depth to Water (ft)	20.42	Elevation (ft)	8.47
Easting (X)	1270797.4			Notes: Hand-augered from 0 to 2 feet bgs.										
Northing (Y)	239144.24													

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0						SM	Brown silty fine to coarse sand with occasional gravel and trace roots (loose, moist) (fill)	NS		XRF Readings "As = X ppm"
						SM	Black silty fine to medium sand with occasional gravel, soot, contains ash (loose, moist) (fill)	NS	5.1	
	36					ASH	1-inch layer of black ash (fill)	NS	<1	As = <45 ppm
						SP	Black with orange fused vesicular agglomerate (medium sand- to fine gravel-sized) (fill)	NS	<1	As = <28 ppm
						SP-SM	2-inch layer of gray fine to medium sand with silt and soot (fill)	NS	<1	As = <30 ppm
	36					SP	2-inch layer of gray fine to medium sand with silt and soot (fill)	NS	<1	As = 75 ppm (±11) As = <12 ppm
						GP	Black with orange fused vesicular agglomerate (medium sand- to fine gravel-sized) (fill)	NS	<1	
						GP	2-inch layer of orange coarse gravel-sized material (fill)	NS	1.5	As = <11 ppm
						GP	Black fused vesicular agglomerate: coarse sand- to fine gravel-sized (loose, moist to wet) (fill)	NS	1.5	Groundwater encountered at 7.5 feet during drilling
						GP	Grades to wet at 7.5 feet	MS	78.9	Sheen is metallic
						GP	Black fused vesicular agglomerate (coarse sand- to coarse gravel-sized), occasionally gray, orange, green, white with trace ash (medium dense, wet) (fill)	NS		Green and white particles in sheen pan
	40					GP	Black fused vesicular agglomerate (coarse sand- to coarse gravel-sized), occasionally gray, orange, green, white with trace ash (medium dense, wet) (fill)	NS		As = 36 ppm (±9)
						GP	2-inch layer of finer material (medium sand- to fine gravel-sized)	SS	49.5	Slight hydrocarbon-like odor As = 21 ppm (±5)
						GP	2-inch layer of finer material (medium sand- to fine gravel-sized)	NS	7.8	As = <19 ppm
						GP	2-inch layer of finer material (medium sand- to fine gravel-sized)	SS	4.7	As = <13 ppm
						GP	2-inch layer of dark gray fine to medium sand with trace silt	NS	2.7	As = 63 ppm (±7)
	12					GP	2-inch layer of dark gray fine to medium sand with trace silt	NS	1.3	As = 69 ppm (±10)
						GP	2-inch layer of dark gray fine to medium sand with trace silt	NS	1.3	

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

### Log of Boring PAI-14D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-3  
 Sheet 1 of 2

Date: 9/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD



Start Drilled	9/27/2016	End	9/27/2016	Total Depth (ft)	34	Logged By	GRL ZAS	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	30.44			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	9/27/2016	Depth to Water (ft)	19.65	Elevation (ft)	10.79
Easting (X)	1270766.29			Notes: Hand-augered from 0 to 2 feet bgs.										
Northing (Y)	239103.83													

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0	50					AC	1.5-inches asphalt concrete			XRF Readings "As = X ppm"	
						SP-SM	Brown fine to coarse sand with silt and occasional gravel (loose, moist) (fill)				
						CC	Grades to dark brown				
						SP-SM	Degraded concrete (medium dense, moist) (fill)	NS	<1	As = 27 ppm (±8)	
						SP	Brown fine to coarse sand with silt and occasional gravel (loose, moist) (fill)	NS	<1	As = 72 ppm (±11)	
							Brown to dark brown fused, light weight vesicular agglomerate (fine to coarse sand-sized) with trace light colored platy fused agglomerate (loose, moist) (fill)	NS	<1	As = 30 ppm (±7)	
5	36						Becomes dark brown to dark gray	NS	<1	As = <18 ppm	
								NS	<1	As = <25 ppm	
								NS	<1	As = <26 ppm	
								NS	1.3	As = 21 ppm (±5)	
10	30					GP	Multi-colored fused, light weight vesicular agglomerate (fine to coarse sand- to fine to coarse gravel-sized) with sand (loose, wet) (fill)	NS	<1	Groundwater encountered at 9.9 feet during drilling	
								HS	<1	As = 23 ppm (±6)	
								MS	<1	As = 176 ppm (±9)	
								SS	<1	As = 48 ppm (±10); sheen has color	
										As = 51 ppm (±9); sheen has no color	
										As = 23 ppm (±6)	
								NS	<1	As = <22 ppm	
15	36							NS	<1	As = 103 ppm (±8)	
								NS	<1	As = 105 ppm (±10)	
								NS	<1	As = 110 ppm (±11)	
								SS	10	As = 453 ppm (±17); platy sheen, jar test dark brown NAPL covered 80% of water surface in jar, some color	
							With wood, becomes medium dense	NAPL	50.3	As = 278 ppm (±10)	
							Gray fine to coarse gravel with sand (medium dense, wet) (fill)	NAPL	20.1	As = 35 ppm (±7)	

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

### Log of Boring PAI-15D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-4  
 Sheet 1 of 2

Date: 9/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample						
20			60				SP	Gray fine to medium sand with trace silt and occasional gravel (medium dense, wet) (Qvr)	NS	7.5	As = <23 ppm
							SP-SM	Gray fine to medium sand with silt and occasional gravel (medium dense to dense, wet) (Qvr)	NS	12	As = <20 ppm
									NS	20.1	As = 17 ppm (±5)
									NS	33.1	As = 16 ppm (±5)
							SM	Gray silty fine to medium sand with occasional gravel (dense, wet) (Qvr)	NS	33.5	As = <15 ppm
25			60						NS	<1	As = 30 ppm (±6)
									NS	14.5	As = <15 ppm
								Grades siltier	NS	19	As = <14 ppm
							SP-SM	Gray fine to medium sand with silt (dense, wet) (Qva)	NS	20.1	As = <15 ppm
							GP	Gray fine to coarse gravel with trace silt and sand (dense, wet) (Qva)	NS	6.1	As = <64 ppm
							SP-SM	Gray fine to medium sand with silt (dense, wet) (Qva)	NS	4.8	As = 22 ppm (±6) As = 33 ppm (±9)
							ML	Gray sandy silt (hard, moist) (pre-Fraser diamict [Qpdd])	NS	<1	As = 40 ppm (±7)
								Grades to trace sand			As = 79 ppm (±9) As = 90 ppm (±10)

PAI-15-30-32.5 CA  
 DUP-1 30-32.5 CA

Qpgt

Temporary pre-pack well screen installed from 30.6 to 33.1 feet bgs; grab groundwater sample PAI-15D-160927 collected.

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

Date: 6/30/17 File: P:\00186846\GINT\018684601.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBL\_ENVIRONMENTAL\_STANDARD

**Log of Boring PAI-15D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Drilled	Start 9/27/2016	End 9/27/2016	Total Depth (ft)	20	Logged By Checked By	GRL ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	30.11 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT	
Easting (X) Northing (Y)	1270766.25 239105.28			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-augered from 0 to 2 feet bgs.								9/27/2016	9.85	20.26

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-15D for soil descriptions
5										
10						▼				
15										
20										

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

Temporary pre-pack well screen installed from 14.7 to 19.7 feet bgs; grab groundwater sample PAI-15S-160927 collected.

<b>Log of Boring PAI-15S</b>		
	Project:	Puget Sound Energy GWPS
	Project Location:	Gas Works Park, Seattle, Washington
	Project Number:	0186-846-01
		Figure 1-5 Sheet 1 of 1

Date: 9/30/17 Path: P:\00186846\GINT\018684601.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBE\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/15/2016	End	9/15/2016	Total Depth (ft)	33	Logged By	GRL	Checked By	SBS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	33.87			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	9/15/2016	Depth to Water (ft)	19.50	Elevation (ft)	14.37
Easting (X)	1270737.01			Notes: Hand-augered from 0 to 1½ feet bgs.										
Northing (Y)	239113.2													

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0						BRICK	1.5 inch brick paved surface	NS	<1	XRF Readings "As = X ppm"	
						SP	Brown fine to coarse sand (loose, moist) (fill)	NS	<1		
							Grades to occasional gravel, medium dense	NS	<1	As = <25 ppm	
	32					GP	Gray and brown fine to coarse gravel with trace silt, sand and trace roots (medium dense, moist) (fill)	NS	<1	As = <26 ppm	
						SM	1-inch layer brown silty fine to coarse sand with trace organic matter (medium dense, moist) (fill)	NS	<1	As = <30 ppm	
						SP	Brown fine to coarse sand with trace silt and occasional gravel (fill)	NS	<1	As = <69 ppm	
	60					SM	Becomes light brown	NS	<1	As = <43 ppm	
						ML	Brown silty fine to coarse sand with occasional gravel (fill)	NS	<1	As = <64 ppm	
						GM	2-inch layer of wood	NS	<1	As = <41 ppm	
						GP	Brown silt with trace sand and occasional gravel (fill)	NS	<1	As = <76 ppm	
						SOOT	Brown silty fine to coarse gravel with trace pockets of soot and trace brick dust (fill)	NS	<1	As = <22 ppm	
						SP	Gray coarse gravel with trace brick dust (fill)	NS	<1	As = <25 ppm	
							Black soot with trace black fused agglomerate (fill); pink/gray color towards bottom	NS	2.1	As = <17 ppm	
	30						Black fused vesicular agglomerate (fine sand- to fine gravel-sized), light weight with trace soot (loose, moist) (fill)	NS	1.1	As = 101 ppm (±11)	
							Grades to multi-colored (black, tan, white, orange)	NS	<1	As = 148 ppm (±13)	
							Grades to black	HS	2.7	Slight hydrocarbon-like odor from 13 to 15 feet	
							Grades to more fine	HS	2.7	Groundwater encountered at 13 feet during drilling	
	40					GP	Black fused agglomerate (fine gravel-sized, occasional coarse sand- and coarse gravel-sized) (loose, wet) (fill)	NAPL	5.9	As = 974 ppm (±29) Coated with NAPL	
								NAPL	132.6	As = 1,406 ppm (±39); very thin NAPL layer	
								NAPL	629.8	Naphthalene-like odor	
						ML	Olive green silt with sand and olive green coated black fused agglomerate with trace organic matter (weathered wood) (very soft, wet) (fill)	HS	172.5	As = 1,372 ppm (±65)	
							Grades to black	HS	16.2	As = 248 ppm (±9)	
	60					MH	Gray silt with trace fibrous organic matter (soft, wet) (Qvr)	NS	152.3	As = 216ppm (±53)	
								NS	118.6	As = 49ppm (±12)	

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

### Log of Boring PAI-16D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-6  
 Sheet 1 of 2

Date: 6/30/17 Path: P:\00186846\GINT\0186846\GEOENGINEERS\_DF\_STD\_US\_GLB\GIEE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
20							ML	Gray silt interbedded with fine to medium sand (soft, wet) (Qvr)	NS	179.2	As = 39 ppm (±11)	
									NS	30.3	As = 87 ppm (±17)	
							GM	Gray silty fine to coarse gravel with sand (medium dense, wet) (Qvr)	NS	17.2	As = 30 ppm (±9)	
							SP-SM	Gray fine to medium sand with silt (dense, wet) (Qvr)	NS	8.7	As = <19 ppm	
10		48						Grades with gravel Grades with occasional gravel		19.0	As = <22 ppm	
								Grades coarser Grades finer	NS	9.8	As = <19 ppm	
25							SP	Gray fine to medium sand with trace silt and occasional gravel (dense, wet) (Qva)	NS	2.7	As = <21 ppm	
							SP-SM	Gray fine to medium sand with silt and occasional gravel (dense, wet) (Qva)	NS	3.4	As = <36 ppm	
		60							NS	13.0	As = 73 ppm (±18)	
									NS	9.8	As = <22 ppm	
30									NS	16.3	As = <20 ppm	
									NS	7.2	As = <19 ppm	
									NS	10.4	As = <24 ppm	
											As = <13 ppm	

PAI-16-28-33 CA

Temporary pre-pack well screen installed from 28 to 33 feet bgs; grab groundwater sample PAI-16D-160915 collected.

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

**Log of Boring PAI-16D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 6/30/17 File: P:\00186846\GINT\018684601.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBL\_ENVIRONMENTAL\_STANDARD

Drilled	Start 9/15/2016	End 9/15/2016	Total Depth (ft)	18	Logged By Checked By	GRL SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	33.79 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT	
Easting (X) Northing (Y)	1270737.28 239113.61			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-augered from 0 to 1½ feet bgs.								9/15/2016	13.75	20.04

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-16D for soil descriptions.
5										
10										
15					▼					
<p>Temporary pre-pack well screen installed from 16 to 18 feet bgs; grab groundwater sample PAI-16S-190915 collected.</p>										
<p>Note: Please see Figure 1-1 for explanation of symbols</p>										

### Log of Boring PAI-16S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/15/2016	End	9/15/2016	Total Depth (ft)	35	Logged By	GRL	Checked By	SBS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	33.96			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	9/15/2016	Depth to Water (ft)	13.75	Elevation (ft)	20.21
Easting (X)	1270729.73			Notes: Hand-augered from 0 to 1 foot bgs.										
Northing (Y)	239167.06													

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0						BRICK	1.5 inch brick paved surface	NS	<1	XRF Readings "As = X ppm"	
	48					SP-SM	Brown fine to medium sand with silt and occasional gravel (medium dense, moist) (fill)	SS	<1	As = <28 ppm	
							Grades to orange		<1	As = <15 ppm	
						ML	Gray silt with fine sand occasional gravel (medium stiff, moist) (fill)	NS	<1	As = <25 ppm	
						SM	Brown silty fine to medium sand with occasional gravel, glass-like fragments, trace brick dust, trace ash, trace wood (loose, moist) (fill)	NS	<1	As = <23 ppm	
						CC	Concrete	NS	<1	As = <30 ppm	
						SOOT	Black soot with silty fine to medium sand and trace wood (medium dense, moist) (fill)		<1	As = <28 ppm	
	50					GP	Black, tan and white vesicular agglomerate (fine gravel-sized) (fill)		<1	As = 84 ppm (±14)	
						ML	Gray silt with trace wood (medium stiff, moist) (fill)	SS	<1	As = <15 ppm	
						SM	Dark gray silty fine sand with soot (loose, moist) (fill)		<1		
						SOOT	Gray silty fine to medium sand with occasional gravel and one piece of clear glass (loose, moist) (fill)	NS	<1		
						SP	Black soot with fine sand and fused agglomerate (loose, moist) (fill)	SS	17.3	As = 427 ppm (±22) As = 641 ppm (±35)	
							Black with orange fused vesicular, glassy agglomerate (medium sand- to fine gravel-sized) with occasional gravel (loose, moist) (fill)	SS	1.8	As = 934 ppm (±36) As = 3,779 ppm (±106)	
	21					ML	Dark gray sandy silt (fill)	MS	8.1	As = 39 ppm (±10); sheen popping, no color	
						SP	Multi-colored fused vesicular agglomerate: medium sand- to fine gravel-sized occasionally vitreous (loose, moist) (fill)	NS	3.4	As = 3,960 ppm (±144)	
								NS	2	As = 2,512 ppm (±78)	
						ML	Gray sandy silt with trace organic matter (fill)		2.4	As = <24 ppm	
						SP	Orange with black fused agglomerate (medium sand- to coarse gravel-sized) (loose, moist) (fill)		1.2	As = 1,599 ppm (±46)	
						GP	Black fused agglomerate with occasional gravel (fill)		68.2	Groundwater encountered at 13.3 feet during drilling As = 480 ppm (±27)	
	55								67.3	As = 2,049 ppm (±69)	
						GM/ML	Olive green agglomerate, silt and black soot and NAPL (fill)	NAPL	44.6	Strong naphthalene-like odor As = 6,678 ppm (±218)	
						SM	Gray silty fine to medium sand with soot (fill)		490.1	Strong hydrocarbon-like odor	
						ML	Gray silt with trace black decaying organic matter (Qvr)		63.9	Jar test: LNAPL brown blebs; stains sides of jar As = 710 ppm (±42) As = 199 ppm (±13)	
	0					SP-SM	Dark gray silty fine to medium sand (loose, wet) (Qvr)				

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

### Log of Boring PAI-17D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-8  
 Sheet 1 of 2

Date: 6/30/17 File: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBL\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample							
20		60								SS	12.2	As = 117 ppm (±21); blocky sheen with black staining
							ML	Dark gray sandy silt (soft, wet) (Qvr)	NS	6.6		As = 75 ppm (±10)
							GP	Dark gray fine gravel with sand (medium dense, wet) (Qvr)				
							SP-SM/SM	Dark gray fine to medium sand with silt and occasional gravel to silty fine to medium sand with occasional gravel (medium dense, wet) (Qvr)	NS	17.8		As = 59 ppm (±8)
												As = 29 ppm (±8)
							ML	Gray sandy silt (soft, wet) (Qvr)	NS	17.8		
							SM	Dark gray to black silty fine to medium sand with occasional gravel (medium dense, wet) (Qvr)	NS	4.8		As = 32 ppm (±10)
25		60						Grades to gray	NS	8.8		As = 74 ppm (±8)
							ML	Gray sandy silt (very soft, wet) (Qvr)	NS	1.1		As = 17 ppm (±5)
							SM	Gray silty fine to medium sand (medium dense, wet) (Qvr)	NS	12.2		As = 16 ppm (±5)
							SM	Gray silty fine to medium sand (dense, moist) (Qva)	NS	6.6		As = <19 ppm
							SM	Gray silty fine sand with occasional gravel (very dense, moist) (pre-Fraser till [Qpgt])	NS	4.2		As = <19 ppm As = <15 ppm
30		48						1-cm layer of gray sandy silt (very stiff, moist)	NS	1.4		As = 133 ppm (±37)
								1-cm layer of gray sandy silt (very stiff, moist)	NS	3.6		As = 59 ppm (±13)
								1-cm layer of gray sandy silt (very stiff, moist)	NS	1.4		As = 37 ppm (±10)
									NS	7.0		As = 42 ppm (±8)
										3.3		As = 38 ppm (±5)

PAI-17-26.5-29 CA

Temporary pre-pack well screen installed from 24 to 29 feet bgs; grab groundwater sample PAI-17D-190615 collected.

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

**Log of Boring PAI-17D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 6/30/17 File: P:\00186846\GINT\018684601.GPJ D:\Library\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBE\_ENVIRONMENTAL\_STANDARD

Drilled	Start 9/15/2016	End 9/15/2016	Total Depth (ft)	18	Logged By Checked By	GRL SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	34.16 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT	
Easting (X) Northing (Y)	1270729.71 239167.75			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-augered from 0 to 1 foot bgs.								9/15/2016	13.80	20.36

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-17D for soil descriptions
5										
10										
15										
										Temporary pre-pack well screen installed from 14 to 16 feet bgs; grab groundwater sample PAI-17S-190615 collected.

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

### Log of Boring PAI-17S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 9/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/16/2016	End	9/16/2016	Total Depth (ft)	15	Logged By	GRL	Checked By	SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	33.89			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Easting (X)	1270710.42			Notes:		Refusal at 15 feet below ground surface on concrete. Another boring (PAI-18B) attempted nearby, but refusal was encountered at 5 feet on concrete.							
Northing (Y)	239141.61					Not encountered							

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample						
0			48				BRICK	1.5-inch brick paved surface			XRF Readings "As = X ppm"
							SP	Brown fine to coarse sand (loose, moist) (fill)	NS	<1	As = <38 ppm
							SP	Brown to light brown fine to coarse sand with trace silt and gravel (loose, moist) (fill)	NS	<1	As = 31 ppm (±9)
							SM	Grades to dark brown	NS	<1	As = 64 ppm (±9)
							SM	Dark brown silty fine to coarse sand with gravel, trace brick debris (loose, moist) (fill)	NS	<1	
							SM	Fine gravel-sized angular briquette-like pieces	NS	<1	
							SM	Trace very fine roots	NS	<1	
5			54				SM	Black sooty silty fine sand (loose, moist) (fill)	NS	<1	As = 30 ppm (±9)
							SP	Brown fine to coarse sand with occasional gravel and trace silt (loose, moist) (fill)	NS	<1	As = <25 ppm
							SP	Dark gray fine to medium sand with trace silt, occasional gravel and trace organic matter (very fine roots) (loose, moist) (fill)	NS	<1	As = 85 ppm (±16)
							SP-SM	Brown to light brown fine sand with silt and trace organic matter (very fine roots) (fill)	NS	<1	As = 13 ppm (±3)
							SP	Grades to no roots	NS	<1	
							SP	Grades with occasional gravel	NS	<1	
							SP	Trace decaying wood	NS	<1	
							SP	Grades to light brown	NS	<1	
10			36				SP-SM	Dark gray fine to coarse sand with occasional gravel, black vesicular fused lightweight and heavier agglomerate, occasionally glassy metallic (loose, moist) (fill)	NS	<1	As = <58 ppm
							SP-SM	Brown to dark brown fine to coarse sand with silt (loose, moist) (fill)	NS	<1	As = 79 ppm (±11)
							SM	Black silty fine to coarse sand with orange fused non-vesicular agglomerate (loose, moist) (fill)	NS	<1	As = 541 ppm (±27)
							SOOT	Black soot with occasional gravel, trace metallic fused agglomerate (medium stiff, moist) (fill)	NS	<1	As = 941 ppm (±42)
							ML	Black soot with occasional gravel, trace metallic fused agglomerate (medium stiff, moist) (fill)	NS	<1	As = 1,217 ppm (±32); sheen with brown and black blebs
							ML	Grades with fine sand	NAPL	250.1	Strong naphthalene-like odor from 12.5 to 13.5
							ML	Dark gray sandy silt (fill)	SS	74.1	As = 410 ppm (±19)
							ML	1-inch layer of dark gray with minor green	SS	74.1	Slight hydrocarbon-like odor
							ML	Dark gray to black NAPL coated sandy silt with decaying wood debris and one piece of plywood (fill)	SS	74.1	As = 393 ppm (±24)
15			10				ML	Dark gray to black NAPL coated sandy silt with decaying wood debris and one piece of plywood (fill)	SS	74.1	As = 434 ppm (±47)
							ML	Light and dark gray mottled silt with occasional gravel (medium stiff, moist) (fill)	SS	74.1	

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

### Log of Boring PAI-18



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-10  
 Sheet 1 of 1

Date: 9/30/17 File: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GIE6\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/13/2016	End	9/13/2016	Total Depth (ft)	25	Logged By	GRL	Checked By	SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	29.88			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	9/13/2016	Depth to Water (ft)	15.60	Elevation (ft)	14.28
Easting (X)	1270684.79			Notes: Hand-augered from 0 to 2 feet bgs.									
Northing (Y)	239165.17												

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0							SP	Gray fine to coarse sand with trace silt (loose, moist) (fill)			XRF Readings "As = X ppm"
		30					SP	Brown fine to coarse sand with occasional gravel, trace silt and trace organic matter (fine roots) (loose, moist) (fill)			As = <35 ppm Slight hydrocarbon-like odor from 2 to 7 feet
							SM	Dark gray silty fine to coarse sand with occasional gravel and brick fragments (loose to medium dense, moist) (fill)	NS	<1	As = <42 ppm
								Grades with gravel, trace wood and fine roots	NS	25.6	As = <28 ppm
5									SS	67.8	
		42							SS	14.8	As = 870 ppm (±60)
									SS		
									HS	21.8	As = 1,131 ppm (±54) Moderate hydrocarbon-like odor from 7 to 9 feet
									SS	163.8	As = 1,177 ppm (±50); platy, organic sheen
									ML	51.0	As = 43 ppm (±7) Slight hydrocarbon-like odor
10									SP-SM		
		48							SP-SM		As = 80 ppm (±17) Groundwater encountered at 10.1 feet during drilling
									MS	64.8	As = 428 ppm (±40) Moderate hydrocarbon-like odor from 11 to 15 feet
									ML	131.6	As = 222 ppm (±12)
									SM	89.5	As = <32 ppm As = 70 ppm (±13); popping, orange metallic sheen
									HS	155.6	As = 54 ppm (±8)
									HS	54.8	
15									SP	8.9	As = 98 ppm (±10)
		60							NS	14.8	As = <27 ppm
									NS	9.0	As = 71 ppm (±16)
									SP-SM	8.1	As = 28 ppm (±8)
									NS	24.7	
									NS	34.6	As = <18 ppm

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

### Log of Boring PAI-19D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-11  
 Sheet 1 of 2

Date: 9/30/17 File: P:\00186846\GINT\018684601.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample							
20		60					ML	Gray silt with trace sand (very soft, wet) (Qvr)	NS	27.1	As = <17 ppm	
							SP-SM	Gray fine to medium sand with silt and occasional gravel (medium dense, moist) (Qvr)	NS	5.3	As = 329 ppm (±22)	
							NS		NS	5.6	As = <13 ppm	
							SM	Gray silty fine sand with occasional gravel (medium dense, moist) (Qvr)	NS	3.4	As = <10 ppm	
							SP-SM	Dark gray fine to medium sand with silt and occasional gravel (medium dense, moist) (Qvr)	NS	5.6	As = <23 ppm	
25							SP	Dark gray fine to medium sand with trace silt and occasional gravel (medium dense, moist) (Qvr)	NS			
PAI-19-22.5-24.5 CA PAI-19-24.5-25 CA Temporary pre-pack well screen installed from 22.5 to 25 feet bgs; grab groundwater sample PAI-19D-190913 collected.												

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

### Log of Boring PAI-19D (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-11  
 Sheet 2 of 2

Drilled	Start 9/13/2016	End 9/13/2016	Total Depth (ft)	15	Logged By Checked By	GRL SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	29.76 USACE (Locks)		Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT		
Easting (X) Northing (Y)	1270684.79 239166.09		System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)	
Notes: Hand-augered from 0 to 2 feet bgs.							9/13/2016	10.10	19.66	

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-19D for soil descriptions
5										
10										
15										Temporary pre-pack well screen installed from 11 to 15 feet bgs; grab groundwater sample PAI-19S-190913 collected.

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

### Log of Boring PAI-19S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-12  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/12/2016	End	9/12/2016	Total Depth (ft)	25	Logged By	GRL	Checked By	SBS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	29.88			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	9/12/2016	Depth to Water (ft)	16.10	Elevation (ft)	13.78
Easting (X)	1270664.98			Notes: Hand-augered from 0 to 2 feet bgs.										
Northing (Y)	239141.46													

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0							SP	Gray fine to coarse sand with trace silt (loose, moist) (fill)	NS		XRF Readings "As = X ppm"	
							WD	2-inch plywood	SS	7.0	Sheen 1% coverage Slight hydrocarbon-like odor	
		34					SM	Dark gray silty fine to coarse sand with occasional gravel (medium dense, moist) (fill)	NS		As = <30 ppm	
									NS	8.4	As = <22 ppm	
5		40							NS		As = <24 ppm	
									NS	2.0	As = <19 ppm	
								Grades with trace roots	NS	40.1	As = <16 ppm	
							GP	Light gray fine to coarse gravel with sand and trace silt (medium dense, moist) (fill)	NS	388.8	As = 183 ppm (±16)	
10		48					SM	Dark gray silty fine to coarse sand with occasional gravel (medium dense, moist) (fill)	HS	65.0	Jar test: dark brown NAPL covered 5% of water surface Moderate hydrocarbon-like odor As = 54 ppm (±7)	
									NS	25.2	As = <26 ppm Slight hydrocarbon-like odor from 11 to 14 feet	
							SP	Gray fine to coarse sand with occasional gravel and trace silt (medium dense, moist) (fill)	SS	818.5	As = 59 ppm (±10)	
							ML	Dark gray silt with 4-inch and 6-inch long planar wood fragments (medium stiff, wet) (fill)	NS	98.8	As = <33 ppm Groundwater encountered at 13.4 feet during drilling	
							SM	Dark gray silty fine to coarse sand with gravel (medium dense, wet) (fill)	MS	735.6	As = <34 ppm As = <23 ppm	
15		60							NS	92.6	Jar test: dark brown NAPL covered 10% of water surface Moderate hydrocarbon-like odor As = <28 ppm	
							SP-SM	Dark gray fine to medium sand with silt and occasional gravel (medium dense to dense, wet) (Qvr)	NS	189.8	As = <28 ppm	
									NS	202.2	As = <32 ppm Slight hydrocarbon-like odor from 16 to 20 feet	
									NS	77.4	As = <15 ppm	
									NS	142.3	As = <21 ppm	
									NS	90.2	As = <39 ppm	
20									NS	50.4	As = 54 ppm (±8)	

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

### Log of Boring PAI-20D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-13  
 Sheet 1 of 2

Date: 6/30/17 Path: P:\00186846\GINT\0186846\1.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEO\_ENVIRONMENTAL\_STANDARD

Date: 6/30/17 File: P:\00186846\GINT\018684601.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
20		38						SP-SM	Dark gray fine to medium sand with silt and occasional gravel (dense, wet) (Qva)	
					PAI-20-20-25 CA					As = <25 ppm
										As = 17 ppm (±4)
										As = 38 ppm (±7)
25								SP-SM	Dark gray fine to medium sand with silt and occasional gravel (very dense, wet) (Qpgt)	
										As = <13 ppm
										Temporary PVC well screen installed from 20 to 25 feet bgs; grab groundwater sample PAI-20D-190912 collected.

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

**Log of Boring PAI-20D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Drilled	Start 9/13/2016	End 9/13/2016	Total Depth (ft)	15	Logged By Checked By	GRL SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	30.12 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT	
Easting (X) Northing (Y)	1270666.21 239142.27			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-augered from 0 to 2 feet bgs.								9/13/2016	13.40	16.72

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-20D for soil descriptions
5										
10										
15										Temporary pre-pack well screen installed from 10 to 15 feet bgs; grab groundwater sample PAI-20S-190913 collected.

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

### Log of Boring PAI-20AS



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-14  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Drilled	Start 9/12/2016	End 9/12/2016	Total Depth (ft)	15	Logged By Checked By	GRL SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	29.92 USACE (Locks)		Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT		
Easting (X) Northing (Y)	1270665.11 239142.29		System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)	
Notes: Hand-augered from 0 to 2 feet bgs.							9/12/2016	13.60	16.32	

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-20D for soil descriptions
5										
10										
15										Temporary PVC well screen installed from 13 to 15 feet bgs; grab groundwater sample PAI-20S-190912 collected.

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

### Log of Boring PAI-20S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-15  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBL\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/16/2016	End	9/16/2016	Total Depth (ft)	16	Logged By	GRL	Checked By	SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	34.17			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Easting (X)	1270699.24			Notes: Refusal at 16 feet below ground surface on concrete.				Not encountered					
Northing (Y)	239116.44												

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0		46					BRICK	1.5-inch brick paved surface	NS	<1	XRF Readings "As = X ppm" As = <23 ppm
							SP	Brown fine to coarse sand with trace silt (loose, moist) (fill)			
							GP	Light brown fine to coarse gravel with sand and trace silt (medium dense, moist) (fill)			
									NS	<1	As = <26 ppm
5		60					SP	Light brown fine to coarse sand with occasional gravel (loose, moist) (fill)			
							SM	Gray-brown silty fine to coarse sand with gravel, trace organic matter (fine roots) and brick fragments; agglomerate grades out at 6.4 feet (medium dense, moist) (fill)	NS	<1	As = 17 ppm (±6)
								Trace black glassy material			
							SM	Gray to black silty fine sand with trace decomposing wood (loose, moist) (fill)	NS	<1	As = <29 ppm As = 144 ppm (±14)
							GP	Light gray fine gravel with sand (loose, moist) (fill)	NS	<1	As = 161 ppm (±13)
							SM	Black silty sooty fine to medium sand to sandy silt, occasional metallic agglomerate, occasionally vesicular and glassy (loose, moist) (fill)	NS	<1	As = 39 ppm (±11)
10		28						Grades with trace wood at 10 feet	NS	<1	As = 37 ppm (±7)
								Dark gray soot, grades orange at 10.25 feet	NS	1.8	As = 270 ppm (±21)
								White mortar-like material at 10.5 feet	NS	<1	Strong naphthalene-like odor
							SP	Stratified red brick and black soot at 10.75 feet	SS	17.4	As = <20 ppm
								Grades with black agglomerate at 11.2 feet	NS	4.5	As = 210 ppm (±17)
								White mortar-like material at 11.5 feet	NS		As = <24 ppm
							GP	Orange and white fused agglomerate: medium sand- to coarse gravel-sized (loose, moist) (fill)	NS	5.6	
								Brown and gray fine to coarse gravel with sand and trace silt (loose, moist) (fill)	NS	5.5	As = 23 ppm (±7)
							ML	Grades with trace brick dust	NS	41.6	As = 168 ppm (±18)
							GP	Dark gray silt with occasional gravel (moist) (fill)	MS	483.6	As = 502 ppm (±31); metallic sheen that dissipates
15								Gray fine to coarse gravel with sand (loose, moist) (fill)	MS	48.1	As = 270 ppm (±20)
									SS	18.6	
									NS		As = 116 ppm (±13)

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

### Log of Boring PAI-21



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-16  
 Sheet 1 of 1

Date: 9/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEB\_ENVIRONMENTAL\_STANDARD

Start Drilled	10/17/2016	End	10/17/2016	Total Depth (ft)	30	Logged By	MWB	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	34.26			Hammer Data	N/A			Drilling Equipment	Sonic DB320					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	10/17/2016	Depth to Water (ft)	13.43	Elevation (ft)	20.83
Easting (X)	1270700.07			Notes: Hand-augered from 0 to 2 feet bgs.										
Northing (Y)	239117.73													

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample						
0		60					BRICK	1.5-inch brick paved surface			XRF Readings "As = X ppm"
							SP	Light brown fine sand with gravel and cobbles up to 3 inches (loose, moist) (fill)	NS	<1	As = <38 ppm
							SP	Brown sand with gravel and cobbles up to 4 inches (loose, moist) (fill)	NS	<1	As = <45 ppm
5		60					SP	Brown fine to medium sand with gravel and cobbles up to 5 inches (loose, wet) (fill)	NS	<1	As = <43 ppm
							SP	Light brown fine to medium sand with gravel (loose, moist) (fill)	NS	<1	As = <17 ppm
							SP-SM	Gray to black sand with silt, gravel, wood material and asphaltic debris (fill)	NS	<1	As = <28 ppm
10		60					ASH	Ash with brick fragments (loose, moist) (fill)	SS	10.0	As = 317 ppm (±23); slight blocky sheen, burnt odor
							SP	Black-brown fine sand with gravel, cobbles up to 4 inches and wood debris (fill)	NS	123.9	As = <94 ppm
							SOOT	Black ash and soot (fill)	NS	235.6	
							SP	Gray fine sand with gravel (loose, moist) (fill)	NS	210.1	As = <114 ppm
							WD	Black fibrous wood 3-inches long with silt and gravel (fill)	NS	268.4	Groundwater encountered at 14 feet during drilling
15		60					CC	Light gray fine sand with gravel and ash - concrete (loose, moist) (fill)	NS	201.3	As = 620 ppm (±30)
							SP	Brown fine to medium sand with gravel (loose, wet) (fill)	NS	245.2	As = <46 ppm
							SP-SM	Gray fine to medium sand with silt, gravel and cobbles up to 4 inches (loose, moist) (Qvr)	HS	245.2	As = <73 ppm; heavy sheen/rainbow; shake test 10% orange blebs
									SS	104.6	As = <20 ppm; slightly blocky sheen
									NS	135.5	As = <73 ppm
20									NS	110.3	As = <21 ppm

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

### Log of Boring PAI-21BD



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-17  
 Sheet 1 of 2

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEB\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20	60							NS	23.4	As = <49 ppm
								MS	17.3	As = <65 ppm
25	60							NS	7.0	As = <29 ppm
								NS	20.1	As = <29 ppm
								MS	41.5	As = <24 ppm; sheen with gray, blocky edges
							SM			As = <24 ppm; shake test 10% dark brown-black blebs
30								NS	3.7	As = <24 ppm

PAL-21B-23-28 CA

Temporary pre-pack well screen installed from 23 to 28 feet bgs; grab groundwater sample PAI-21BD-161017 collected.

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

**Log of Boring PAI-21BD (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 6/30/17 Path: P:\00186846\GINT\018684601.GPJ D:\Library\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GELB\_ENVIRONMENTAL\_STANDARD

Start Drilled	10/17/2016	End	10/17/2016	Total Depth (ft)	16.5	Logged By	MWB	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	34.24			Hammer Data	N/A			Drilling Equipment	Sonic DB320					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	10/17/2016	Depth to Water (ft)	15.95	Elevation (ft)	18.29
Easting (X)	1270699.26			Notes: Hand-augered from 0 to 2 feet bgs.										
Northing (Y)	239116.46													

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-21BD for soil descriptions.
5										
10										
15										
										Temporary PVC well screen installed from 14 to 16.5 feet bgs; grab groundwater sample PAI-21BS-161017 collected.

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

### Log of Boring PAI-21BS



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-18  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBE\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/16/2016	End	9/16/2016	Total Depth (ft)	29	Logged By	GRL	Checked By	SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	32.64			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	9/16/2016	Depth to Water (ft)	11.45	Elevation (ft)	21.19
Easting (X)	1270675.04			Notes: Hand-augered from 0 to 2 feet bgs.									
Northing (Y)	239085.68												

Elevation (feet)	FIELD DATA						Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0			8				AC	2 inches asphalt concrete	NS	<1	XRF Readings "As = X ppm" As = <24 ppm	
							GP-GM	Brown fine to coarse gravel with silt and sand (medium dense, moist) (fill)	NS	<1	As = <30 ppm	
									NS	<1	As = <18 ppm	
5			54				ML	Black sooty sandy silt with trace brick dust (medium stiff, moist) (fill)	NS	<1	As = 81 ppm (±15)	
							SM	Grades with trace sand	NS	<1	As = <28 ppm	
							ML	Gray and tan silty fine to coarse sand with occasional gravel (medium dense, moist) (fill)	NS	<1	As = <14 ppm	
							SP-SM	(fill)	NS	<1	As = <18 ppm	
							SP	Tan silt (stiff, moist) (fill)	NS	<1	As = 307 ppm (±18); fine yellow powder on surface during sheen test	
							SP-SM	Tan fine to medium sand with silt and occasional gravel (medium dense, moist) (fill)	NS	<1	As = 986 ppm (±47)	
							SM	(fill)	NS	<1	As = 1,272 ppm (±39)	
							ML	Black fine to medium sand with thin layer of brick debris on top (loose, moist) (fill)	NS	<1	As = 618 ppm (±18)	
							GM	Gray fine to medium sand with silt (medium dense, moist) (fill)	SS	<1	As = 852 ppm (±27); gray, blocky sheen	
10			8					Grades brown mottling	NS	<1	As = 518 ppm (±17)	
								Grades gray with light green	NS	<1	As = 309 ppm (±16)	
							SP	Gray-brown silty fine to medium sand with occasional gravel (medium dense, moist) (fill)	NS	<1	As = 381 ppm (±24)	
			60				ML	(fill)	NS	<1	As = 741 ppm (±47)	
							SM	Gray with brown and orange mottling sandy silt with occasional gravel (medium stiff to stiff, moist to wet) (fill)	NS	<1	Groundwater encountered at 12 feet during drilling	
							SM	(fill)	NS	<1	As = 226 ppm (±11)	
							GP-GM	Gray with brown and orange mottling silty gravel (medium dense, moist) (fill)	NS	<1	As = 758 ppm (±32)	
							ML	Gray medium to coarse sand with gravel and trace silt (medium dense, moist) (fill)	NS	<1	As = 206 ppm (±13)	
							ML	(fill)	NS	<1	As = 62 ppm (±6)	
							SP-SM	Dark brown and gray with orange mottling silt with trace sand (medium stiff, moist) (fill)	NS	<1	As = 477 ppm (±38)	
								Gray with dark brown and light green silty fine to medium sand (medium dense, moist) (fill)	NS	<1	Slight burnt plastic odor	
15			60					(fill)	NS	<1	As = 172 ppm (±11)	
								Dark gray to black silty sooty fine to medium sand (medium dense, moist) (fill)	NS	<1	As = 131 ppm (±13)	
								Gray to brown fine to coarse gravel with silt and sand, 1 inch piece of brick (medium dense, wet) (fill)	NS	<1		
								Grades gray with light green	NS	<1		
								Gray sandy silt (medium stiff, wet) (Qvr)	NS	<1		
								Gray silt (medium stiff, wet) (Qvr)	NS	<1	As = 116 ppm (±15)	
								Black stained fine to medium sand with silt and occasional gravel (medium dense, wet) (Qvr)	NS	<1		
20								Grades to gray at 14.5 feet	NS	<1		
								Grades with gravel at 15 feet	NS	<1		

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

### Log of Boring PAI-22D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-19  
 Sheet 1 of 2

Date: 9/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEB\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Water Level					
20							Grades to dark gray at 17.4 feet Grades to gray at 18.4 feet Grades to dark gray at 19 feet	NS		As = 121 ppm (±11)
	48					ML	Gray silt with sand and occasional gravel (very stiff to hard, moist) (Qvr)	NS	3.9	As = 123 ppm (±12)
								NS	13.4	As = 162 ppm (±16)
						SP-SM	Dark gray to black fine to medium sand with silt (loose, wet) (Qvr)	NS	1.4	As = 23 ppm (±6) As = 162 ppm (±11)
							Grades to medium dense	NS	16.3	As = 29 ppm (±5)
25	48					ML	Gray silt with fine sand and occasional gravel (hard, moist) (Qvr)	NS	7.6	As = 17 ppm (±4) As = 70 ppm (±9)
						SM	Gray silty fine sand with gravel (dense, wet) (Qvr)	NS	1.1	As = 55 ppm (±15)
						ML	Grades to dark gray, moist Dark gray silt with fine sand and occasional gravel (hard, moist) (Qpgd)	NS		As = 52 ppm (±9)
								NS	6.8	As = 30 ppm (±5)

PAI-22-  
23-25  
CA

Temporary pre-pack well screen installed from 23 to 25 feet bgs; grab groundwater sample PAI-22D-190916 collected.

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

### Log of Boring PAI-22D (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-19  
 Sheet 2 of 2

Drilled	Start 9/16/2016	End 9/16/2016	Total Depth (ft)	15	Logged By Checked By	GRL SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	32.54 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT	
Easting (X) Northing (Y)	1270674.18 239084.59			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-augered from 0 to 2 feet bgs.								9/16/2016	11.30	21.24

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										
30										
5										
10										
12						▼				
15										
<p>See adjacent boring PAI-22D for soil descriptions</p> <p>Temporary pre-pack well screen installed from 12 to 13 feet bgs; grab groundwater sample PAI-22S-190916 collected.</p>										

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

### Log of Boring PAI-22S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-20  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/26/2016	End	9/26/2016	Total Depth (ft)	29	Logged By	GRL ZAS	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	30.17 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Easting (X) Northing (Y)	1270640.71 239142.16			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	9/26/2016	Depth to Water (ft)	10.48	Elevation (ft)	19.69
Notes: Hand-augered from 0 to 2 feet bgs.													

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0							SP	Brown fine to medium sand with trace organic matter (loose, moist) (fill)			XRF Readings "As = X ppm"	
25							NS		<1		As = <28 ppm	
							SP-SM	Dark brown fine to medium sand with silt, occasional gravel and trace wood (loose, moist to wet) (fill)			As = <26 ppm	
							SM	Dark brown silty fine to medium sand with occasional gravel and trace wood (loose, moist to wet) (fill)			As = <24 ppm	
5							NS		<1			
48							NS		1.9			
							NS	Grades to gray with gravel, without wood	34.8		As = 24 ppm (±7)	
							SP-SM	Gray fine to medium sand with silt and occasional gravel (loose, wet) (fill)		40.1	As = <31 ppm Groundwater encountered at 8.4 feet during drilling	
							ML	Dark brown silt with sand (medium stiff, moist) (fill)		65	Sheen is blocky As = 194 ppm (±14); sheen has color	
							SP-SM	Gray fine to medium sand with silt (loose, wet) (fill)		7	As = 84 ppm (±11)	
10							ML	Gray silt (stiff, moist) (Qvr)		<1	As = 40 ppm (±8)	
							GP-GM	Grades to medium stiff with trace organic matter		104.8	As = <28 ppm Jar test: NAPL at surface is almost 1 mm thick, covers surface	
							SP-SM	Brown fine to coarse gravel with sand and silt (medium dense, wet) (Qvr)		4.4	As = 53 ppm (±11)	
							SS	Gray-brown fine to medium sand with silt and occasional gravel (medium dense, moist to wet) (Qvr)			As = <19 ppm	
							NS	Grades to gray		76.2	As = 23 ppm (±6)	
							NS	Grades to dark gray		<1	As = 60 ppm (±11)	
15							SS				As = 104 ppm (±10)	
							SM	Dark gray silty fine to medium sand with occasional gravel (medium dense, wet) (Qvr)		11.8	As = 114 ppm (±13)	
							ML			24.3	As = 132 ppm (±8)	
							GP-GM	Dark gray sandy silt with occasional gravel (soft, wet) (Qvr)			As = 58 ppm (±8)	
							NS	Dark gray fine to coarse gravel with silt and sand (medium dense, wet) (Qvr)		<1		
20							SP-SM	Dark gray fine to medium sand with silt (medium dense, wet) (Qvr)		<1	As = 181 ppm (±13)	

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

### Log of Boring PAI-23D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-21  
 Sheet 1 of 2

Date: 9/30/17 Path: P:\00186846\GINT\0186846\01.GPJ D:\Library\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Water Level					
20	60					ML	Gray sandy silt with gravel (very stiff, moist) (Qvr)	NS	30.4	As = 85 ppm (±9)
						SP-SM	Gray fine to medium sand with silt and occasional gravel (dense, moist) (Qvr) Grades to wet	NS	6.1	As = <22 ppm
						SM	Grades to moist to wet Gray silty fine to medium sand with occasional gravel (dense, wet) (Qvr)	NS	4.7	As = 109 ppm (±11)
								NS	<1	
								NS	<1	As = <18 ppm
25	48					SP-SM	Gray fine to medium sand with silt and occasional gravel (medium dense, wet) (Qvr)	NS	4.7	As = <18 ppm
						SP-SM	Gray fine to medium sand with silt and occasional gravel (dense, wet) (Qva)	NS	4.7	As = 102 ppm (±10) As = 92 ppm (±11)
								NS	<1	As = 161 ppm (±14)
						ML	Gray sandy silt with occasional gravel (hard, moist) (Qpgd)	NS	<1	As = <28 ppm
								NS	<1	As = <17 ppm

PAI-23-  
26-28  
CA

Temporary pre-pack well screen installed from 25.8 to 27.8 feet bgs; grab groundwater samples PAI-23D-160926 and D-160926 collected.

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

**Log of Boring PAI-23D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ D:\Library\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Drilled	Start 9/26/2016	End 9/26/2016	Total Depth (ft)	11	Logged By Checked By	GRL ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	30.25 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT	
Easting (X) Northing (Y)	1270640.84 239143.07			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-augered from 0 to 2 feet bgs.								9/26/2016	8.37	21.88

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-23D for soil descriptions
5										
10										

Temporary pre-pack well screen installed from 8.5 to 9.5 feet bgs; grab groundwater sample PAI-23S-160926 collected.

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

### Log of Boring PAI-23S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-22  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBL\_ENVIRONMENTAL\_STANDARD



Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Graphic Log				
20	48			PAI-24-21.3-22.3 CA		SP Gray fine to medium sand with trace silt (dense, wet) (Qva)	NAPL NS	266.8 <1	As = 24 ppm (±7) Jar test: thin brown NAPL at top covers 80% As = 43 ppm (±14)
						ML Grades to dark gray Gray sandy silt with occasional gravel (dense, moist) (Qva)	NS	<1	As = <18 ppm As = <25 ppm
						SM Gray silty fine to medium sand (Qva)	NS	<1	As = <16 ppm
						ML Gray silt with trace sand and occasional gravel (hard, moist) (Qpgd)	NS	<1	As = <21 ppm
							NS	<1	As = <16 ppm

Temporary pre-pack well screen installed from 21.5 to 22.5 feet bgs; grab groundwater sample PAI-24D-160926 collected.

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

### Log of Boring PAI-24D (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-23  
 Sheet 2 of 2

Drilled	Start 9/26/2016	End 9/26/2016	Total Depth (ft)	11	Logged By Checked By	GRL SBS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	30.66 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT	
Easting (X) Northing (Y)	1270636.94 239108.25			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-augered from 0 to 2 feet bgs.								9/26/2016	9.80	20.86

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-24D for soil descriptions
5										
10					▼					

Temporary pre-pack well screen installed from 9.8 to 10.8 feet bgs; grab groundwater sample PAI-24S-160926 collected.

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

### Log of Boring PAI-24S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-24  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Drilled	Start 9/27/2016	End 9/27/2016	Total Depth (ft)	29	Logged By Checked By	RNM ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	28.23 USACE (Locks)		Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT		
Easting (X) Northing (Y)	1270804.73 239185.15		System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)	
Notes: Hand-augered from 0 to 2 feet bgs.							9/27/2016	14.69	13.54	

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-11 for soil descriptions
5										
10										
15										
20										

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

Date: 6/30/17 Path: P:\00188846\GINT\018884601.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

<b>Log of Boring PAI-25D</b>		
	Project:	Puget Sound Energy GWPS
	Project Location:	Gas Works Park, Seattle, Washington
	Project Number:	0186-846-01
		Figure 1-25 Sheet 1 of 2

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
20										
15										
10										
25										
20										
15										
10										
5										
0										
										Temporary pre-pack well screen installed from 27.13 to 28.63 feet; grab groundwater sample PAI-25D-190927 collected.

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

**Log of Boring PAI-25D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled	9/27/2016	End	9/27/2016	Total Depth (ft)	29	Logged By	GRL ZAS	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	31.57			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	9/27/2016	Depth to Water (ft)	11.32	Elevation (ft)	20.25
Easting (X)	1270722.02			Notes: Hand-augered from 0 to 1½ feet bgs.										
Northing (Y)	239071.36													

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0						AC	3½-inches asphalt concrete				XRF Readings "As = X ppm" No recovery from 0 to 2 feet
30	32					SP-SM	Brown fine to coarse sand with silt, gravel and trace organic matter (loose, moist) (fill)	NS	<1		
						SM	Gray silty fine to coarse sand with gravel and occasional cobbles (medium dense, moist) (fill)	NS	<1		As = <21 ppm
5	30						Geogrid at 1.5 feet	NS	<1		As = <20 ppm
							Gray sandy silt with gravel and trace wood (medium stiff, moist) (fill)				
10	46					SP	Grades to gray and brown	NS	<1		As = <26 ppm
						ML	Gray fine to medium sand with trace silt (loose, moist) (fill)	NS	<1		
15	49					ML	Gray silt (medium stiff, moist) (fill)	NS	<1		As = 31 ppm (±10)
						SM	Brown silt with organic matter (decaying wood) (soft, moist) (fill)	NS	<1		As = 38 ppm (±12)
20						ML	Gray silty fine sand with gravel (loose, moist) (fill)	NS	<1		As = 322 ppm (±20)
						GP	Dark gray sandy silt (fill)	SS	<1		As = 36 ppm (±7); blocky sheen
							Black with occasional light gray and orange fused agglomerate (fine sand- to coarse gravel-sized) (fill)				As = 16 ppm (±4)
							Grades to vesicular fused agglomerate and coarser				
							With fine to medium sand	NS	<1		As = 43 ppm (±8)
						SM/ML	Dark gray silty fine to coarse sand to sandy silt (loose/soft, moist) (fill)	SS	<1		As = <25 ppm
						GP	Black fused agglomerate (loose, wet) (fill)	MS	41.7		As = 382 ppm (±22)
							Groundwater encountered at 11.3 feet during drilling				
						GP	Dark gray fine gravel with trace silt and sand (loose, wet) (fill)	NS	13.9		As = 295 ppm (±12)
						WD	Grades to olive	NS	4.4		As = 349 ppm (±24)
						SP	Brown organic matter (decaying wood) (fill)		<1		As = 883 ppm (±21)
						SP-SM	Gray fine to medium sand with trace silt and organic matter (loose, wet) (Qvr)	NS	<1		As = 203 ppm (±11)
							Grades coarser	NS	<1		As = 252 ppm (±14)
							Gray fine to medium sand with silt, occasional gravel and trace organic matter (medium dense, wet) (Qvr)				As = 147 ppm (±9)
							Grades to dark gray without organic matter	NS	<1		As = <22 ppm
						SP	Gray and black fine to coarse sand with trace silt and occasional gravel (dense, wet) (Qvr)	NS	<1		As = 24 ppm (±7)
						SP-SM	Dark gray fine to medium sand with silt and occasional gravel (dense, wet) (Qvr)	NS	<1		As = <28 ppm
						SP	1-cm layer dark gray sandy silt with occasional gravel (medium stiff, moist) (Qvr)				
						SP-SM	Gray fine to coarse sand with occasional gravel (medium dense, wet) (Qvr)				As = <16 ppm
							Dark gray fine to medium sand with silt and occasional gravel (dense, wet) (Qva)	NS	<1		As = <23 ppm

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

### Log of Boring PAI-26D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-26  
 Sheet 1 of 2

Date: 9/30/17 File: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBL\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS	
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Water Level					Graphic Log
20		60							NS	<1	As = <24 ppm
10									NS	<1	As = 23 ppm (±7)
									NS	<1	As = <20 ppm
									NS	<1	As = <19 ppm
									NS	<1	As = <21 ppm
25		48							NS	<1	As = <19 ppm
									NS	<1	As = <26 ppm
5									NS	<1	As = <24 ppm
									NS	<1	As = <23 ppm
									NS	<1	As = 21 ppm (±6)

Temporary pre-pack well screen installed from 20.25 to 25.25 feet bgs; grab groundwater sample PAI-26D-190928 collected.

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

Date: 6/30/17 File: P:\00186846\GINT\018684601.GPJ D:\Library\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

### Log of Boring PAI-26D (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-26  
 Sheet 2 of 2

Drilled	Start 9/27/2016	End 9/27/2016	Total Depth (ft)	12.5	Logged By Checked By	GRL ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	31.55 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT	
Easting (X) Northing (Y)	1270721.42 239071.53			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-augered from 0 to 1½ feet bgs.								9/27/2016	11.42	20.13

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-26D for soil descriptions
30										
5										
10										
12.5										

Temporary pre-pack well screen installed from 11.4 to 12.4 feet bgs; grab groundwater samples PAI-26S-190928 and duplicate PAI-26D-160928 collected.

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

### Log of Boring PAI-26S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-27  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/28/2016	End	9/28/2016	Total Depth (ft)	30	Logged By	GRL ZAS	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	25.84			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	9/28/2016	Depth to Water (ft)	8.16	Elevation (ft)	17.68
Easting (X)	1270773.32			Notes: Hand-augered from 0 to 5 feet bgs.									
Northing (Y)	239024.91												

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0						SP-SM	Brown fine to coarse sand with silt, occasional gravel and trace organic matter (roots) (loose, moist) (fill)	NS	<1	XRF Readings "As = X ppm"	
						SP	Brown medium sand (loose, moist) (fill)	NS	<1		
						SM	Grades with trace silt Gray silty fine sand with occasional gravel (medium dense, moist) (fill)	NS	<1		
								NS	<1		
								NS	<1		
5		47				GM	Gray silty fine to coarse gravel with sand (medium dense, moist) (fill)	NS	<1	As = <21 ppm	
						SM	Black sooty silty fused agglomerate (fine to coarse sand-sized) (loose, moist) (fill)	NS	<1	As = 59 ppm (±15)	
						GP	Two very smooth glassy pieces Black fused vesicular agglomerate (fine to coarse gravel-sized with sand-sized) with brick debris (loose, wet) (fill)	NS	78.2	As = <21 ppm	
							Grades without brick debris	HS	326.1	Groundwater encountered at 6.2 feet during drilling As = <22 ppm Jar test: fine sand-sized blebs covering ~20% of surface; trace blebs suspended in water column	
								MS	90	As = 26 ppm (±5)	
									40.1	As = 92 ppm (±11)	
10		40					1-inch layer tan fused agglomerate	NS	24.2	As = 130 ppm (±10)	
							With occasional light colored platy fused agglomerate	MS	1	As = 268 ppm (±20)	
						SM	Gray silty fine to medium sand with occasional gravel (medium dense, wet) (Qvr)	SS	<1	As = 245 ppm (±11)	
								NS	<1	As = 51 ppm (±7)	
15		36						NS	<1	As = 38 ppm (±5)	
						SP-SM	Gray fine to medium sand with silt and occasional gravel (medium dense, wet) (Qvr) Alternates gray and dark gray	NS	<1	As = 87 ppm (±6)	
								NS	<1	As = 16 ppm (±4)	

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

### Log of Boring PAI-27D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-28  
 Sheet 1 of 2

Date: 9/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEOE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample							
20		24					SM	Gray silty fine to medium sand with occasional gravel (medium dense, wet) (Qvr)	NS	<1	As = 15 ppm (±4)	
							SP	Gray fine to medium sand with trace silt and gravel (medium dense, wet) (Qvr)				
							SM	Gray silty fine to medium sand with occasional gravel (medium dense, wet) (Qvr)	NS	<1	As = 27 ppm (±6)	
							GM	Gray silty fine to medium sand with occasional gravel (medium dense, wet) (Qvr)	NS	<1	As = 22 ppm (±5)	
							ML	Gray silty fine to coarse gravel with sand (dense, wet) (Qvr)				
							SM	Gray silt with sand (stiff, moist) (Qvr)				
							SP-SM	Dark gray silty fine sand (medium dense, wet) (Qvr)				
							SP-SM	Dark gray fine to medium sand with silt and occasional gravel (dense, wet) (Qvr)				
25		52					SM	Gray silty fine to medium sand with occasional gravel (dense, wet) (Qvr)	NS	<1	As = 31 ppm (±7)	
							GM	Gray silty fine to coarse gravel with sand (dense, wet) (Qvr)	NS	<1	As = 26 ppm (±5)	
							SM	Gray silty fine to coarse gravel with sand (dense, wet) (Qvr)				
							ML	Dark gray silty fine sand with occasional gravel (dense, wet) (Qvr)	NS	<1	As = <19 ppm	
							SM	Gray silt with trace sand and occasional gravel (hard, moist) (Qpgt)	NS	<1	As = <14 ppm	
							SM	Dark gray to black silty fine to medium sand with occasional gravel (dense, wet) (Qpgt)	NS	<1	As = <12 ppm	
30								Grades finer				

PAI-27-25.5-26.5 CA

Temporary pre-pack well screen installed from 25.3 to 26.3 feet bgs; grab groundwater sample PAI-27D-160928 collected.

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

**Log of Boring PAI-27D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 6/30/17 File: P:\00186846\GINT\018684601.GPJ D:\Library\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBE\_ENVIRONMENTAL\_STANDARD

Drilled	Start 9/28/2016	End 9/28/2016	Total Depth (ft)	12.5	Logged By Checked By	GRL ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	25.91 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT	
Easting (X) Northing (Y)	1270773.62 239026.05			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Hand-augered from 0 to 5 feet bgs.								9/28/2016	5.62	20.29

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										
5										
10										

Temporary pre-pack well screen installed from 9.5 to 12.5 feet bgs; grab groundwater sample PAI-27S-160928 collected.

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

### Log of Boring PAI-27S

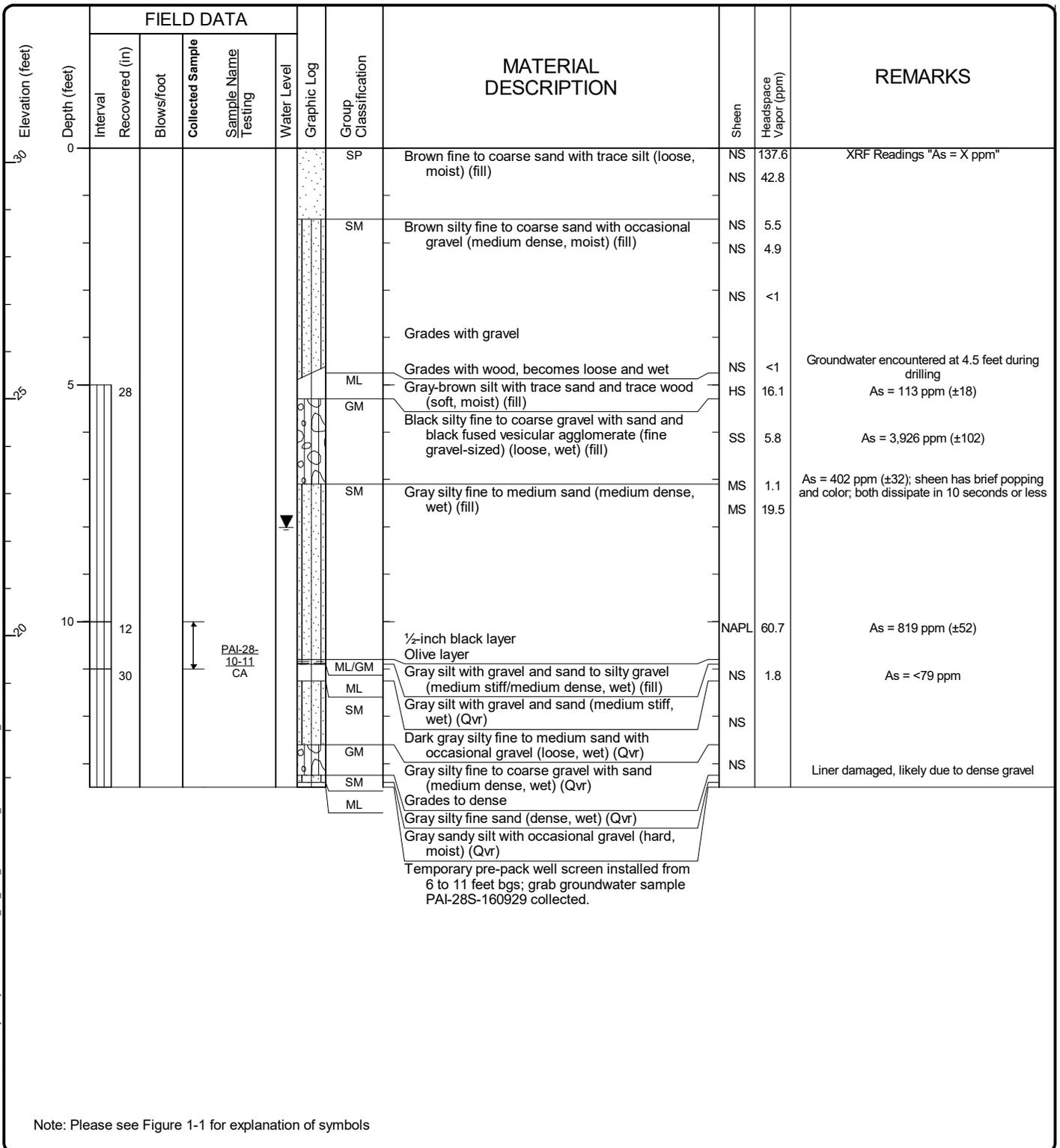


Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-29  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBL\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/29/2016	End	9/29/2016	Total Depth (ft)	13.5	Logged By	GRL ZAS	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	30.3 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Easting (X) Northing (Y)	1270660.37 239171.22			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	9/29/2016	Depth to Water (ft)	8.01	Elevation (ft)	22.29
Notes: Hand-augered from 0 to 2 feet bgs.													



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

### Log of Boring PAI-28S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-30  
 Sheet 1 of 1

Start Drilled	9/29/2016	End	9/29/2016	Total Depth (ft)	13.4	Logged By	GRL ZAS	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	33.64			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)			
Easting (X)	1270655.38			Notes: Hand-augered from 0 to 3½ feet bgs.									Not encountered
Northing (Y)	239052.22												

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0							SP-SM	Brown fine to medium sand with silt and trace organic matter (fine roots) (loose, moist) (fill)	NS	<1	XRF Readings "As = X ppm"	
							SP	Brown fine to coarse sand with trace silt (loose, moist) (fill) Liner encountered at 1.6 feet	NS	<1		
									NS	<1		
									NS	<1		
30		18					SM	Gray silty fine to coarse sand (medium dense, moist) (fill)	NS	<1	As = 40 ppm (±8)	
							ML	Gray sandy silt with gravel and organic matter (medium stiff, moist) (fill)	NS	<1	As = 78 ppm (±10)	
5		50					SM	Gray silty fine to coarse sand with gravel (medium dense, moist) (fill)	NS	<1	As = <32 ppm	
							SOOT	Black soot with trace silt, sand and organic matter (medium stiff, moist) (fill)	NS	<1	As = 169 ppm (±12)	
							ML	Black soot with trace silt, sand and organic matter (medium stiff, moist) (fill)	NS	<1	As = <20 ppm	
							SM	Brick fragment encountered at 6.4 feet	NS	<1		
							SM	Gray sandy silt with gravel (stiff, moist) (fill)	NS	<1	As = <21 ppm	
							ML	Gray silty fine sand with occasional gravel (dense, moist) (fill)	NS	<1		
							ML	Trace brick dust at 7.2 feet	NS	<1	As = <15 ppm	
10		40					ML	Brown silty fine sand with occasional gravel and trace organic matter (medium dense, moist) (fill)	NS	<1	As = <16 ppm	
							ML	Gray silt with sand, organic matter at top, darker laminae likely decaying organic matter (hard, moist) (Qpgd)	NS	<1	As = <23 ppm	
							SM	Gray with orange mottling sandy silt with occasional gravel (hard, moist) (Qpgd)	NS	<1	As = <26 ppm	
							ML	Grades to no mottling	NS	<1	As = <17 ppm	
							ML	Gray with orange mottling silty fine sand (Qpgd)	NS	<1		
							ML	Grades to no mottling	NS	<1		
							ML	Gray sandy silt with occasional gravel (hard, moist) (Qpgd)	NS	<1	As = <23 ppm	

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

### Log of Boring PAI-29



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-31  
 Sheet 1 of 1

Date: 9/30/17 Path: P:\00186846\GINT\018684601.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GIEE\_ENVIRONMENTAL\_STANDARD

Start Drilled	9/29/2016	End	9/29/2016	Total Depth (ft)	19	Logged By	GRL ZAS	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft)	33.75			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT				
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	9/29/2016	Depth to Water (ft)	7.90	Elevation (ft)	25.85
Easting (X)	1270589.08			Notes:									
Northing (Y)	239145.81												

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0	43					SM	Brown silty fine to coarse sand with gravel (medium dense, moist) (fill)	NS	<1	XRF Readings "As = X ppm"	
						WD	Brown organic matter (decaying small wood pieces) (fill)	NS	<1	As = 79 ppm (±7)	
						SM	Black silty sooty fine to coarse sand with trace fused agglomerate (medium dense) (fill)	NS	<1	As = <29 ppm	
						SM	Black silty fused agglomerate (fine to coarse sand-sized) with sand, soot and occasional gravel (loose, wet) (fill)	NS	<1	Groundwater encountered at 2.8 feet during drilling As = 32 ppm (±8)	
5	30						Grades to very loose				
								NS			
								NS	1.6	As = <35 ppm	
						ML	With gravel Gray-black silt with trace organic matter (medium stiff, moist) (fill)	SS	4.9	As = 81 ppm (±11)	
						ML	One piece of wood encountered Gray silt with occasional gravel (medium stiff, moist) (fill)	SS	10.8	As = 31 ppm (±7)	
	52					ML	Grades to brown with trace organic matter Grades to dark brown	SS	8.6	As = 54 ppm (±11)	
						ML	Gray silt with occasional gravel (stiff, moist) (Qvr)	SS	9.6	As = <18 ppm	
						SM	Orange and brown mottling Gray silty fine sand with occasional gravel (dense, moist) (Qvr)	SS	29.9	As = <16 ppm	
							Grades to dark gray	SS			
								MS	66.8	As = <21 ppm	
15	48					ML	Gray silt (medium stiff, moist) (Qvr)	SS	83.4	As = <19 ppm	
							Grades sandy and soft, wet	SS		As = 61 ppm (±12)	
						SM	Gray silty fine to medium sand (very loose, wet) (Qvr)	NAPL	185.6	As = <20 ppm; sheen has color Jar test: thin NAPL covers surface, small brown and occasional black blebs cover 20%	
							Grades to loose Grades to medium dense			As = <19 ppm	
						SM	Gray silty fine to medium sand (dense, wet) (Qva)				
							Grades with gravel and very dense Grades to gray with light purple to mauve color			As = <16 ppm	
							Temporary pre-pack well screen installed from 5 to 9 feet bgs; grab groundwater sample PAI-30S-160929 collected.				
									8.2		

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

### Log of Boring PAI-30S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-32  
 Sheet 1 of 1

Date: 9/30/17 File: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GIEE\_ENVIRONMENTAL\_STANDARD

Start Drilled	10/18/2016	End	10/18/2016	Total Depth (ft)	31	Logged By	MWB	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	29.87			Hammer Data	N/A			Drilling Equipment	Sonic DB320					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	10/18/2016	Depth to Water (ft)	22.90	Elevation (ft)	6.97
Easting (X)	1270674.32			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	10/18/2016	Depth to Water (ft)	22.90	Elevation (ft)	6.97
Northing (Y)	239144.6			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	10/18/2016	Depth to Water (ft)	22.90	Elevation (ft)	6.97
Notes: Hand-augered from 0 to 2 feet bgs.														

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS		
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing					Water Level	Graphic Log
0		60						SP-SM	Brown-tan sand with silt and gravel (loose, moist) (fill)	NS	<1	XRF Readings "As = X ppm"
								SP	Gray fine to coarse sand with gravel (loose, moist) (fill)	NS	<1	As = <25 ppm
								ML	Dark gray silt with rounded gravel and trace wood debris (stiff, moist) (fill)	NS	<1	As = <40 ppm
										NS	<1	As = <32 ppm
5		60						AC	Black semi-solid asphaltic material (loose, moist) (fill)	NS	3.4	
								SP	Gray fine sand with gravel (loose, moist) (fill)	SS	41.0	As = <30 ppm; slight blue sheen
								SP	Black fine sand coated with soot and occasional gravel (medium dense, moist) (fill)	NS	97.2	As = <42 ppm
										SS	42.2	As = 151 ppm (±29)
								SP	Black sand with soot, occasional gravel and fibrous wood (loose, moist) (fill)	MS	31.7	As = 231 ppm (±40); rainbow sheen hydrocarbon-like odor
10		60						GP	Black gravel with sand coated in soot (loose, moist) (fill)	NS	125.3	As = 128 ppm (±19)
								ML	Black-gray silt with gravel, occasional sand and soot (stiff, moist) (fill)	NS	68.1	As = 391 ppm (±39)
								CC	Light gray crushed concrete rubble with metal debris (loose, moist) (fill)	NS	14.1	As = <31 ppm
										NS	29.2	
										NS		
15		60						SP-SM	Black fine sand with silt, gravel and large cobbles (loose, wet) (fill)	NS	16.2	As = <34 ppm Groundwater encountered at 15 feet during drilling
										MS	13.8	As = <73 ppm; rainbow sheen popping
								SP-SM	Dark gray fine to medium sand with silt and gravel (medium dense, moist) (Qvr)	NS	27.2	As = <44 ppm As = <40 ppm
										NS	10.7	As = <25 ppm
										NS	6.0	As = <31 ppm
20								SP-SM	Gray fine to medium sand with silt and			

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

### Log of Boring PAI-31D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-33  
 Sheet 1 of 2

Date: 6/30/17 Path: P:\00186846\GINT\0186846\1.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample							
20		60						occasional gravel (very dense, moist) (Qva)	NS	6.1	As = <19 ppm	
									NS			
									NS	2.4	As = <21 ppm	
							SP-SM	Gray fine sand with silt and occasional gravel (loose, wet) (Qva)	NS	2.8	As = <25 ppm	
							SP-SM	Dark gray fine to medium sand with silt and gravel (loose, moist) (Qva)	NS	4.3	As = <20 ppm	
25		60					SP-SM	Gray fine to medium sand with silt and gravel (medium dense, moist) (Qva)	NS	3.4	As = <29 ppm	
							SP-SM	Gray fine sand with silt, occasional gravel and large cobbles (loose, moist) (Qva)	NS	1.1	As = <20 ppm	
							SP-SM	Gray fine to medium sand with silt and occasional gravel (medium dense, moist) (Qva)	NS	1.0	As = <35 ppm	
							SP-SM	Dark gray to gray fine sand with silt and occasional gravel (very dense, moist to wet) (Qpgt)	NS	<1	As = <34 ppm As = <24 ppm	
							SP-SM	Light gray fine sand with silt and gravel (very dense, moist) (Qpgt)	NS	<1	As = <16 ppm As = <24 ppm	
30		12					SP-SM	Light gray fine sand with silt and gravel (very dense, moist) (Qpgt)	NS	<1	As = <26 ppm	
									NS	<1	As = <26 ppm	

PAI-31-27-29.5 CA

Temporary pre-pack well screen installed from 27 to 29.5 feet bgs; grab groundwater sample PAI-31D-161018 collected.

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

**Log of Boring PAI-31D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-33  
 Sheet 2 of 2

Date: 6/30/17 File: P:\00186846\GINT\018684601.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Start Drilled	10/18/2016	End	10/18/2016	Total Depth (ft)	16.5	Logged By	MWB	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	30			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	10/18/2016	Depth to Water (ft)	12.40	Elevation (ft)	17.6
Easting (X)	1270674.92			Notes: Hand-augered from 0 to 2 feet bgs.										
Northing (Y)	239146.62													

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										
5										
10										
15										
										Temporary pre-pack well screen installed from 15 to 16.5 feet bgs; grab groundwater sample PAI-31S-161018 collected.

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

### Log of Boring PAI-31S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-34  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Start Drilled	10/18/2016	End	10/18/2016	Total Depth (ft)	31	Logged By	MWB	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	29.72			Hammer Data	N/A			Drilling Equipment	Sonic DB320					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	10/18/2016	Depth to Water (ft)	18.64	Elevation (ft)	11.08
Easting (X)	1270661.22			Notes: Hand-augered from 0 to 2 feet bgs.										
Northing (Y)	239168.47													

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS		
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing					Water Level	Graphic Log
0		60						SP	Brown fine to coarse sand with trace silt (loose, moist) (fill)	NS		XRF Readings "As = X ppm"
								SP-SM	Dark brown sand with silt, occasional gravel and wood debris and 1 inch layer of asphaltic material (loose, moist) (fill)	NS	<1	As = <20 ppm
								NS		NS	<1	
								NS		NS	4.5	As = 34 ppm (±11)
5		60						SP	Black fine sand with gravel coated in soot and cobbles up to 3 inches in diameter (loose, moist) (fill)	NS	11.4	As = 62 ppm (±15)
								GP	Black gravel with sand coated in soot and wood debris (loose, wet) (fill)	NS	7.0	As = 355 ppm (±24)
								SP-SM	Black to dark gray fine sand with silt, gravel, large cobbles and wood debris (medium dense, moist) (fill)	NS	31.6	As = 908 ppm (±29) Groundwater encountered at 7 feet during drilling
								SS		SS	230.7	As = 531 ppm (±30)
								SP-SM	Dark gray fine sand with silt and trace gravel (loose, wet) (fill)	SS	172.9	As = 595 ppm (±24) Hydrocarbon-like odor
10		60						SP-SM	Gray fine sand with silt and occasional gravel (loose, wet) (fill)	NS	76.3	As = 333 ppm (±18)
								SP	Black fine sand with gravel, soot coated (loose, moist) (fill)	NS	1.3	As = 111 ppm (±13)
								SP-SM	Gray sand with silt and coarse gravel (loose, moist) (Qvr)	NS	3.6	As = 402 ppm (±15)
								NS		NS	3.6	As = 294 ppm (±13)
								SP-SM	Dark gray fine to medium sand with silt, gravel and large cobbles up to 6 inches in diameter (loose, moist) (Qvr)	NS	<1	
								NS		NS	8.9	As = 237 ppm (±25)
								NS		NS	9.6	
								NS		NS	11.7	
15		60						SP	Gray fine to medium sand with trace silt and trace gravel (loose, moist) (Qva)	NS	6.2	
								NS		NS	2.5	As = <20 ppm
20												

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

### Log of Boring PAI-32D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-35  
 Sheet 1 of 2

Date: 6/30/17 Path: P:\00186846\GINT\0186846\1.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GELB\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample							
20		60						SP-SM	Gray fine to medium sand with silt and occasional gravel (medium dense, moist) (Qva)	NS	32.8	As = 26 ppm (±8)
								NS		NS	4.2	As = <19 ppm
								SP-SM	Gray fine to medium sand with silt and occasional gravel (very dense, moist) (Qpgt)	NS	1.8	
								SP-SM	Light gray fine to medium sand with silt and gravel (very dense, moist) (Qpgt)	NS	5.3	As = <34 ppm
								NS		NS	2.0	As = <47 ppm
25		60						NS		NS	4.7	
								SP-SM	Gray fine sand with silt and gravel (very dense, moist) (Qpgt)	NS	1.3	As = <17 ppm
								NS		NS	<1	
								NS		NS	<1	As = <22 ppm
								NS		NS		
30		12						NS		NS		
								NS		NS	<1	As = <26 ppm

Temporary pre-pack well screen installed from 21 to 26 feet bgs; grab groundwater sample PAI-32D-161018 collected.

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

### Log of Boring PAI-32D (continued)



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-35  
 Sheet 2 of 2

Start Drilled	10/19/2016	End	10/19/2016	Total Depth (ft)	35	Logged By	MWB	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous
Surface Elevation (ft) Vertical Datum	34.01 USACE (Locks)			Hammer Data	N/A			Drilling Equipment	Sonic DB320				
Easting (X) Northing (Y)	1270710.62 239156.29			System Datum	WA State Plane, North NAD83 (feet)			Groundwater Date Measured	10/19/2016	Depth to Water (ft)	15.94	Elevation (ft)	18.07
Notes: Hand-augered from 0 to 2 feet bgs.													

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0	60					BRICK	1.5-inch brick paved surface	NS	<1	XRF Readings "As = X ppm"	
						SP	Brown fine to coarse sand with gravel (loose, moist) (fill)	NS	<1		
						SP-SM	Brown fine sand with silt and gravel (loose, moist) (fill)	NS	<1		
						SP-SM	Black fine sand with silt and gravel coated in soot (loose, moist) (fill)	NS	<1	As = <32 ppm	
						SP-SM	Black with brown-orange mottling fine to medium sand with silt, gravel and metal debris (fill)	NS	<1	As = 71 ppm (±13)	
5	60					SP-SM	Black fine sand with silt and gravel coated in soot (loose, moist) (fill)	NS	<1	As = 49 ppm (±14)	
						SP-SM	Black fine sand with silt, gravel and wood debris (fill)	NS	<1	As = <37 ppm	
						SP	Gray fine sand with gravel and cobbles (fill)	NS	<1	As = <31 ppm	
						SP-SM	Black fine sand with silt and gravel coated in soot (fill)	NS	<1	As = <37 ppm	
						SP	Gray fine to medium sand with gravel (loose, moist) (fill)	NS	<1	As = 268 ppm (±21)	
						SP-SM	Black fine sand with silt and gravel coated in soot (fill)	NS	7.5	As = 899 ppm (±31)	
10	60					SP	Black fine sand with silt and gravel coated in soot (fill)	NS	<1	Groundwater encountered at 9.8 feet during drilling	
						SP-SM	Gray-green fine sand with gravel and trace vesicular metallic agglomerate (medium dense, moist) (fill)	NS	<1	As = 6,252 ppm (±114)	
						SP-SM	(1/2-inch pocket of yellow-coated grains at 9 3/4 feet)	NS	1.4	As = 1,700 ppm (±51)	
						SP-SM	Gray fine sand with silt (loose, wet) (fill)	NS	<1	As = 7,614 ppm (±190)	
						GP	Black stained gravel with sand (loose, wet) (fill)	NS	<1		
						GP	Black stained gravel with sand (loose, wet) (fill)	NS	3.9	As = 7,392 ppm (±197)	
15	60					SP-SM	Brown-gray fine sand with silt coated in NAPL (fill)	NAPL	37.2	Shake test 90% coverage; 1 cm of brown LNAPL	
						ML	Gray silt with trace sand (loose, wet) (fill)	HS	24.8	As = 170 ppm (±13); rainbow sheen	
						SP	Black stained fine to coarse sand with trace silt and gravel, coated in NAPL (fill)	NAPL	300.7	As = 80 ppm (±10); shake test 20% coverage; <1 cm of black LNAPL Strong hydrocarbon-like odor	
						CC	Gray concrete rubble (fill)	MS	<1	As = 892 ppm (±38); blocky rainbow sheen	
20								NS	<1	As = <25 ppm	

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

### Log of Boring PAI-33D



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-36  
 Sheet 1 of 2

Date: 6/30/17 File: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBE\_ENVIRONMENTAL\_STANDARD

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample							
20		60					SP-SM	Dark gray fine to medium sand with silt and gravel (medium dense, moist) (Qvr)	NS	1.0		
							SP-SM	Gray fine to medium sand with silt and occasional gravel (medium dense to very dense, moist) (Qvr)	NS	1.0	As = <19 ppm	
									NS	<1	As = 21 ppm (±7)	
							SP-SM	Gray fine to medium sand with silt and gravel (very dense, moist) (Qvr)	NS		As = <33 ppm	
25		60					SP-SM	Gray fine to medium sand with silt, occasional gravel and large cobbles (medium dense, moist) (Qvr)	NS	7.3	As = <33 ppm	
							SP-SM	Gray fine to medium sand with silt, occasional gravel and large cobbles (dense, moist) (Qva)	NS	10.5	As = <27 ppm	
							SP-SM	Light gray fine sand with silt and gravel (very dense, moist) (Qpgt)	NS	8.4	As = <16 ppm	
									NS	3.7	As = <20 ppm	
									NS			
									NS			
30		60							NS			
									NS			
									NS			
									NS			
									NS			
35									NS	3.1	As = 24 ppm (±6)	

PAI-33-25-30 CA

Temporary pre-pack well screen installed from 25 to 30 feet bgs; grab groundwater sample PAI-33D-161019 collected.

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

Date: 6/30/17 File: P:\00186846\GINT\018684601.GPJ D:\Library\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEBE\_ENVIRONMENTAL\_STANDARD

**Log of Boring PAI-33D (continued)**



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled	10/19/2016	End	10/19/2016	Total Depth (ft)	15	Logged By	MWB	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	33.98			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	10/19/2016	Depth to Water (ft)	14.00	Elevation (ft)	19.98
Easting (X)	1270710.71			Notes: Hand-augered from 0 to 2 feet bgs.										
Northing (Y)	239158.07													

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent PAI-33D for soil descriptions
5										
10										
15										Temporary pre-pack well screen installed from 10 to 15 feet bgs; grab groundwater sample PAI-33S-161019 collected.

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

### Log of Boring PAI-33S



Project: Puget Sound Energy GWPS  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure 1-37  
 Sheet 1 of 1

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ\_Database\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

Start Drilled	10/19/2016	End	10/19/2016	Total Depth (ft)	20	Logged By	MWB	Checked By	ZAS	Driller	Cascade Drilling	Drilling Method	Continuous	
Surface Elevation (ft)	34.07			Hammer Data	N/A			Drilling Equipment	Geoprobe 7730 DT					
Vertical Datum	USACE (Locks)			System Datum	WA State Plane, North NAD83 (feet)			Groundwater	Date Measured	10/19/2016	Depth to Water (ft)	15.02	Elevation (ft)	19.05
Easting (X)	1270710.33			Notes: Hand-augered from 0 to 2 feet bgs.										
Northing (Y)	239157.3													

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0										See adjacent boring PAI-33D for soil descriptions
5										
10										
15					▼					
20										

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

Temporary pre-pack well screen installed from 15 to 20 feet bgs; grab groundwater sample PAI-33M-161019 collected.

### Log of Boring PAI-33M

	Project:	Puget Sound Energy GWPS	Figure 1-38 Sheet 1 of 1
	Project Location:	Gas Works Park, Seattle, Washington	
	Project Number:	0186-846-01	

Date: 6/30/17 Path: P:\00186846\GINT\0186846\01.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_GLB\GEGE\_ENVIRONMENTAL\_STANDARD

**Interim Action  
Play Area  
(GeoEngineers, Inc. 2017)**

**2017 Borings**

## SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS <small>(LITTLE OR NO FINES)</small>		<b>GW</b>	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>GP</b>	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>GM</b>	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
	SAND AND SANDY SOILS	CLEAN SANDS <small>(LITTLE OR NO FINES)</small>		<b>SW</b>	WELL-GRADED SANDS, GRAVELLY SANDS
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>SP</b>	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>SM</b>	SILTY SANDS, SAND - SILT MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		<b>ML</b>	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
		LIQUID LIMIT LESS THAN 50		<b>CL</b>	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		LIQUID LIMIT LESS THAN 50		<b>OL</b>	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		<b>MH</b>	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
		LIQUID LIMIT GREATER THAN 50		<b>CH</b>	INORGANIC CLAYS OF HIGH PLASTICITY
		LIQUID LIMIT GREATER THAN 50		<b>OH</b>	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				<b>PT</b>	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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

### Sampler Symbol Descriptions

	2.4-inch I.D. split barrel
	Standard Penetration Test (SPT)
	Shelby tube
	Piston
	Direct-Push
	Bulk or grab
	Continuous Coring

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

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

"WOH" indicates sampler pushed using the weight of the hammer.

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

## ADDITIONAL MATERIAL SYMBOLS

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

### Groundwater Contact



Measured groundwater level in exploration, well, or piezometer



Measured free product in well or piezometer

### Graphic Log Contact



Distinct contact between soil strata



Approximate contact between soil strata

### Material Description Contact



Contact between geologic units



Contact between soil of the same geologic unit

### Laboratory / Field Tests

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

### Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

## Key to Exploration Logs

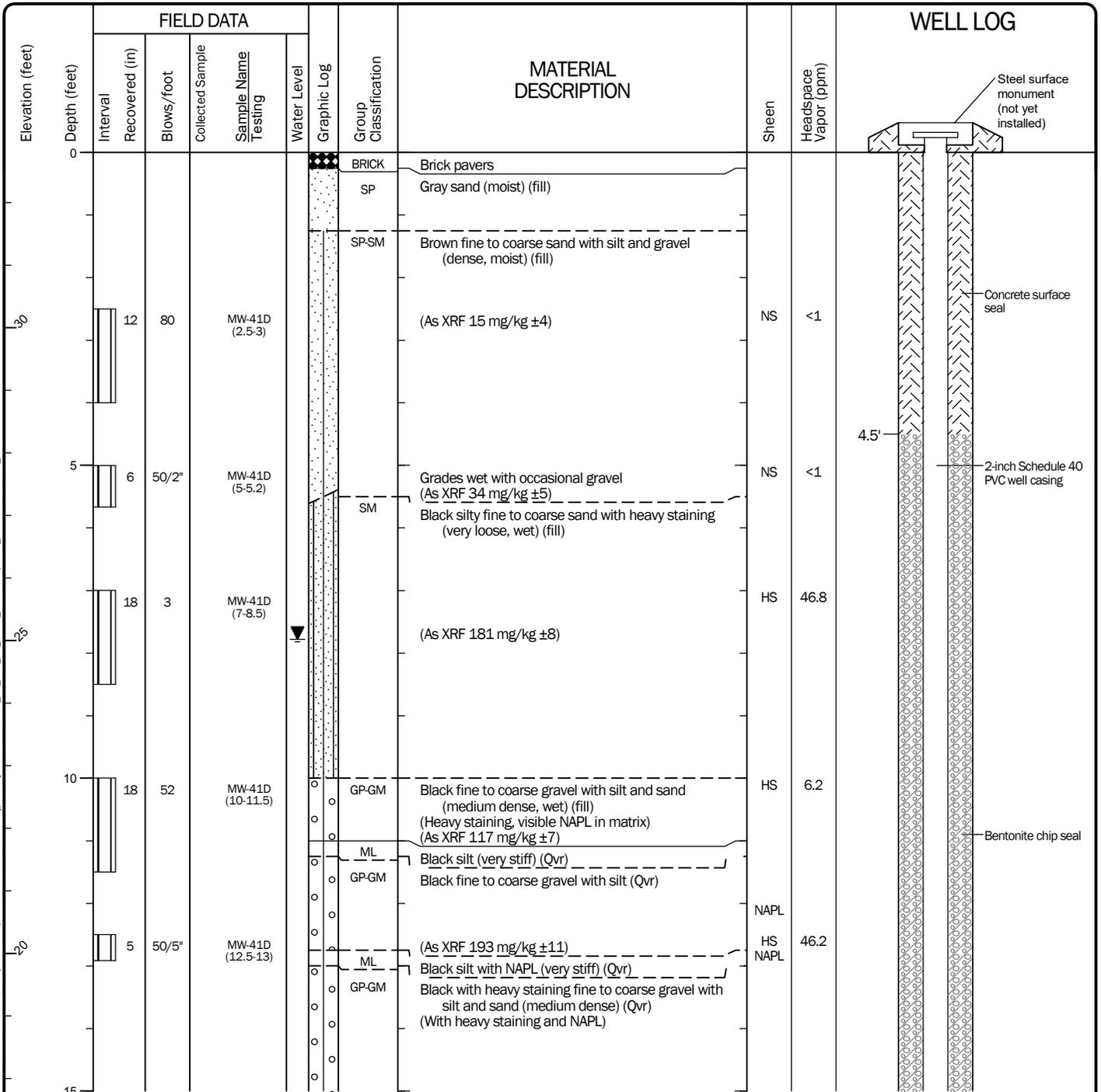


Figure A-1



Start Drilled 3/28/2017	End 3/28/2017	Total Depth (ft)	29.4	Logged By Checked By	PDR SBS	Driller Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 042 A 2 (in) well was installed on 3/28/2017 to a depth of 29.4 (ft).				
Surface Elevation (ft) Vertical Datum	32.8 USACE (feet)	Top of Casing Elevation (ft)	32.44	Groundwater Date Measured			Depth to Water (ft)	Elevation (ft)
Easting (X) Northing (Y)	1270628.03 239126.07	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017			7.78	24.66

Notes: Monitoring well temporarily protected by a 16-inch square, 12-inch deep, covered wood form per drawing Sheet 6.0 (Stage 1).  
Monitoring well developed by alternately pumping and surging: 12 gallons removed.



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

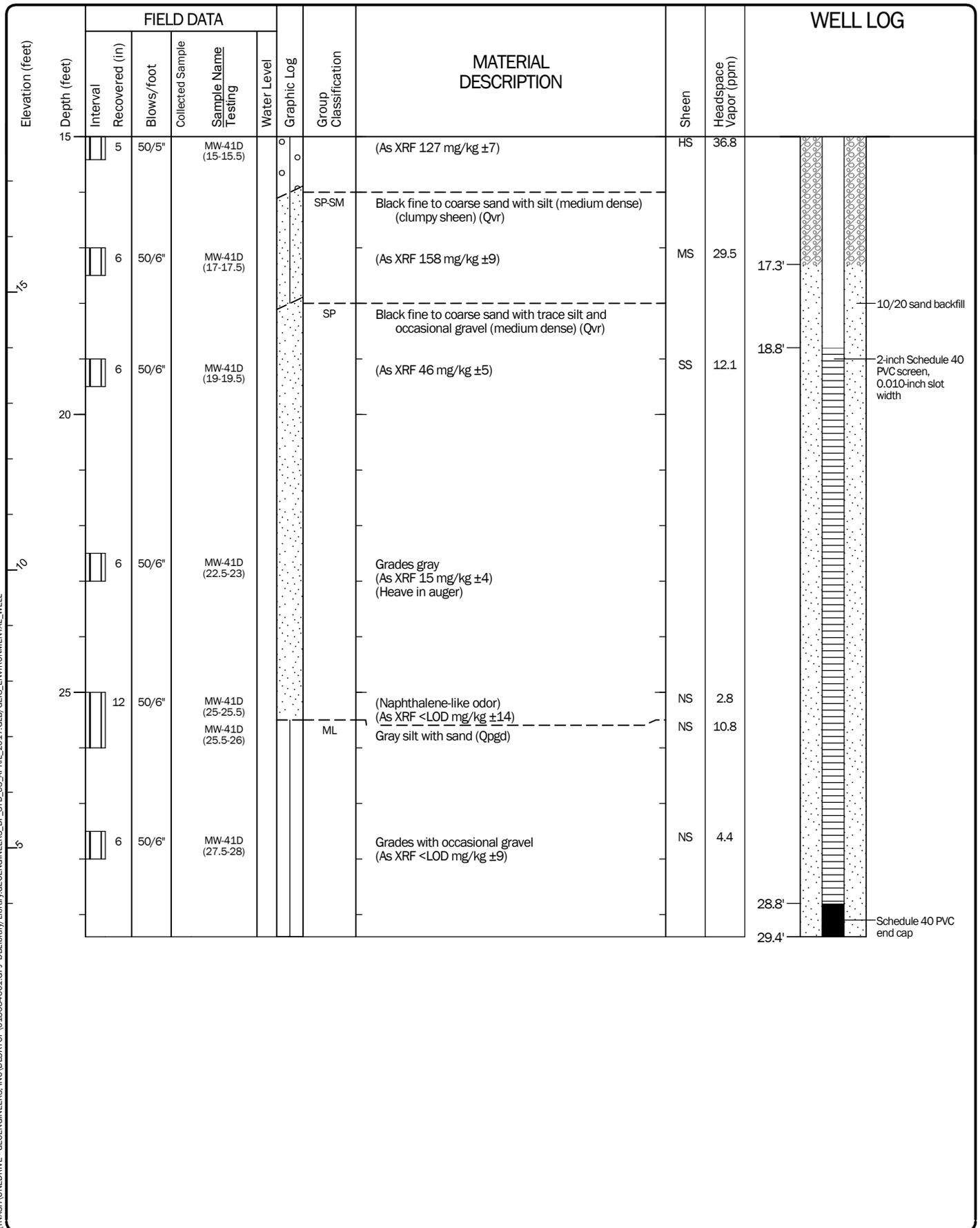
### Log of Monitoring Well MW-41D



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Figure A-3  
Sheet 1 of 2

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**Log of Monitoring Well MW-41D (continued)**



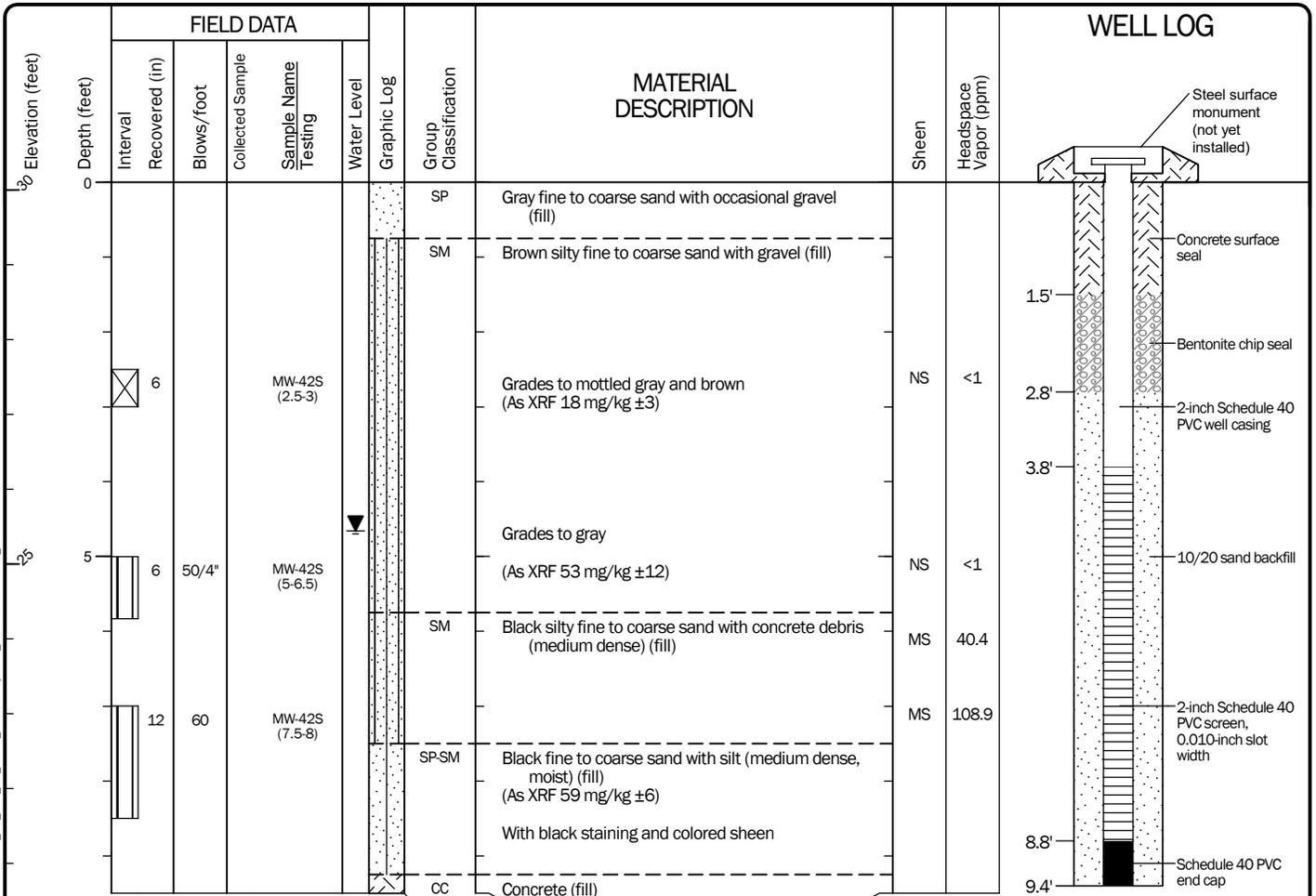
Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-3  
 Sheet 2 of 2

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Start Drilled 3/27/2017	End 3/27/2017	Total Depth (ft)	9.5	Logged By Checked By	PDR SBS	Driller Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 040 A 2 (in) well was installed on 3/27/2017 to a depth of 9.4 (ft).				
Surface Elevation (ft) Vertical Datum	30.1 USACE (feet)	Top of Casing Elevation (ft)	36.10	Groundwater Date Measured		Depth to Water (ft)	Elevation (ft)	
Easting (X) Northing (Y)	1270667.56 239153.02	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017	4.66	31.44		

Notes: Monitoring well temporarily protected by a 16-inch-diameter Schedule 80 PVC covered protective pipe, per drawing Sheet 7.0 (Stage 1).  
Monitoring well developed by alternately pumping and surging: 32 gallons removed.



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-42S

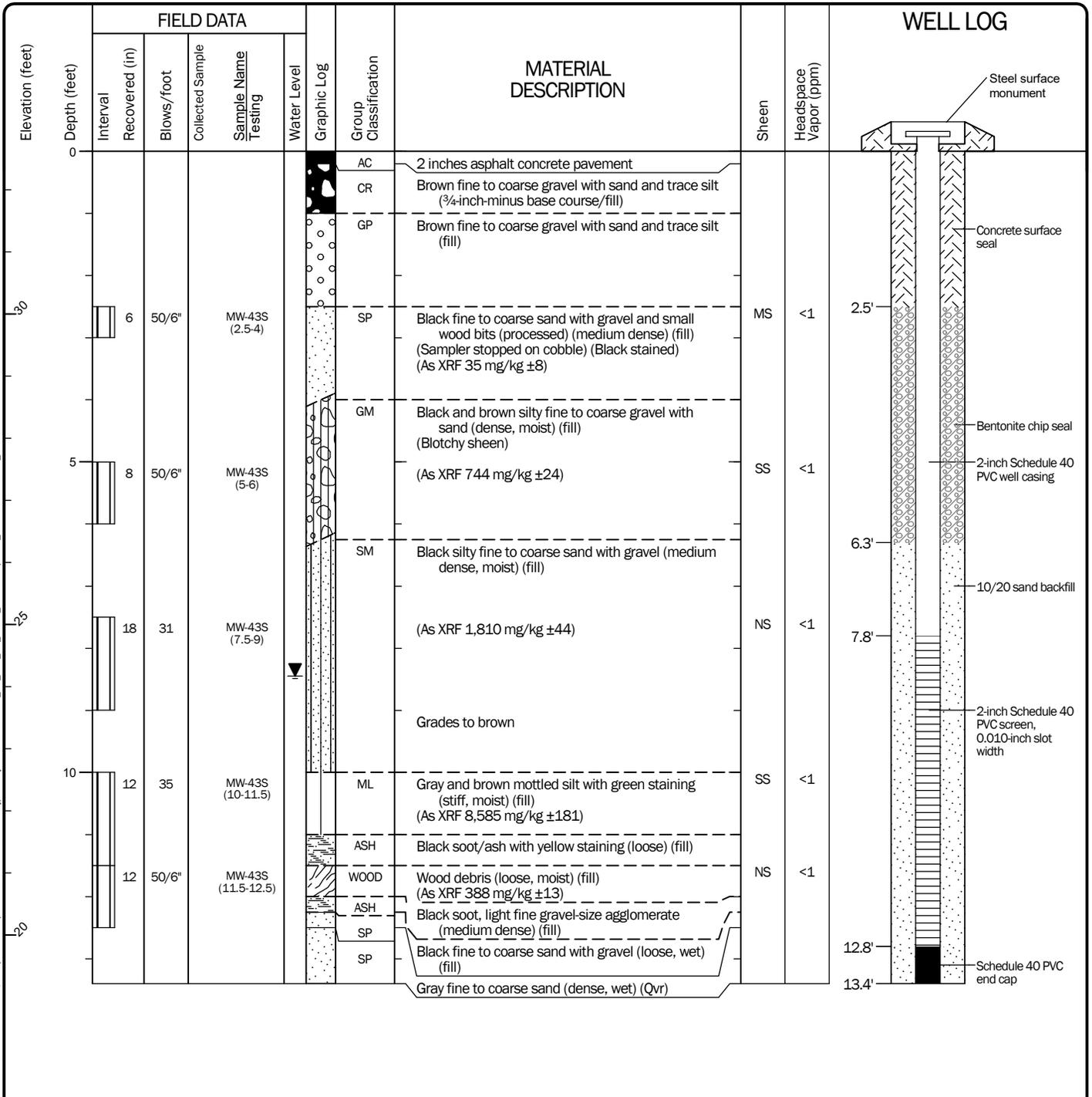


Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Figure A-4  
Sheet 1 of 1

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Start Drilled 4/12/2017	End 4/12/2017	Total Depth (ft)	13.4	Logged By Checked By	PDR SBS	Driller Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 072 A 2 (in) well was installed on 4/12/2017 to a depth of 13.4 (ft).				
Surface Elevation (ft) Vertical Datum	32.62 USACE (feet)	Top of Casing Elevation (ft)	32.28	Groundwater Date Measured			Depth to Water (ft)	Elevation (ft)
Easting (X) Northing (Y)	1270677.38 239087.49	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017			8.45	23.83
Notes: Monitoring well completed with an 8-inch-diameter steel flush-mounted monument. Monitoring well developed by alternately pumping and surging: 1.1 gallons removed.								



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-43S



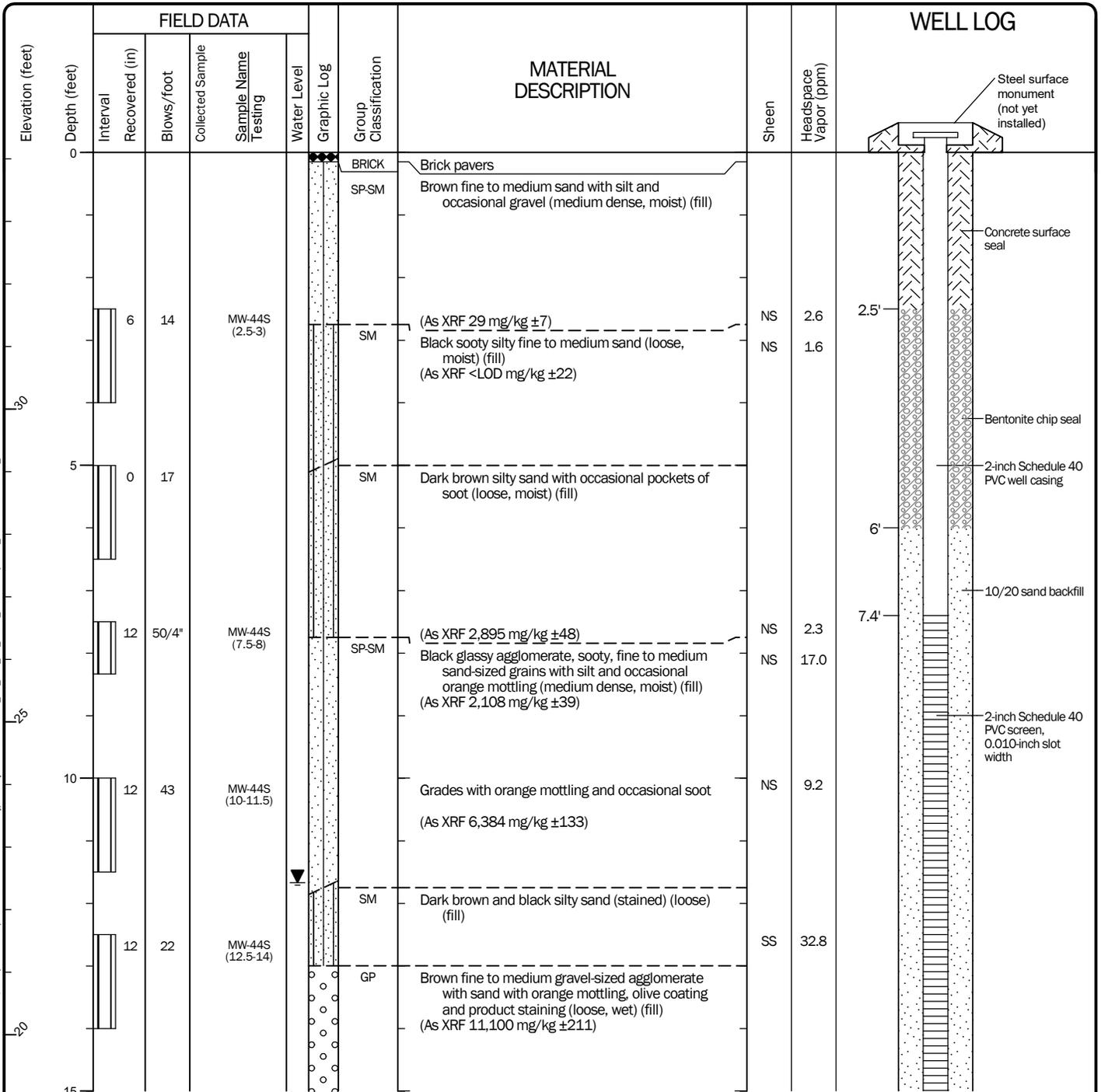
Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Figure A-5  
Sheet 1 of 1

Date: 12/6/21 Path: C:\Users\T\Ash\ONEDRIVE - GEOENGINEERS, INC\DESKTOP\018684601\GPI - DB\Library\Library\GEOENGINEERS\_DF\_STD\_US\_APRIL\_2017\GLB\GEB\_ENVIRONMENTAL\_WELL

Start Drilled 4/14/2017	End 4/14/2017	Total Depth (ft)	19	Logged By Checked By	CDV SBS	Driller	Cascade Drilling	Drilling Method	8 1/4-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 056 A 2 (in) well was installed on 4/14/2017 to a depth of 18 (ft).					
Surface Elevation (ft) Vertical Datum	34.1 USACE (feet)	Top of Casing Elevation (ft)	33.54	Groundwater Date Measured			Depth to Water (ft)	Elevation (ft)	
Easting (X) Northing (Y)	1270720.72 239159.31	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017	11.67	21.87			

Notes: Monitoring well temporarily protected by a 16-inch square, 12-inch deep, covered wood form per drawing Sheet 6.0 (Stage 1).  
Monitoring well developed by alternately pumping and surging: 14 gallons removed.



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-44S



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Figure A-6  
Sheet 1 of 2

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Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
15	9	9		MW-44S (15-16.5)		ML GP	MS NS	221.3 15.0	
	12	50/3"		MW-44S (17.5-18.5)		SM SP-SM	NS SS	27.9 341.8	

**Log of Monitoring Well MW-44S (continued)**

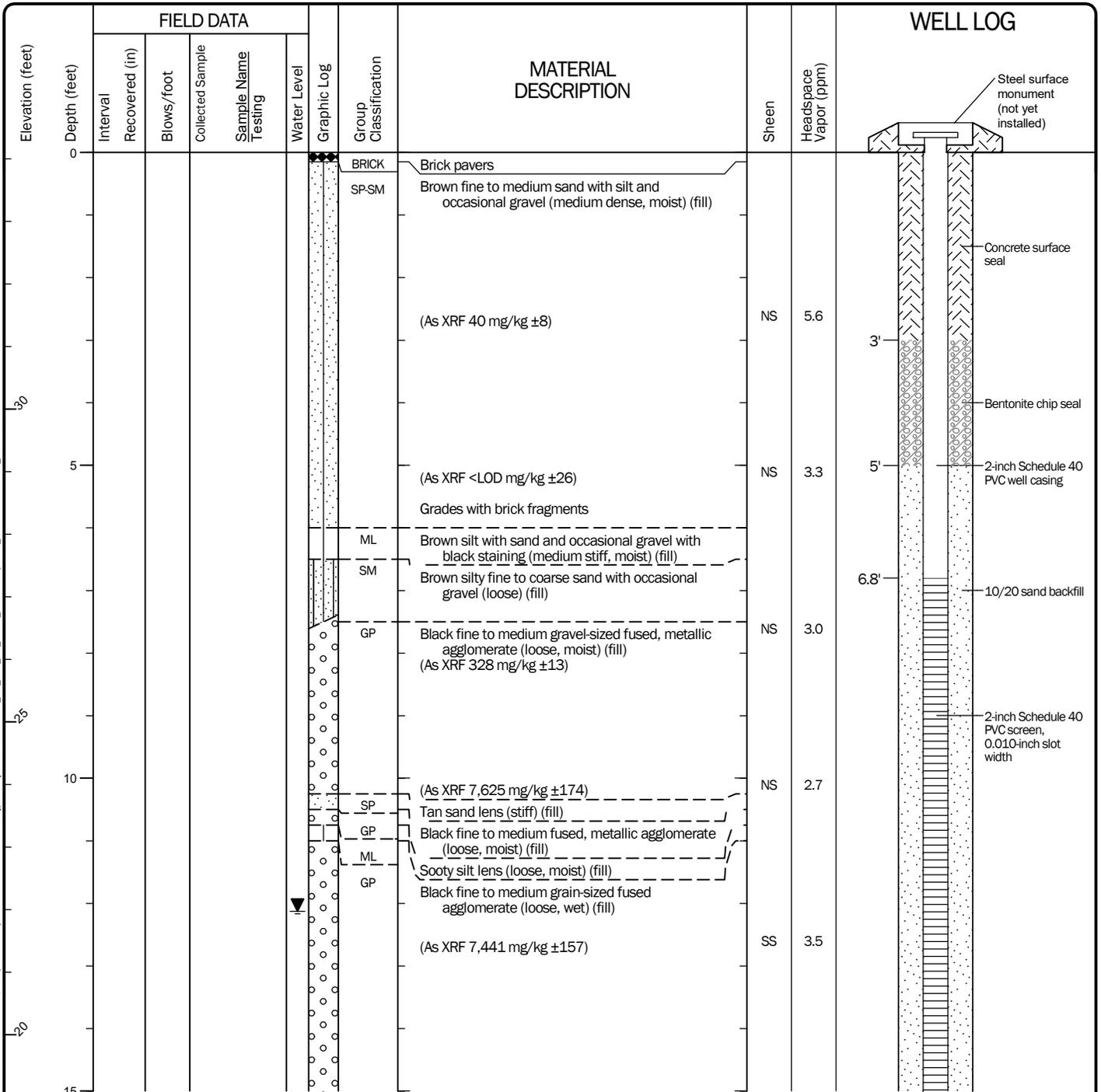


Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-6  
 Sheet 2 of 2

Start Drilled 3/31/2017	End 3/31/2017	Total Depth (ft)	17.5	Logged By Checked By	CDV SBS	Driller	Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 051 A 2 (in) well was installed on 3/31/2017 to a depth of 17.4 (ft).					
Surface Elevation (ft) Vertical Datum	34.1 USACE (feet)	Top of Casing Elevation (ft)	33.99	Groundwater Date Measured			Depth to Water (ft)	Elevation (ft)	
Easting (X) Northing (Y)	1270725.64 239142.5	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017			12.13	21.86	

Notes: Monitoring well temporarily protected by a 16-inch square, 12-inch deep, covered wood form per drawing Sheet 6.0 (Stage 1).  
Monitoring well developed by alternately pumping and surging: 29 gallons removed.



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-45S



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Figure A-7  
Sheet 1 of 2

Date: 12/6/21 Path: C:\Users\T\Ash\ONE\DRIVE - GEOENGINEERS, INC.\DESKTOP\018684601.GPJ - DBL\Library\Library\GEOENGINEERS\_DF\_STD\_US\_APRIL\_2017.GLB\GEB\_ENVIRONMENTAL\_WELL

Date: 12/6/21 Path: C:\Users\T\NASH\ONEDRIVE - GEOENGINEERS, INC.\DESKTOP-018684601\GPI\_DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_APRIL\_2017.GLB\GEB\_ENVIRONMENTAL\_WELL

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
15										
							SOOT	SS	37.3	
								SS	55.0	

Material description, sheen and headspace vapor obtained from adjacent boring MW-45D

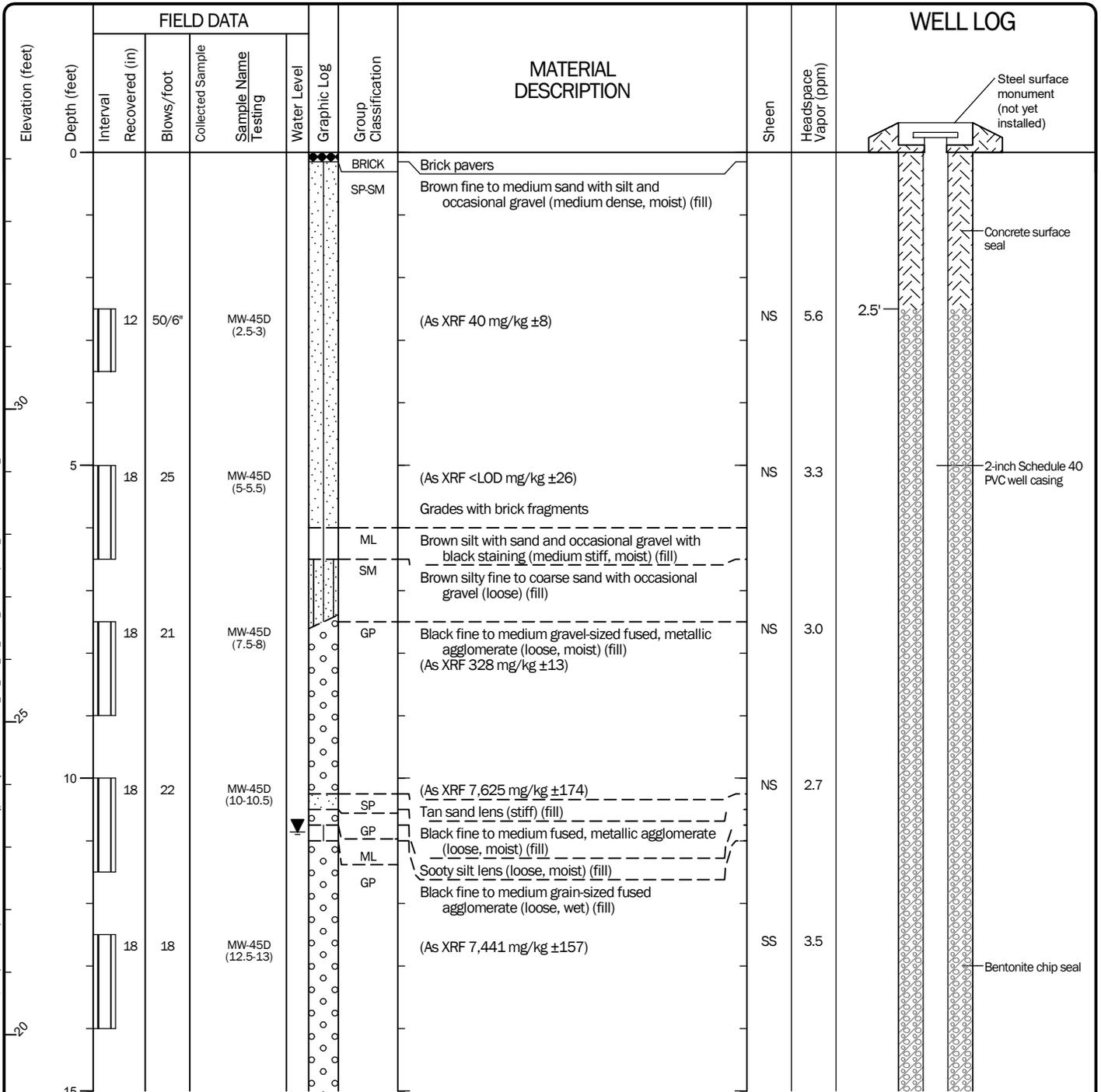
**Log of Monitoring Well MW-45S (continued)**



Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled 3/31/2017	End 3/31/2017	Total Depth (ft)	31.2	Logged By Checked By	CDV SBS	Driller	Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 050 A 2 (in) well was installed on 3/31/2017 to a depth of 31.2 (ft).					
Surface Elevation (ft) Vertical Datum	34.1 USACE (feet)	Top of Casing Elevation (ft)	33.25	Groundwater Date Measured			Depth to Water (ft)	Elevation (ft)	
Easting (X) Northing (Y)	1270727.34 239138.49	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017			10.86	22.39	

Notes: Monitoring well temporarily protected by a 16-inch square, 12-inch deep, covered wood form per drawing Sheet 6.0 (Stage 1).  
Monitoring well developed by alternately pumping and surging: 37 gallons removed.



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

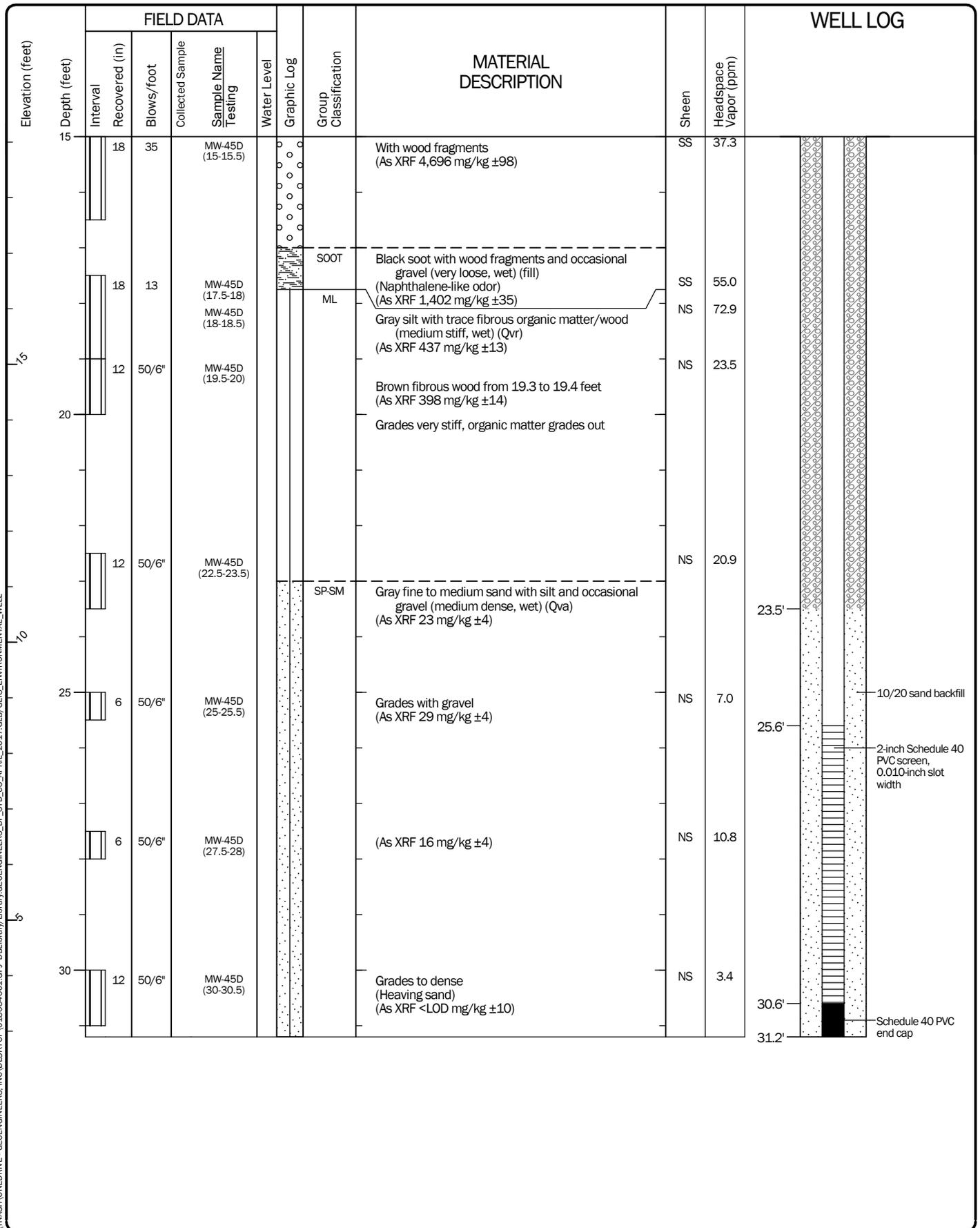
### Log of Monitoring Well MW-45D



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Figure A-8  
Sheet 1 of 2

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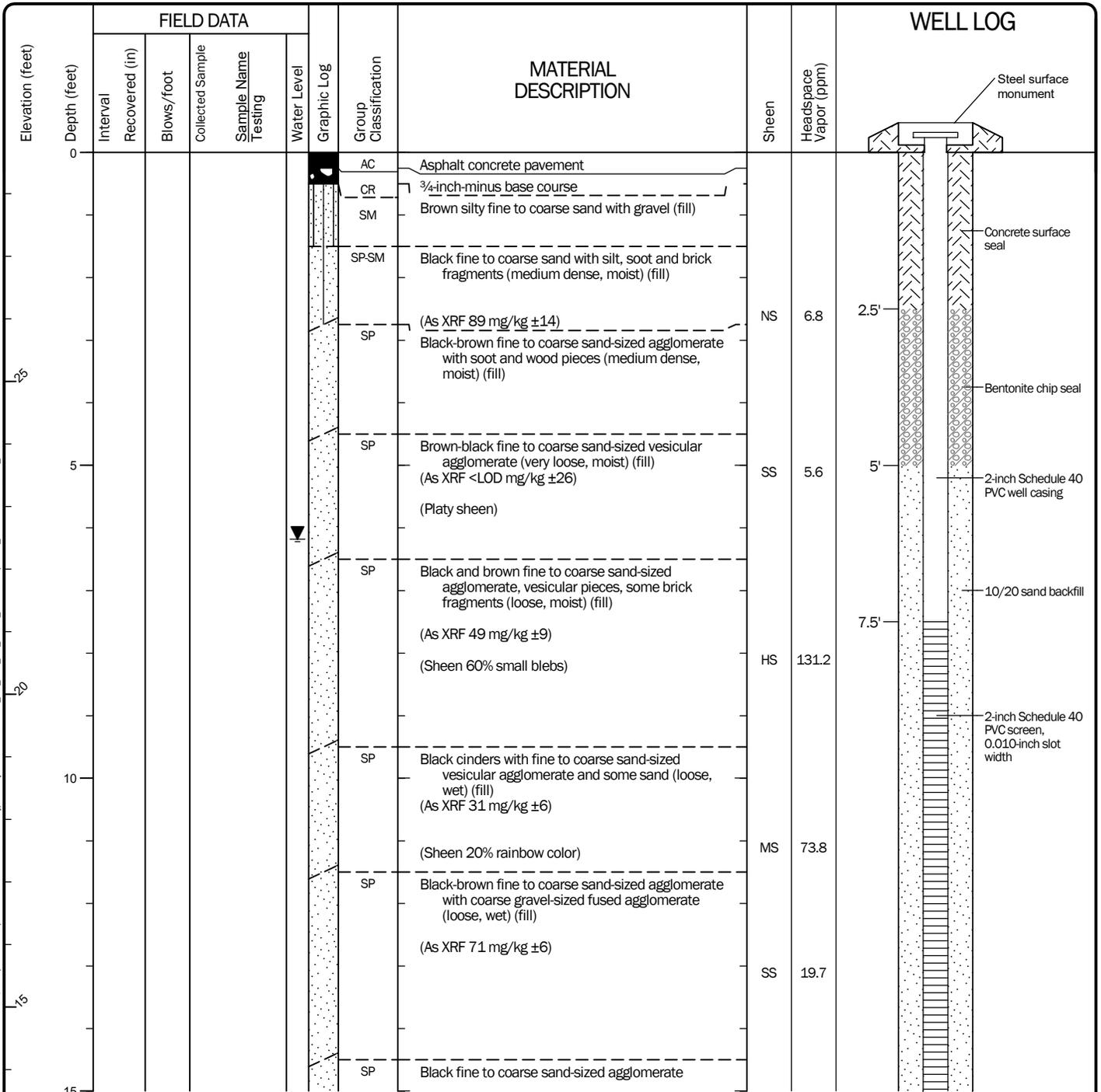
**Log of Monitoring Well MW-45D (continued)**



Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

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Start Drilled 4/13/2017	End 4/13/2017	Total Depth (ft)	18.1	Logged By Checked By	CDV SBS	Driller	Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 078 A 2 (in) well was installed on 4/13/2017 to a depth of 18.1 (ft).					
Surface Elevation (ft) Vertical Datum	28.66 USACE (feet)	Top of Casing Elevation (ft)	28.09	Groundwater Date Measured			Depth to Water (ft)	Elevation (ft)	
Easting (X) Northing (Y)	1270760.23 239143.44	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017			6.18	21.91	
Notes: Monitoring well completed with an 8-inch-diameter steel flush-mounted monument. Monitoring well developed by alternately pumping and surging; 8 gallons removed.									



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-46S



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

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Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
15							(loose, wet) (fill)	HS	16.4	
						SP	(Sheen with blebs and color) (As XRF 91 mg/kg ±6) Black fine to coarse sand-sized agglomerate with NAPL (medium dense, wet) (fill) (As XRF 12,661 mg/kg ±306)	HS	89.6	
								NAPL		

Material description, sheen and headspace vapor obtained from adjacent boring MW-46D

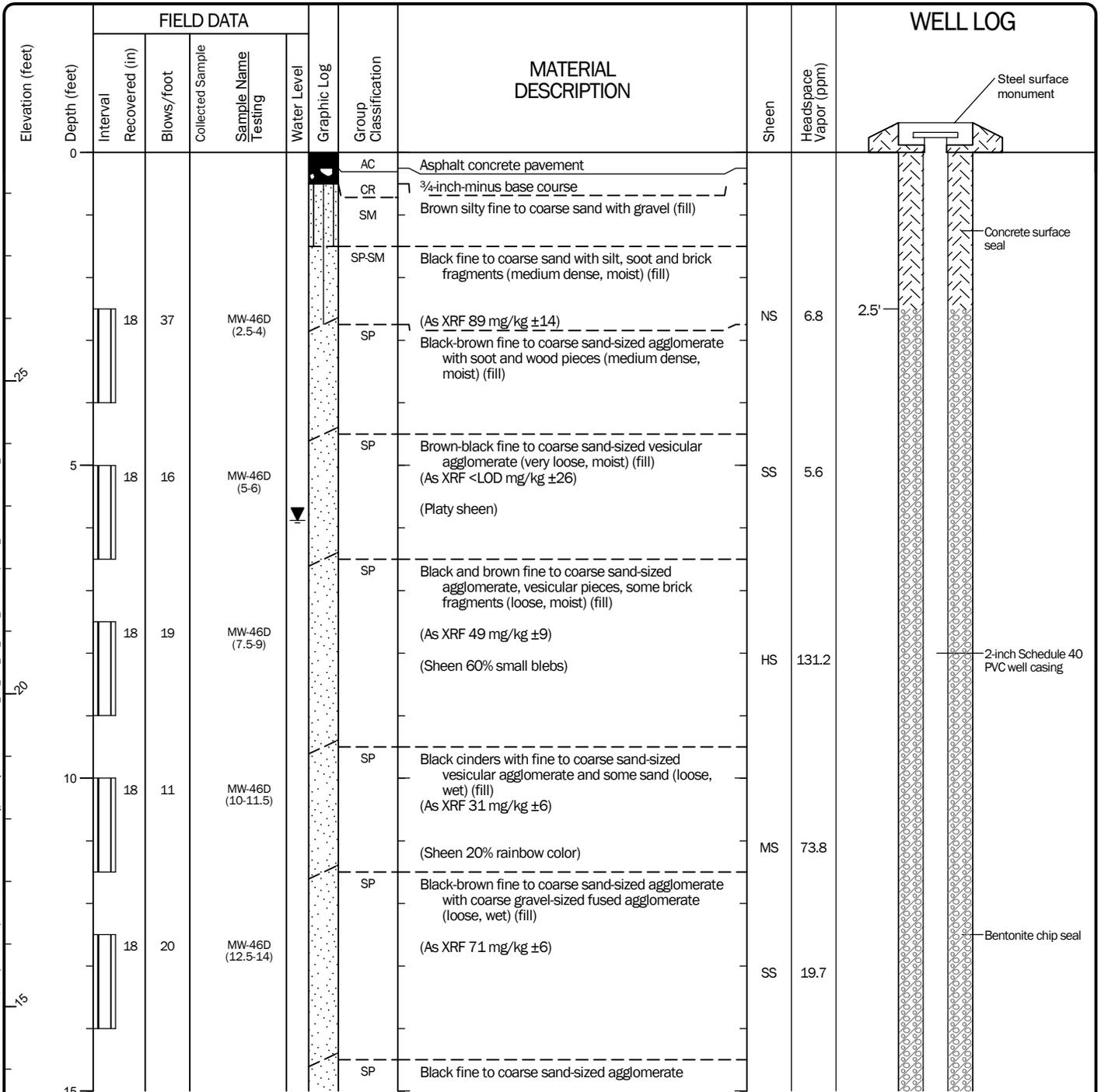
**Log of Monitoring Well MW-46S (continued)**



Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled 4/13/2017	End 4/13/2017	Total Depth (ft)	30.5	Logged By Checked By	PDR SBS	Driller Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment		CME 55		DOE Well I.D.: BKA 074 A 2 (in) well was installed on 4/13/2017 to a depth of 30.1 (ft).		
Surface Elevation (ft) Vertical Datum	28.65 USACE (feet)	Top of Casing Elevation (ft)		28.17		Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Easting (X) Northing (Y)	1270760.61 239148.59	Horizontal Datum		WA State Plane North NAD83 (feet)		4/24/2017	5.88	22.29

Notes: Monitoring well completed with an 8-inch-diameter steel flush-mounted monument.  
Monitoring well developed by alternately pumping and surging: 13 gallons removed.



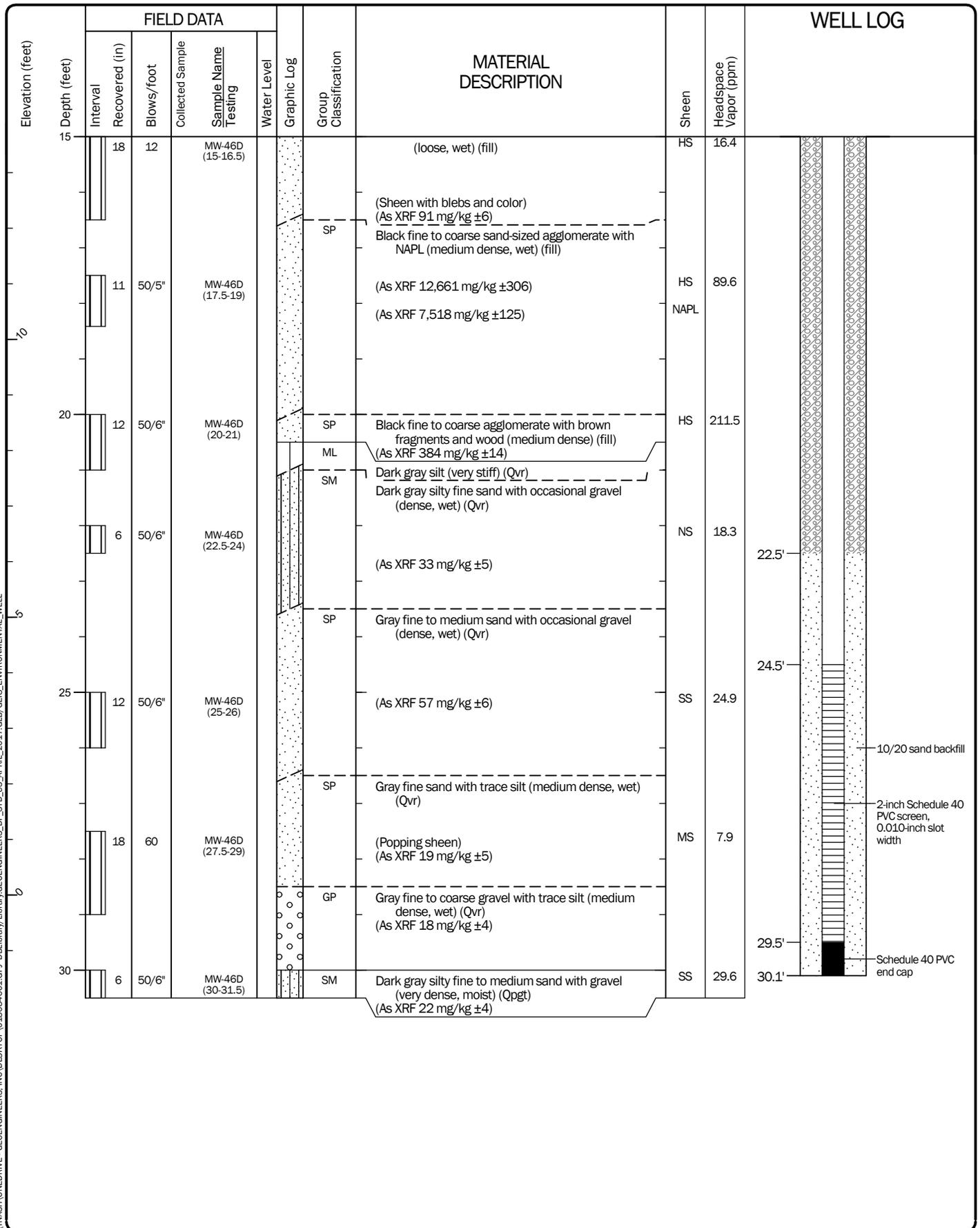
Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-46D



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

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**Log of Monitoring Well MW-46D (continued)**

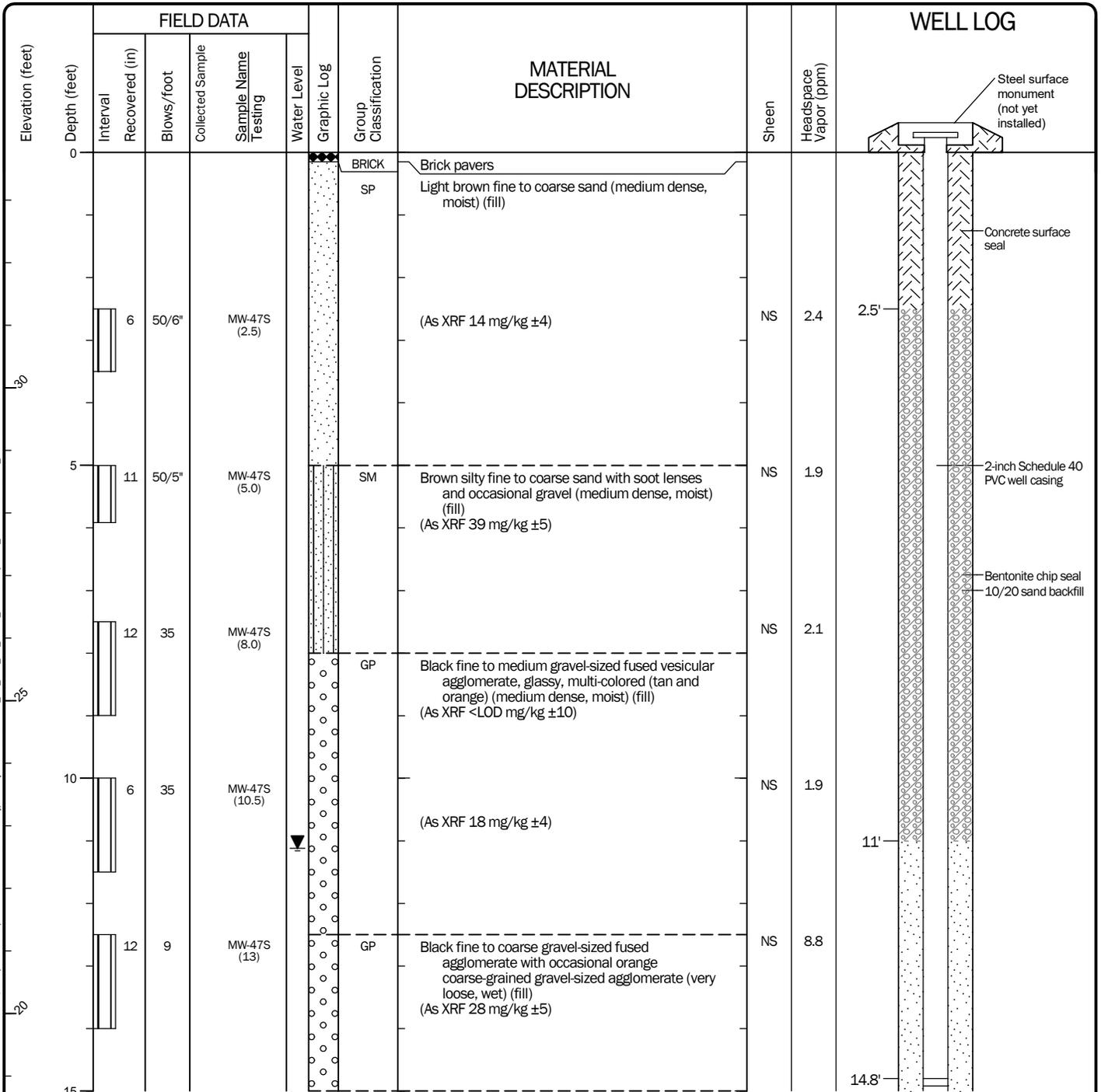


Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 12/6/21 Path: C:\Users\TNAHQ\OneDrive - GEOENGINEERS, INC.\Desktop\018684601.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_APRIL\_2017.GLB\GEB\_ENVIRONMENTAL\_WELL

Drilled	Start 4/4/2017	End 4/4/2017	Total Depth (ft)	20.7	Logged By Checked By	CDV SBS	Driller	Cascade Drilling	Drilling Method	8 1/4-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop		Drilling Equipment		CME 55		DOE Well I.D.: BKA057 A 2 (in) well was installed on 4/4/2017 to a depth of 20.4 (ft).			
Surface Elevation (ft)		33.76		Top of Casing Elevation (ft)		33.05		Groundwater		
Vertical Datum		USACE (feet)		Horizontal Datum		WA State Plane North NAD83 (feet)		Date Measured	Depth to Water (ft)	Elevation (ft)
Easting (X) Northing (Y)		1270743.9 239111.94		Horizontal Datum		WA State Plane North NAD83 (feet)		4/24/2017	11.12	21.93

Notes: Monitoring well temporarily protected by a 16-inch square, 12-inch deep, covered wood form per drawing Sheet 6.0 (Stage 1).  
Monitoring well developed by alternately pumping and surging: 1.1 gallons removed.



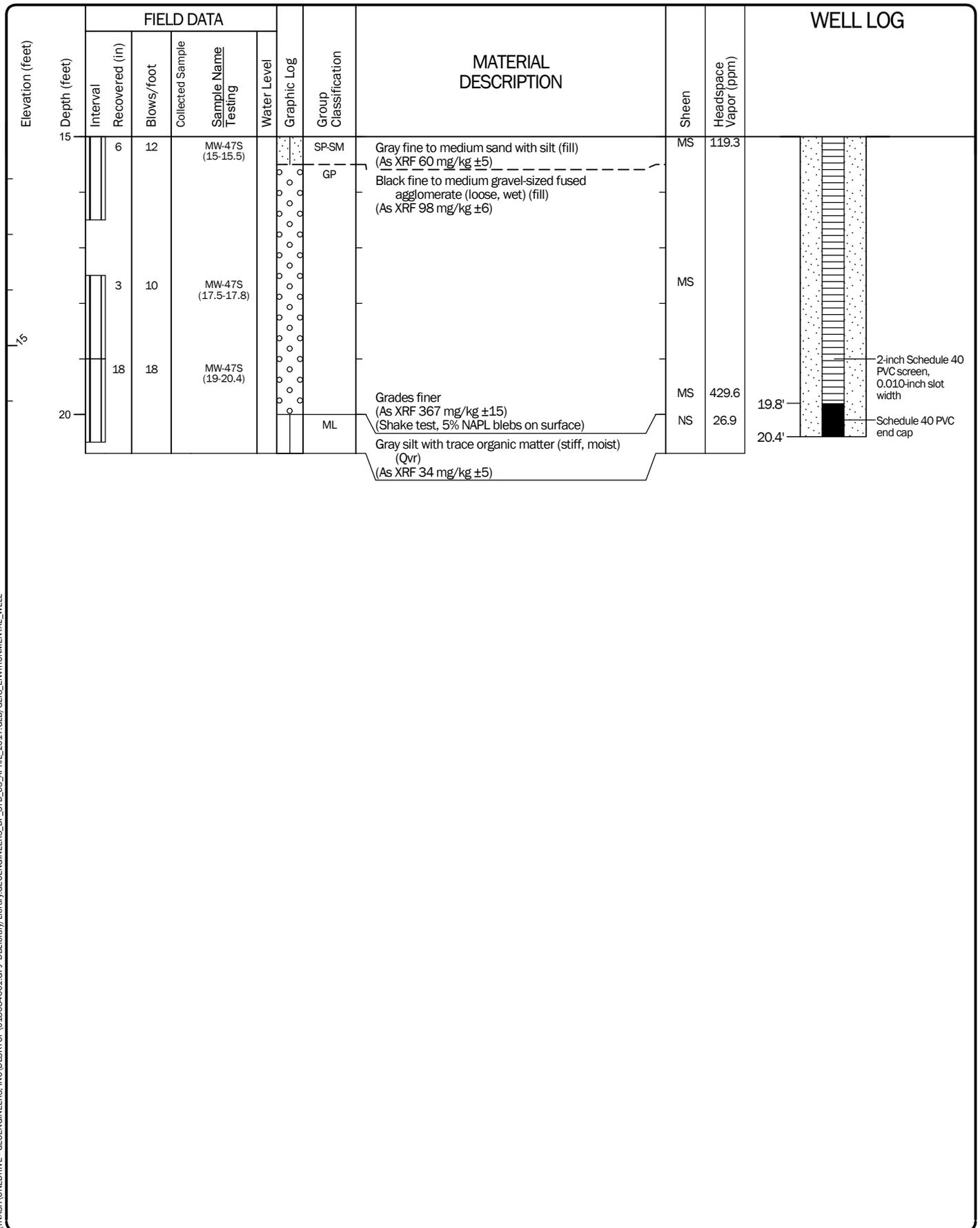
Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-47S



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Date: 12/6/21 Path: C:\Users\T\OneDrive - GEOENGINEERS, INC.\DESKTOP\018684601.GPJ - DBL\Library\Library\GEOENGINEERS\_DF\_STD\_US\_APRIL\_2017.GLB\GEB\_ENVIRONMENTAL\_WELL



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**Log of Monitoring Well MW-47S (continued)**

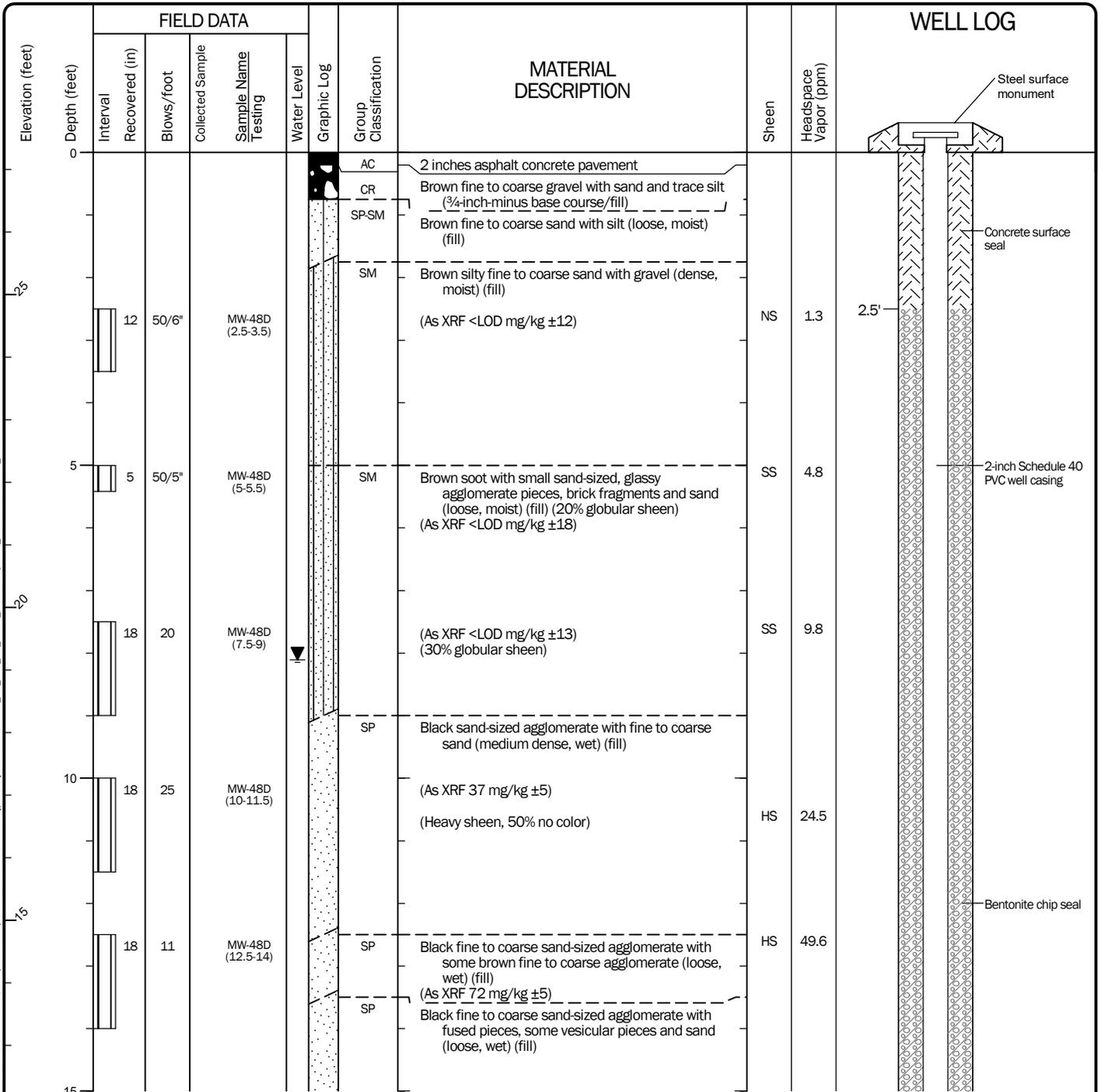


Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-11  
 Sheet 2 of 2

Start Drilled 4/13/2017	End 4/13/2017	Total Depth (ft)	33.1	Logged By Checked By	PDR SBS	Driller Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA073 A 2 (in) well was installed on 4/13/2017 to a depth of 33.1 (ft).				
Surface Elevation (ft) Vertical Datum	27.27 USACE (feet)	Top of Casing Elevation (ft)	30.05	Groundwater Date Measured		Depth to Water (ft)	Elevation (ft)	
Easting (X) Northing (Y)	1270756.15 239081.86	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017	8.11	21.94		

Notes: Monitoring well completed with an 8-inch-diameter steel flush-mounted monument.  
Monitoring well developed by alternately pumping and surging; 44 gallons removed.



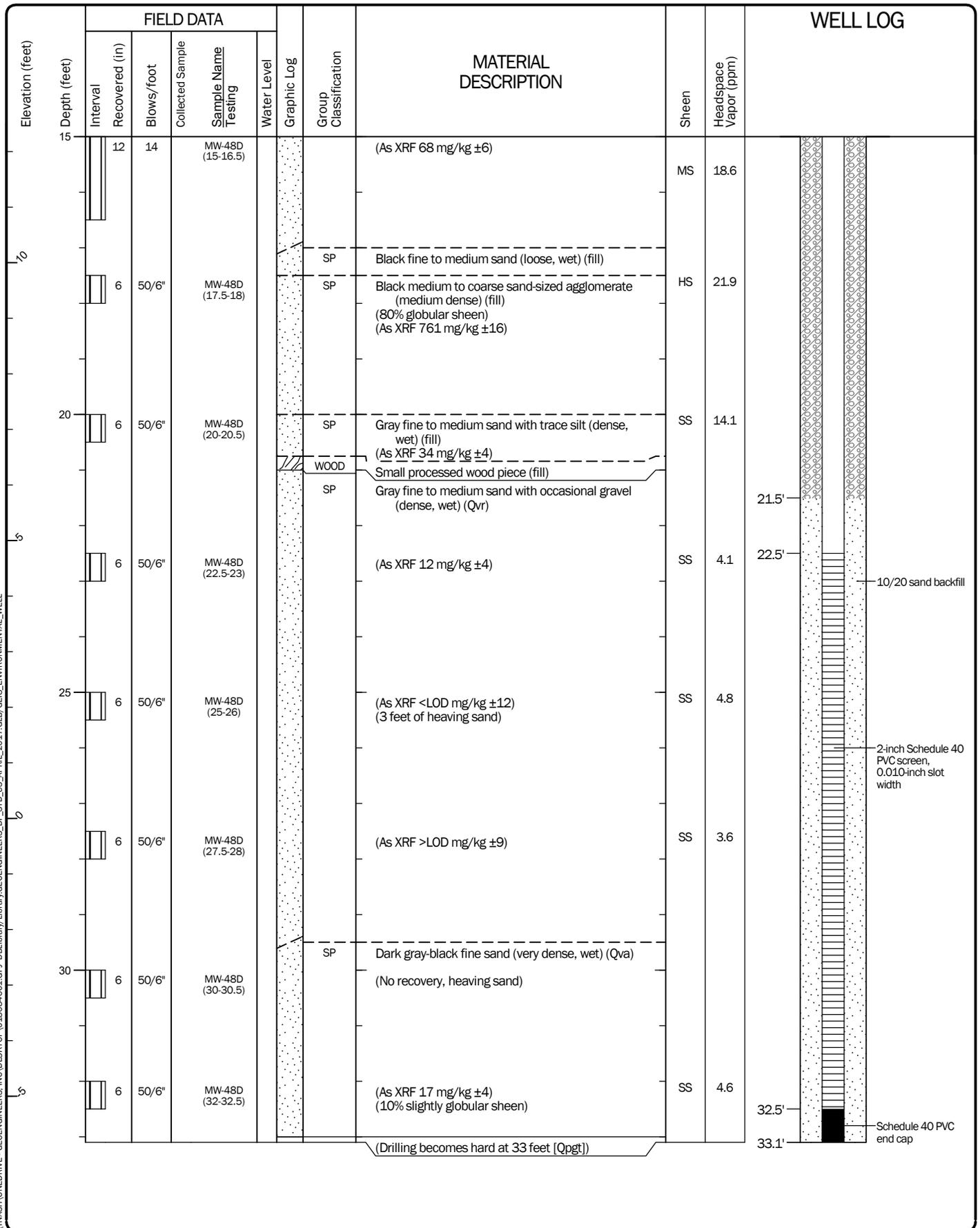
Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-48D



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Date: 12/6/21 Path: C:\Users\T\NASH\ONE\DRIVE - GEOENGINEERS, INC.\DESKTOP\018684601.GPJ - DBL\Library\Library\GEOENGINEERS\_DF\_STD\_US\_APRIL\_2017.GLB\GEB\_ENVIRONMENTAL\_WELL



**Log of Monitoring Well MW-48D (continued)**

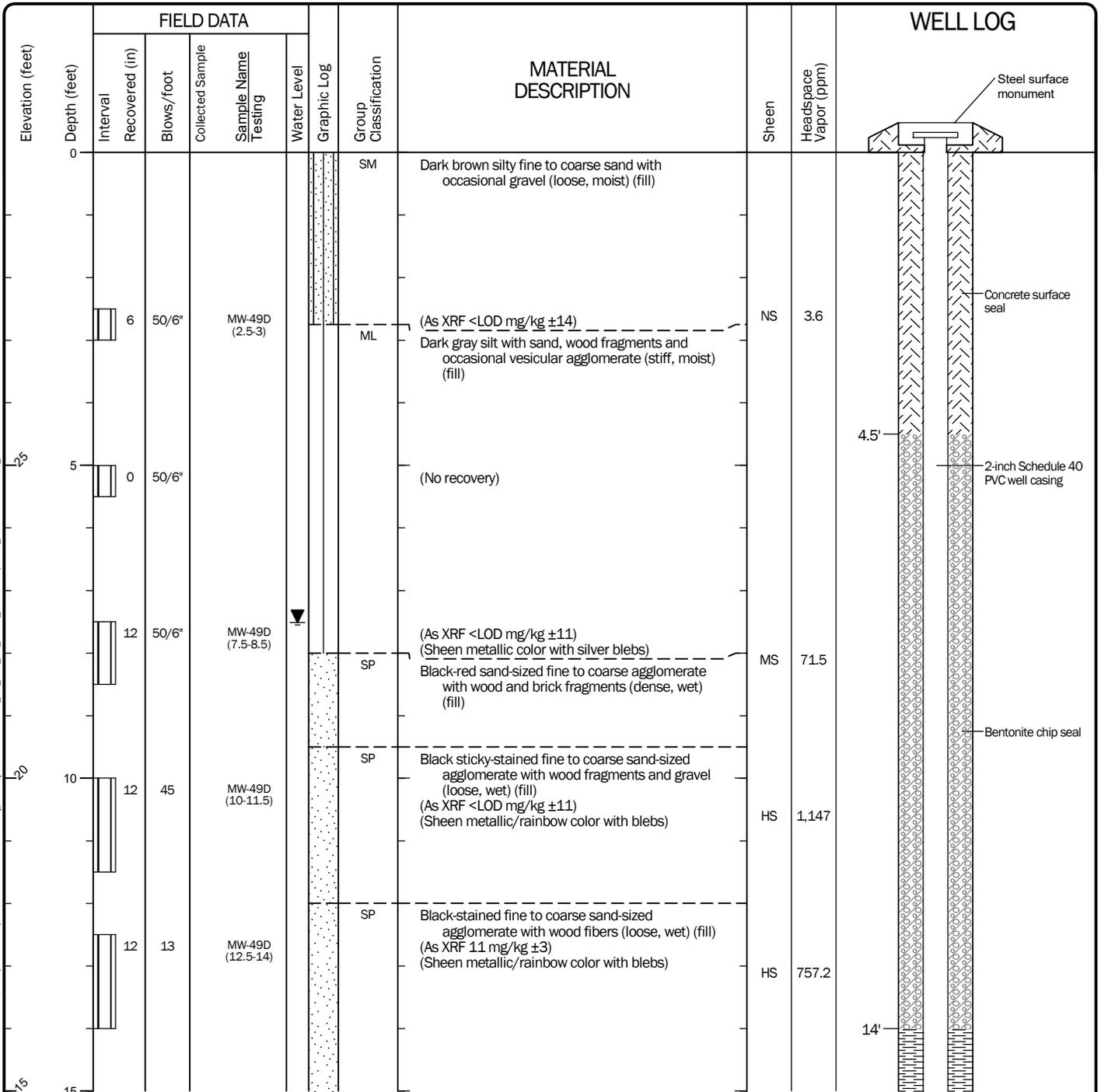


Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Date: 12/6/21 Path: C:\Users\TNAHQ\OneDrive - GEOENGINEERS, INC.\Desktop\018684601.GPJ DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_APRIL\_2017.GLB\GEB\_ENVIRONMENTAL\_WELL

Start Drilled 4/18/2017	End 4/18/2017	Total Depth (ft)	35.5	Logged By Checked By	PDR SBS	Driller Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 079 A 2 (in) well was installed on 4/18/2017 to a depth of 35.2 (ft).				
Surface Elevation (ft) Vertical Datum	30 USACE (feet)	Top of Casing Elevation (ft)	29.40	Groundwater Date Measured		Depth to Water (ft)	Elevation (ft)	
Easting (X) Northing (Y)	1270775.15 239063.29	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017	7.51	21.89		

Notes: Monitoring well completed with an 8-inch-diameter steel flush-mounted monument.  
Monitoring well developed by alternately pumping and surging; 5 gallons removed.



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-49D



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Date: 12/6/21 Path: C:\Users\T\NASH\ONE\DRIVE - GEOENGINEERS, INC.\DESKTOP-018684601\GPI\_DBLibrary\Library\GEOENGINEERS\_DF\_STD\_US\_APRIL\_2017.GLB\GEB\_ENVIRONMENTAL\_WELL



Date: 12/6/21 Path: C:\Users\T\NASH\ONEDRIVE - GEOENGINEERS, INC.\DESKTOP-018684601.GPJ DB\Library\Library\GEOENGINEERS\_DF\_STD\_US\_APRIL\_2017.GLB\GEB\_ENVIRONMENTAL\_WELL

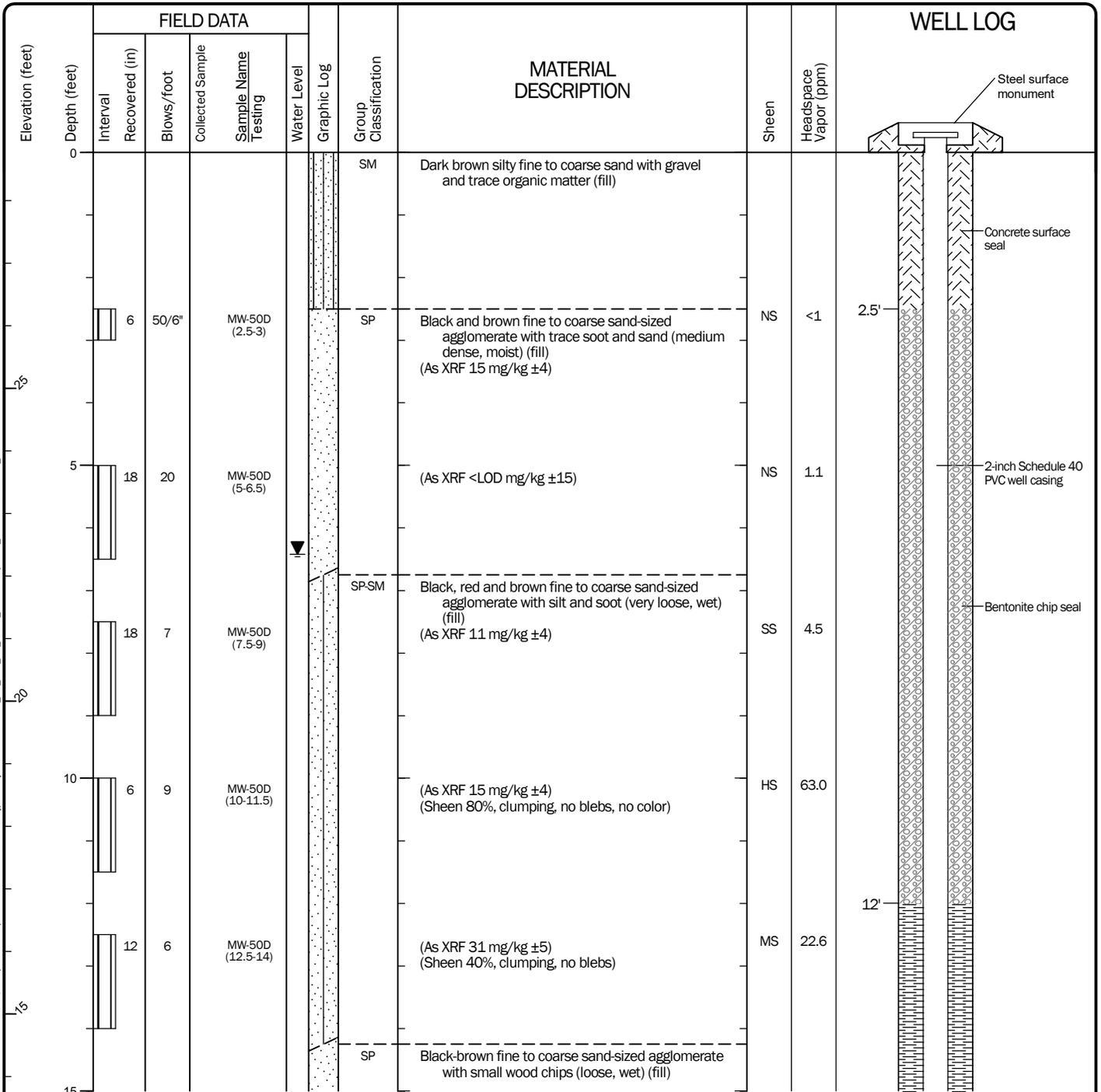
Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
35	6	50/6"		MW-49D (35-35.5)			ML	Dark gray silt with sand and gravel (very stiff, moist) (Qpgd) (As XRF 44 mg/kg ±7)		 <p>34.6'</p> <p>35.2'</p> <p>Schedule 40 PVC end cap</p>

**Log of Monitoring Well MW-49D (continued)**



Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled 4/17/2017	End 4/17/2017	Total Depth (ft)	35.25	Logged By Checked By	PDR SBS	Driller Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 077 A 2 (in) well was installed on 4/17/2017 to a depth of 35.2 (ft).				
Surface Elevation (ft) Vertical Datum	28.77 USACE (feet)	Top of Casing Elevation (ft)	28.31	Groundwater Date Measured			Depth to Water (ft)	Elevation (ft)
Easting (X) Northing (Y)	1270793.29 239117.04	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017			6.42	21.89
Notes: Monitoring well completed with an 8-inch-diameter steel flush-mounted monument. Monitoring well developed by alternately pumping and surging: 25 gallons removed.								



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-50D



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Figure A-14  
Sheet 1 of 3

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Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG	
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							Well Log	Well Log
15		12	14		MW-50D (15-16.5)			(As XRF 72 mg/kg ±6)	SS	3.2			
10		12	8		MW-50D (17.5-19)			(As XRF 90 mg/kg ±6)	SS	8.2			
20		6	8		MW-50D (20-21.5)		SP	Black coarse sand-sized agglomerate with occasional gravel-sized agglomerate, light weight (very loose, wet) (fill) (As XRF 113 mg/kg ±6)	MS	8.2		Bentonite grout seal	
5		6	50/6"		MW-50D (22.5-23)		SP	Black fine to coarse sand-sized agglomerate with gravel and staining (loose, wet) (fill)	SS	34.8			
25		12	50/6"		MW-50D (25-26)		ML	Dark gray silt with sand (very stiff, wet) (Qvr) (As XRF 112 mg/kg ±6)	MS	29.4			
							SP-SM	Gray fine to coarse sand with silt (very dense, wet) (Qvr) (As XRF 34 mg/kg ±4)	SS	54.2			
0		12	50/6"		MW-50D (27.5-28.5)			(As XRF 15 mg/kg ±4)	SS	48.3		10/20 sand backfill	
30		4	50/4"		MW-50D (30-30.5)		ML	Gray silt with sand (very stiff, moist) (Qvr) (As XRF 12 mg/kg ±3)	SS	42.5		2-inch Schedule 40 PVC screen, 0.010-inch slot width	
		0	50/6"					(No recovery) (Very hard drilling)					

### Log of Monitoring Well MW-50D (continued)

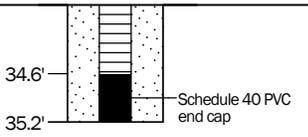


Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Figure A-14  
 Sheet 2 of 3

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Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG	
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					Graphic Log
35		4	50/4"		MW-50D (35-35.25)		SP-SM		NS	1.0	

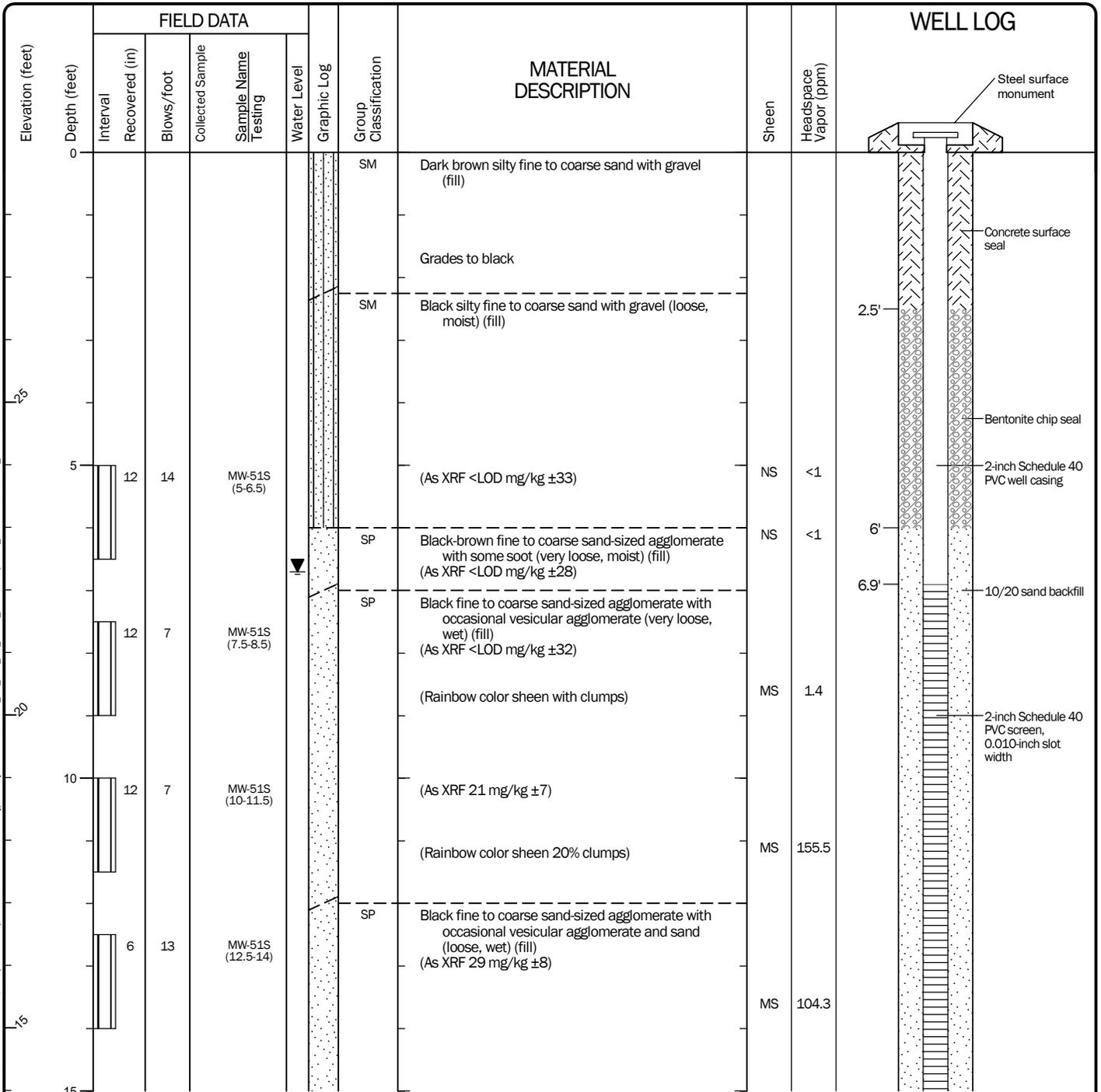
**Log of Monitoring Well MW-50D (continued)**



Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled 4/14/2017	End 4/14/2017	Total Depth (ft)	17.5	Logged By Checked By	PDR SBS	Driller Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 55	DOE Well I.D.: BKA 076 A 2 (in) well was installed on 4/14/2017 to a depth of 17.5 (ft).				
Surface Elevation (ft) Vertical Datum	28.99 USACE (feet)	Top of Casing Elevation (ft)	28.62	Groundwater Date Measured			Depth to Water (ft)	Elevation (ft)
Easting (X) Northing (Y)	1270795.79 239136.65	Horizontal Datum	WA State Plane North NAD83 (feet)	4/24/2017	6.70	21.92		

Notes: Monitoring well completed with an 8-inch-diameter steel flush-mounted monument.  
Monitoring well developed by alternately pumping and surging; 6 gallons removed.



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-51S



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

Figure A-15  
Sheet 1 of 2

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Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
15		6	16		MW-51S (15-16.5)					
							(As XRF <LOD mg/kg ±24)	MS	67.2	

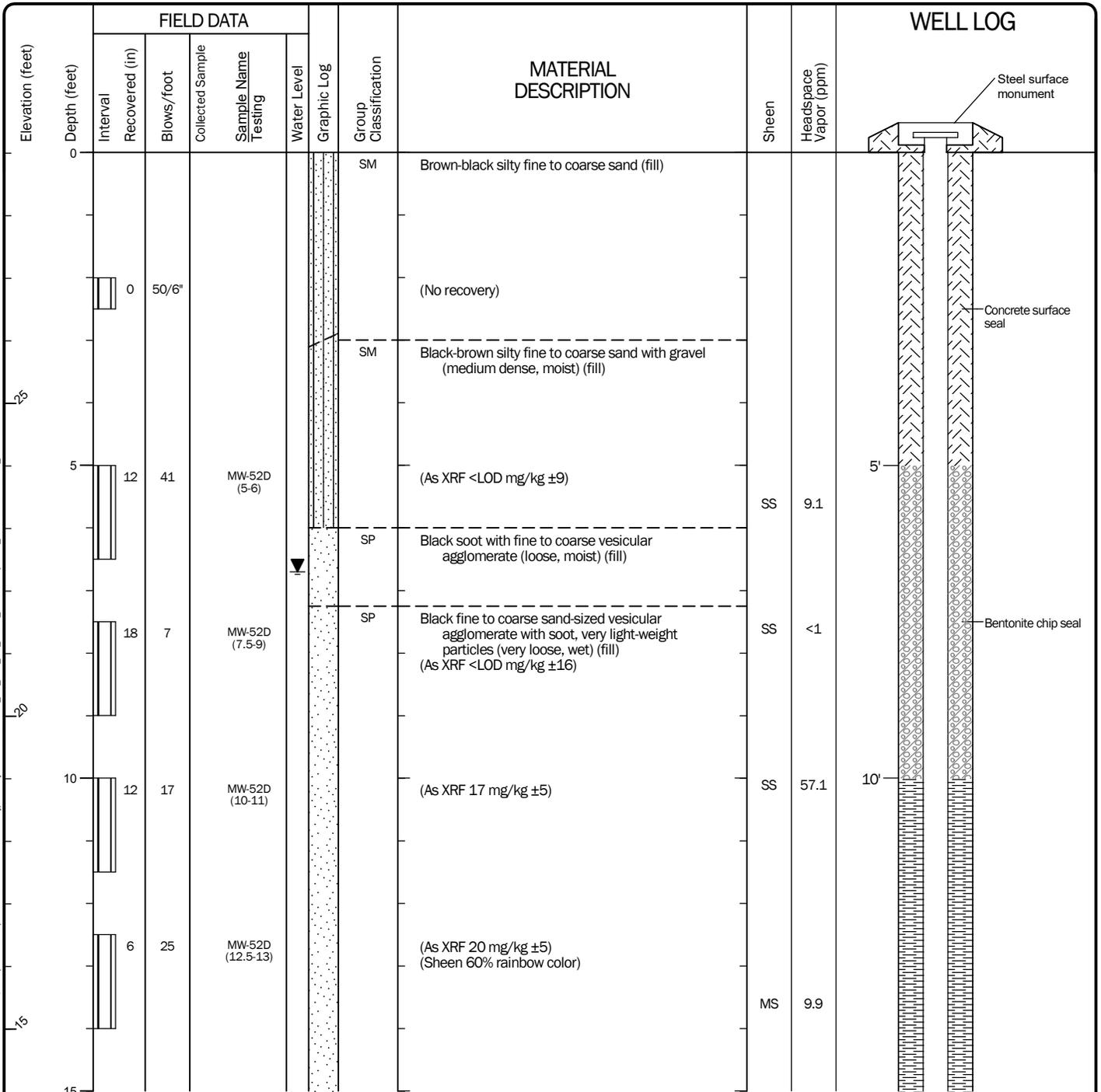
**Log of Monitoring Well MW-51S (continued)**



Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

Start Drilled 4/14/2017	End 4/14/2017	Total Depth (ft)	35.5	Logged By Checked By	PDR SBS	Driller Cascade Drilling	Drilling Method	8¼-inch OD Hollow-stem Auger
Hammer Data	Wire Release 140 (lbs) / 30 (in) Drop			Drilling Equipment		CME 55		DOE Well I.D.: BKA075 A 2 (in) well was installed on 4/14/2017 to a depth of 35.4 (ft).
Surface Elevation (ft) Vertical Datum		29.01 USACE (feet)		Top of Casing Elevation (ft)		28.56		
Easting (X) Northing (Y)		1270796.96 239147.84		Horizontal Datum		WA State Plane North NAD83 (feet)		
Groundwater Date Measured		4/24/2017		Depth to Water (ft)		6.70		
Elevation (ft)					21.86			

Notes: Monitoring well completed with an 8-inch-diameter steel flush-mounted monument.  
Monitoring well developed by alternately pumping and surging; 3 gallons removed.



Note: See Figure 2B.1-1.1 for explanation of symbols.  
Coordinates Data Source: Horizontal approximated based on Locational Survey, Vertical approximated based on Locational Survey

### Log of Monitoring Well MW-52D



Project: GWPS-Play Area Groundwater Infrastructure Installation  
Project Location: Gas Works Park, Seattle, Washington  
Project Number: 0186-846-01

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Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG	
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							Well Log	Well Log
15		0	17					(No recovery, very light weight agglomerate washing out of spoon)					
10		6	10	MW-52D (17.5-18)			SP	Black-brown fine to coarse sand-sized vesicular agglomerate with occasional gravel-sized fused agglomerate, very light weight (very loose, wet) (fill) (As XRF 128 mg/kg ±6) (Sheen 40% rainbow color)	MS	10.0			Bentonite grout seal
20		6	13	MW-52D (20-20.5)			SP	Black-brown fine to coarse sand-sized agglomerate with trace silt (loose, wet) (fill) (As XRF 109 mg/kg ±6)	SS	7.1			
		12	18	MW-52D (22.5-24)				(As XRF 297 mg/kg ±11) (Sheen 80% globular with blebs and rainbow color)	SS HS	39.5 245			
5		12	50/6"	MW-52D (25-26)			SP	Black-brown fine to coarse sand-sized agglomerate with gravel (loose, wet) (fill) (As XRF 92 mg/kg ±6)					
		12	50/6"	MW-52D (25-26)			ML	Dark gray-black silt (very stiff, wet) (Qvr)	MS	18.8			
		6	50/6"	MW-52D (27.5-28)			SP	Dark gray fine to coarse sand (dense, wet) (Qvr)  (As XRF 98 mg/kg ±6) (Sheen <10% rainbow color)	SS	17.4	27.5'		10/20 sand backfill
0		0	50/6"					(As XRF 25 mg/kg ±4) (No recovery, gray fine sand)					
		12	50/6"	MW-52D (32.5-33.5)			SP-SM	Gray fine sand with silt (dense, wet) (Qva)  (As XRF 26 mg/kg ±5)	SS	22.2	29.8'		2-inch Schedule 40 PVC screen, 0.010-inch slot width

**Log of Monitoring Well MW-52D (continued)**



Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

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Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
35	0	50/6"								
	6	50/6"		MW-52D (35-35.5)			SM	SS	10.2	

**Log of Monitoring Well MW-52D (continued)**



Project: GWPS-Play Area Groundwater Infrastructure Installation  
 Project Location: Gas Works Park, Seattle, Washington  
 Project Number: 0186-846-01

**ATTACHMENT 3C-2**  
**Sediment Logs**

**ATTACHMENT 3C-2**  
**Sediment Logs - Core Logs**

**Retec 1999  
Phase 1  
Sediment Investigation**

**Cores**



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# CORING LOG

## CR-1

1011 S.W. Klickitat Way  
Suite #207  
Seattle, Washington 98134  
(206) 624-9349  
www.thermoretec.com

PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat
START DATE: 10/04/99 TIME: 16:20	RECOVERY LENGTH: 5.1 feet	METHOD: 3" OD Stainless Steel Core Tube
LABORATORY DATE: 10/06/99 TIME: 13:00	DRIVE LENGTH: 8.3 feet	FIELD LOG BY: J. Palmer
DEPTH TO MUD: 41.0 feet	MUDLINE ELEVATION: -27.0 feet (NGVD)	LAB LOG BY: Y. Maestas & J. Zwiebel

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						DEPTH (in feet)		
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY		INTERPRETED IN-SITU PROFILE	
							LITHOLOGY	U.S.C.S.	
0	CR-1A CR-1A (7)	53		20	MH			MH	0
	CR-1B				SP SP SP	. . . . .	. . . . .		
	CR-1C			18	SW	. . . . .	. . . . .		
5						. . . . .	. . . . .	SP SP SP	5
						. . . . .	. . . . .	SW	
10						. . . . .	. . . . .		10
15						. . . . .	. . . . .		15
20						. . . . .	. . . . .		20

**SANDY SILT:** Dark brown to black; 20% very fine-grained sand; 20% abundant black wood chips and debris; 1 piece of coke; strong sheen with blebs of NAPL; strong hydrocarbon odor.

**SAND:** Brown-gray; medium- to coarse-grained; silt slumped on sides; loose; 80% sheen and 10% NAPL following fractures over grains; strong odor.

**GRAVELLY SAND:** Brown-gray; medium- to predominantly coarse-grained sand; 35% fine gravel; loose; 90% sheen and 5% NAPL over grains; strong odor.

**SILTY SAND:** Brown-gray; medium- to coarse-grained; trace silt; loose; 70% yellow sheening following fractures; no odor.

6.0 - Organics present; lot of staining.

**COBBLY GRAVELLY SAND:** Brown-black; 10% cobble up to 4.5" diameter; fine to coarse gravel; trace silt; loose; sheen coating 90%, trace blebs of NAPL; strong hydrocarbon odor.

Total depth = 8.3 feet bgs.

**REMARKS:** Each attempt moved farther from shore to avoid suspected wood chip and bark layer. Heavy contamination in surface sediments. Mudline elevation and depth to mud are approximations.

- Composite Sample Interval    
  - Diagnostic Sample  
 - Minor Lithology Change    
  - Major Lithology Change



# CORING LOG

## CR-2

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PROJECT NO.: <i>6JRWI-04403-500 Sediment Investigation</i>		CLIENT: <i>Graham &amp; James/Riddell Williams</i>
LOCATION: <i>Seattle, Washington</i>		RIG TYPE: <i>Vibracore from Boat</i>
START DATE: <i>10/02/99</i> TIME: <i>17:00</i>	RECOVERY LENGTH: <i>9.5 feet</i>	METHOD: <i>3" OD Stainless Steel Core Tube</i>
LABORATORY DATE: <i>10/05/99</i> TIME: <i>10:30</i>	DRIVE LENGTH: <i>12.5 feet</i>	FIELD LOG BY: <i>J. Palmer</i>
DEPTH TO MUD: <i>16.2 feet</i>	MUDLINE ELEVATION: <i>-2.2 feet (NGVD)</i>	LAB LOG BY: <i>Y. Maestas &amp; J. Zwiebel</i>

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	
0	CR-2A				GW		0
	CR-2B				SP		2.9'-4.9' - Slight hydrocarbon odor.
5	CR-2C				SW		5
	CR-2C (105)				SW		5.7'-9.7' - Coarse gravel at 7.4' scattered throughout; slight hydrocarbon odor.
10							10
							9.7'-10.0' - Slight hydrocarbon odor.
15							15
20							20

REMARKS: Very hard stuff. Transducer out of water. Lots of debris.  
 Mudline elevation and depth to mud are approximations.  
 □ - Composite Sample Interval    ■ - Diagnostic Sample  
 - Minor Lithology Change        - Major Lithology Change



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**CORING LOG**  
CR-3

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 10/01/99 TIME: 13:15	RECOVERY LENGTH: 5.5 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/02/99 TIME: NA	DRIVE LENGTH: 6.3 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 7.2 feet	MUDLINE ELEVATION: 6.8 feet (NGVD)	LAB LOG BY: J. Zwiebel & J. Henley	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY		LITHOLOGY	U.S.C.S.	
0	CR-3A			3.9	PT SW		ORGANIC DEBRIS; 10% wood; fresh marine grass; vegetation.  GRAVELLY SILTY SAND (TILL); Gray; 15% fine to coarse gravel; 20% silt; dense; no sheen; no odor.		PT SW	0
5	CR-3B			3.4						5
10										10
15										15
20										20

Total depth = 6.3 feet bgs.

REMARKS: Very hard stuff. Transducer failed. Pulling out core was very difficult.  
Mudline elevation and depth to mud are approximations.  
Ø - Composite Sample Interval — Major Lithology Change





# CORING LOG

## CR-5

1011 S.W. Klickitat Way  
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Seattle, Washington 98134  
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PROJECT NO.: GJRWI-04403-500 Sediment Investigation	CLIENT: Graham & James/Riddell Williams
LOCATION: Seattle, Washington	RIG TYPE: Vibracore from Boat
START DATE: 10/01/99 TIME: 09:48	RECOVERY LENGTH: 1.9 feet
LABORATORY DATE: 10/06/99 TIME: 16:30	DRIVE LENGTH: 4.0 feet
DEPTH TO MUD: 26.6 feet	MUDLINE ELEVATION: -12.6 feet (NGVD)
	FIELD LOG BY: J. Palmer
	LAB LOG BY: Y. Maestas & J. Zwiebel

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						DEPTH (in feet)			
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY		SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE	
								LITHOLOGY	U.S.C.S.	
0	CR-5A	X			OH	OH	0	OH		0
					GW	GW		GW		
5							5			5
10							10			10
15							15			15
20							20			20

**CLAYEY SILT:** Dark brown to black; 30% clay; trace fine-grained sand; 20% wood fibers; soft; mild sheen; medium hydrocarbon odor.

2.3' - 90% black wood debris.

**SANDY GRAVEL:** Dark brown and black; fine to coarse, up to 2" diameter; 20% medium- to coarse-grained sand; 20% wood debris up to 3" long; trace silt (carbon black); trace sheen; medium hydrocarbon odor.

Total depth = 4.0 feet bgs.

REMARKS: 7" core tube used to resample top layer of sediment. Previous sample lost when core tube broke during cutting. Sediment had abundant sheen, some product.  
Mudline elevation and depth to mud are approximate.  
# Composite Sample Interval      Major Lithology Change



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CR-6

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PROJECT NO.: <i>GJRWI-04403-500 Sediment Investigation</i>	CLIENT: <i>Graham &amp; James/Riddell Williams</i>
LOCATION: <i>Seattle, Washington</i>	RIG TYPE: <i>Vibracore from Boat</i>
START DATE: <i>10/01/99</i> TIME: <i>11:36</i>	RECOVERY LENGTH: <i>6.0 feet</i>
LABORATORY DATE: <i>10/05/99</i> TIME: <i>12:40</i>	DRIVE LENGTH: <i>9.0 feet</i>
DEPTH TO MUD: <i>14.0 feet</i>	MUDLINE ELEVATION: <i>0.0 feet (NGVD)</i>
	LAB LOG BY: <i>Y. Maestas &amp; J. Zwiebel</i>

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE					SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.		LITHOLOGY	LITHOLOGY	
0	CR-6A				MH	<p><b>CLAYEY SILT:</b> Dark gray; wood chunks up to 2" long; clams; wood fibers; abundant vesicular black aggregate material; no sheen; slight odor.</p>			0
	CR-6B				SP SW SP SW				
5						<p><b>SAND:</b> Dark gray; fine- to medium-grained; trace silt; medium dense; no sheen; slight hydrocarbon odor.</p> <p><b>SANDY GRAVEL:</b> Gray (salt and pepper), heavy on black; fine- to coarse-grained; 40% sand; with cobble up to 3" diameter; no sheen; slight hydrocarbon odor.</p> <p><b>SAND:</b> Gray (salt and pepper); medium- to coarse-grained; trace gravel; very dense; no sheen; slight to no odor.</p> <p><b>GRAVELLY SILTY SAND (TILL):</b> Medium gray; 40% silt; 10% fine to coarse gravel up to 1.5" diameter; very dense; no sheen; no odor.</p>	SP SW SP SW	5	
10						Total depth = 9.0 feet bgs.			10
15									15
20									20

REMARKS: Medium difficult core drive.  
Mudline elevation and depth to mud are approximations.  
 X - Composite Sample Interval    - Major Lithology Change  
 - Depositional Lithology Change



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**CORING LOG**  
CR-7

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Suite #207  
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PROJECT NO.: GJRWI-04403-500 Sediment Investigation	CLIENT: Graham & James/Riddell Williams
LOCATION: Seattle, Washington	RIG TYPE: Vibracore from Boat
START DATE: 10/04/99 TIME: 15:10	RECOVERY LENGTH: 4.0 feet
LABORATORY DATE: 10/07/99 TIME: 10:00	DRIVE LENGTH: 4.0 feet
DEPTH TO MUD: 24.8 feet	MUDLINE ELEVATION: -10.8 feet (NGVD)
	LAB LOG BY: Y. Maestas & J. Zwiebel

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY		LITHOLOGY	U.S.C.S.	
0	CR-7A				SW	●●●●●●●●●●	GRAVELLY SILTY SAND (TILL): Medium gray; fine- to coarse-grained; 30% silt; 20% fine to coarse gravel up to 2" diameter; trace wood chunks and wood fibers; very dense; no sheen; no odor.  2.8'-4.0' - Trace wood fibers; very dense; no sheen; no odor.	●●●●●●●●●●	SW	0
	CR-7A (25)									
5							Total depth = 4.0 feet bgs.			5
10										10
15										15
20										20

REMARKS: Very hard bottom conditions. Lots of cobble and rock. Very compact gravel and clay found in bottom of rejected cores.  
Mudline elevation and depth to mud are approximations.  
■ Composite Sample Interval    ■ Diagnostic Sample



# CORING LOG

## CR-8

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 09/30/99 TIME: 11:45	RECOVERY LENGTH: 8.0 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/02/99 TIME: 08:30	DRIVE LENGTH: 12.0 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 32.7 feet	MUDLINE ELEVATION: -18.7 feet (NGVD)	LAB LOG BY: J. Zwiebel & Y. Maestas	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY		LITHOLOGY	U.S.C.S.	
0	CR-8A				OH	[OH Pattern]	<u>CLAYEY SILT</u> : Dark brown with organic staining; trace very fine-grained sand; organic debris; rootlets; 25% fibrous organic wood debris; sheen; no odor.	[OH Pattern]	OH	0
				6.9	OH	[OH Pattern]				
	CR-8B				SP	[SP Pattern]				
					SP	[SP Pattern]				
					GW	[GW Pattern]	<u>CLAYEY SILT</u> : Medium brown; trace sand; wood chunks up to 1.5" diameter; fibrous organics; no sheen; hydrocarbon smell.	[OH Pattern]	OH	
					SP	[SP Pattern]	<u>SAND</u> : Medium gray (salt and pepper); fine- to medium-, with trace coarse-grained; angular material; 5%-10% fibrous organic matter; 2 mm wood layer at 2.0'; no sheen; no odor.	[SP Pattern]	SP	
5	CR-8C				SP	[SP Pattern]	<u>SAND</u> : Medium gray (salt and pepper); fine- to medium-grained; trace gravel grading into lower unit from 5.0'; trace wood fibers; no sheen; no odor.	[GW Pattern]	GW	5
					SW	[SW Pattern]	<u>SANDY GRAVEL</u> : Gray (salt and pepper); fine to coarse (5% coarse); fine- to medium-grained sand; no sheen; no odor.	[SP Pattern]	SP	
					SW	[SW Pattern]	<u>SAND</u> : Medium gray (salt and pepper); fine- to medium-grained; trace fine to medium gravel; no sheen; no odor.	[SW Pattern]	SW	
10						[SW Pattern]	<u>GRAVELLY SAND</u> : Medium gray (salt and pepper); medium- to coarse-grained; 25% fine to coarse gravel; no wood; no organics; no sheen; no odor.	[SW Pattern]		10
						[SW Pattern]	Total depth = 12.0 feet bgs.	[SW Pattern]		
15						[SW Pattern]		[SW Pattern]		15
20						[SW Pattern]		[SW Pattern]		20

**REMARKS:** Core tube bent during retrieval, however, sample integrity determined to be intact.  
 Mudline elevation and depth to mud are approximations.  
 Ø Composite Sample Interval      Minor Lithology Change  
 Major Lithology Change



# CORING LOG

## CR-9

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat
START DATE: 10/02/99 TIME: 11:45	RECOVERY LENGTH: 5.1 feet	METHOD: 3" OD Stainless Steel Core Tube
LABORATORY DATE: 10/05/99 TIME: 08:30	DRIVE LENGTH: 7.0 feet	FIELD LOG BY: J. Palmer
DEPTH TO MUD: 34.2 feet	MUDLINE ELEVATION: -20.2 feet (NGVD)	LAB LOG BY: J. Zwiebel & Y. Maestas

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	
0	CR-9A				MH		0
	CR-9A (20)				MH		
	CR-9B				SP		
					GP		
					SW		
5							5
10							10
15							15
20							20

**SOIL DESCRIPTION**

**SILT:** Dark brown; trace very fine-grained sand; slight sheen; slight hydrocarbon odor.

**SANDY SILT:** Medium brown; very fine-grained sand; trace wood fibers; no sheen; slight hydrocarbon odor.

**SAND:** Medium gray; fine- to medium-grained; trace silt; no sheen; no odor.

1.7'-1.8' - Color change to black; grades into lower unit; no odor.

**SILTY SANDY GRAVEL:** Dark gray; 35% sand; 15% silt; no organics; medium dense; no sheen; no odor.

2.1'-2.8' - No sheen; no odor.

**GRAVELLY SAND:** Medium gray (salt and pepper); medium- to coarse-grained, more fine-grained at top; 35% fine to coarse gravel; loose; no sheen; no odor.

Total depth = 7.0 feet bgs.

**REMARKS:** Sample location quite sloped. Had to adjust vibracore base to compensate. Base may have slid during beginning of core drive.  
Mudline elevation and depth to mud are approximations.

Composite Sample Interval    
  Diagnostic Sample  
 Minor Lithology Change    
  Major Lithology Change

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# CORING LOG

## CR-10

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PROJECT NO.: <i>GJRWI-04403-500 Sediment Investigation</i>		CLIENT: <i>Graham &amp; James/Riddell Williams</i>
LOCATION: <i>Seattle, Washington</i>		RIG TYPE: <i>Vibrocure from Boat</i>
START DATE: <i>10/04/99</i> TIME: <i>11:50</i>	RECOVERY LENGTH: <i>8.0 feet</i>	METHOD: <i>3" OD Stainless Steel Core Tube</i>
LABORATORY DATE: <i>10/06/99</i> TIME: <i>15:05</i>	DRIVE LENGTH: <i>8.0 feet</i>	FIELD LOG BY: <i>J. Palmer</i>
DEPTH TO MUD: <i>31.6 feet</i>	MUDLINE ELEVATION: <i>-17.6 feet (NGVD)</i>	LAB LOG BY: <i>Y. Maestas &amp; J. Zwiebel</i>

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE					SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.		LITHOLOGY	LITHOLOGY	
0	CR-10A			18	OH	ORGANIC TARRY LAYER: Black; 10% tar; 5% wood chunks; trace to 5% very fine-grained sand; sticky; strong hydrocarbon odor.	OH		0
5	CR-10B				OH	CLAYEY SILT: Gray to black; 30% clay; soft; 80% sheen; 30% NAPL; strong hydrocarbon odor.	OH		5
5					SM	SILTY SAND: Gray to black; medium-grained; 20% silt; trace fibrous organic material; soft; 80% sheen; 15%-20% NAPL; strong hydrocarbon odor.	SM		5
5	CR-10C				SW	5.4'-5.8' - With 4" diameter cobble; 3" fibrous organic material.	SW		5
10						GRAVELLY SILTY SAND (TILL): Dark gray; 30% silt; 20% fine to coarse gravel; very dense; no sheen; strong hydrocarbon odor.			10
20						Total depth = 8.0 feet bgs.			20

REMARKS: Sample had abundant sheening and hydrocarbon odor. Very dirty. Lots of product.  
Mudline elevation and depth to mud are approximations.  
 ⦿ - Composite Sample Interval    - Major Lithology Change  
 - Depositional Lithology Change



# CORING LOG

## CR-11

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PROJECT NO.: 6JRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 09/30/99 TIME: 11:00	RECOVERY LENGTH: 9.4 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/02/99 TIME: NA	DRIVE LENGTH: 12.0 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 39.0 feet	MUDLINE ELEVATION: -25.0 feet (NGVD)	LAB LOG BY: J. Zwiebel & J. Henley	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	
0	CR-11A			2.8	OH	<p><b>CLAYEY ORGANIC SILT:</b> Dark brown; trace very fine-grained sand; trace organic fiber and wood chips up to 3" long; saturated; very soft; no sheen; no odor.</p> <p><b>CLAYEY ORGANIC SILT:</b> Medium reddish-brown; trace very fine-grained sand; trace wood fibers; no sheen; no odor.</p> <p>1.7'-2.5' - Color change to light grayish-brown; no sand; trace sheen (outside of sample); slight hydrocarbon odor.</p> <p>2.5'-3.5' - Color change to brown; trace very fine-grained sand; trace wood fibers; no sheen; slight hydrocarbon odor.</p> <p>3.5'-3.9' - Trace hydrocarbon odor.</p> <p><b>SAND:</b> Medium gray (salt and pepper); fine- to medium- at top, medium- to coarse-grained at bottom; no sheen; slight hydrocarbon odor.</p> <p><b>SANDY GRAVEL:</b> Gray; fine to coarse; fine- to coarse-grained sand; trace cobble; no sheen; slight hydrocarbon odor decreasing with depth.</p> <p>Total depth = 12.0 feet bgs.</p>	0
					OH		0
	CR-11B				OH		0
					OH		0
				3.9	SP		0
					SP		0
	CR-11C				GW		0
					GW		0
5					GW		5
					GW		5
10					GW		10
					GW		10
15					GW	15	
					GW	15	
20					GW	20	

REMARKS: Mudline elevation and depth to mud are approximations.  
 B - Composite Sample Interval  
 Minor Lithology Change:                      Major Lithology Change:



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CR-12

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 10/04/99 TIME: 11:03	RECOVERY LENGTH: 2.7 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/05/99 TIME: 15:50	DRIVE LENGTH: 7.5 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 30.5 feet	MUDLINE ELEVATION: -16.5 feet (NGVD)	LAB LOG BY: Y. Maestas & J. Zwiebel	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE					SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.		LITHOLOGY	LITHOLOGY	
0	CR-12A	X			MH	<p><b>SANDY SILT:</b> Dark brown; 15% fine-grained sand; 20% light tan soft and braided fibrous ropy material up to 2" long, and black spongy chunks of possible wood; spotty blebs of sheening with possible product; strong hydrocarbon odor.</p> <p><b>SILTY SAND:</b> Medium gray; medium- to coarse-grained; 40% silt; trace coarse gravel; slight sheen; strong hydrocarbon odor.</p> <p><b>SILTY GRAVELLY SAND:</b> Medium gray; fine- to coarse-grained; 20% silt; 30% fine to coarse gravel up to 1.5" diameter; trace cobble up to 3" diameter; tar surrounding some gravel and cobble; sand stained brown with 1-3 mm NAPL blebs; slight sheen; strong odor.</p> <p><b>SILTY GRAVEL:</b> Medium gray; fine to coarse, mostly medium, up to 1" diameter; 20% silt; slight sheen; medium odor.</p> <p>Total depth = 7.5 feet bgs.</p>	MH	MH	0
	CR-12B	X			SM		SM	SM	
5					SW		SW	SW	5
					GM		GM	GM	
10									10
15									15
20									20

**REMARKS:** Core base may have slid down bottom due to steep slope. May account for poor recovery.  
Mudline elevation and depth to mud are approximations.  
W - Composite Sample Interval  
Minor Lithology Change      Major Lithology Change

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CR-13

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 10/01/99 TIME: 15:34	RECOVERY LENGTH: 12.1 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/04/99 TIME: 09:50	DRIVE LENGTH: 13.0 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 39.0 feet	MUDLINE ELEVATION: -25.0 feet (NGVD)	LAB LOG BY: Y. Maestas & J. Zwiebel	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE					SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)				
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.		LITHOLOGY	LITHOLOGY		U.S.C.S.			
0	CR-13A				OH	<p><b>SANDY SILT:</b> Dark brown to black, mottled; very fine-grained sand; trace rootlets and wood fibers; wood chunks and coarse gravel; very soft; medium sheen; medium tar odor.</p> <p><b>CLAYEY SILT:</b> Medium gray, with mottled dark gray chunks; no organics; soft; no sheen; no odor.</p> <p><b>CLAYEY SILT:</b> Medium brown; trace very fine-grained sand; trace rootlets and wood fibers and black wood chunks up to 0.5" diameter (anoxic); trace sheen; no odor.</p> <p>3.2'-6.4' - No wood chunks; no sheen; no odor.</p> <p>6.4'-9.5' - Single piece of fine gravel; no wood; no sheen; odor.</p> <p>9.5'-11.1' - Trace fine to coarse gravel; hydrocarbon odor.</p> <p>10.9' - 1 mm sand lense similar to 12.1'.</p>	OH	OH	0				
	CR-13A (2-3)				OH				OH	OH	5		
	CR-13B				OH						OH	OH	10
	CR-13C								15				
				2.6						20			
	CR-13C (108)		31		SW			SW		25			
					SW	<p><b>GRAVELLY SAND:</b> Brownish-gray; fine- to coarse-grained; fine to coarse gravel; trace wood fibers; medium dense; no sheen; odor.</p> <p><b>SILTY GRAVELLY SAND:</b> Dark gray; medium- to coarse-grained; 35% fine to coarse gravel up to 1.5" diameter; 15% silt; wood chunks; strong sheen; trace NAPL; odor.</p> <p><b>GRAVELLY SAND:</b> Dark gray; medium- to coarse-grained; 35% fine to coarse gravel up to 1.5 " diameter; wood chunks; strong sheen; thin NAPL layer on surface, increasing with depth; staining; odor.</p> <p>Total depth = 13.0 feet bgs.</p>	SW	SW	20				
					SW				SW	SW	25		
					SW						SW	SW	30
					SW								35
									40				
									45				
									50				
									55				
									60				
									65				
									70				
									75				
									80				
									85				
									90				
									95				
									100				
									105				
									110				
									115				
									120				
									125				
									130				
									135				
									140				
									145				
									150				
									155				
									160				
									165				
									170				
									175				
									180				
									185				
									190				
									195				
									200				

REMARKS: Sediment was soft (pudding-like). Core tube dropped straight down and came straight back up. Lots of sheening on water surface.  
Mudline elevation and depth to mud are approximations.

Composite Sample Interval       Diagnostic Sample  
 Minor Lithology Change       Major Lithology Change

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# CORING LOG

## CR-14

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat
START DATE: 09/30/99 TIME: 15:10	RECOVERY LENGTH: 6.0 feet	METHOD: 3" OD Stainless Steel Core Tube
LABORATORY DATE: 10/02/99 TIME: NA	DRIVE LENGTH: 6.0 feet	FIELD LOG BY: J. Palmer
DEPTH TO MUD: 27.5 feet	MUDLINE ELEVATION: -13.5 feet (NGVD)	LAB LOG BY: J. Zwiebel & J. Henley

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY		LITHOLOGY	U.S.C.S.	
0	CR-14A				OH	[OH symbol]	<p><u>CLAYEY ORGANIC SILT</u>: Dark gray to black; trace very fine- to fine-grained sand; trace organic fibers; saturated; very soft; heavy staining; 5% black NAPL throughout; medium to strong hydrocarbon odor.</p>	OH		0
				OH	[OH symbol]	OH			OH	
	CR-14B			1.8	MH	[MH symbol]	<p><u>CLAYEY ORGANIC SILT</u>: Dark gray (outside 0.25"), brown (inside); 5% organic fibers; trace very fine- to fine-grained sand; 5% NAPL in pockets on outside of sample with heavy sheen; trace NAPL along wood fibers inside sample; no odor.</p>	MH		
				SP	[SP symbol]	SP			SP	
				SW	[SW symbol]	SW		SW		
				SM	[SM symbol]	SM		SM		
5				SW	[SW symbol]	SW	<p><u>CLAYEY SILT</u>: Dark gray to black; fewer organics; trace very fine- to fine-grained sand; trace NAPL; no odor.</p> <p style="text-align: center;">3.0'-3.2' - Hydrocarbon odor.</p>	SW		5
						[SAND symbol]	<p><u>SAND</u>: Gray (salt and pepper); fine- to medium-grained; trace silt; strong sheen; strong hydrocarbon odor.</p>			
						[GRAVELLY SAND symbol]	<p><u>GRAVELLY SAND</u>: Fine to coarse gravel; trace to 5% silt; no sheen; strong hydrocarbon odor.</p>			
						[SILTY SAND symbol]	<p><u>SILTY SAND</u>: Medium gray; trace clay; trace gravel; trace wood fiber; strong sheen and trace product along outside, trace NAPL inside along fractures; no odor.</p>			
10						[SILTY GRAVELLY SAND symbol]	<p><u>SILTY GRAVELLY SAND</u>: Medium gray; very fine- to coarse-grained; well graded; fine to coarse gravel; trace NAPL from 5.5'-6.0'; no odor.</p>			10
							<p>Total depth = 6.0 feet bgs.</p>			
15										15
20										20

REMARKS: Product in sample which coated gloves and tape measure. Had to dispose of any equipment that came into contact with this sample. Mudline elevation and depth to mud are approximations.

⊗ - Composite Sample Interval  
 Minor Lithology Change

Major Lithology Change



# CORING LOG

## CR-15

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 10/05/99 TIME: 10:56	RECOVERY LENGTH: 2.5 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/07/99 TIME: 12:20	DRIVE LENGTH: 5.0 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 31.2 feet	MUDLINE ELEVATION: -17.2 feet (NGVD)	LAB LOG BY: Y. Maestas & J. Zwiebel	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						DEPTH (in feet)			
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY		SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE	
								LITHOLOGY	U.S.C.S.	
0	CR-15A	X			MH SW	●●●●		●●●●	MH	0
5						●●●●	<p><u>SANDY SILT</u>; Dark brown; 25% very fine-grained sand; highly saturated; very soft; mild sheen; slight hydrocarbon odor.</p> <p><u>GRAVELLY SANDY SILT (TILL)</u>; Medium gray; 25% fine-grained sand; 15% fine to coarse gravel; trace clay; very dense; no sheen; no odor.</p>	●●●●	SW	5
10							Total depth = 5.0 feet bgs.			10
15										15
20										20

**REMARKS:** Very hard bottom conditions. Debris on bottom caused core to tip over. Station moved in with each additional attempt. Grayish sand/clay and gravel in bottom of rejected cores.  
Mudline elevation and depth to mud are approximations.  
 N Composite Sample Interval      — Depositional Lithology Change

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CR-17

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 10/04/99 TIME: 13:45	RECOVERY LENGTH: 3.0 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/06/99 TIME: 08:45	DRIVE LENGTH: 7.5 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 25.0 feet	MUDLINE ELEVATION: -11.0 feet (NGVD)	LAB LOG BY: Y. Maestas & J. Zwiebel	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						SOIL DESCRIPTION		INTERPRETED IN-SITU PROFILE		DEPTH (in feet)	
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY			LITHOLOGY	U.S.C.S.		
0	CR-17A	14.1			OH		<p><b>SILT</b>; Black; trace very fine-grained sand; no organics; highly saturated; very soft; medium sheen; strong odor.</p> <p><b>SANDY SILT</b>; Black; 20% fine- to medium-grained sand; wood chips; angular aggregated material (coke); soft; medium sheen; some blebs of NAPL; strong odor.</p> <p>1.8'-3.6' - Strong sheen; some blebs of NAPL; strong hydrocarbon odor decreasing with depth.</p> <p>2.7' - Wood chip up to 3" diameter.</p> <p><b>SANDY SILTY GRAVEL (TILL)</b>; Medium gray; fine to coarse up to 2" diameter; 20% fine- to coarse-grained sand; 30% silt; very dense; no sheen; slight odor.</p> <p>Total depth = 7.5 feet bgs.</p>			OH		0
	CR-17A (9)				MH					MH		
	CR-17B				GW					GW		
5											5	
10											10	
15											15	
20											20	

REMARKS: Steep slope on bottom  
Mudline elevation and depth to mud are approximate.  
 □ Composite Sample Interval    ■ Disposive Sample  
 - Minor Lithology Change  
 — Depositional Lithology Change



# CORING LOG

## CR-18

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 10/02/99 TIME: 14:10	RECOVERY LENGTH: 5.1 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/04/99 TIME: 15:00	DRIVE LENGTH: 9.0 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 10.7 feet	MUDLINE ELEVATION: 3.3 feet (NGVD)	LAB LOG BY: Y. Maestas & J. Zwiebel	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						DEPTH (in feet)			
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY		SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE	
								LITHOLOGY	U.S.C.S.	
0	CR-18A	X			GP	••	0	••	GP	0
	CR-18B	X			SW	••		••		
	CR-18C	X				••		••		
5						••	5	••	SW	5
						••		••		
10						••	10	••		10
						••		••		
15						••	15	••		15
						••		••		
20						••	20	••		20

**REMARKS:** Soft bottom conditions with logs scattered about. Core base may have set up on one or more logs resulting in lost sediment or inaccurate transducer reports.  
Mudline elevation and depth to mud are approximations.  
 • Composite Sample Interval  
 — Depositional Lithology Change

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CR-19

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 10/04/99 TIME: 17:10	RECOVERY LENGTH: 6.25 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/07/99 TIME: 08:40	DRIVE LENGTH: 12.9 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 37.0 feet	MUDLINE ELEVATION: -23.0 feet (NGVD)	LAB LOG BY: Y. Maestas & J. Zwiebel	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE					SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)	
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.		LITHOLOGY	LITHOLOGY		U.S.C.S.
0	CR-19A	135			MH	<p><b>CLAYEY SILT:</b> Black; trace fine-grained sand; wood chunk and debris; soft; 80% sheen; 20% NAPL.</p>	MH		0	
	CR-19B				SP				<p><b>SILTY SAND:</b> Dark gray; fine-grained; 4% silt; trace wood fibers; papery fragment at top of sample; loose; 80% sheen; trace NAPL.</p>	SP
					GP	<p><b>SANDY GRAVEL:</b> Black; fine to medium; 40% fine- to coarse-grained sand; trace silt; loose; 90% sheen (40% NAPL - silver/metallic color).</p>	MH			
	CR-19C				SP			<p><b>SILT:</b> Medium brown with black band at top of sample; medium dense; slight sheen; 15% NAPL in fractures.</p> <p><b>SAND:</b> Medium brown; medium-grained; trace silt; medium dense; abundant sheening; trace NAPL.</p> <p><b>SAND:</b> Medium brown; medium- to coarse-grained; trace fine gravel; medium dense; medium sheen.</p> <p><b>SANDY GRAVEL:</b> Fine to coarse, up to 2" diameter; 20% medium- to coarse-grained sand; loose; abundant sheening; 5% NAPL.</p> <p><b>GRAVELLY SAND:</b> Fine- to coarse-grained; 30% fine gravel; trace silt; medium dense; slight sheening.</p> <p>8.7'-10.7' - Color change to medium gray; slight hydrocarbon odor.</p> <p>10.7'-12.5' - Grades with coarser gravel; one cobble up to 3" diameter; slight sheen; medium hydrocarbon odor.</p> <p>Total depth = 12.9 feet bgs.</p>		
					SP	GW			10	
					SP					
20								40		

REMARKS: Odor not evaluated from 0.0' to 4.2' bgs.  
Mudline elevation and depth to mud are approximations.  
■ - Composite Sample Interval  
▨ - Minor Lithology Change      - Major Lithology Change



# CORING LOG

## CR-20

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation		CLIENT: Graham & James/Riddell Williams	
LOCATION: Seattle, Washington		RIG TYPE: Vibracore from Boat	
START DATE: 10/05/99 TIME: 11:57	RECOVERY LENGTH: 7.5 feet	METHOD: 3" OD Stainless Steel Core Tube	
LABORATORY DATE: 10/07/99 TIME: 12:15	DRIVE LENGTH: 13.0 feet	FIELD LOG BY: J. Palmer	
DEPTH TO MUD: 41.8 feet	MUDLINE ELEVATION: -27.8 feet (NGVD)	LAB LOG BY: Y. Maestas & J. Zwiebel	

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE						SOIL DESCRIPTION		INTERPRETED IN-SITU PROFILE		DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	LITHOLOGY	U.S.C.S.		
0	CR-20A	X			OH		<p><b>CLAYEY SILT:</b> Medium gray; trace very fine-grained sand; trace wood fibers; soft; slight sheening; one bleb of NAPL; no odor.</p> <p>1.6' - Color change to medium brown; organic staining.</p> <p>2.3'-7.5' - Medium brown as at 1.6'; no sheen; organic odor.</p> <p>7.5'-13.0' - Organic odor.</p> <p>Total depth = 13.0 feet bgs.</p>		OH	0	
	CR-20B	X									
	CR-20B (40)	■									
	CR-20C	X									
5										5	
10										10	
15										15	
20										20	

REMARKS: Surface sediment produced large sheen and odor.  
Mudline elevation and depth to mud are approximations.  
■ - Composite Sample Interval    ■ - Diagnostic Sample



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**CORING LOG**  
CR-21

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PROJECT NO.: GJRWI-04403-500 Sediment Investigation	CLIENT: Graham & James/Riddell Williams
LOCATION: Seattle, Washington	RIG TYPE: Vibracore from Boat
START DATE: 10/05/99 TIME: 13:15	RECOVERY LENGTH: 10.25 feet
LABORATORY DATE: 10/06/99 TIME: 10:00	DRIVE LENGTH: 11.0 feet
DEPTH TO MUD: 36.8 feet	MUDLINE ELEVATION: -22.8 feet (NGVD)
	FIELD LOG BY: J. Palmer
	LAB LOG BY: Y. Maestas & J. Zwiebel

DEPTH (in feet)	LAB (AS-RECEIVED) PROFILE					SOIL DESCRIPTION	INTERPRETED IN-SITU PROFILE		DEPTH (in feet)
	SAMPLE ID	SAMPLE DEPTH	HS PID (ppm)	CORE PID (ppm)	U.S.C.S.		LITHOLOGY	LITHOLOGY	
0	CR-21A				OH	<b>SANDY SILT:</b> Black; 30% very fine-grained sand; wood chips; very saturated; soft; moderate sheen; strong hydrocarbon odor.		OH	0
	CR-21B				MH	<b>SANDY CLAYEY SILT:</b> Gray changing to brown with depth; 15% very fine-grained sand; 20% clay; no organics or wood; slight sheen; slight odor.		MH	
5					SP	3.5'-4.0' - Vertical coarser-grained sand lense.		SP	5
	CR-21C				GP	<b>SAND:</b> Gray; fine- to coarse-grained; trace fine gravel; trace silt; no organics; no sheen; slight odor; grades into lower unit.		GP	
					GW	<b>SANDY GRAVEL:</b> Dark gray; fine to coarse, up to 1.5" diameter; no sheen; slight odor.		GW	
					SW	<b>COBBLY SANDY GRAVEL:</b> Gray; 10% cobbles up to 3" diameter; 40% medium- to coarse-grained sand; no organics; loose; no sheen; no odor.		SW	
10					GW	<b>SANDY GRAVEL:</b> Gray; fine to coarse, up to 1" diameter; 40% medium- to coarse-grained sand; loose; no organics; no sheen; no odor.		GW	10
					GW	<b>GRAVELLY SAND:</b> Gray; medium- to coarse-grained; 30% fine to coarse gravel, up to 1" diameter; loose; no organics; no sheen; no odor.			
						7.9'-8.4' - No sheen; no odor.			
						<b>COBBLY SANDY GRAVEL:</b> Dark gray; 30% cobbles up to 2.5" diameter; 30% medium- to coarse-grained sand; trace silt; loose; no sheen; no odor.			
15						Total depth = 11.0 feet bgs.			15
20									20

REMARKS: Surface sediment produced large sheen and odor.  
Mudline elevation and depth to mud are approximations.  
N Composite Sample Interval  
Minor Lithology Change      Major Lithology Change

**Retec 2002  
Phase 2  
Sediment Investigation  
Cores**

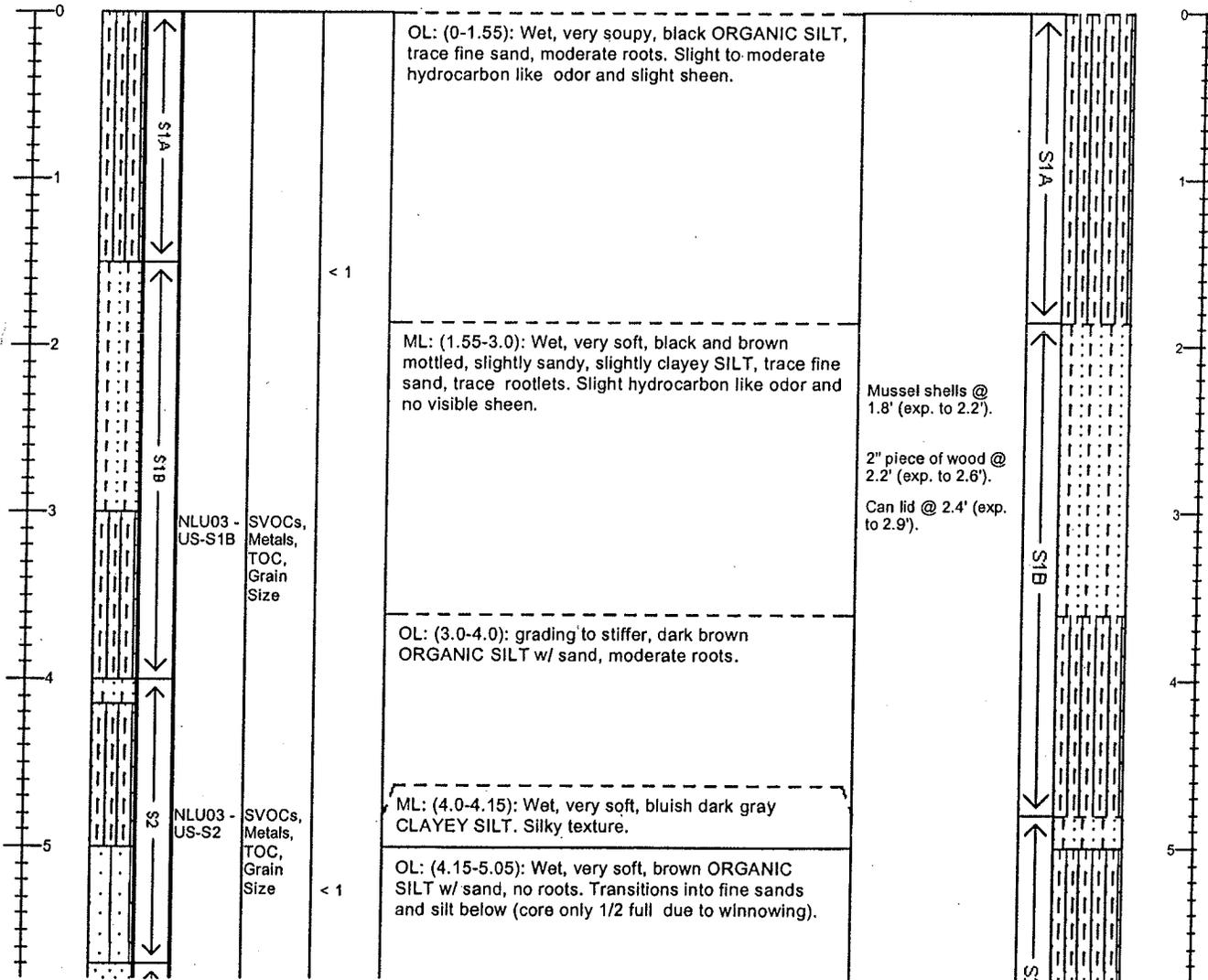


# Sediment Core Log

## Core: NLU03-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>12 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>12 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>29</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>10/18/2002</b>		Mudline Elevation (ft): <b>-8.58</b>	Recovery in ft (%): <b>11 (92)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'46.68</b> E./LONG: <b>122°19'55.14</b>	Process Date: <b>10/19/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>AGF, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			



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Remarks: Slight sheen on water during retrieval.

Calculated Recovery  
 Sample Length/Penetration Length:  
 , 11 / 12 = 92 %

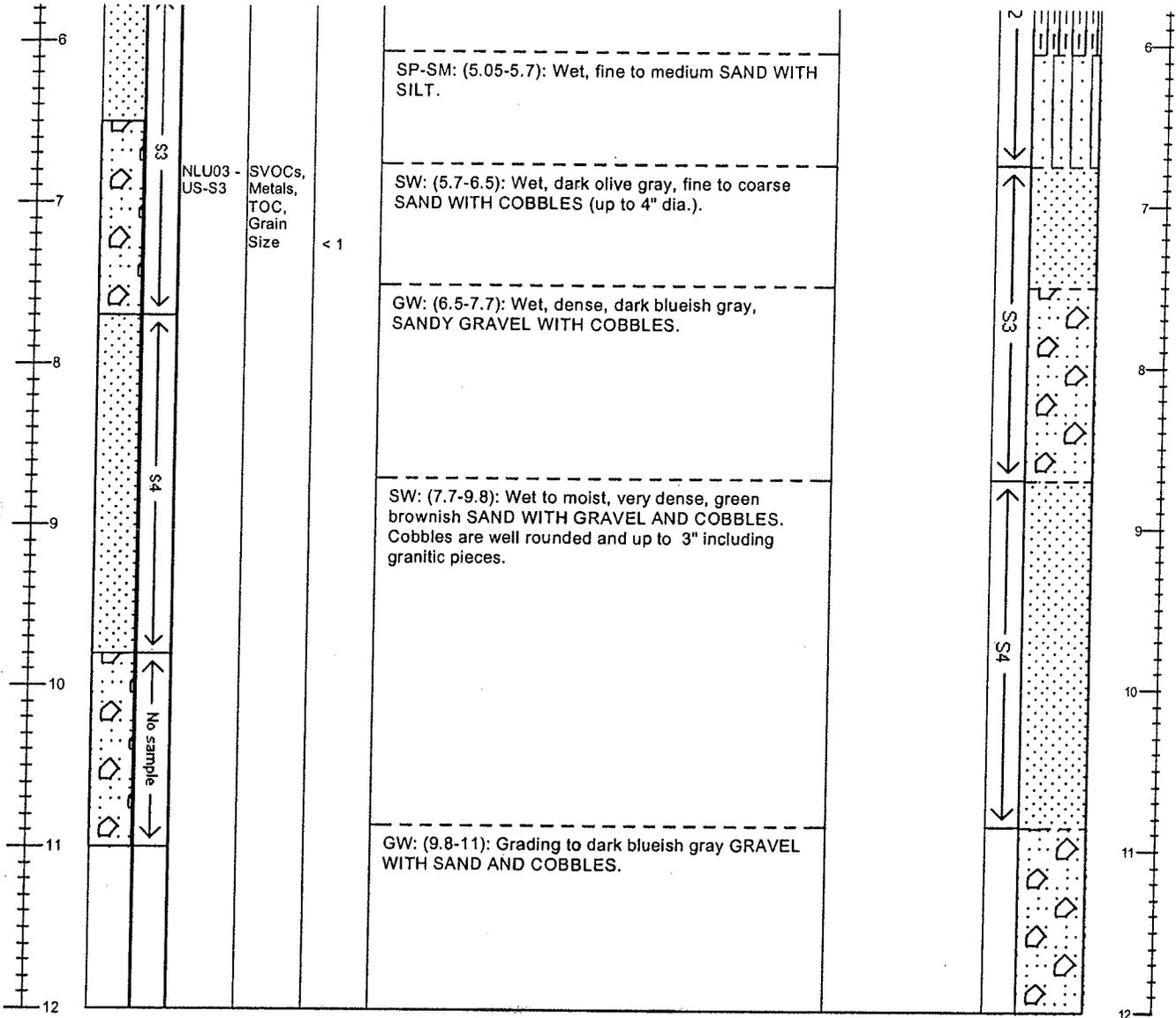


# Sediment Core Log

Core: NLU03-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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 Fax: (206) 624-2839

Remarks: Slight sheen on water during retrieval.

Calculated Recovery  
 Sample Length/Penetration Length:  
 11 / 12 = 92 %

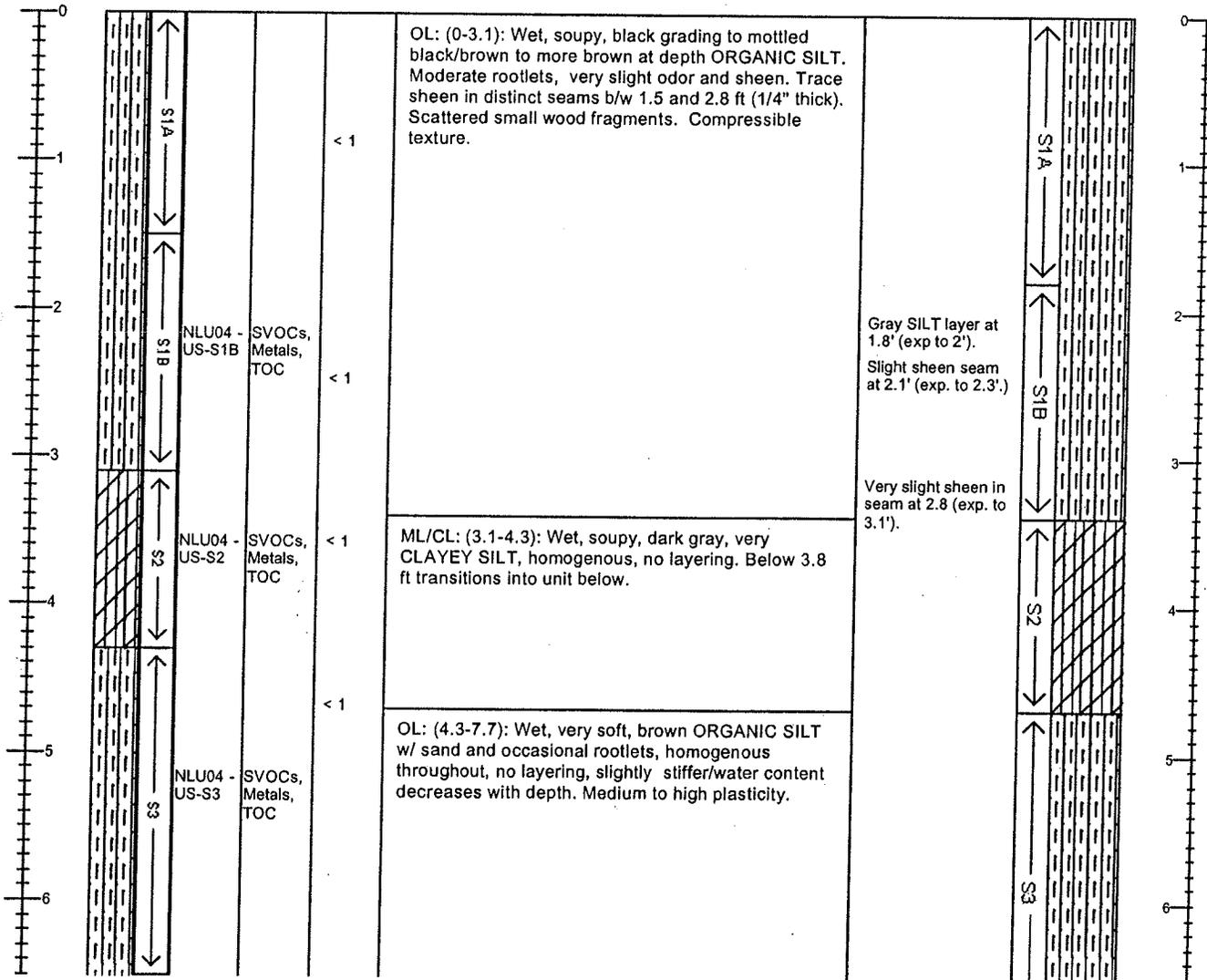


# Sediment Core Log

## Core: NLU04-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>13 ft</b>
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>13 ft</b>
Client: <b>PSE</b>		Water Depth (ft): <b>38.4</b>	Sample Quality: <b>Good</b>
Collection Date: <b>10/18/2002</b>		Mudline Elevation (ft): <b>-17.98</b>	Recovery in ft (%): <b>11.8 (91)</b>
Contractor: <b>MSS</b>		N./LAT: <b>47°38'44.64</b> E./LONG: <b>122°19'54.66</b>	Process Date: <b>10/19/2002</b>
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>AGF, BHH, KLC</b>
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis
			Headspace PID
<b>Sediment Description</b>			
Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			
		Comments	Calc. In situ Depths (ft) & Graphic Log
			Calc. In situ Depth (ft)



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Remarks: 3.5" cobble stuck in shoe.

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 11.8/13 = 91 %

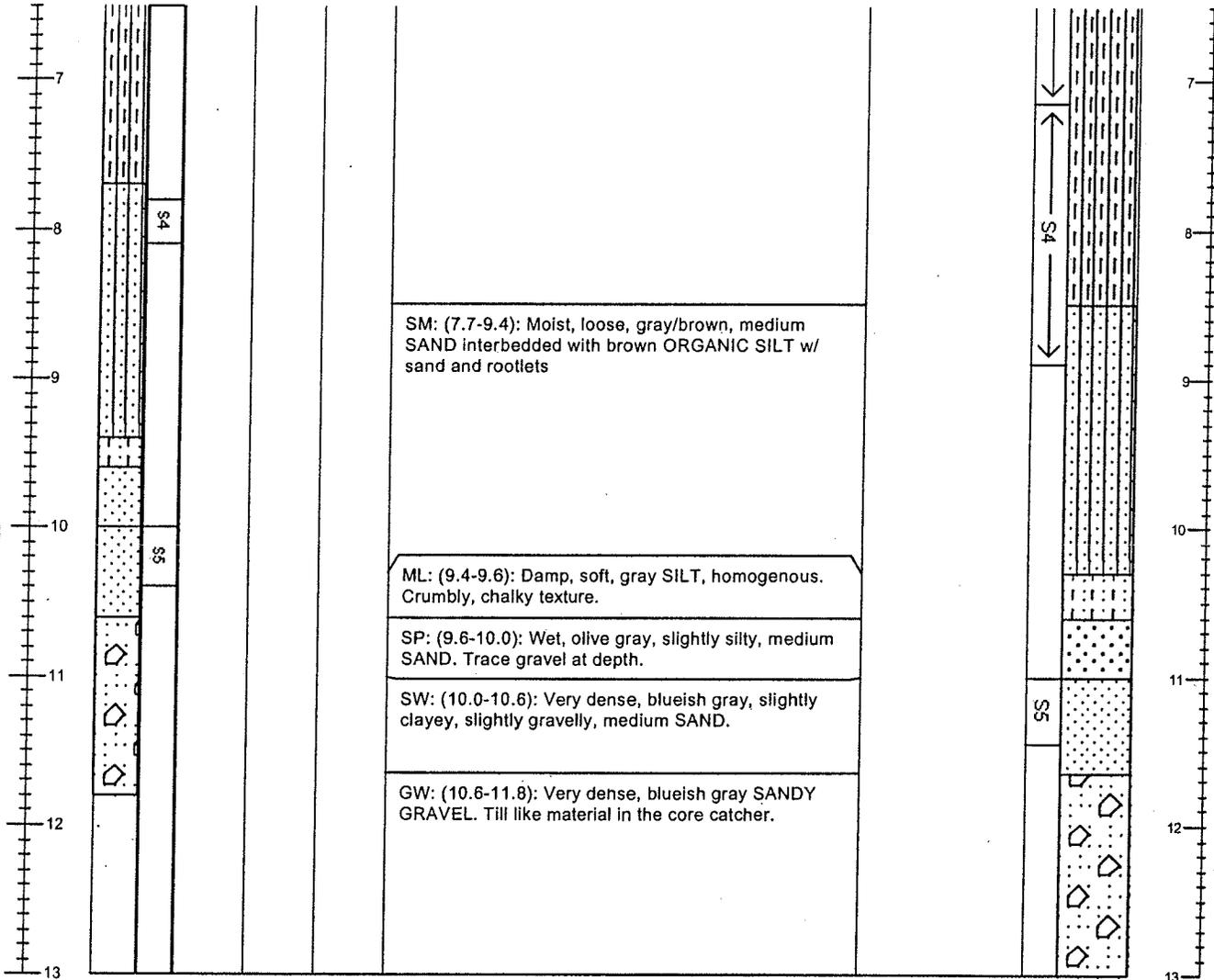


# Sediment Core Log

Core: NLU04-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
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The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> 3.5" cobble stuck in shoe.	<b>Calculated Recovery</b> Sample Length/Penetration Length: 11.8/13 = 91 %
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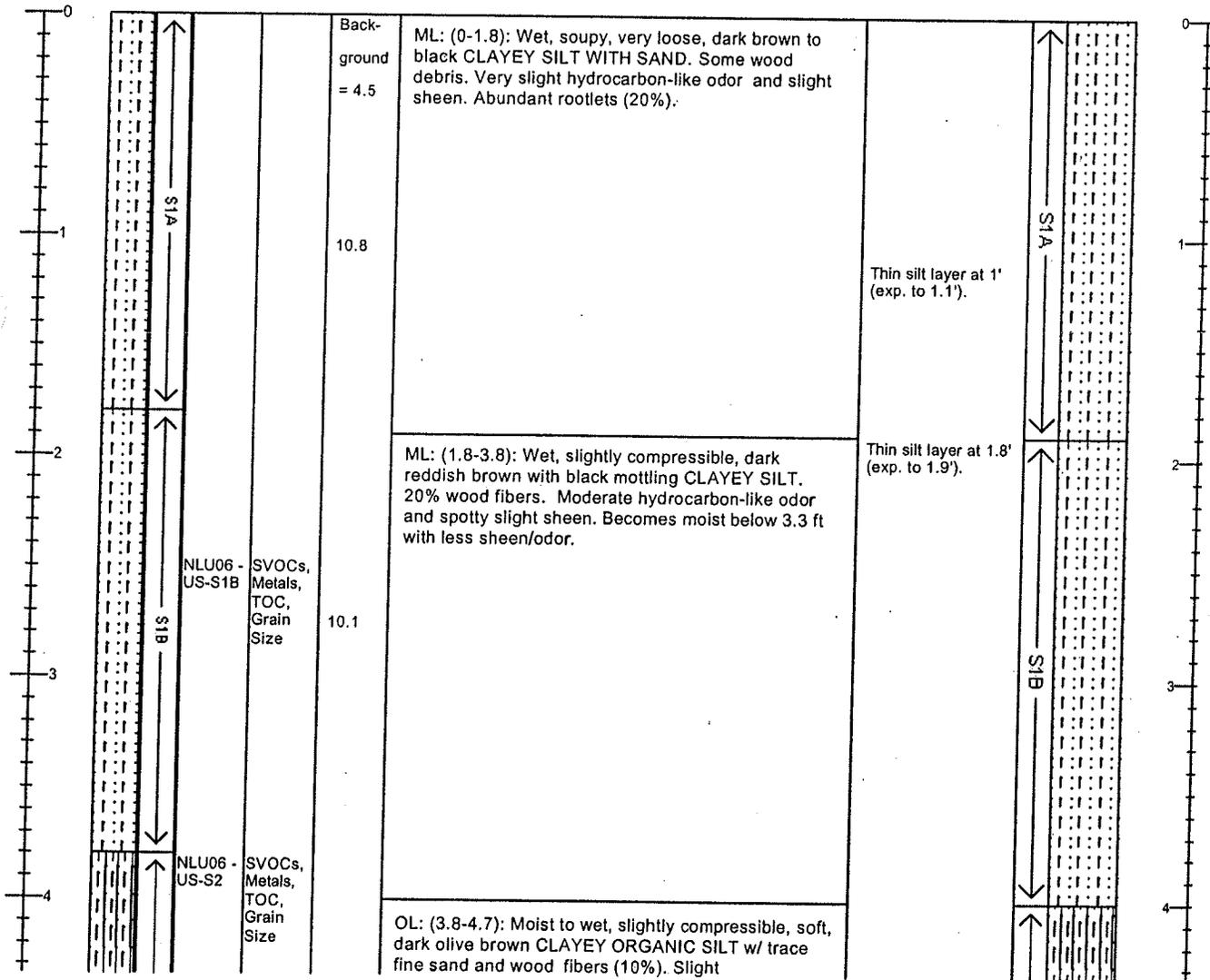


# Sediment Core Log

## Core: NLU06-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>9 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>41</b>	Sample Quality: <b>Good, top fair</b>					
Collection Date: <b>10/19/2002</b>		Mudline Elevation (ft): <b>-20.58</b>	Recovery in ft (%): <b>8.5 (94)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'37.24</b> E./LONG: <b>122°19'59.04</b>	Process Date: <b>10/21/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, AGF</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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Remarks: Base of core stand sunk slightly into soft bottom.

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 8.5 / 9 = 94 %

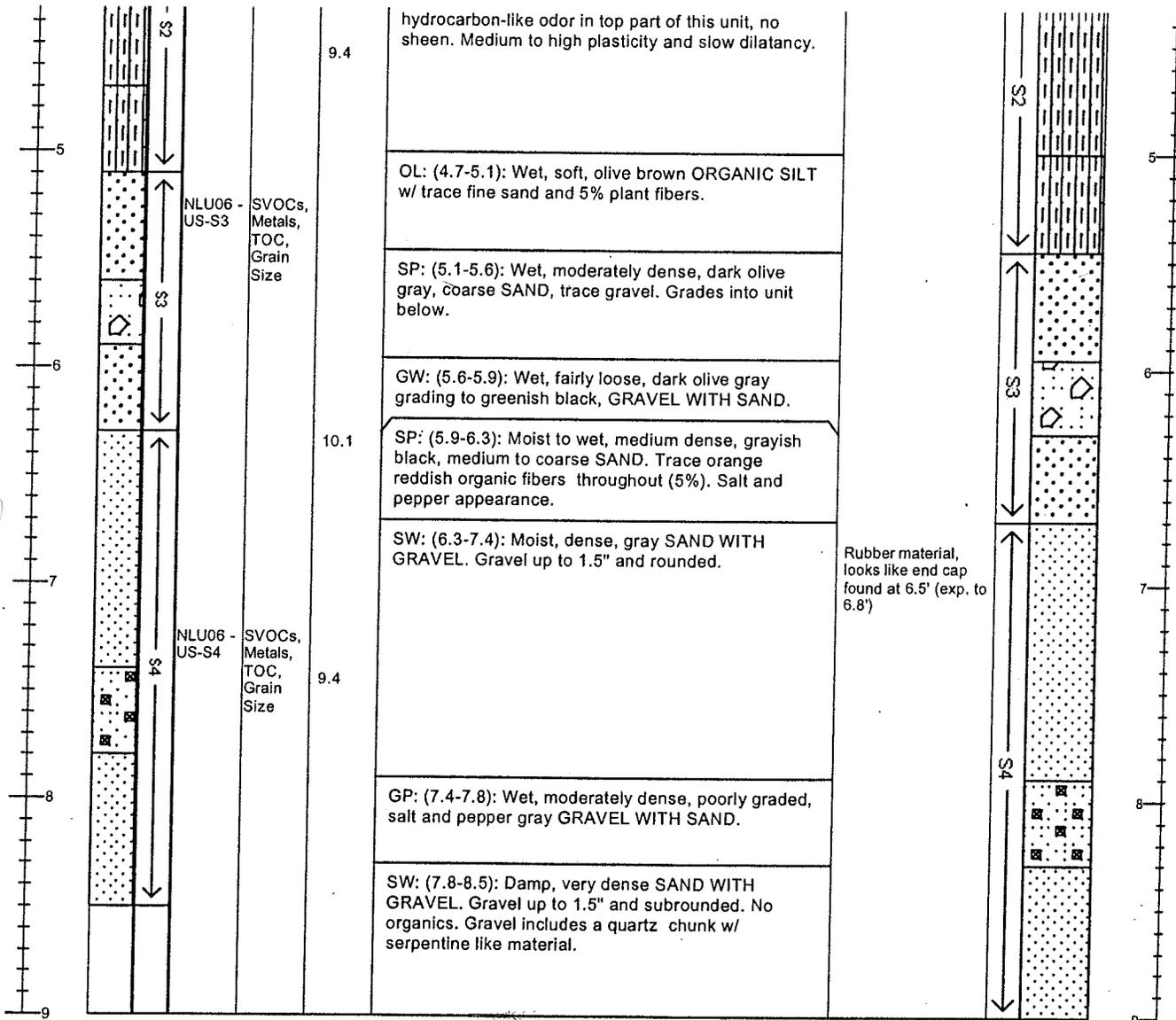


# Sediment Core Log

Sheet 2 of 2

Core: NLU06-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Base of core stand sunk slightly into soft bottom.

Calculated Recovery  
Sample Length/Penetration Length:  
**8.5 / 9 = 94 %**

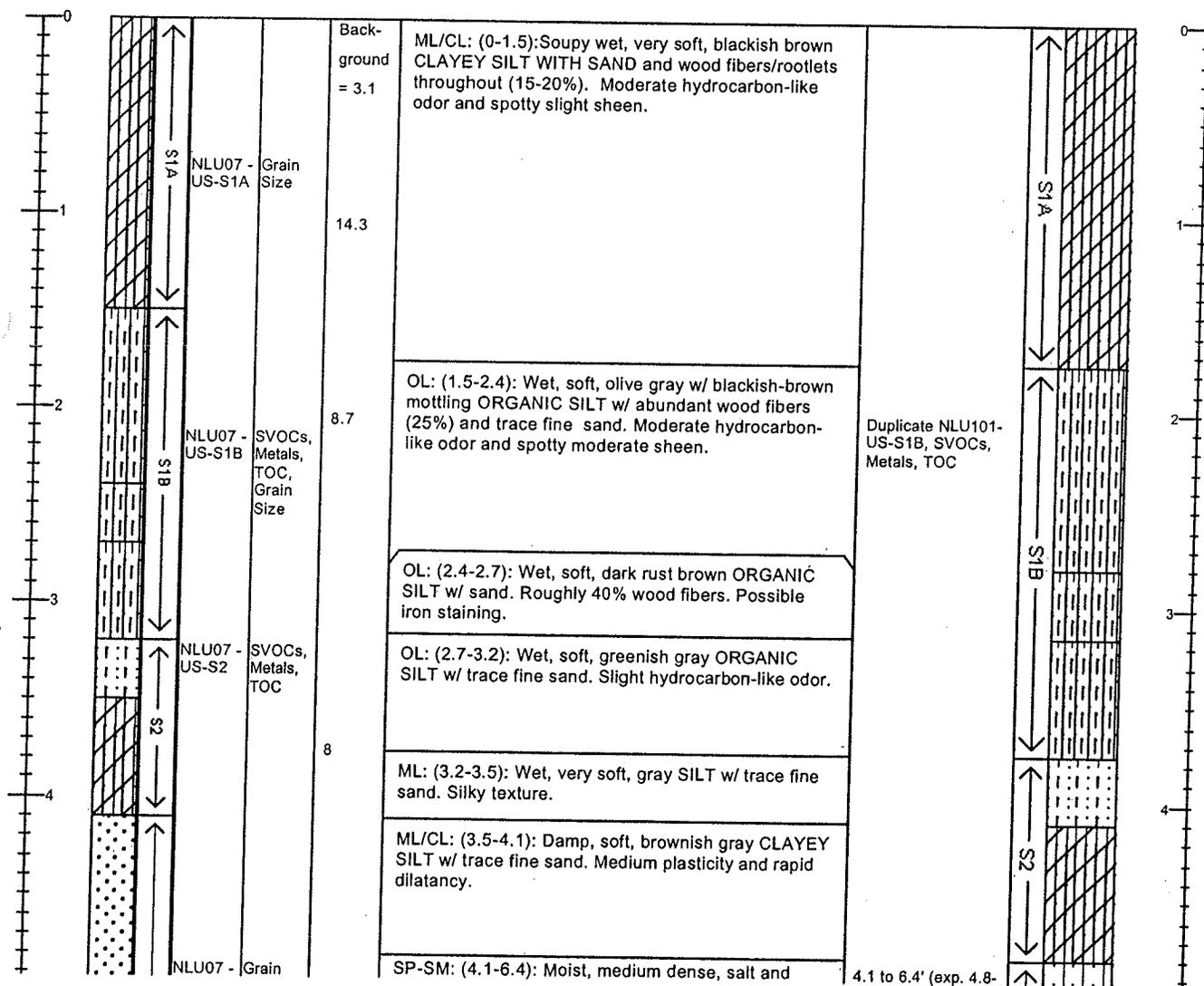


# Sediment Core Log

## Core: NLU07-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>9.8 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>35.4</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>10/18/2002</b>		Mudline Elevation (ft): <b>-14.98</b>	Recovery in ft (%): <b>9.1 (93)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'37.36</b> E./LONG: <b>122°20'03.14</b>	Process Date: <b>10/21/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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Remarks: Base of core stand sunk 0.8' into soft sediment.

**Calculated Recovery**  
Sample Length/Penetration Length:  
**9.1 / 9.8 = 93 %**

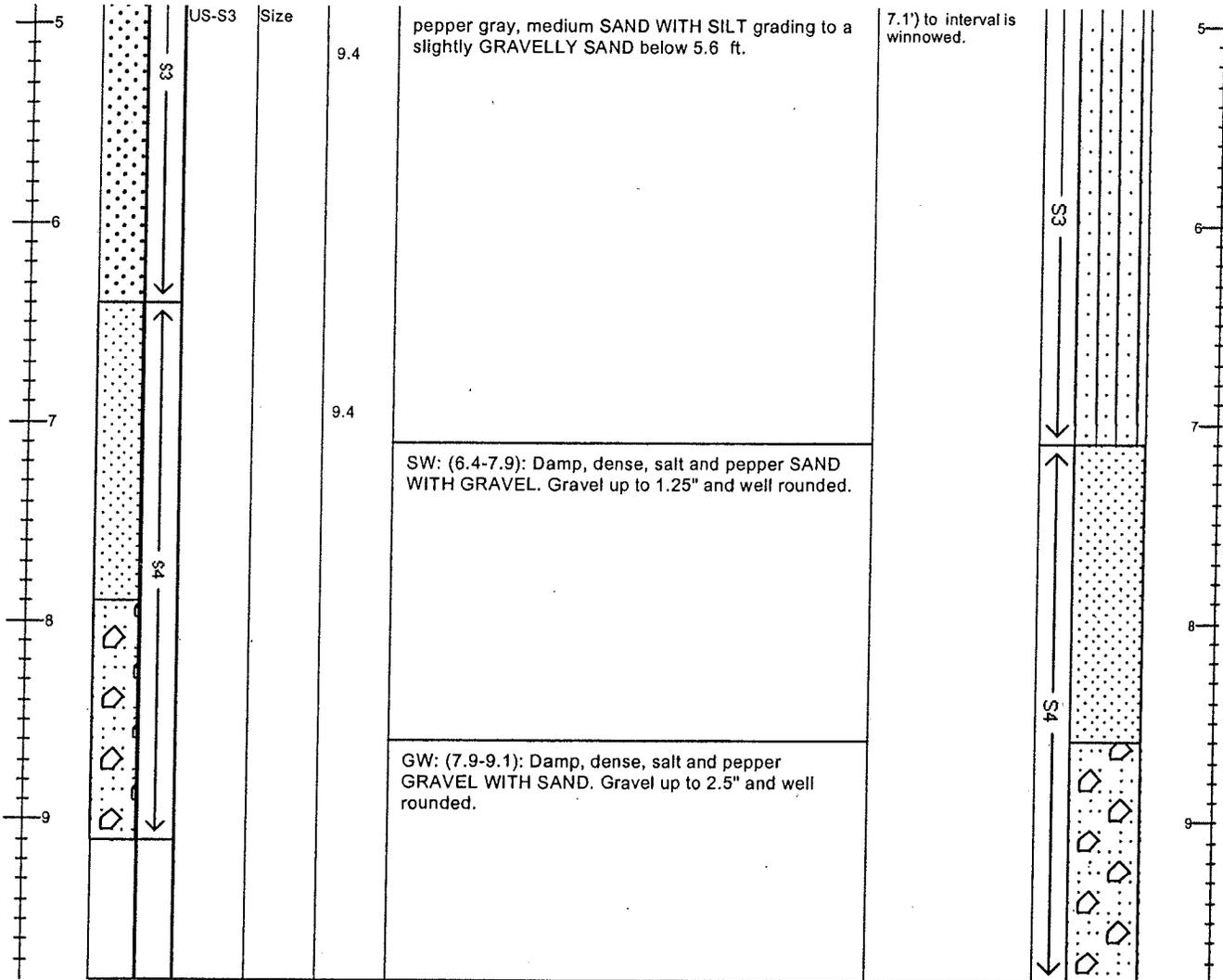


# Sediment Core Log

Core: NLU07-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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Remarks: Base of core stand sunk 0.8' into soft sediment.

**Calculated Recovery**  
Sample Length/Penetration Length:  
 $9.1 / 9.8 = 93 \%$

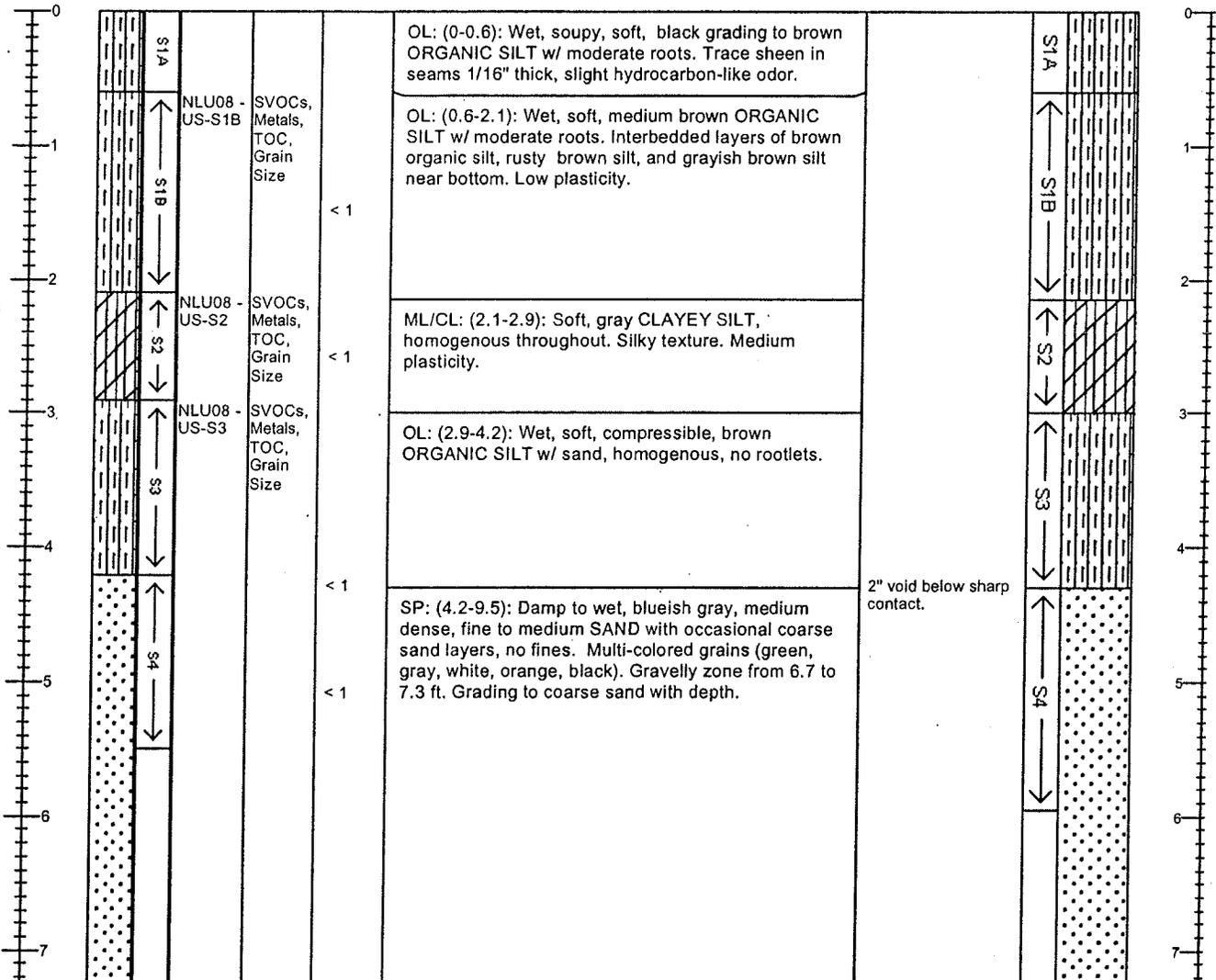


# Sediment Core Log

Core: NLU08-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>16 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.18</b>	Penetration Depth: <b>15 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>41.4</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>10/17/2002</b>		Mudline Elevation (ft): <b>-21.22</b>	Recovery in ft (%): <b>14.6 (97)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'36.29</b> E./LONG: <b>122°20'07.11</b>	Process Date: <b>10/18/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>AGF, NPB, ML, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	<b>Sediment Description</b>	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			



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Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Hydrocarbon-like odor from top of the tube upon retrieval.

**Calculated Recovery**  
Sample Length/Penetration Length:  
**14.6/15 = 97 %**

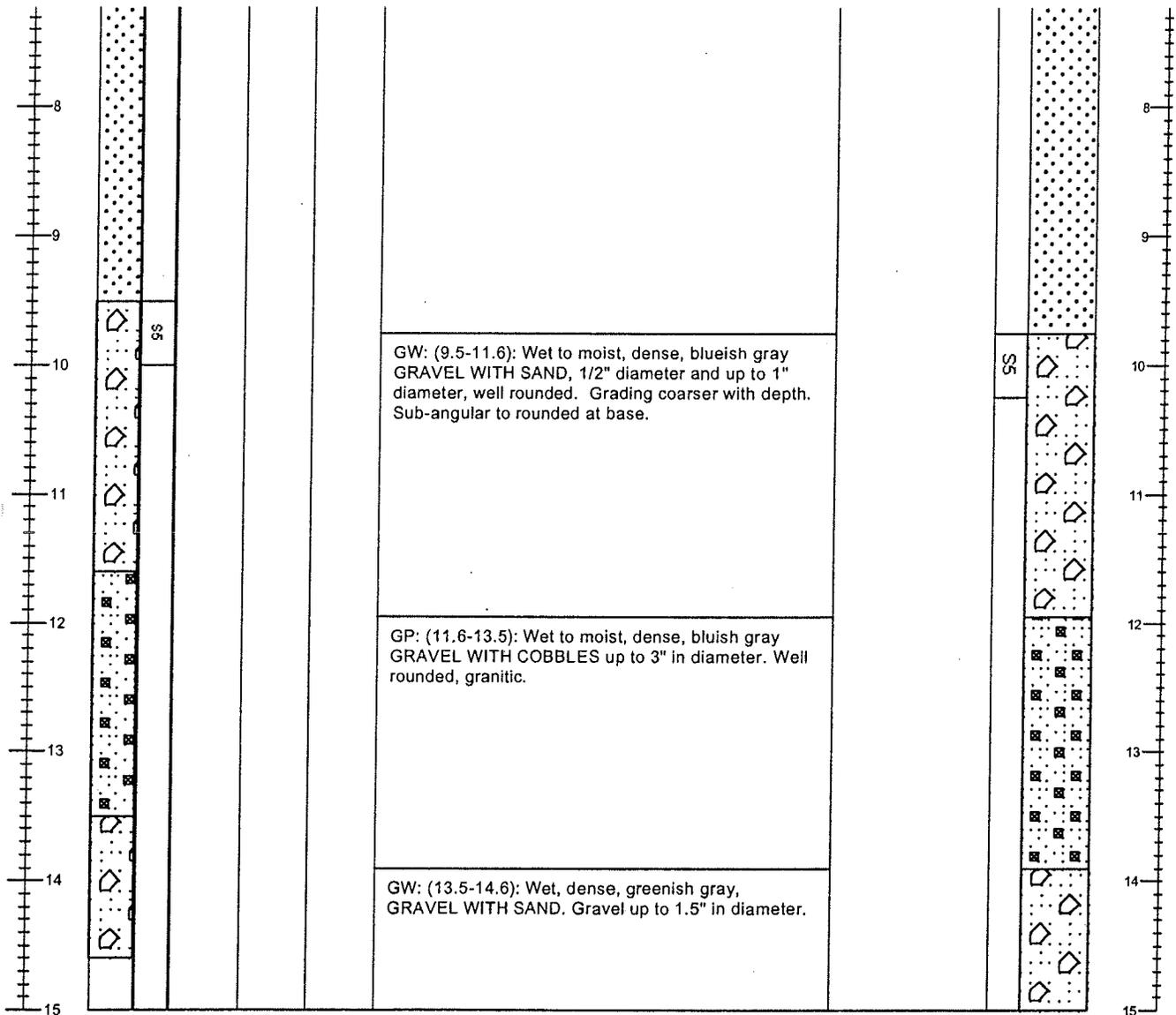


# Sediment Core Log

Core: NLU08-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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GW: (9.5-11.6): Wet to moist, dense, blueish gray GRAVEL WITH SAND, 1/2" diameter and up to 1" diameter, well rounded. Grading coarser with depth. Sub-angular to rounded at base.

GP: (11.6-13.5): Wet to moist, dense, bluish gray GRAVEL WITH COBBLES up to 3" in diameter. Well rounded, granitic.

GW: (13.5-14.6): Wet, dense, greenish gray, GRAVEL WITH SAND. Gravel up to 1.5" in diameter.

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Remarks: Hydrocarbon-like odor from top of the tube upon retrieval.

Calculated Recovery  
Sample Length/Penetration Length:  
**14.6/15 = 97 %**

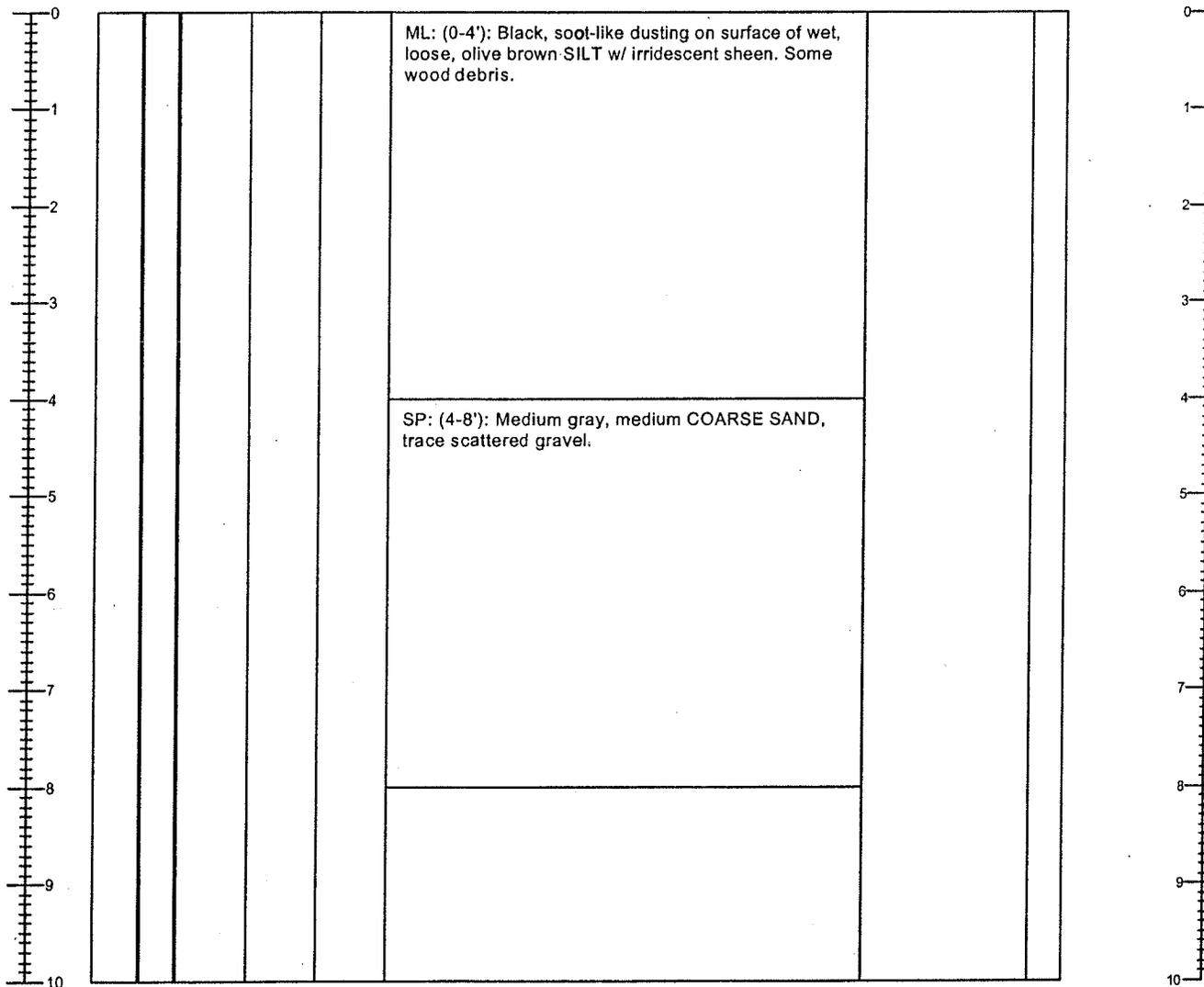


# Sediment Core Log

Core: NLU09-GE

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14</b>
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>10</b>
Client: <b>PSE</b>		Water Depth (ft): <b>28.8</b>	Sample Quality: <b>Good</b>
Collection Date: <b>10/19/02</b>		Mudline Elevation (ft): <b>-8.38</b>	Recovery in ft (%): <b>9.2 (92)</b>
Contractor: <b>MSS</b>		N./LAT: <b>47° 38' 63.35</b> E./LONG: <b>122° 20' 10.85</b>	Process Date: <b>10/19/02</b>
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>KC</b>
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis
Headspace	PID	<b>Sediment Description</b> Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)	
		Comments	Calc. In situ Depths (ft) & Graphic Log
			Calc. In situ Depth (ft)



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Remarks: Intact core was submitted to the laboratory for  
geotechnical analysis only. Logged cuts during tube  
sectioning only performed in the field.

**Calculated Recovery**  
 Sample Length/Penetration Length:  
**9.2 / 10 = 92 %**

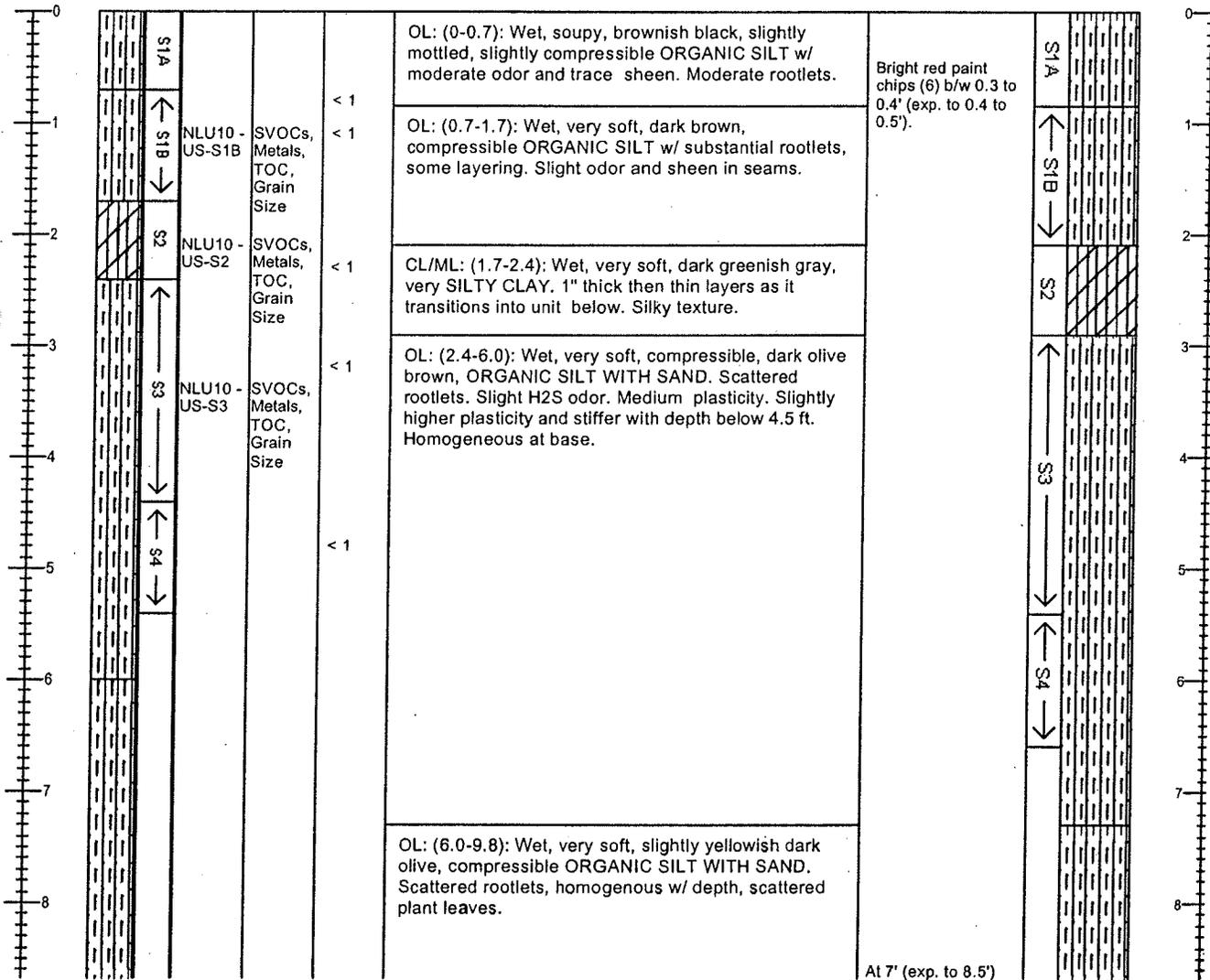


# Sediment Core Log

## Core: NLU10-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>18 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.18</b>	Penetration Depth: <b>17 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>40.9</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>10/17/2002</b>		Mudline Elevation (ft): <b>-20.72</b>	Recovery in ft (%): <b>14 (82)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'36.06</b> E./LONG: <b>122°20'13.55</b>	Process Date: <b>10/19/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>AGF, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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Remarks: Gray till like material fell out of shoe during retrieval.

**Calculated Recovery**  
Sample Length/Penetration Length:  
**14 / 17 = 82 %**

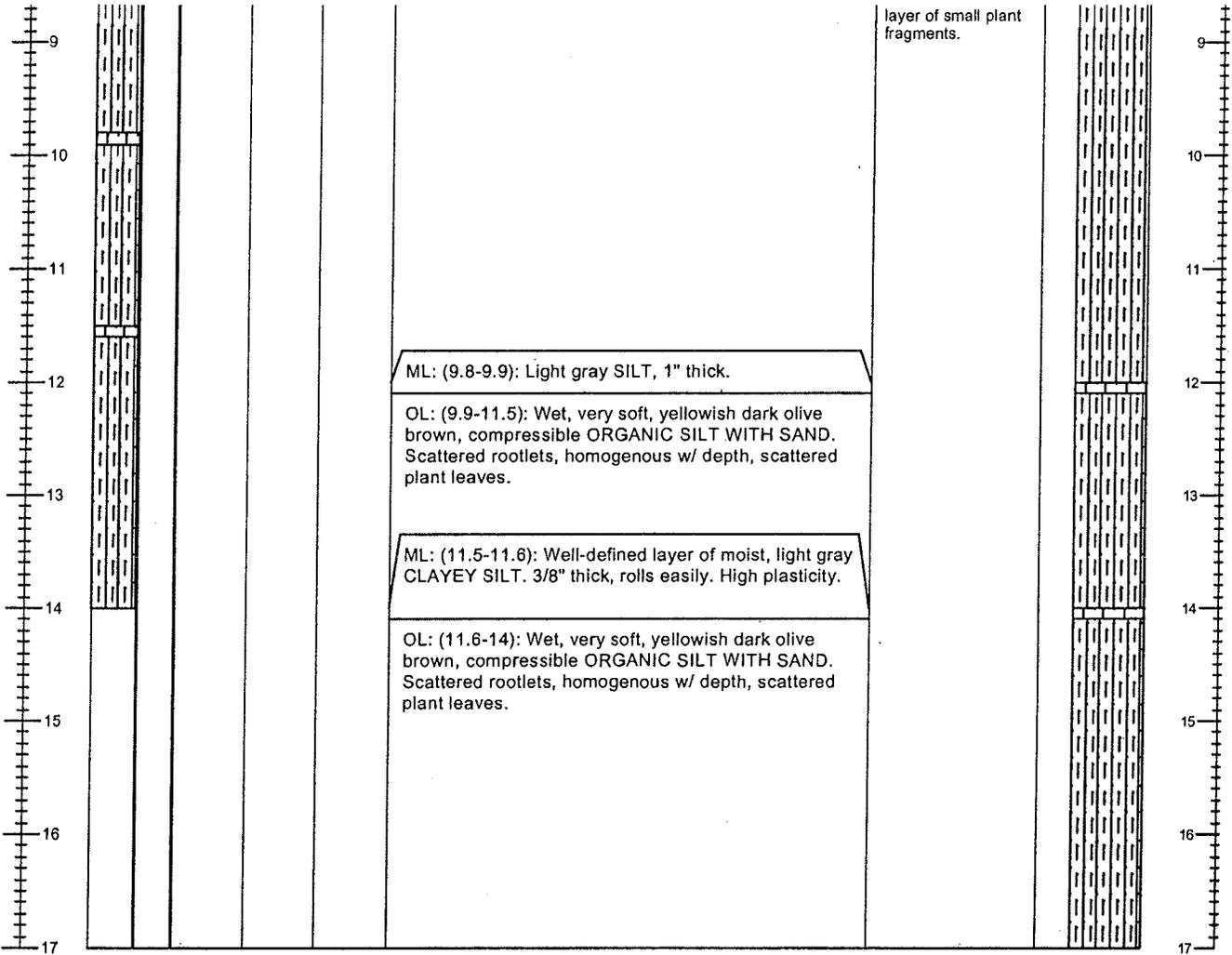


# Sediment Core Log

Core: NLU10-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
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 Fax: (206) 624-2839

**Remarks:** Gray till like material fell out of shoe during retrieval.

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 14 / 17 = 82 %

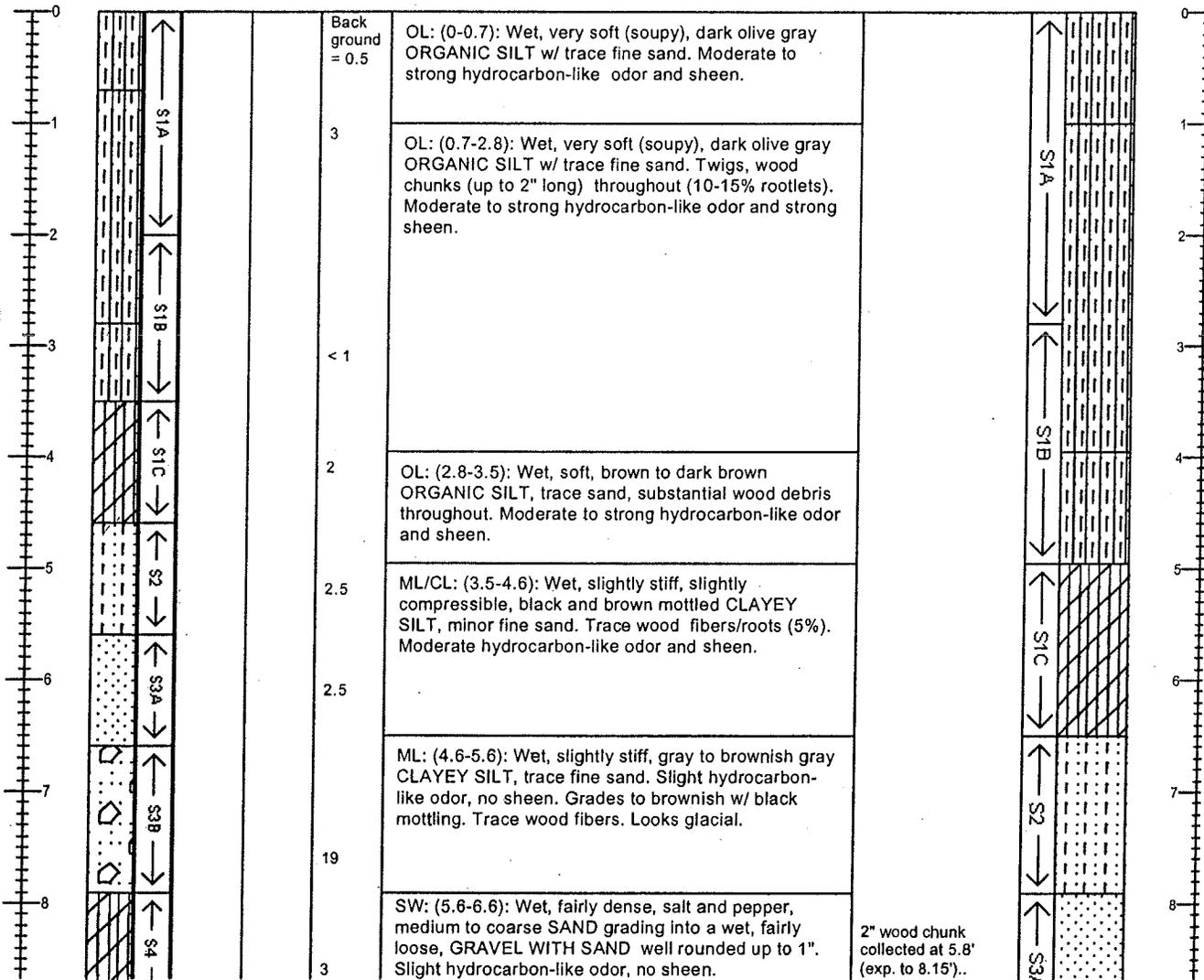


# Sediment Core Log

## Core: NLU11-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>18 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.21</b>	Penetration Depth: <b>17 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>37.8</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>10/16/2002</b>		Mudline Elevation (ft): <b>-17.59</b>	Recovery in ft (%): <b>12 (71)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'40.87</b> E./LONG: <b>122°20'13.70</b>	Process Date: <b>10/18/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, AGF, DB, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			



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Remarks: Sheen on water surface during retrieval.

Calculated Recovery  
Sample Length/Penetration Length:  
**12 / 17 = 71 %**

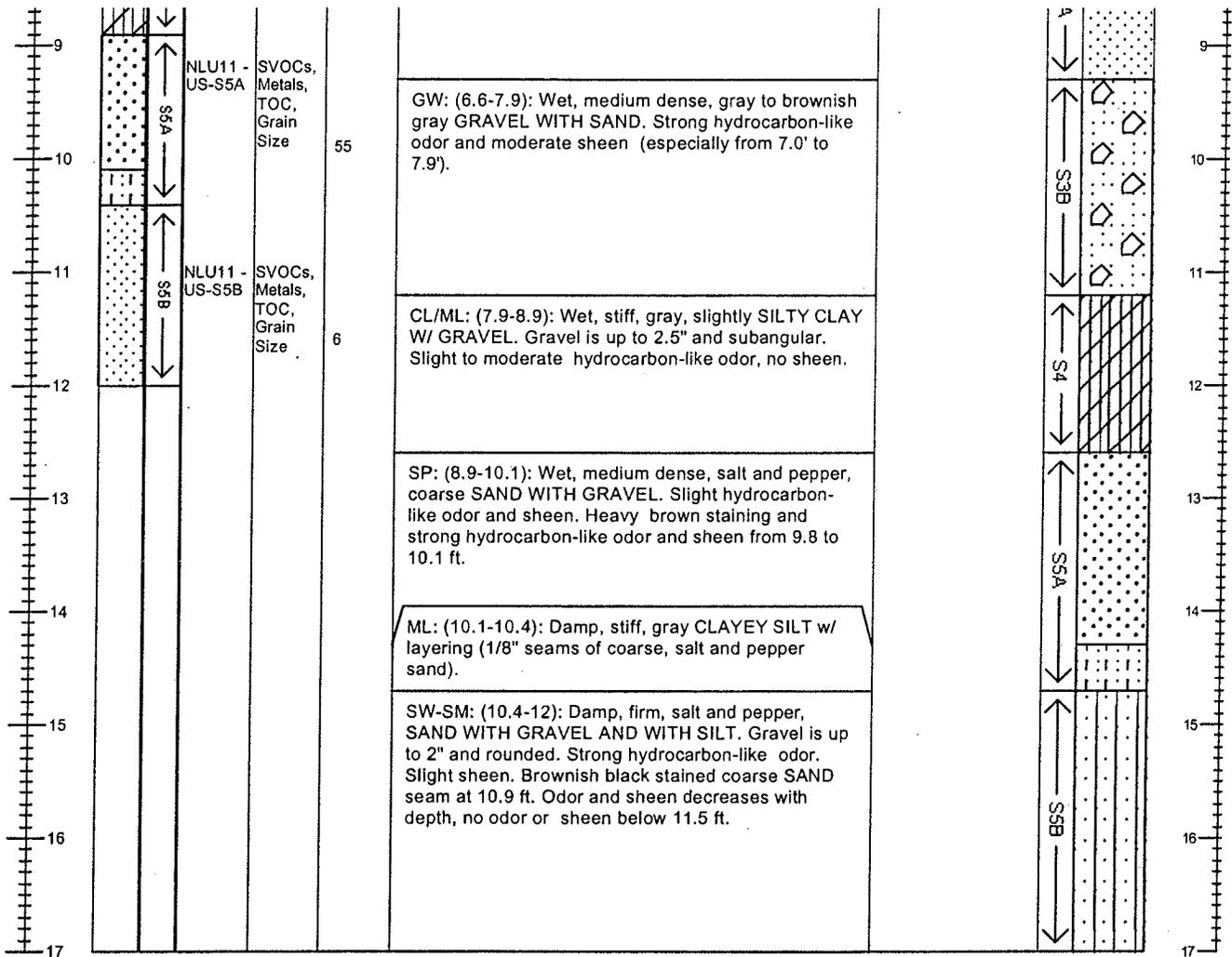


# Sediment Core Log

Core: NLU11-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> Sheen on water surface during retrieval.	<b>Calculated Recovery</b> Sample Length/Penetration Length: 12 / 17 = 71 %
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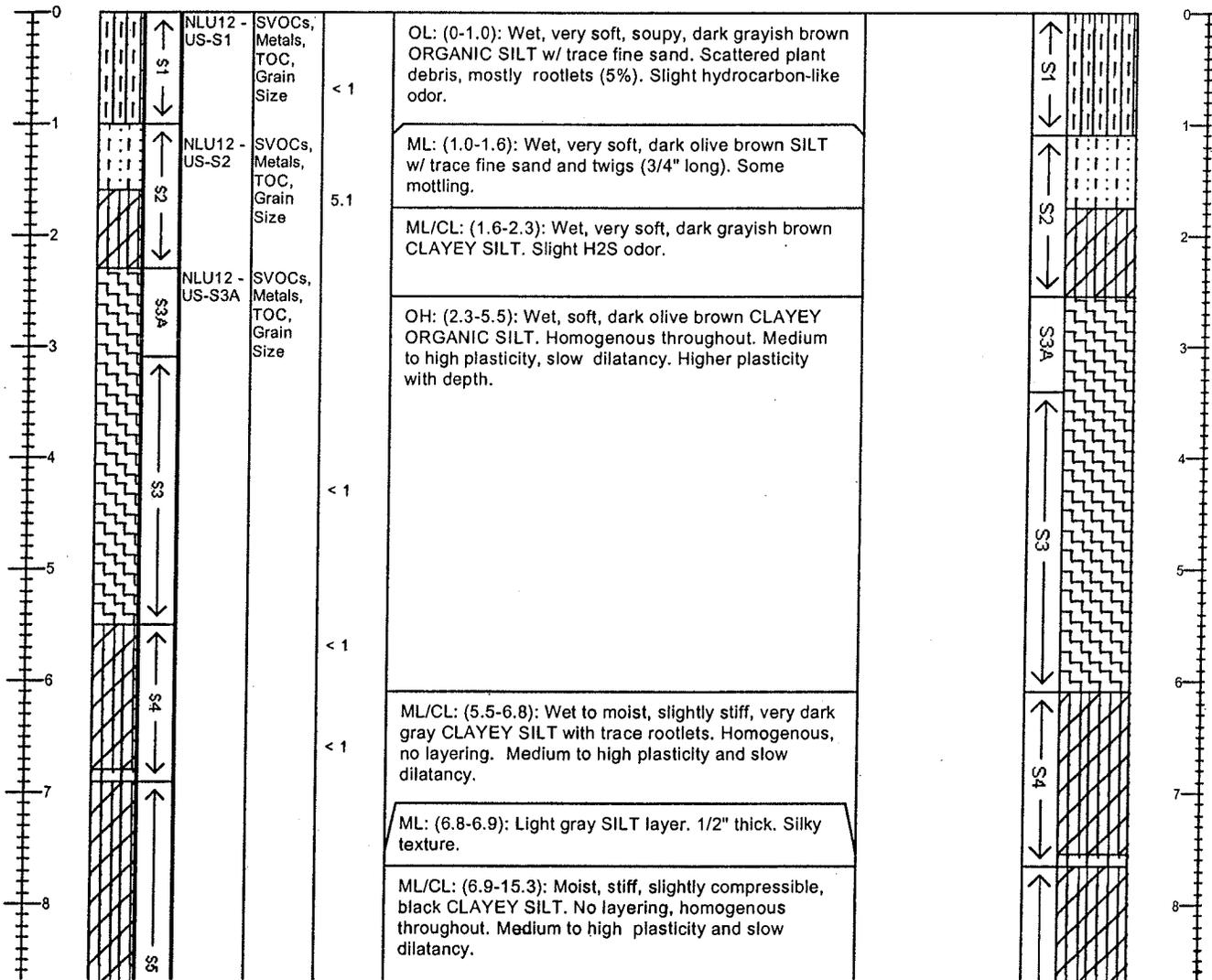


# Sediment Core Log

## Core: NLU12-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>18 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.18</b>	Penetration Depth: <b>17 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>40.5</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>10/17/2002</b>		Mudline Elevation (ft): <b>-20.32</b>	Recovery in ft (%): <b>15.3 (90)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'40.57</b> E./LONG: <b>122°20'19.82</b>	Process Date: <b>10/18/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, KAR</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			



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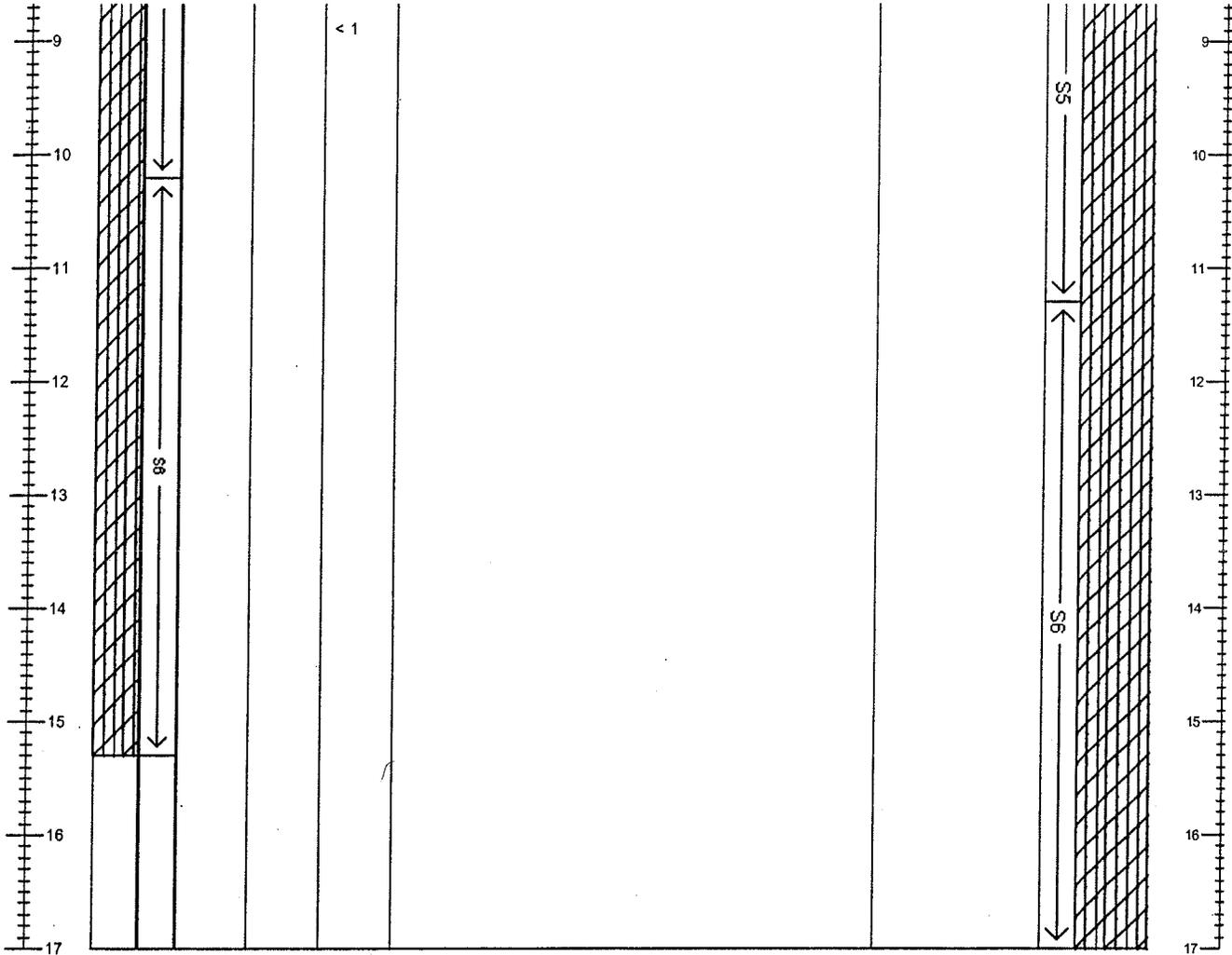


# Sediment Core Log

Core: NLU12-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 15.3/17 = 90 %

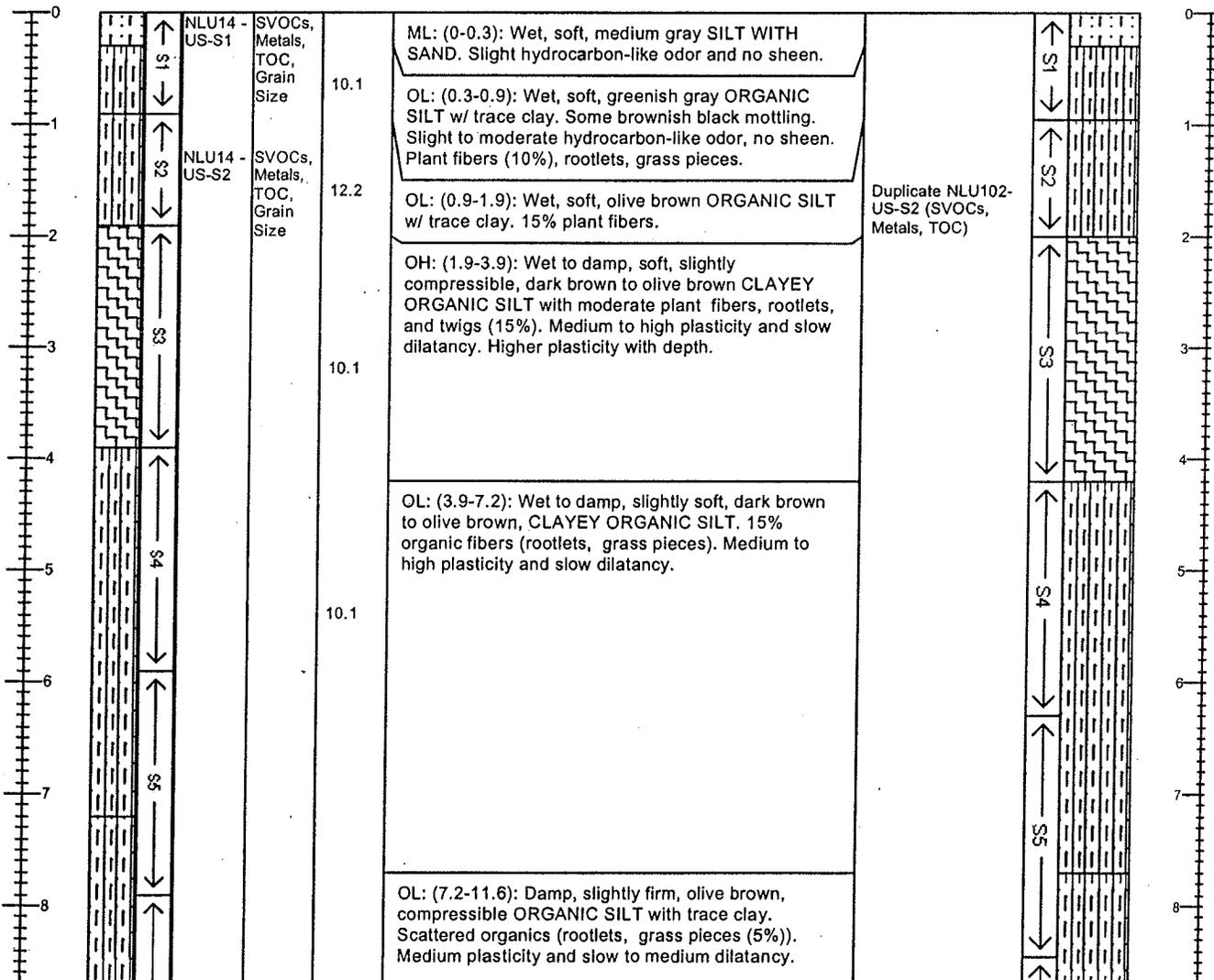


# Sediment Core Log

## Core: NLU14-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>18 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.18</b>	Penetration Depth: <b>17 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>40</b>	Sample Quality: <b>Good, fair at the top</b>					
Collection Date: <b>10/17/2002</b>		Mudline Elevation (ft): <b>-19.82</b>	Recovery in ft (%): <b>15.9 (94)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'39.51</b> E./LONG: <b>122°20'26.56</b>	Process Date: <b>10/22/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			



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Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Calculated Recovery**  
 Sample Length/Penetration Length:  
**15.9 / 17 = 94 %**

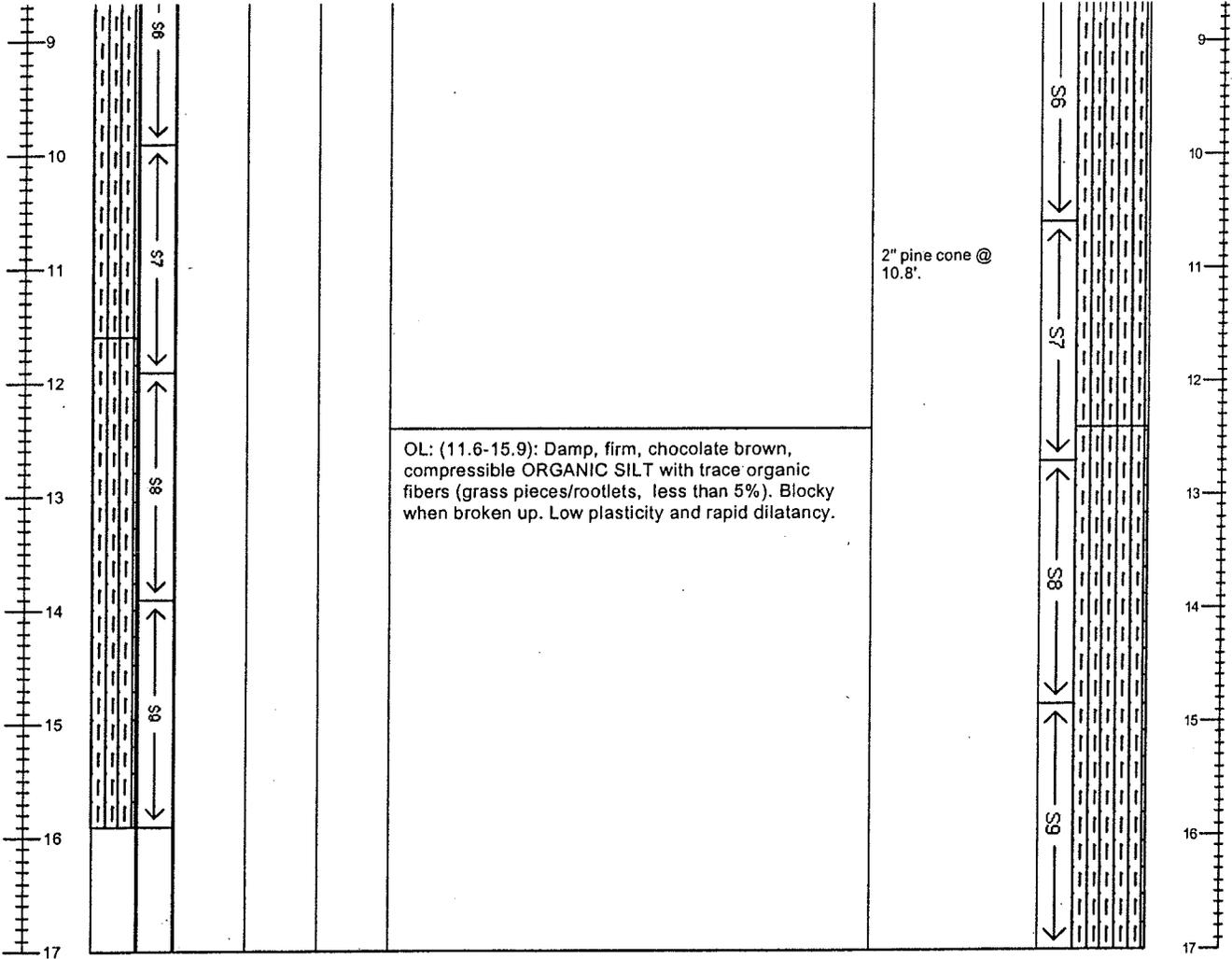


# Sediment Core Log

Sheet 2 of 2

Core: NLU14-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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	_____	
	_____	

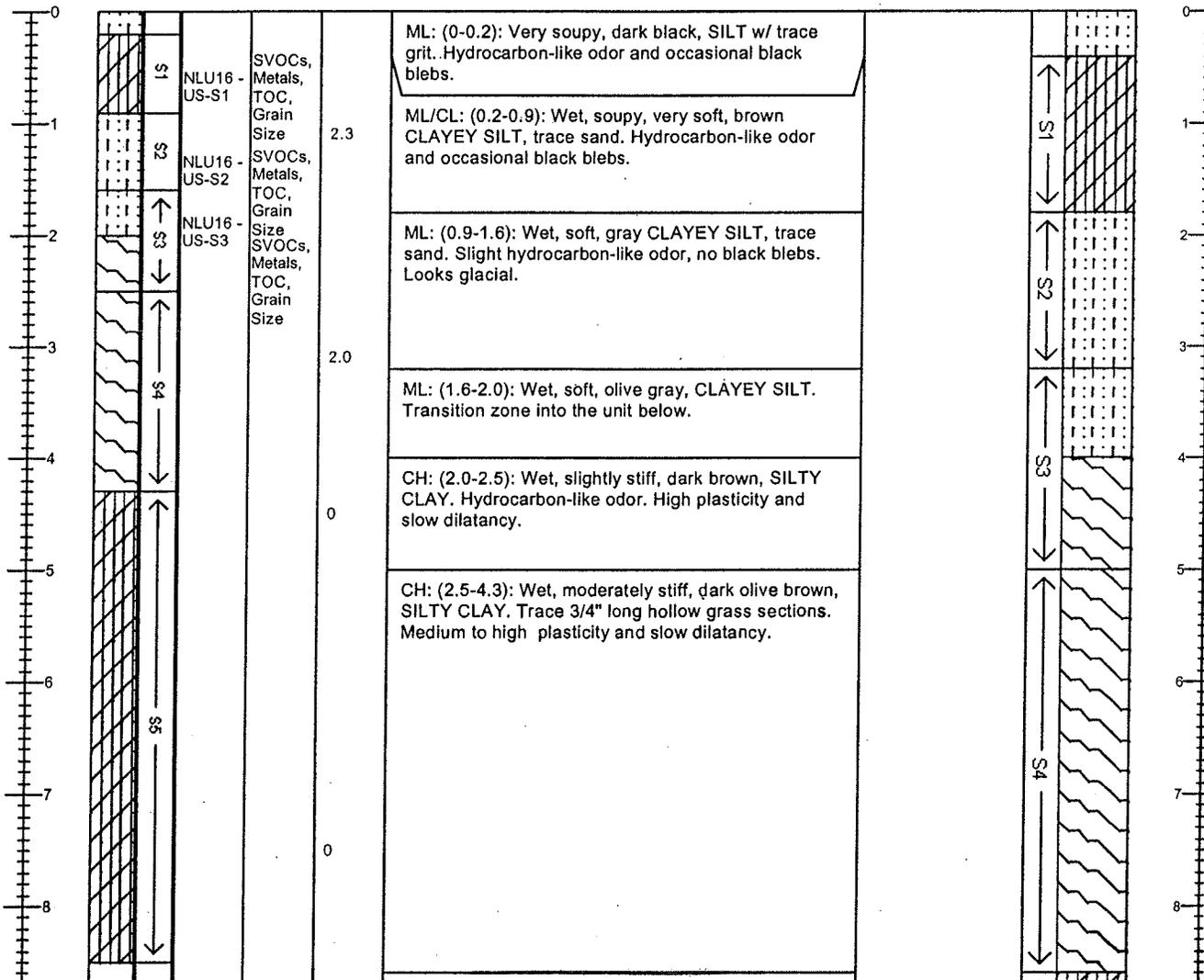


# Sediment Core Log

## Core: NLU16-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>18 ft</b>
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.21</b>	Penetration Depth: <b>17 ft</b>
Client: <b>PSE</b>		Water Depth (ft): <b>40.8</b>	Sample Quality: <b>Good</b>
Collection Date: <b>10/16/2002</b>		Mudline Elevation (ft): <b>-20.59</b>	Recovery in ft (%): <b>8.5 (50)</b>
Contractor: <b>MSS</b>		N./LAT: <b>47°38'44.16</b> E./LONG: <b>122°20'22.70</b>	Process Date: <b>10/17/2002</b>
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>AGF, BHH, NPB, KAR</b>
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis
			<b>Sediment Description</b> Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)
			<b>Comments</b>
			Calc. In situ Depths (ft) & Graphic Log Calc. In situ Depth (ft)



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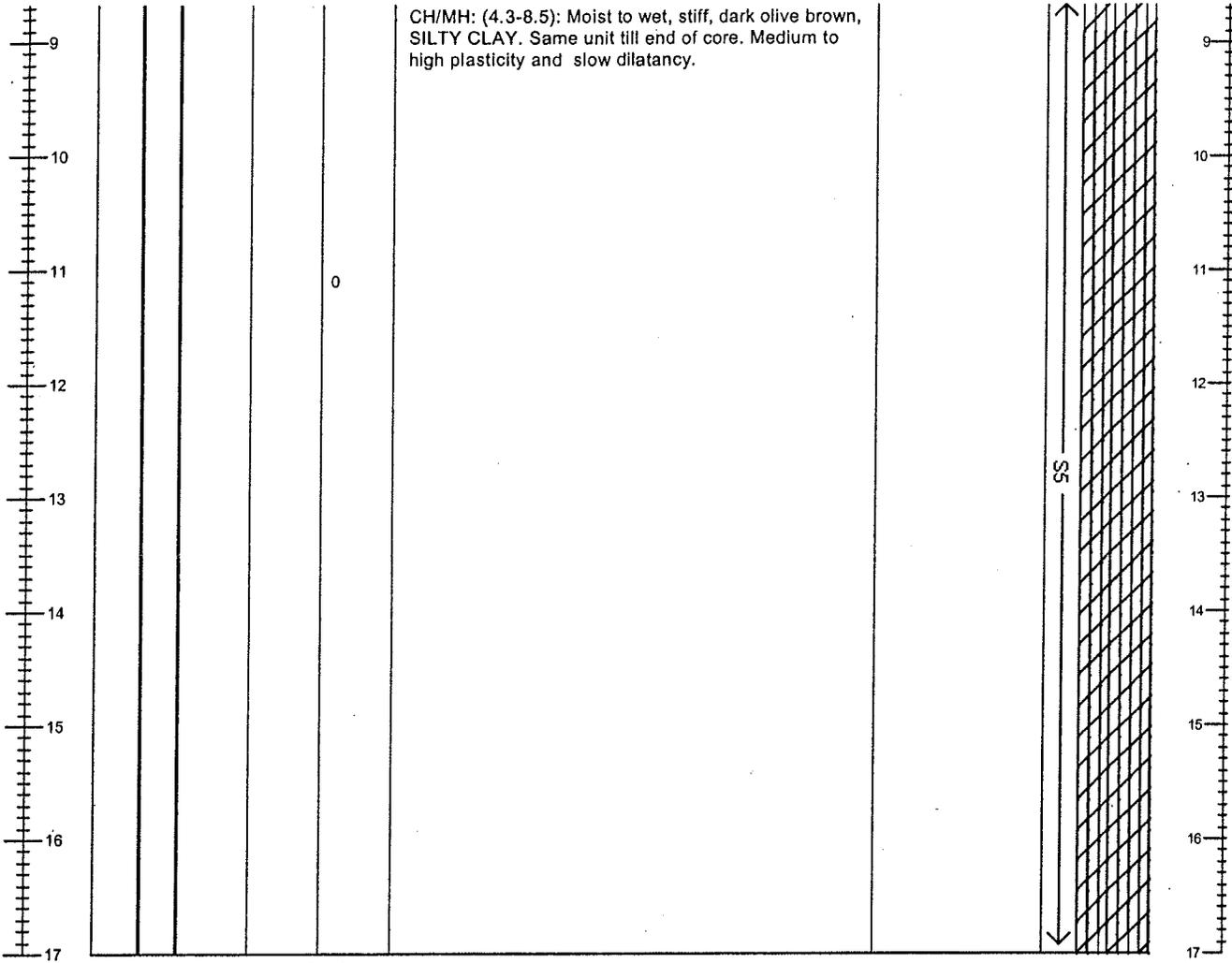


# Sediment Core Log

Core: NLU16-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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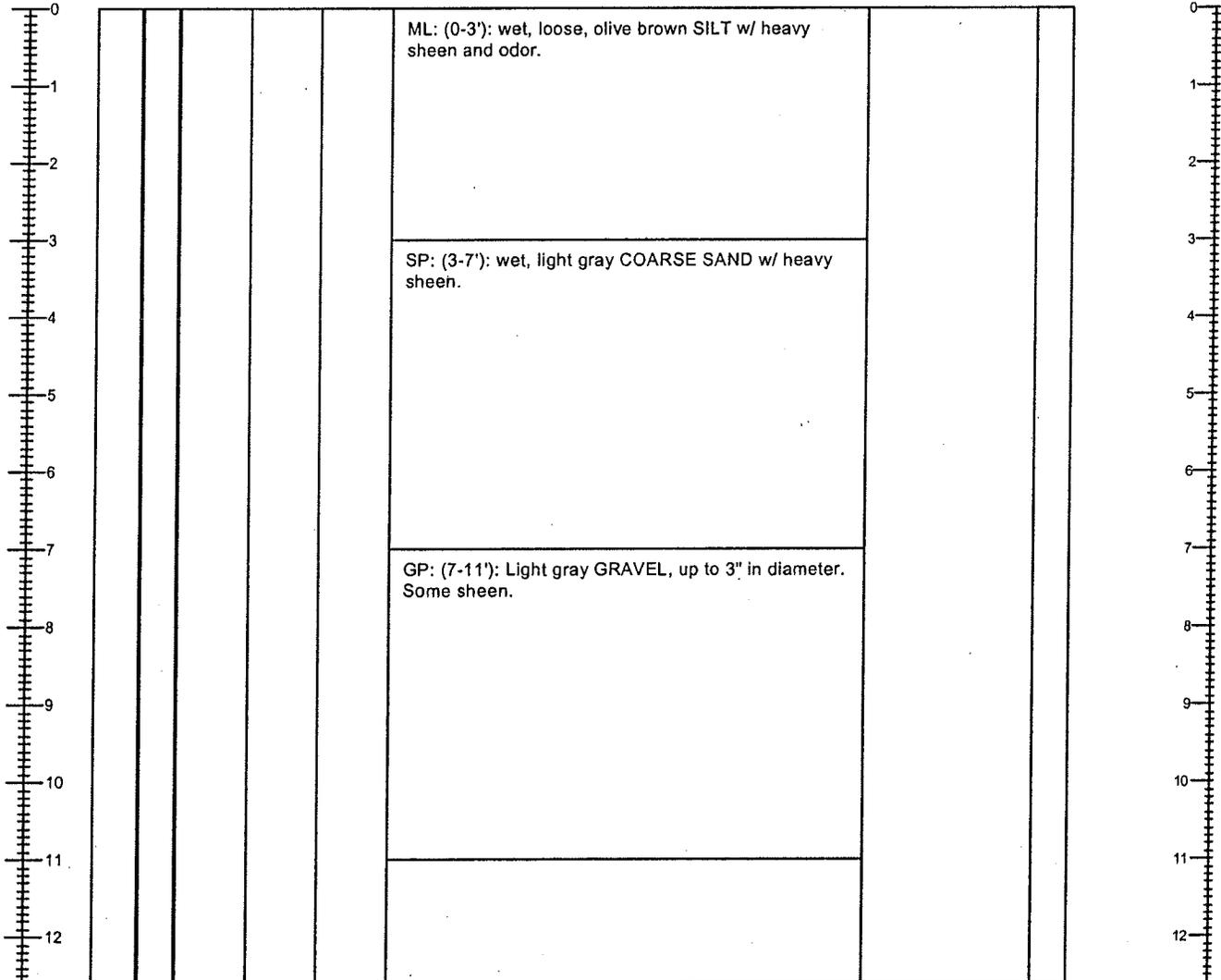


# Sediment Core Log

Core: NLU18-GE

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>12.6</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>34.5</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>10/18/02</b>		Mudline Elevation (ft): <b>-14.08</b>	Recovery in ft (%): <b>12.6 (100)</b>					
Contractor: <b>MSS</b>		N/LAT: <b>47° 38' 74.53</b> E/LONG: <b>122° 19' 92.87</b>	Process Date: <b>10/21/02</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>Rosa Lab</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	<b>Sediment Description</b> Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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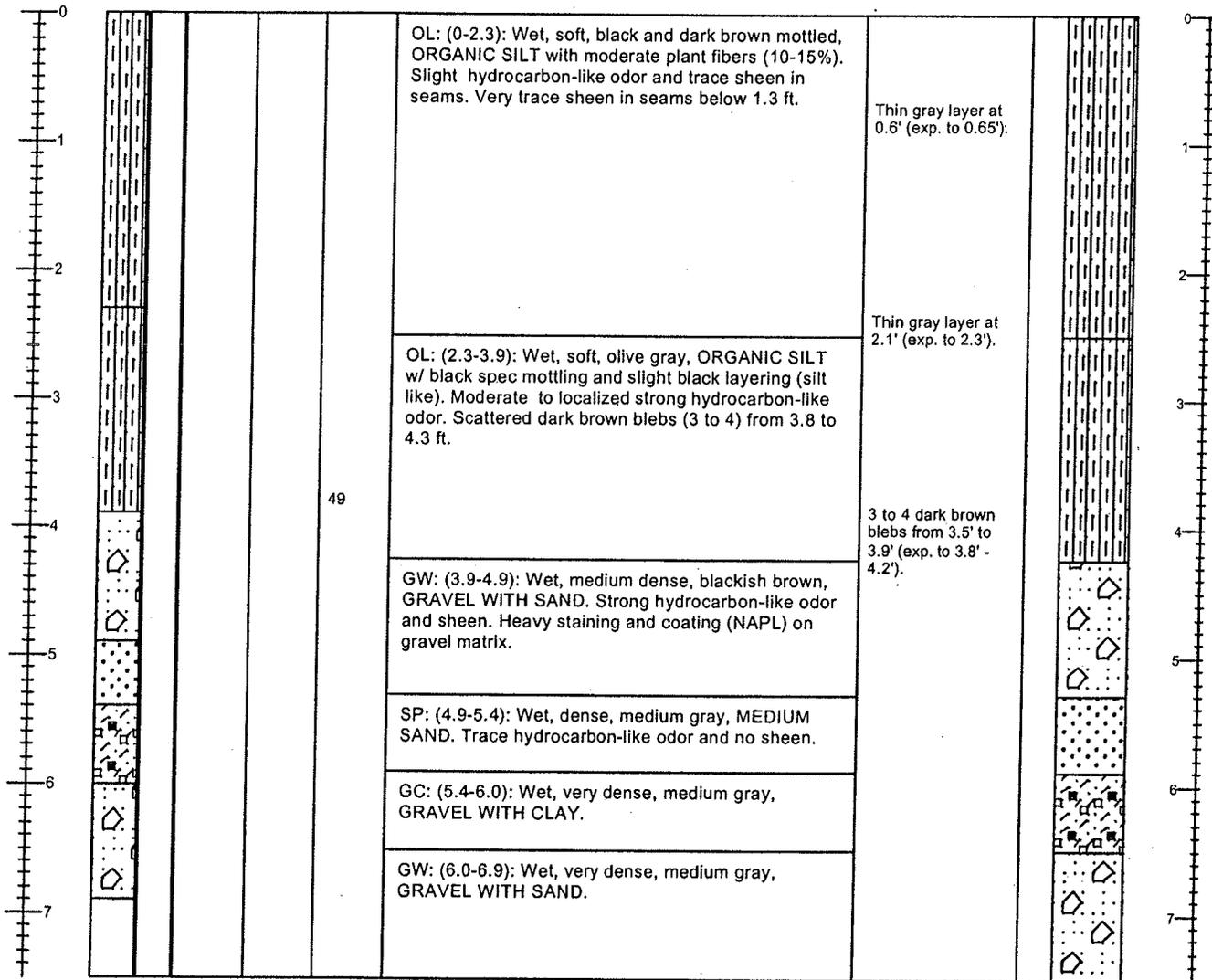


# Sediment Core Log

## Core: NLU109-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>12 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.24</b>	Penetration Depth: <b>7.5 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>34.6</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>11/15/2002</b>		Mudline Elevation (ft): <b>-14.36</b>	Recovery in ft (%): <b>6.9 (92)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'44.72</b> E./LONG: <b>122°19'55.64</b>	Process Date: <b>11/18/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, ML</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	<b>Sediment Description</b> Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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Remarks: Sheen on water during retrieval.

**Calculated Recovery**  
Sample Length/Penetration Length:  
**6.9 / 7.5 = 92 %**

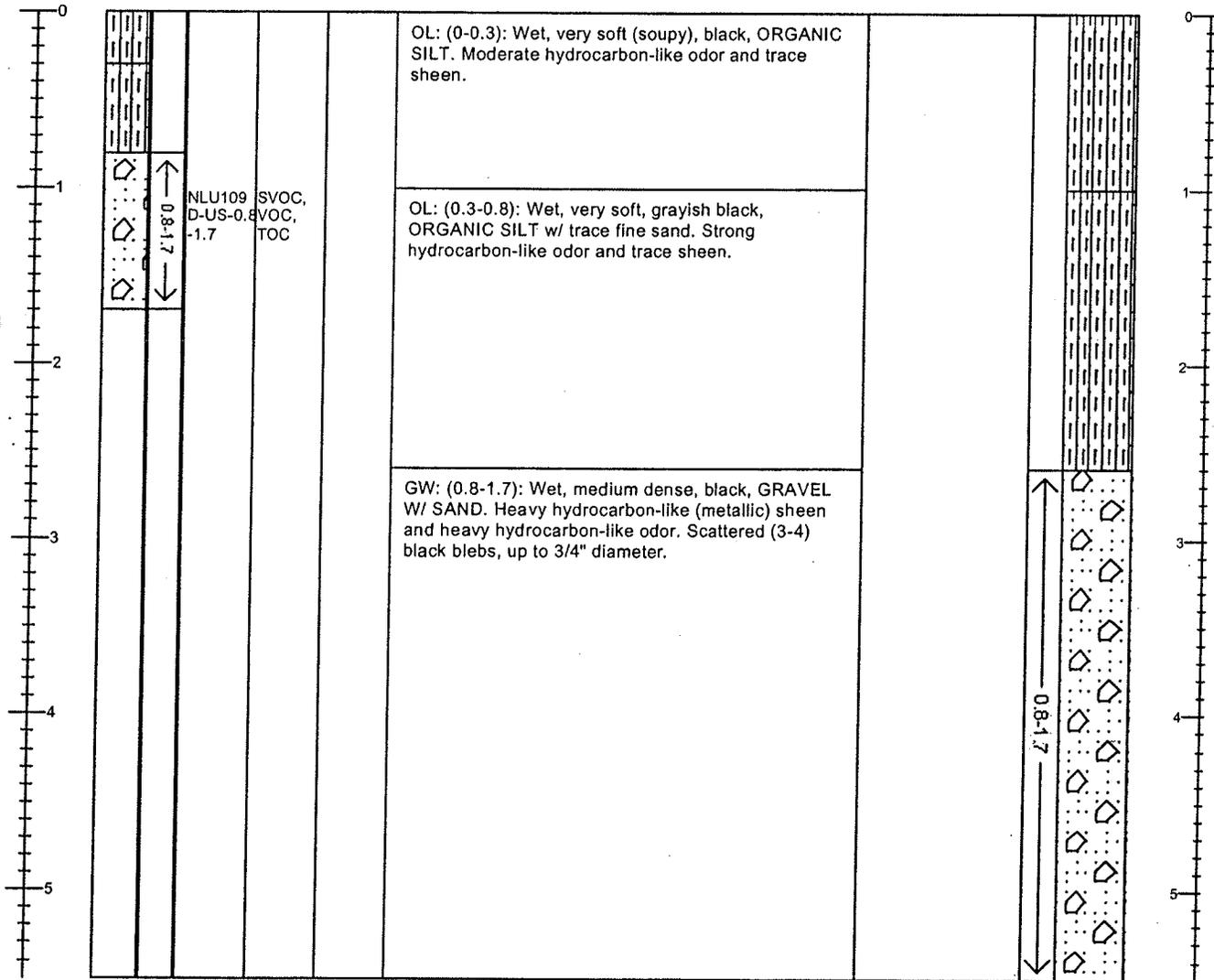


# Sediment Core Log

Core: NLU109D-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.24</b>	Penetration Depth: <b>5.5 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>35.1</b>	Sample Quality: <b>Poor</b>					
Collection Date: <b>11/15/2002</b>		Mudline Elevation (ft): <b>-14.86</b>	Recovery in ft (%): <b>1.7 (31)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'44.72</b> E./LONG: <b>122°19'15.68</b>	Process Date: <b>11/19/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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Remarks: Full core catcher w/ heavy odor.  
Sheen on water during retrieval.

Calculated Recovery  
Sample Length/Penetration Length:  
**1.7 / 5.5 = 31 %**

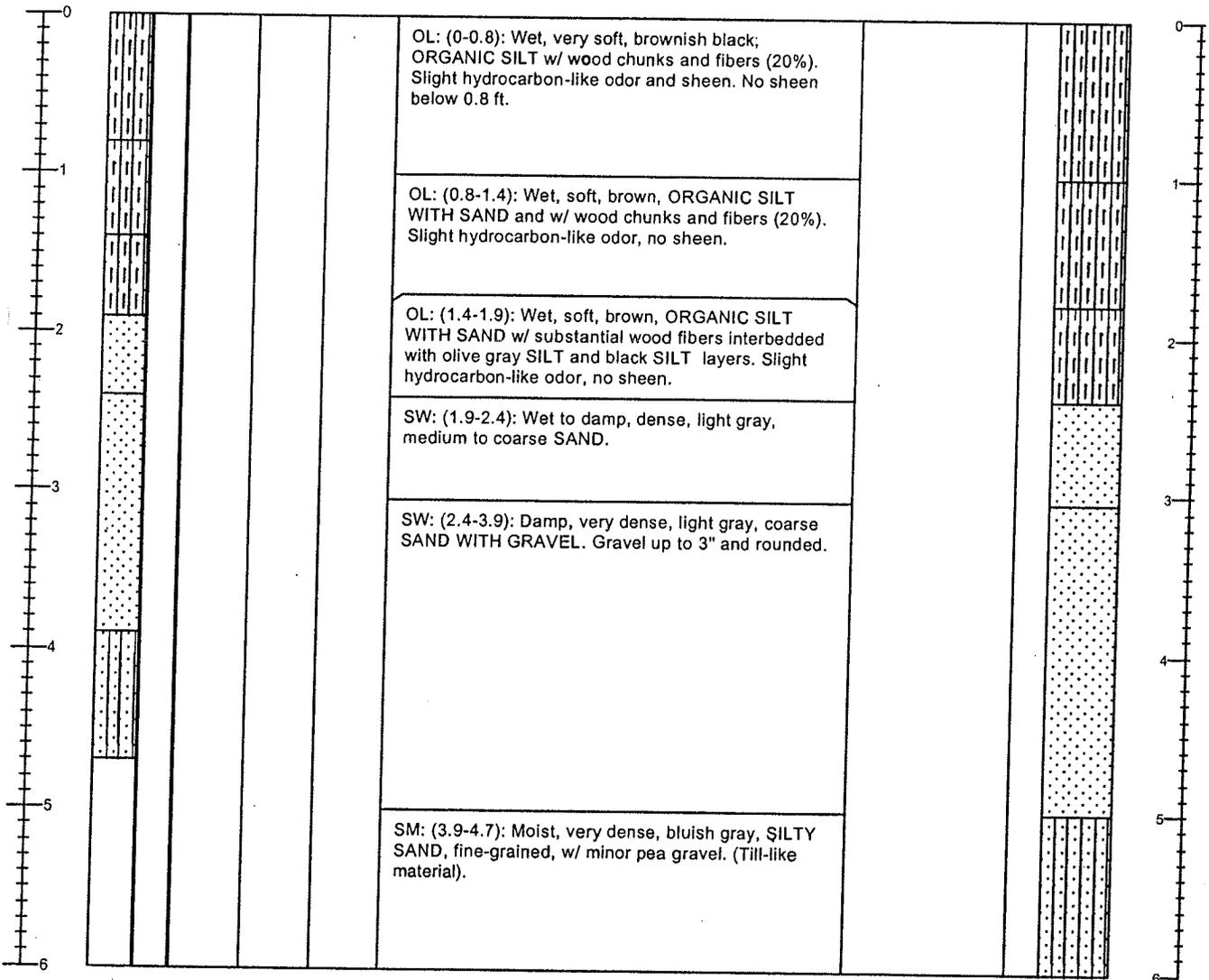


# Sediment Core Log

## Core: NLU110-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.24</b>	Penetration Depth: <b>6 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>38.1</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>11/15/2002</b>		Mudline Elevation (ft): <b>-17.86</b>	Recovery in ft (%): <b>4.7 (78)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'38.12</b> E./LONG: <b>122°20'02.13</b>	Process Date: <b>11/18/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, ML</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	<b>Sediment Description</b>	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			



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Remarks: Shore full of till-like material.

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 4.7 / 6 = 78 %

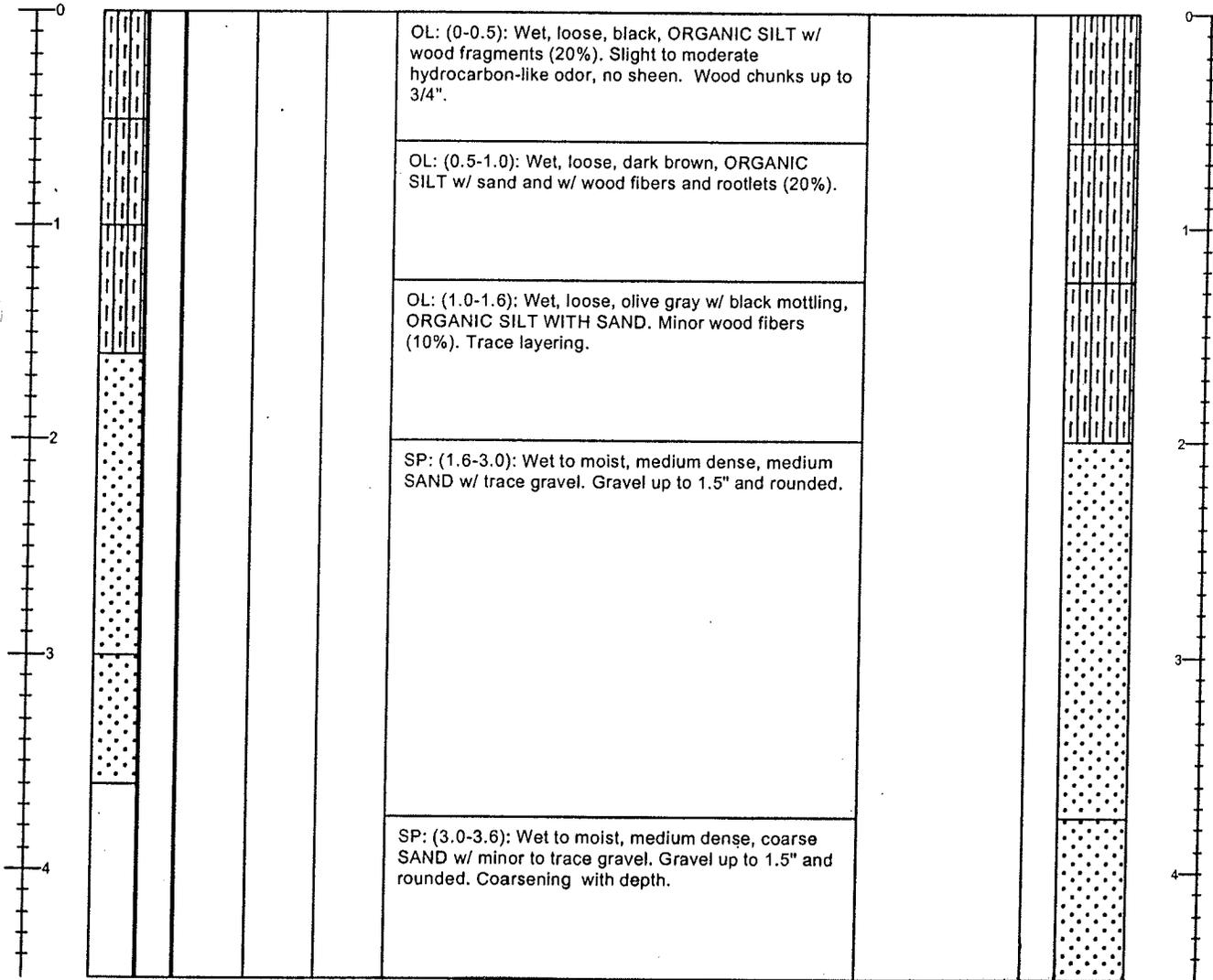


# Sediment Core Log

Sheet 1 of 1

Core: NLU111-US

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.24</b>	Penetration Depth: <b>4.5 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>30.3</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>11/15/2002</b>		Mudline Elevation (ft): <b>-10.06</b>	Recovery in ft (%): <b>3.6 (80)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'37.58</b> E./LONG: <b>122°20'08.53</b>	Process Date: <b>11/18/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, ML</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			



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Remarks: **Shoe is empty.**

Calculated Recovery  
Sample Length/Penetration Length:

$$3.6 / 4.5 = 80 \%$$

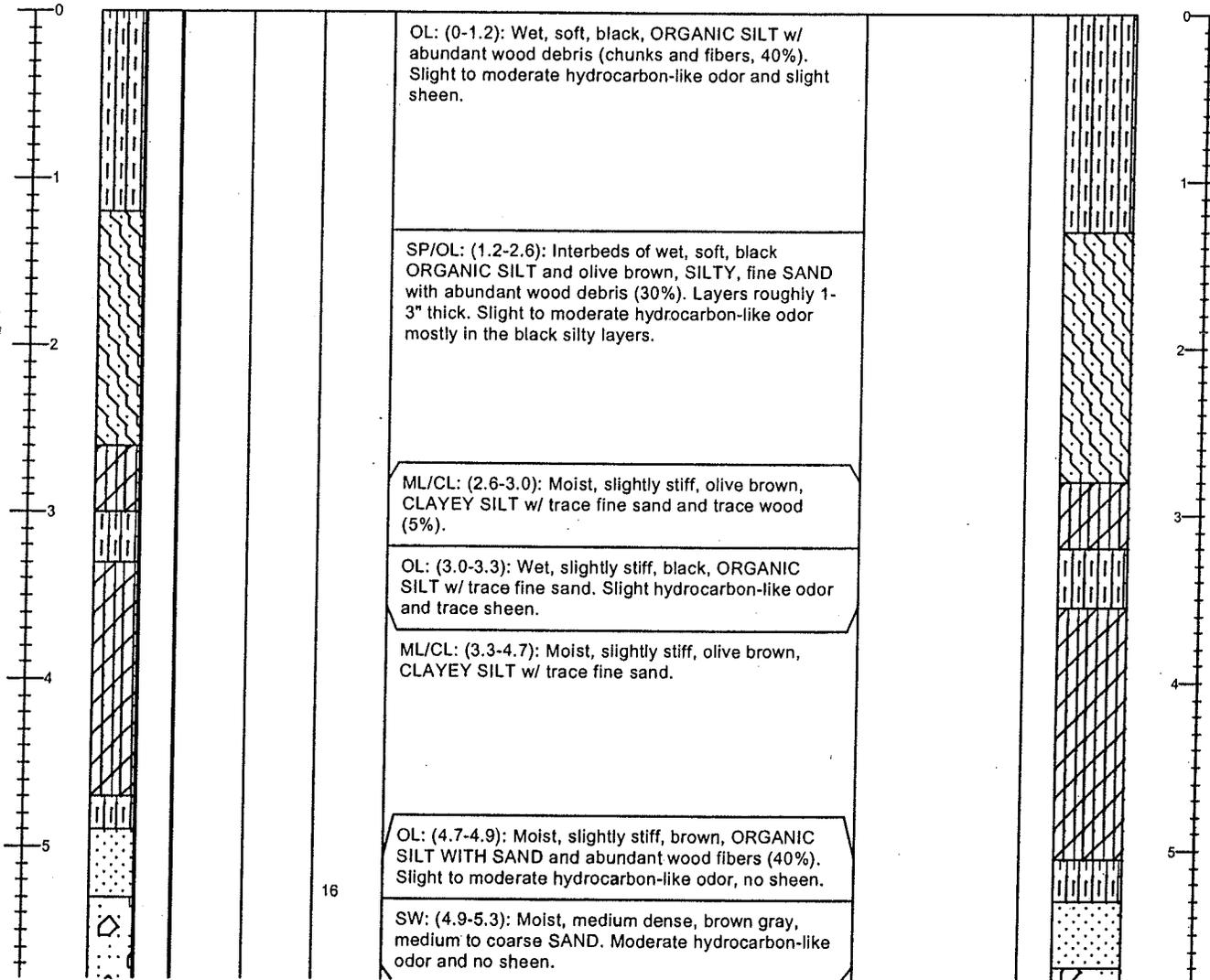


# Sediment Core Log

Core: NLU117-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.24</b>	Penetration Depth: <b>12 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>36.3</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>11/15/2002</b>		Mudline Elevation (ft): <b>-16.06</b>	Recovery in ft (%): <b>11.1 (93)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'40.91</b> E./LONG: <b>122°20'13.77</b>	Process Date: <b>11/18/2002</b>					
Vessel: <b>RV Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, ML</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> Overlying water in core tube has black blebs on surface (stained gloves). Empty shoe, sheen on sidewalls of core catcher.	<b>Calculated Recovery</b> Sample Length/Penetration Length: <b>11.1/12 = 93 %</b>
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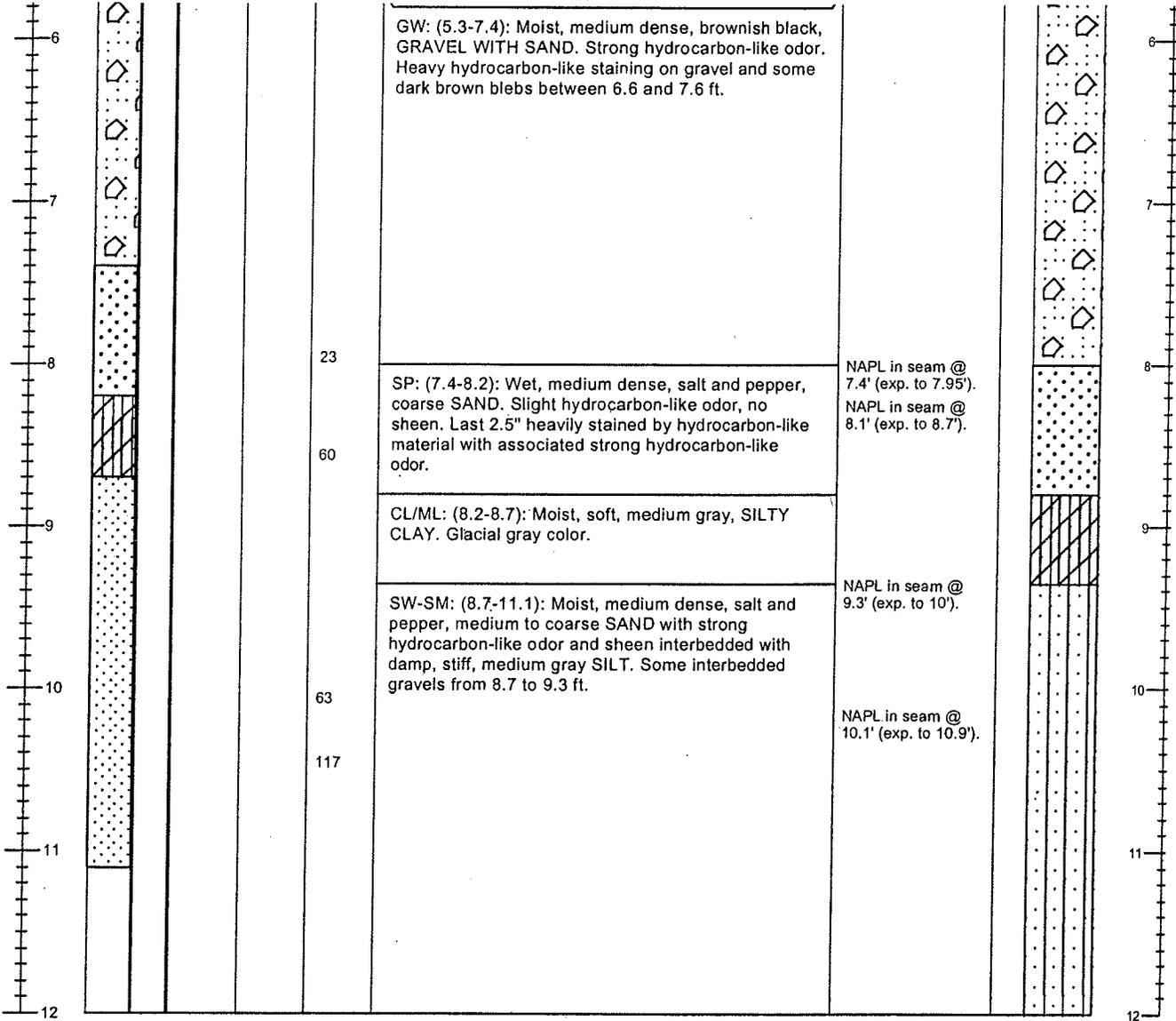


# Sediment Core Log

Core: NLU117-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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<p>The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839</p>	<p><b>Remarks:</b> <u>Overlying water in core tube has black blebs on surface (stained gloves). Empty shoe, sheen on sidewalls of core catcher.</u></p>	<p><b>Calculated Recovery</b> Sample Length/Penetration Length: <b>11.1/12 = 93 %</b></p>
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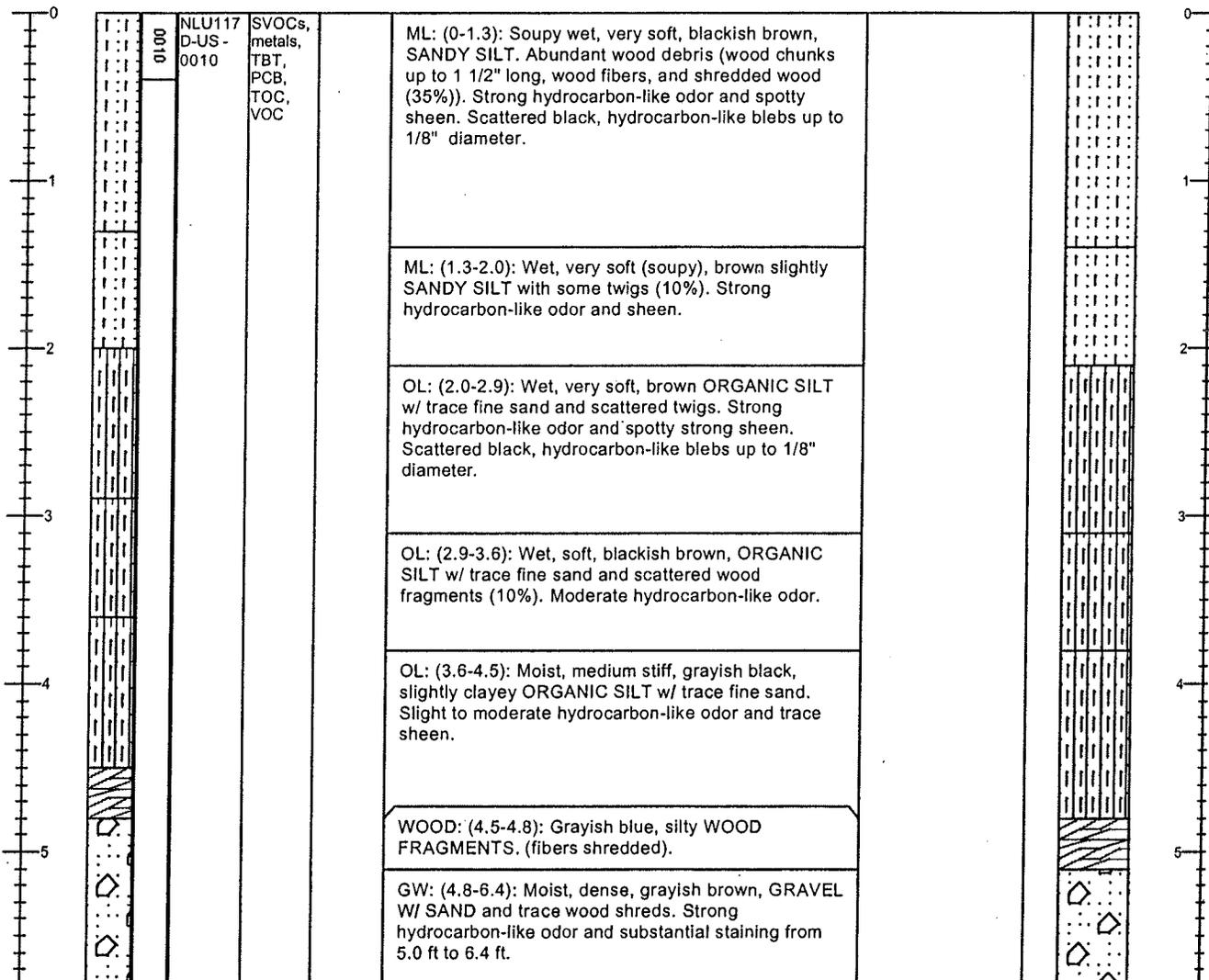


# Sediment Core Log

## Core: NLU117D-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>12 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>35.9</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-15.48</b>	Recovery in ft (%): <b>11.3 (94)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'40.90</b> E./LONG: <b>122°20'13.77</b>	Process Date: <b>11/20/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			



The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> <u>Sampled on a slope.</u>	<b>Calculated Recovery</b> Sample Length/Penetration Length: <b>11.3/12 = 94 %</b>
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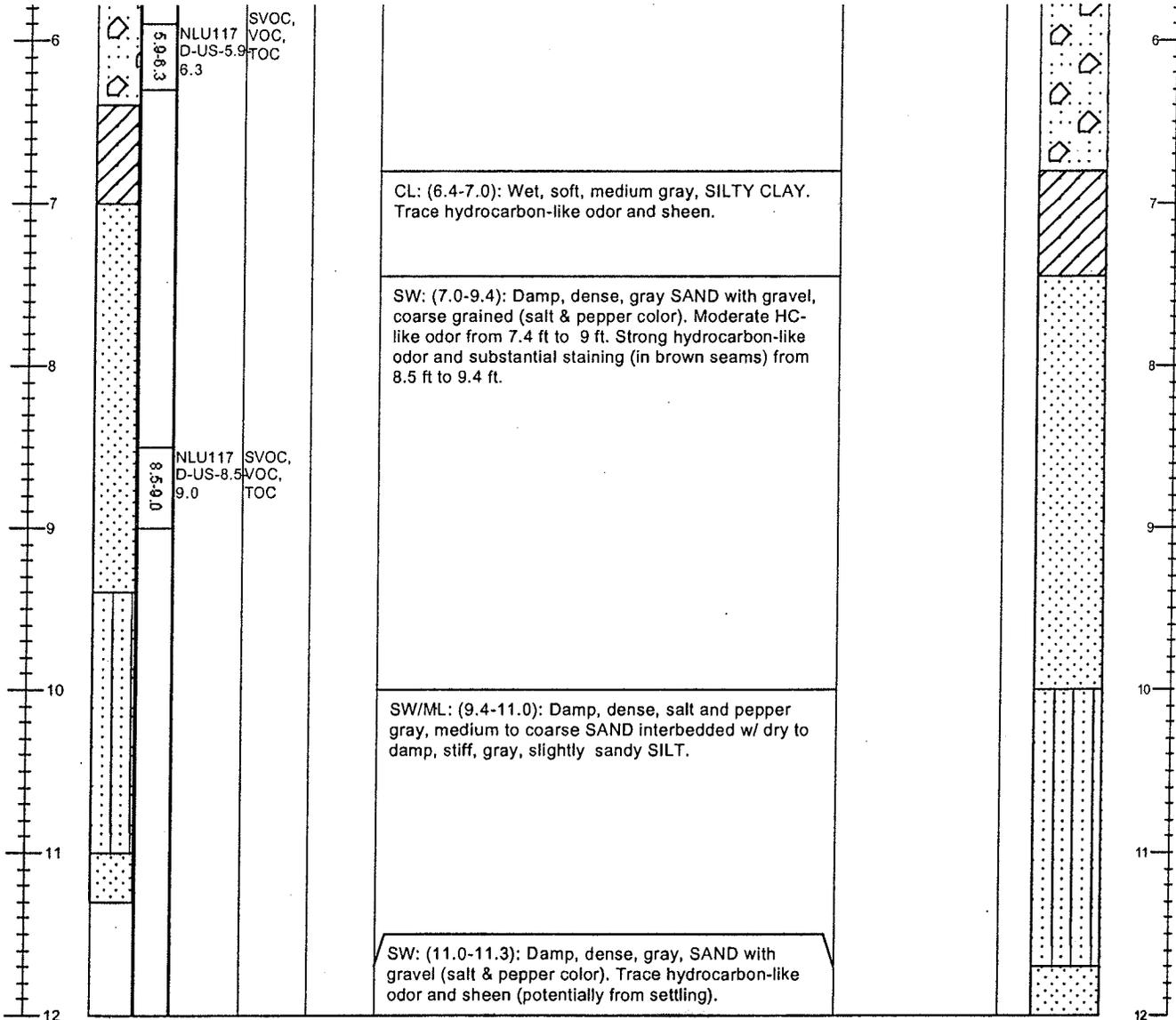


# Sediment Core Log

## Core: NLU117D-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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Remarks: Sampled on a slope.

**Calculated Recovery.**  
Sample Length/Penetration Length:

**11.3/12 = 94 %**

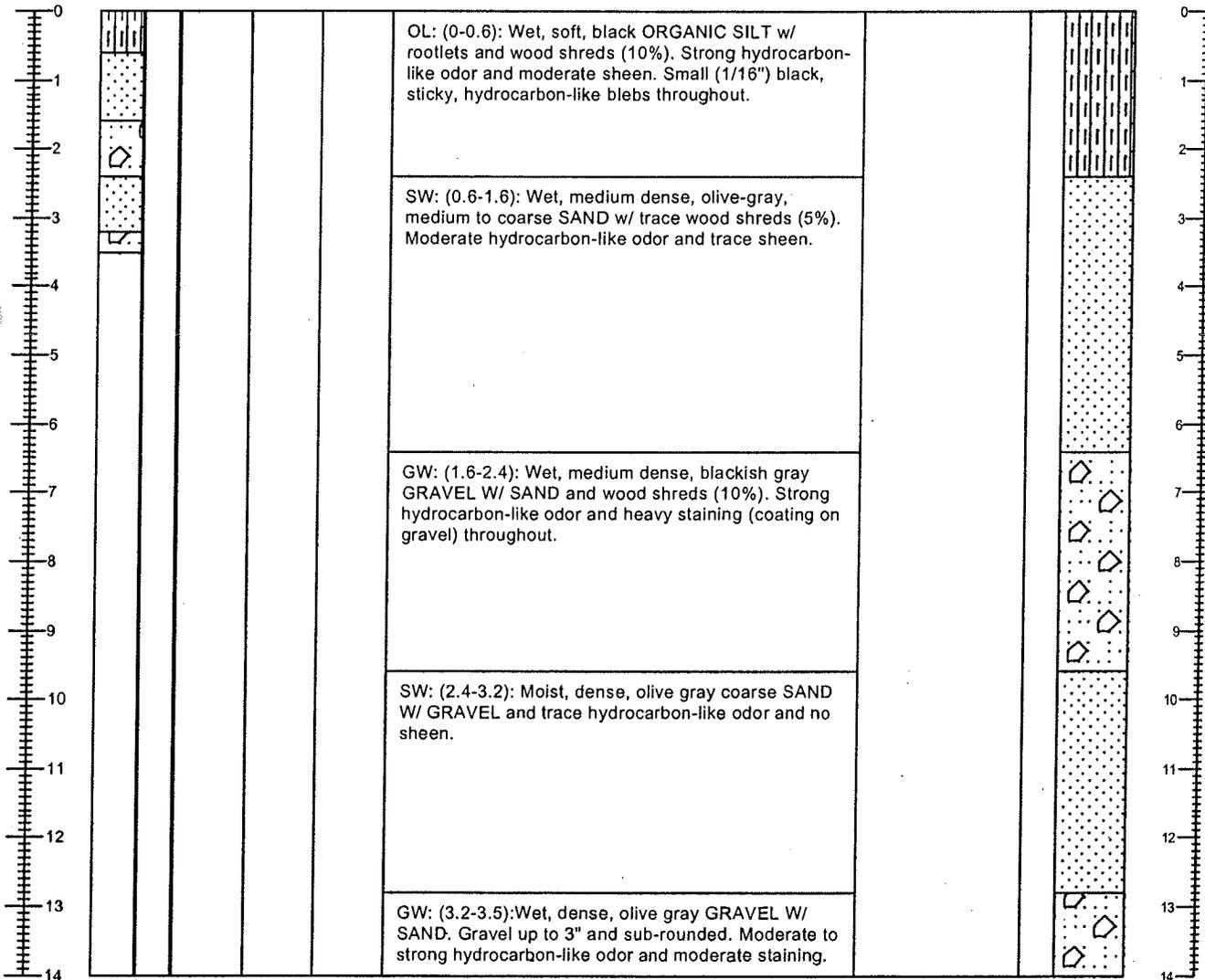


# Sediment Core Log

Core: NLU117R1-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>14 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>34.4</b>	Sample Quality: <b>Poor</b>					
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-13.98</b>	Recovery in ft (%): <b>3.5 (25)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'40.95</b> E./LONG: <b>122°20'13.72</b>	Process Date: <b>11/21/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminium</b>	Logged By: <b>NPB, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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**Remarks:** Surface sheen during retrieval. 3" piece of gravel in shoe.

**Calculated Recovery**  
Sample Length/Penetration Length:  
**3.5 / 14 = 25 %**

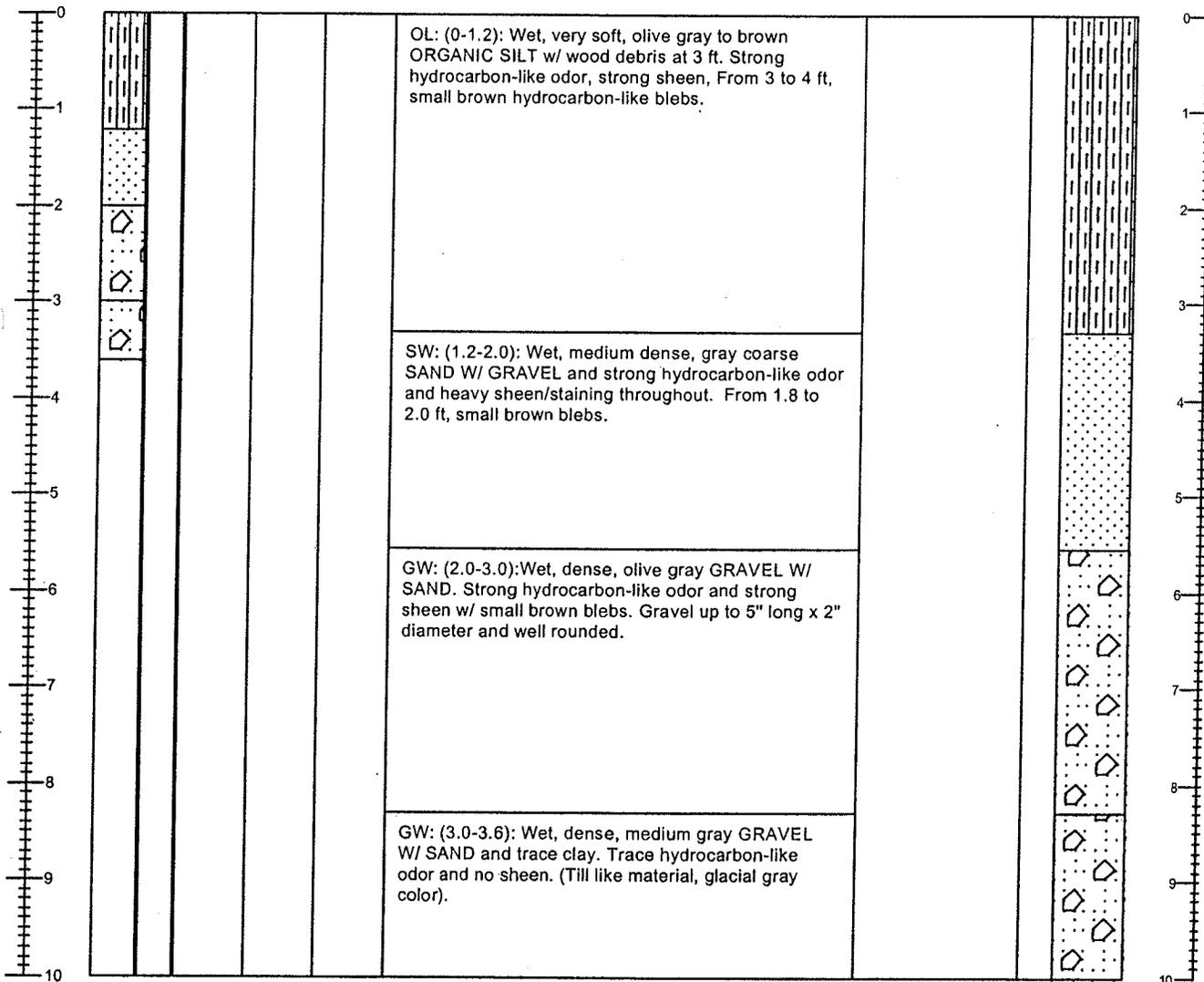


# Sediment Core Log

## Core: NLU117R2-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>12 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>10 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>35.4</b>	Sample Quality: <b>Poor</b>					
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-14.98</b>	Recovery in ft (%): <b>3.6 (36)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'40.97</b> E./LONG: <b>122°20'13.79</b>	Process Date: <b>11/21/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminium</b>	Logged By: <b>NPB, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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Remarks: Sampled on a slope. Three attempts at this location to improve recovery. Visual log only.

Calculated Recovery  
Sample Length/Penetration Length:  
**3.6 / 10 = 36 %**

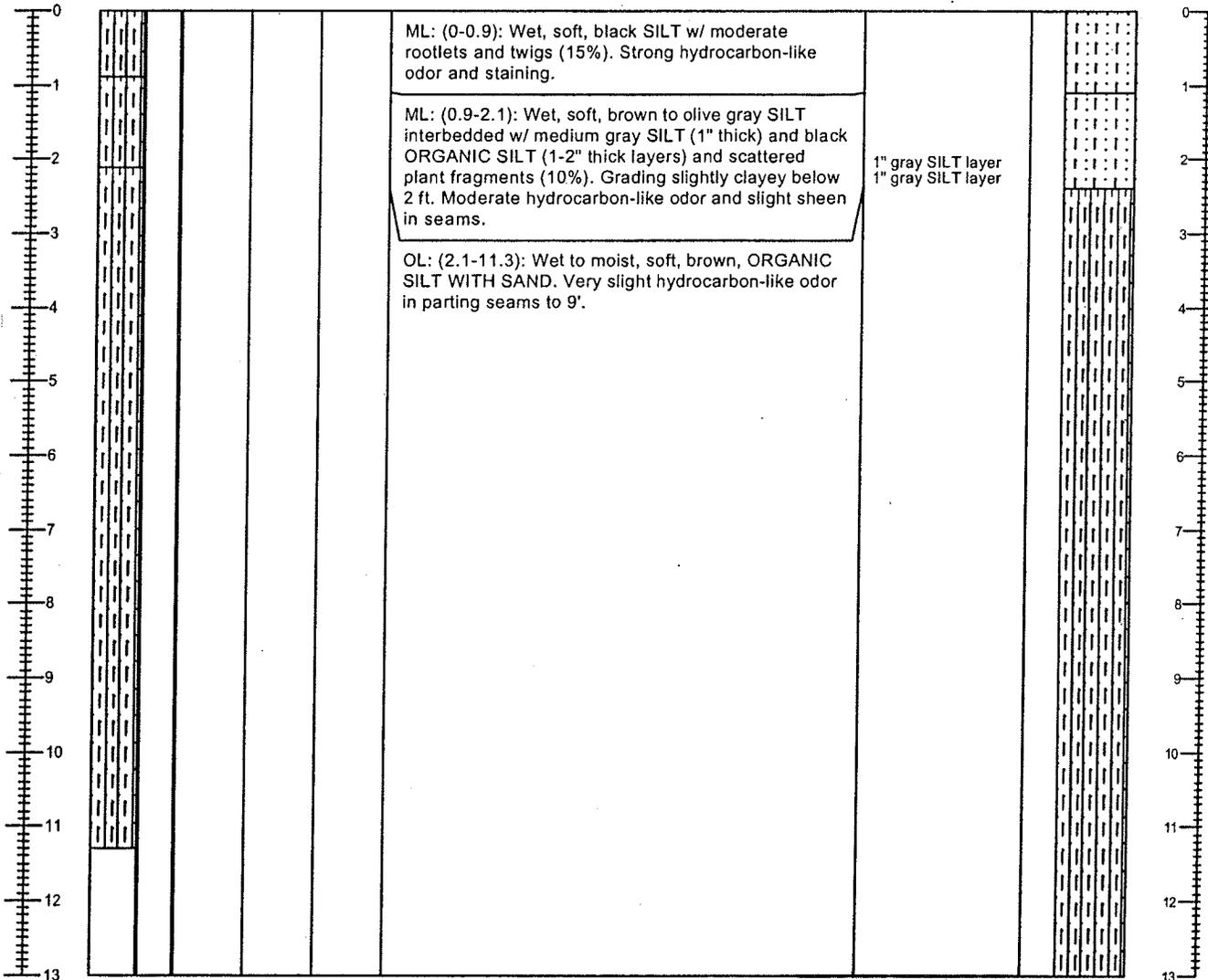


# Sediment Core Log

Core: NLU119-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>13 ft</b>
Client: <b>PSE</b>		Water Depth (ft): <b>39.6</b>	Sample Quality: <b>Good</b>
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-19.18</b>	Recovery in ft (%): <b>11.3 (87)</b>
Contractor: <b>MSS</b>		N./LAT: <b>47°38'44.07</b> E./LONG: <b>122°20'19.03</b>	Process Date: <b>11/19/2002</b>
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis
			<b>Sediment Description</b> Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)
			<b>Comments</b> Calc. In situ Depths (ft) & Graphic Log Calc. In situ Depth (ft)



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Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 11.3/13 = 87 %

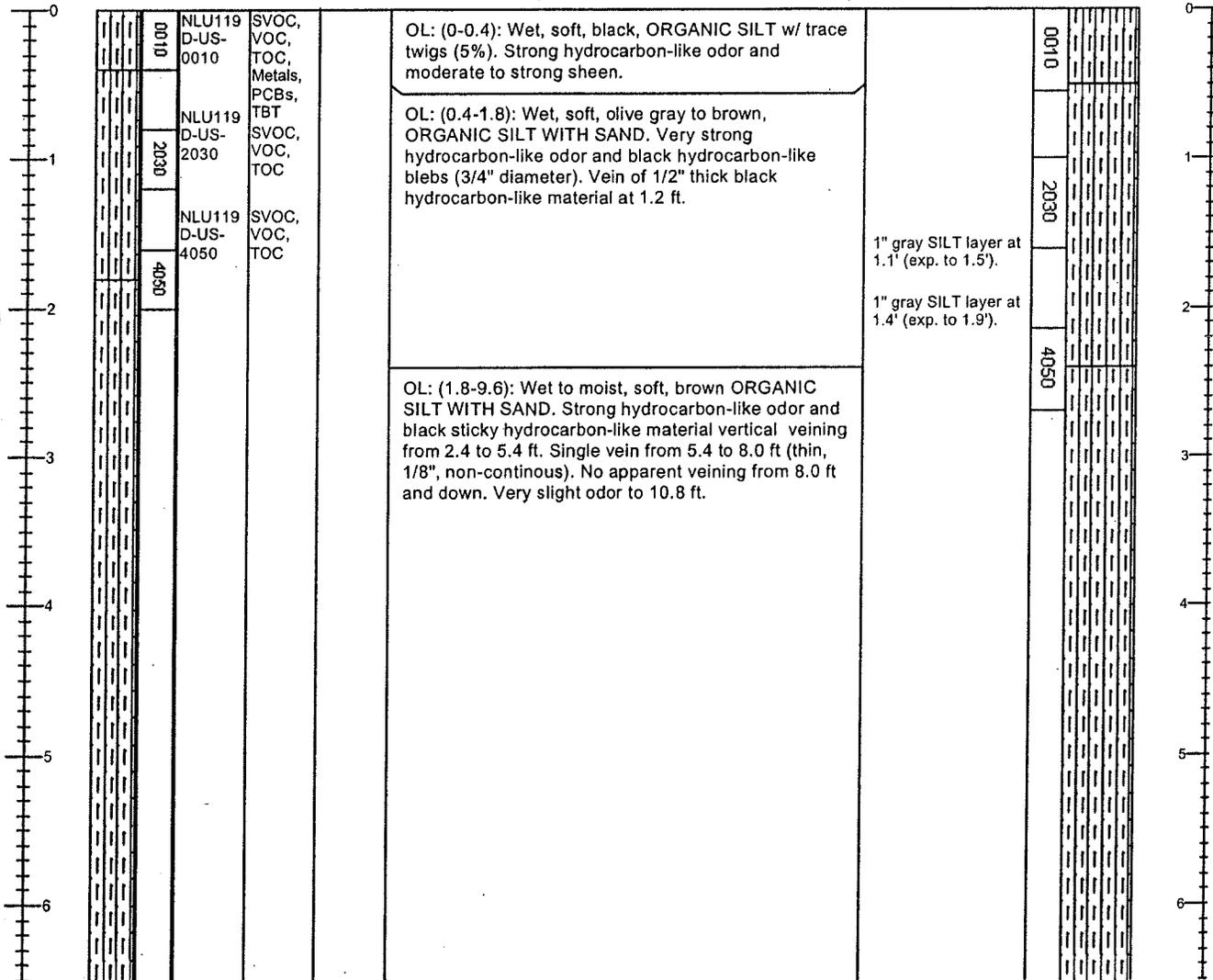


# Sediment Core Log

Core: NLU119D-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>13 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>41</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-20.58</b>	Recovery in ft (%): <b>9.6 (74)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'44.13</b> E./LONG: <b>122°20'19.02</b>	Process Date: <b>11/20/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					<b>Classification Scheme: USCS</b> (Recovered depth interval in feet)			



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Remarks: Sampled intervals are 0-10 cm, 20-30 cm, and 40-50 cm. Sampled names are moved to fit on core log.

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 9.6 / 13 = 74 %

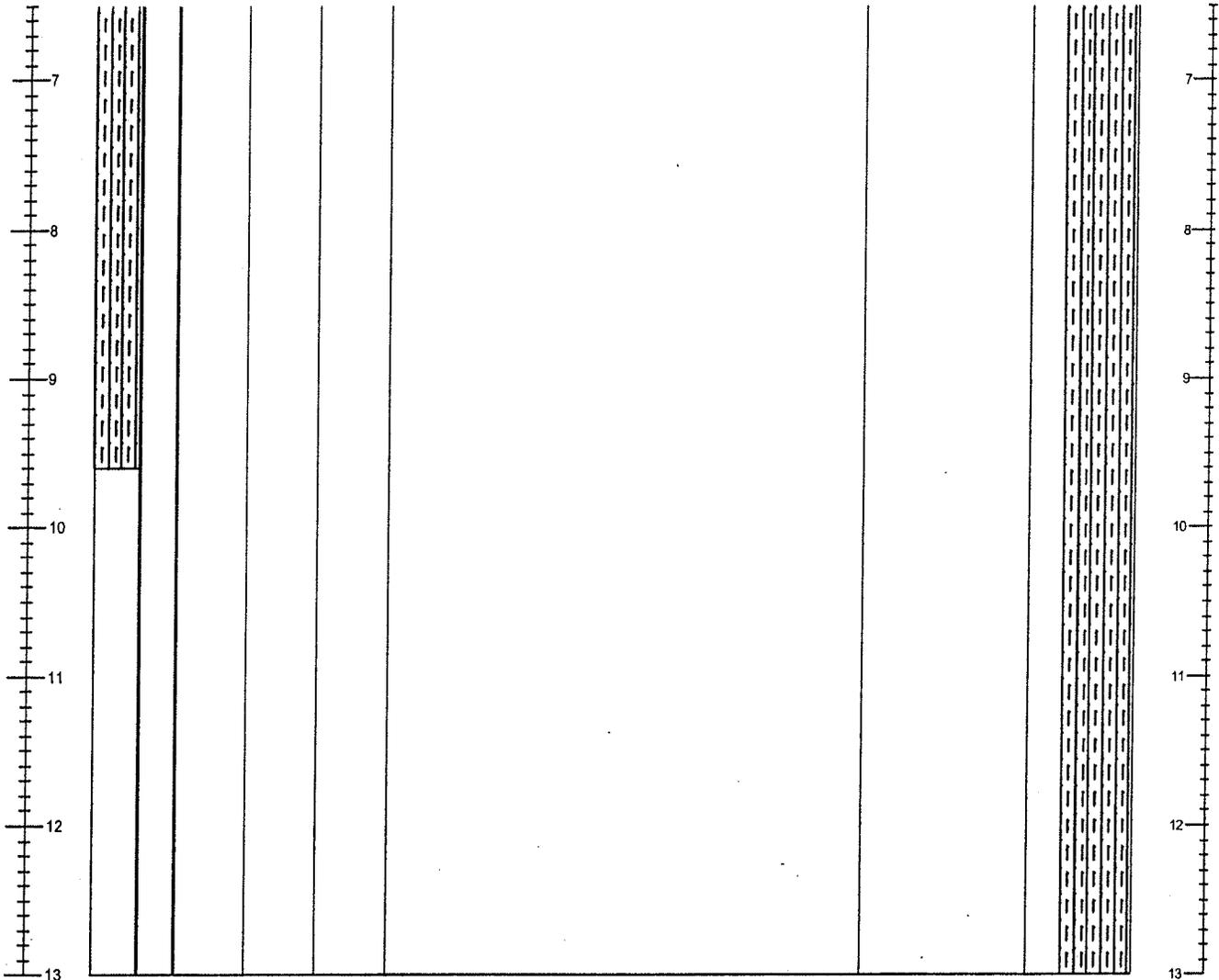


# Sediment Core Log

Core: NLU119D-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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Remarks: Sampled intervals are 0-10 cm, 20-30 cm, and  
40-50 cm. Sampled names are moved to fit  
on core log.

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 9.6 / 13 = 74 %

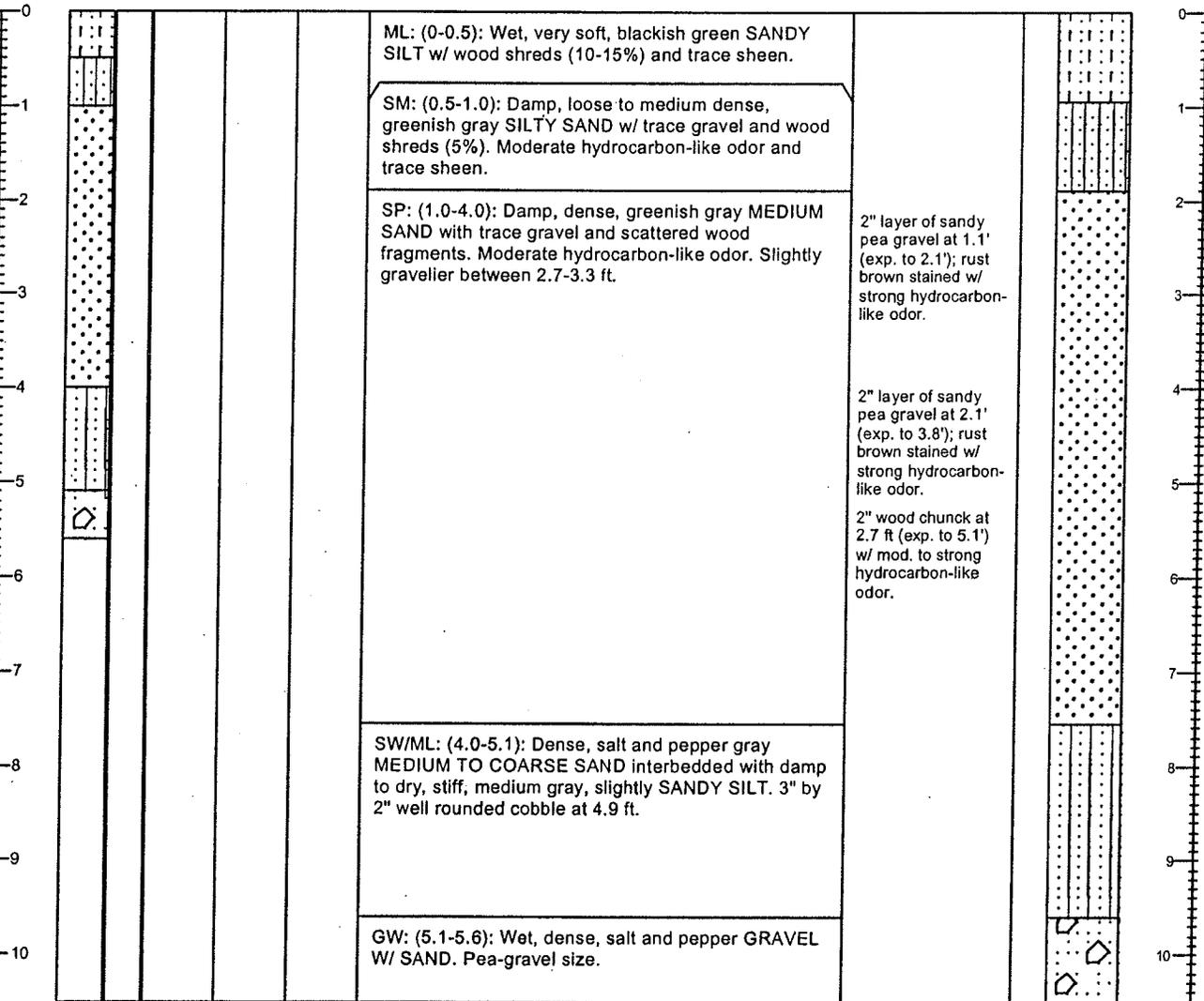


# Sediment Core Log

Core: NLU119R1-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>12 ft</b>
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.24</b>	Penetration Depth: <b>10.5 ft</b>
Client: <b>PSE</b>		Water Depth (ft): <b>37.5</b>	Sample Quality: <b>Fair</b>
Collection Date: <b>11/15/2002</b>		Mudline Elevation (ft): <b>-17.26</b>	Recovery in ft (%): <b>5.6 (53)</b>
Contractor: <b>MSS</b>		N/LAT: <b>47°38'42.84</b> E/LONG: <b>122°20'16.95</b>	Process Date: <b>11/20/2002</b>
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminium</b>	Logged By: <b>NPB, BHH, KLC</b>



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Remarks: 4' of free fall. Light to moderate vibration to 10.5'. Fair quality because recovery was < 75%. Full core catcher.

**Calculated Recovery**  
Sample Length/Penetration Length:  
**5.6 / 10.5 = 53 %**



# Sediment Core Log

## Core: NLU119R2-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>12 ft</b>
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>9 ft</b>
Client: <b>PSE</b>		Water Depth (ft): <b>38.1</b>	Sample Quality: <b>Poor/Good</b>
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-17.68</b>	Recovery in ft (%): <b>3.7 (41)</b>
Contractor: <b>MSS</b>		N./LAT: <b>47°38'42.63</b> E./LONG: <b>122°20'17.23</b>	Process Date: <b>11/21/2002</b>
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
0					OL: (0-0.6): Wet, medium stiff, olive gray ORGANIC SILT w/ trace fine sand. Moderate to strong hydrocarbon-like odor and moderate sheen.			0
1						At 0.5' (exp. to 1.2'), layer of black, sticky, hydrocarbon-like material.		1
2					OL: (0.6-2.6): Wet to damp, soft, brown ORGANIC SILT WITH SAND. Black, sticky, hydrocarbon-like material in veins down to 2.6 ft. Strong hydrocarbon-like odor.			2
3								3
4								4
5								5
6						At 2.3' (exp. to 5.6'), 1" thick fine sand layer, brown stained, strong hydrocarbon-like odor.		6
7					SP: (2.6-2.8): Dense, wet, olive gray medium SAND w/ moderate hydrocarbon-like odor and sheen.			7
8					SW: (2.8-3.7): Dense, damp, olive gray, SAND W/ GRAVEL. Strong hydrocarbon-like odor and brown staining.			8
9								9

The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks: Heavy sheen and odor during retrieval.</b> <hr/> <b>Full catcher.</b> <hr/>	<b>Calculated Recovery</b> Sample Length/Penetration Length: <b>3.7 / 9 = 41 %</b>
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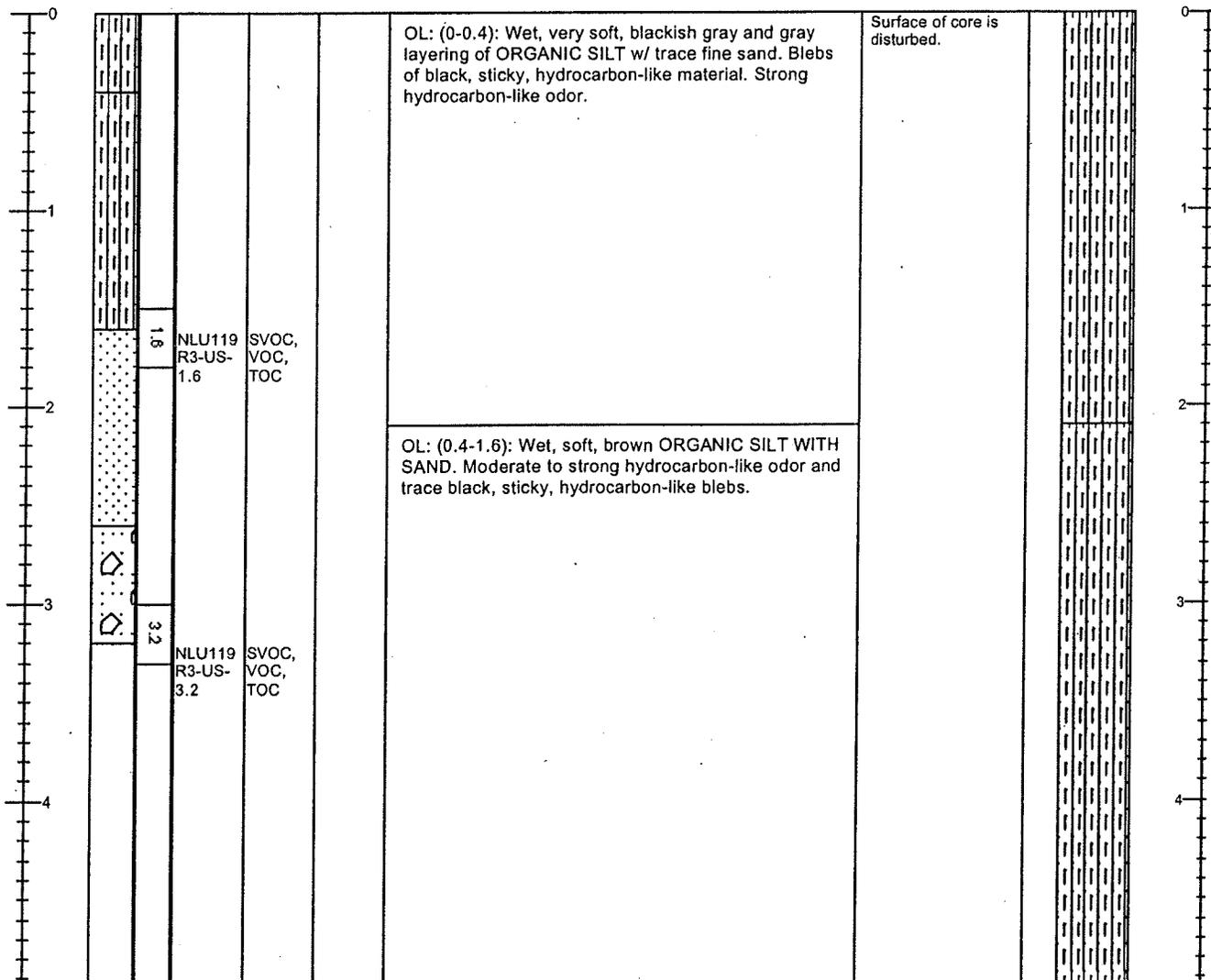


# Sediment Core Log

Core: NLU119R3-US

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>10 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>39.5</b>	Sample Quality: <b>Poor</b>					
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-19.08</b>	Recovery in ft (%): <b>3.2 (32)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'42.38</b> E./LONG: <b>122°20'17.33</b>	Process Date: <b>11/21/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	<b>Sediment Description</b>	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					Classification Scheme: <b>USCS</b> (Recovered depth interval in feet)			



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Remarks: Sheen upon retrieval and sectioning.

**Calculated Recovery**  
Sample Length/Penetration Length:  
**3.2 / 10 = 32 %**

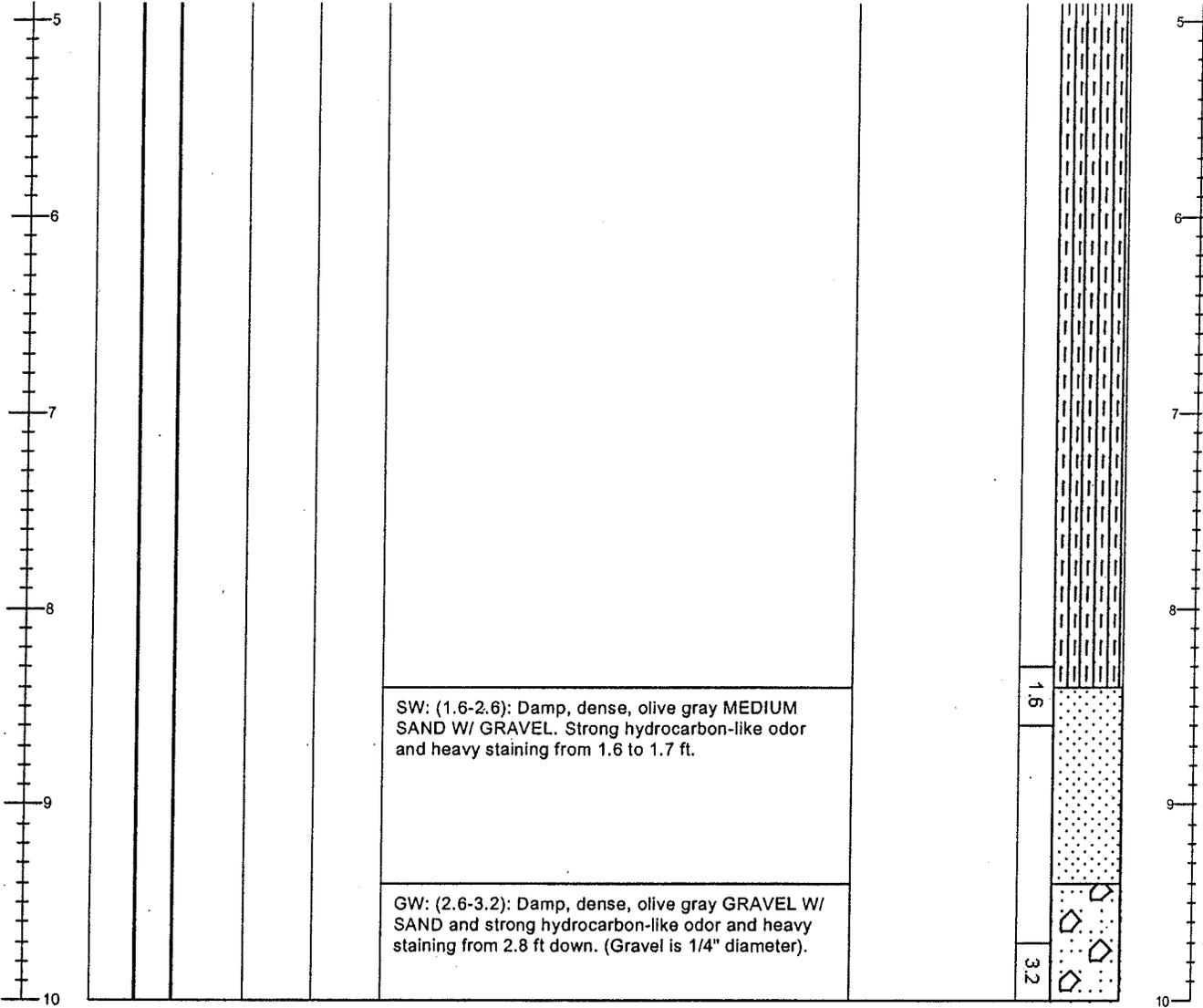


# Sediment Core Log

Core: NLU119R3-US

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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Remarks: Sheen upon retrieval and sectioning.

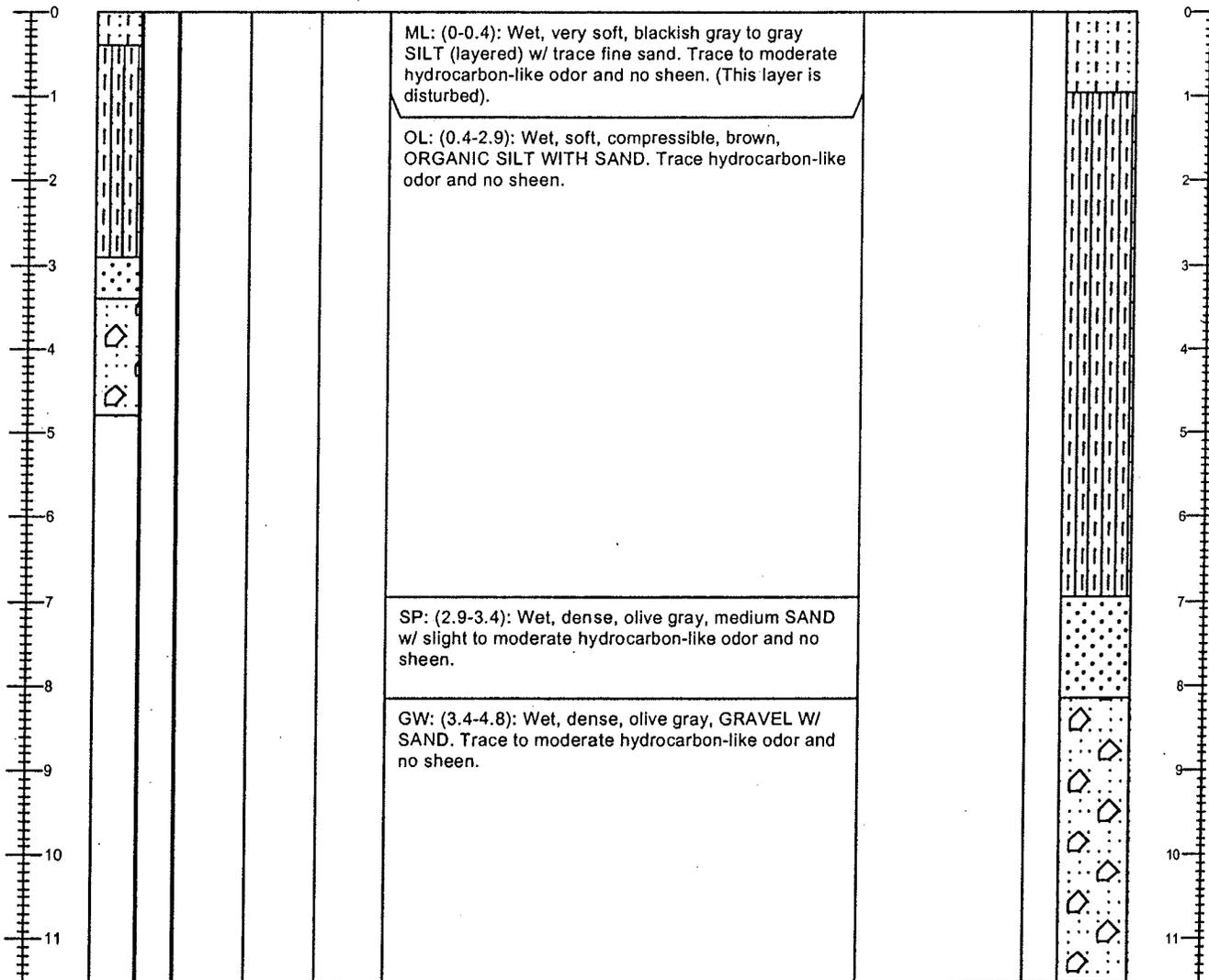
**Calculated Recovery**  
Sample Length/Penetration Length:  
**3.2 / 10 = 32 %**



# Sediment Core Log

Core: NLU119R4-US

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>11.5 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>39.5</b>	Sample Quality: <b>Poor/Good</b>					
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-19.08</b>	Recovery in ft (%): <b>4.8 (42)</b>					
Contractor: <b>MSS</b>		N/LAT: <b>47°38'42.23</b> E/LONG: <b>122°20'17.26</b>	Process Date: <b>11/21/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	<b>Sediment Description</b> Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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Remarks: Full catcher.

**Calculated Recovery**  
Sample Length/Penetration Length:  
**4.8 / 11.5 = 42 %**



# Sediment Core Log

## Core: NLU119R5-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>13 ft</b>
Client: <b>PSE</b>		Water Depth (ft): <b>39.8</b>	Sample Quality: <b>Fair</b>
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-19.38</b>	Recovery in ft (%): <b>3.8 (29)</b>
Contractor: <b>MSS</b>		N./LAT: <b>47°38'43.96</b> E./LONG: <b>122°20'19.01</b>	Process Date: <b>11/21/2002</b>
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
0					OL: (0-0.8): Wet, very soft, black, ORGANIC SILT w/ substantial rootlets (10%). Strong hydrocarbon-like odor and staining. Trace to minor black, sticky, hydrocarbon-like blebs throughout.			0
1								1
2								2
3				124				3
4				93	OL: (0.8-2.0): Wet, soft, brown to olive gray, ORGANIC SILT WITH SAND. Plant fragments (10%) and strong hydrocarbon-like odor, staining/blebs of black, sticky hydrocarbon-like material. Veins of black, sticky, hydrocarbon-like material throughout.			4
5				25		At 1.4' (exp. to 4.8'), damp, dense, glacial gray, sl. sandy SILT layer.		5
6						At 1.7' (exp. to 5.9'), wet, loose, glacial gray, silky SILT layer.		6
7								7
8				22	OL: (2.0-3.8): Wet, soft, brown, ORGANIC SILT WITH SAND. Plant fragments (10%). Moderate to strong hydrocarbon-like odor until 3.2 ft with veining black, sticky, hydrocarbon-like material. No veining after 3.2 ft and less hydrocarbon-like odor.			8
9								9
10								10
11								11
12								12
13								13

The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> Heavy surface sheen upon retrieval.	<b>Calculated Recovery</b> Sample Length/Penetration Length: $3.8 / 13 = 29 \%$
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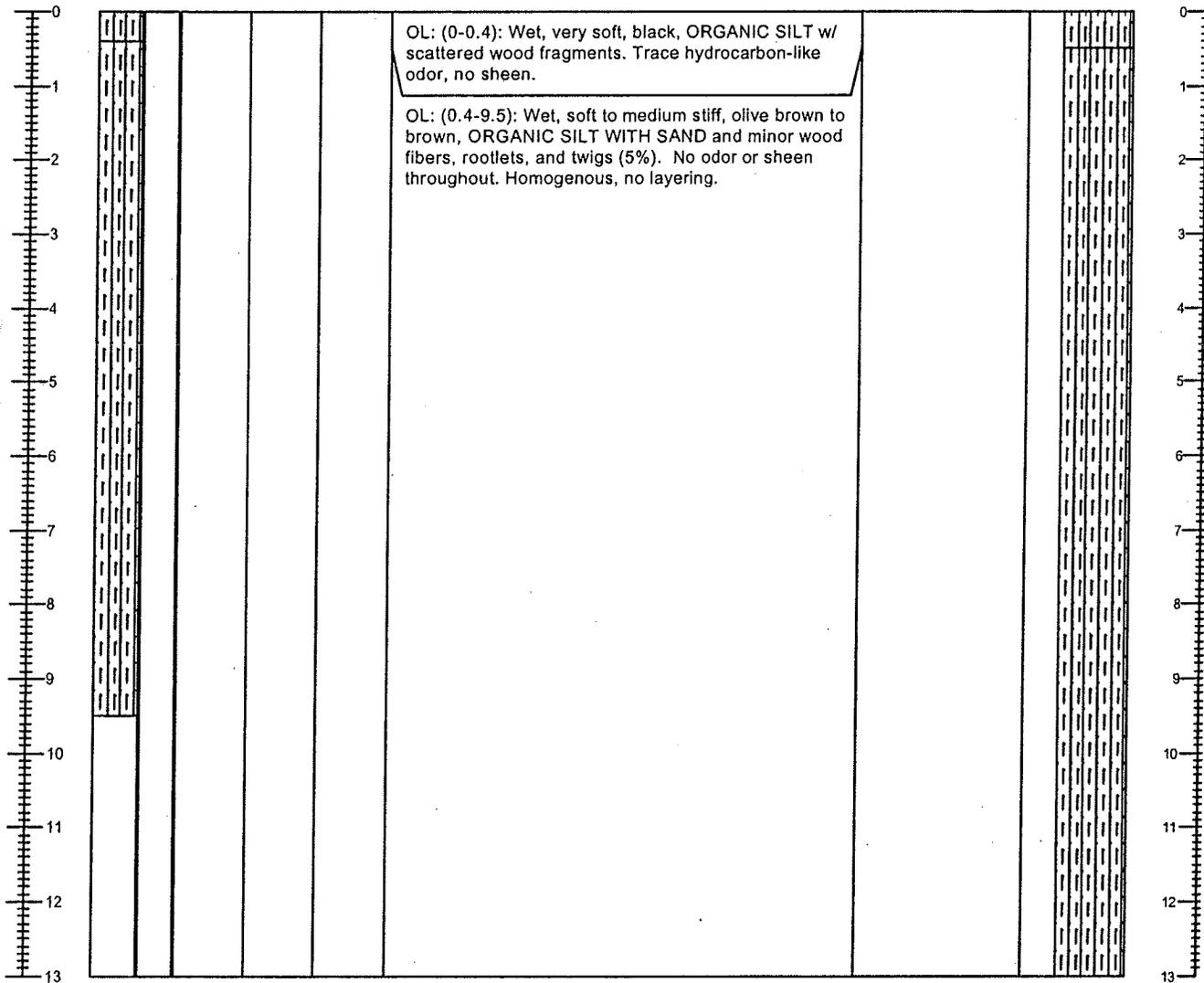


# Sediment Core Log

Core: NLU125-US

Sheet 1 of 1

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>					
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>13 ft</b>					
Client: <b>PSE</b>		Water Depth (ft): <b>42.4</b>	Sample Quality: <b>Good</b>					
Collection Date: <b>11/18/2002</b>		Mudline Elevation (ft): <b>-21.98</b>	Recovery in ft (%): <b>9.5 (73)</b>					
Contractor: <b>MSS</b>		N./LAT: <b>47°38'46.18</b> E./LONG: <b>122°20'22.95</b>	Process Date: <b>11/19/2002</b>					
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>					
Operator: <b>Bill Jaworski</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	<b>Sediment Description</b> Classification Scheme: USCS (Recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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 Fax: (206) 624-2839

Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 9.5 / 13 = 73 %

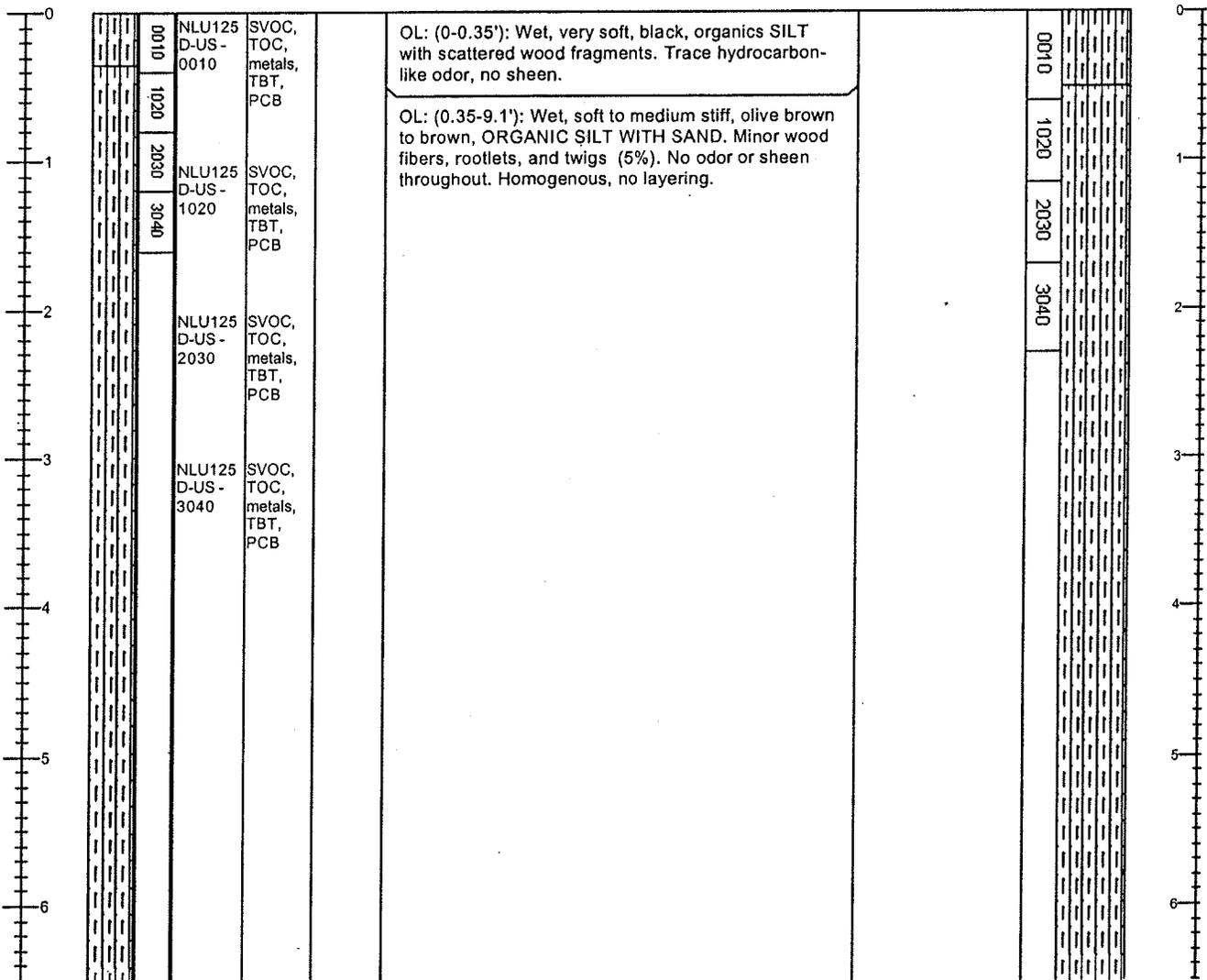


# Sediment Core Log

Core: NLU-125D

Sheet 1 of 2

Project: <b>NLU Phase 2 Investigation</b>		Water Body Type: <b>Lake</b>	Tube Length: <b>14 ft</b>
Project #: <b>GJRW1-04403</b>		SW Elevation (ft)/Tide: <b>20.42</b>	Penetration Depth: <b>13</b>
Client: <b>PSE</b>		Water Depth (ft): <b>41.9</b>	Sample Quality: <b>Good</b>
Collection Date: <b>11/18/02</b>		Mudline Elevation (ft): <b>-21.48</b>	Recovery in ft (%): <b>9.1 (70)</b>
Contractor: <b>MSS</b>		N./LAT: <b>47°38'46.15</b> E./LONG: <b>122°20'22.94</b>	Process Date: <b>11/19/2002</b>
Vessel: <b>R/V Nancy Anne</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USACE</b>	Process Method: <b>Cut tube</b>
Operator: <b>Bill Jaworks</b>		Method/Tube ID: <b>4" OD aluminum</b>	Logged By: <b>NPB, BHH, KLC</b>
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis
<b>Sediment Description</b> Classification Scheme: USCS (Recovered depth interval in feet)			
			Calc. In situ Depths (ft) & Graphic Log
			Calc. In situ Depth (ft)



The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> _____ _____ _____	<b>Calculated Recovery</b> Sample Length/Penetration Length: <b>9.1 / 13 = 70 %</b>
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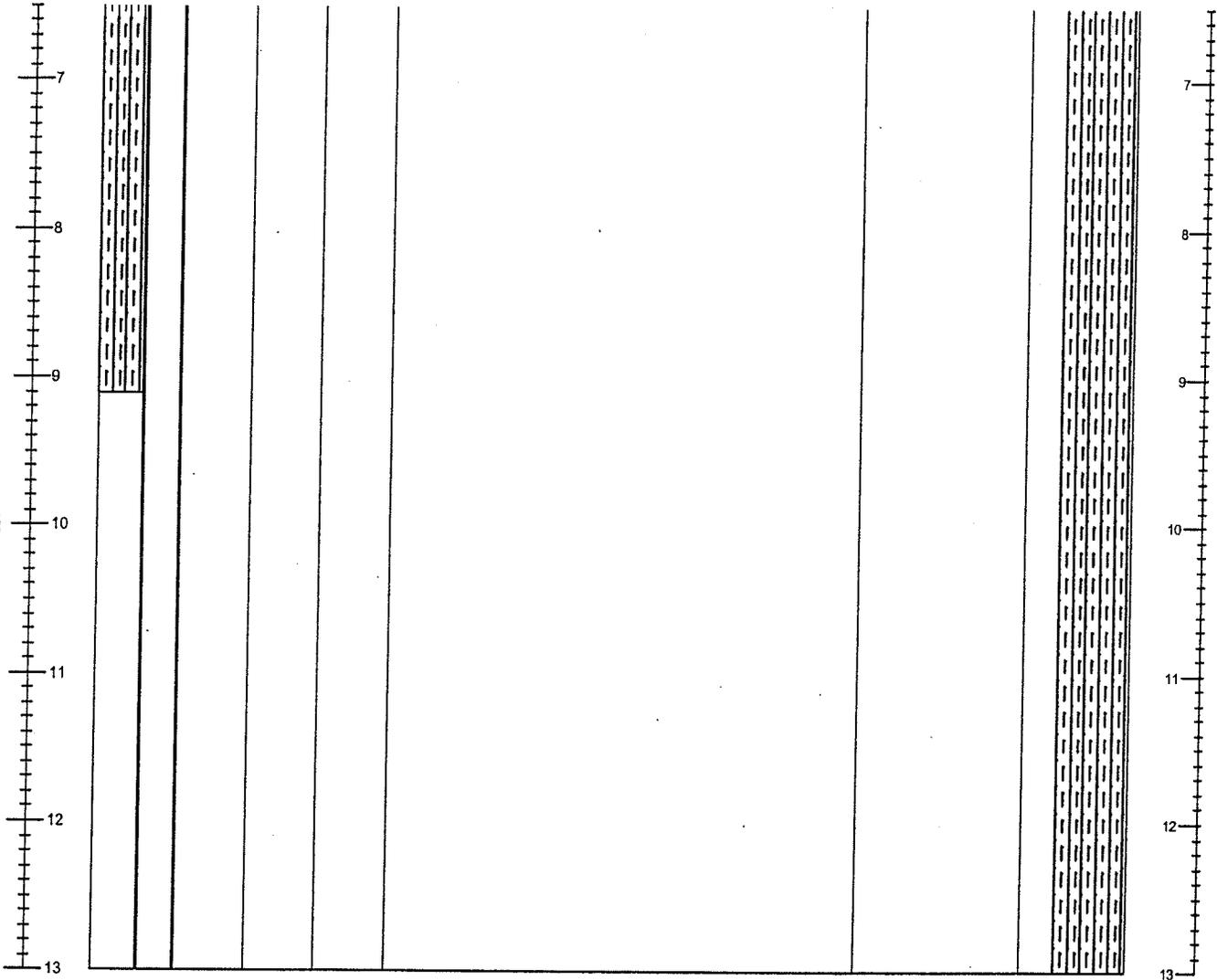


# Sediment Core Log

Core: NLU-125D

Sheet 2 of 2

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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 Seattle, WA 98134-1162  
 Phone: (206) 624-9349  
 Fax: (206) 624-2839

Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 9.1 / 13 = 70 %

**Floyd|Snider 2004  
Western Study Area  
NAPL Sediment Investigation**

**Cores**

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 1--1

**Mudline elevation:** 8.7 ft (Corps lake datum)

**Maximum depth of retained sediment:** 7.2 ft  
**Percent recovery (on-deck):** 74%

**Core collection**      **Laboratory processing**  
**Date:** 8/11/2004      Aug. 11, 2004  
**Time:** 13:40              15:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0					
1	Black; mixture of water, wood chips, clay, silt, gravel and oil; More oily from 1.2 to 1.5; More wood near top, gravel, near bottom; very soft, wet.	Upper recent lake deposits		34011008028	
2					
3	Gray; sandy gravel (GW) with f-c rounded gravel and f-c sand. Some gray, silt lumps or beds. From 1.8 to 2.1 is laminated, silty gravel (GM) with some oil penetration. No hydrocarbon odor or stains below GM. Dense, moist.	Stratified Drift			
4			Sampled GW.	34011008029	
5					
6	Sediment lost during core recovery.				
7	End of Core	End of core	End of core	End of core	End of core
8					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 1--2

**Mudline elevation:** -10.8 ft (Corps lake datum)

**Maximum depth of retained sediment:** 6.9 ft  
**Percent recovery (on-deck):** 70%

**Core collection**      **Laboratory processing**  
**Date:** 8/12/2004      Aug. 12, 2004  
**Time:** 10:35              14:40

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0				34011008046	
1	Black with minor gray beds; mixture of water, wood fibers and fragments, clay and oil. Very soft, wet.	Upper recent lake deposits			
2					
3					
4	Gray interbedded sandy gravey (GW), sand (SP) and sandy silt (SM). GW 6.7-7.6, ML+SM 7.7-8.3, SP 8.3-9.0, SM 9.0-9.1. Dense, wet. No oil, sheen or stains.	Stratified Drift			
5			Sampled SP.	34011008045	
6	Sediment lost during core recovery.				
7	End of Core	End of core	End of core	End of core	End of core
8					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T3

**Station:** 1--3

**Mudline elevation:** 20.9 ft (Corps lake datum)

**Maximum depth of retained sediment:** 5.7 ft  
**Percent recovery (on-deck):** 74%

**Core collection**      **Laboratory processing**  
**Date:** 8/11/2004      Aug. 11, 2004  
**Time:** 12:35              14:45

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0					
			Sampled black, oily emulsion.	34011008027	
1	Black; mixture of water, oil, wood chips and fibers with some sand and trace gravel; Very soft, wet. Creosote/asphalt odor.	Upper recent lake deposits			
2					
3	Gray; gravelly sand with silt (SW), f-c sand, f-c gravel, couple of sandy silt (ML) beds 0.1-ft thick; Dense; wet; trace petrol odor, no oil.	Stratified Drift	Sampled SW.	34011008026	
4					
5	Sample lost during core recovery.				
6	End of Core	End of core	End of core	End of core	End of core

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 2-1 Rep 2

**Mudline elevation:** -12.7 ft (Corps lake datum)

**Maximum depth of retained sediment:** 6.1 ft  
**Percent recovery (on-deck):** 58%

**Core collection**      **Laboratory processing**

**Date:** 8/11/2004      Aug. 11, 2004  
**Time:** 17:00              18:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0	Dark olive; mixture of wood fragments (some lumber scraps), silt, clay and some oil. Very soft (almost a liquid), wet. Smells like creosote or asphalt.	Upper recent lake deposits		34011008036	
1				34011008035	
2	Dark olive; silty clay (CL) with black oil stains from 0.9 to 1.1 and black lamellae throughout. Very soft, wet.	Lower recent lake deposits			
3					
4	Gray; sandy gravel (GW) with f-c sand and f-c rounded gravel, c gravel and cobbles at 5.2; Dense, wet; no oil or stains.	Stratified Drift		34011008034	
5					
6	End of Core	End of core	End of core	End of core	End of core
7					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 2-2 A

**Mudline elevation:** -17.0 ft (Corps lake datum)

**Maximum depth of retained sediment:** 9.7 ft  
**Percent recovery (on-deck):** 72%

**Core collection**      **Laboratory processing**  
**Date:** 8/12/2004      Aug. 12, 2004  
**Time:** 9:00              12:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0					
2	Black with minor dark gray; mixture of water, clay, wood fragments and tarry oil; Very soft, wet.	Upper recent lake deposits			
4			Sampled gray silty clay with black tarry oil.	34011008043	
6	Gray; interbedded sandy gravel (GW) and gravelly sand (SW) with SP from 5.0-6.4, brown wood fibers abundant in upper part of interval; Dense, wet. Brightly colored sheen with black oil 3.6-4.3 and 7.8-8.6;	Stratified Drift	Sampled SW with bright sheen and black oil.	34011008042	
8			Sampled SP with no visible oil.	34011008041	
8			Sampled GW with bright sheen and black oil.	34011004040	34011008044
10	End of Core	End of core	End of core	End of core	End of core
12					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T3

**Station:** 2--2

**Mudline elevation:** -14.3 ft (Corps lake datum)

**Maximum depth of retained sediment:** 9.7 ft  
**Percent recovery (on-deck):** 82%

**Core collection**      **Laboratory processing**  
**Date:** 8/12/2004      Aug. 12, 2004  
**Time:** 9:33              11:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0				34011008039	
	Black; mixture of water, clay, wood and oil; Very soft, wet; black oil blebs and slight sheen; asphalt odor.	Upper recent lake deposits			
2				34011008038	
	Blotched or mottled, black and dark gray; organic clay (OL); some wood fragments near core tube may be carry down; very soft, wet; black may be oil.	Lower recent lake deposits			
4					
	Gray; interbedded sandy gravel (GW) and gravelly sand (SW) with a silty clay (CL) from 5.6-5.9 and gravelly silt (ML) below 7.9; Dense, wet; faint hydrocarbon odor; oil stains and sheen from 4.0-4.5.	Stratified Drift	Sampled sand with few fines below silty clay.	34011008037	
6					
8					
10	End of Core	End of core	End of core	End of core	End of core
12					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 3-3 Rep 3

**Mudline elevation:** -18.6 ft (Corps lake datum)

**Maximum depth of retained sediment:** 14.0 ft  
**Percent recovery (on-deck):** 72%

**Core collection**      **Laboratory processing**  
**Date:** 8/11/2004      Aug. 11, 2004.  
**Time:** 15:07              16:30

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0	Black; mixture of water, wood chips, organic clay, some rounded gravel and black oil; Very soft, wet. Creosote or asphalt odor, very oily.	Upper recent lake deposits		34011008033	
2					
4	Dark olive gray; organic clay (OL), with veins of black oil from 1.1-5.8 and 6.9-7.5; Very soft, wet. Black oil stains from 1.1 to 1.3.	Lower recent lake deposits			
6					
8	Dark olive gray viscous liquid that appears to be mixture of organic clay and black tarry oil; very soft, wet.		Sampled oily vein.	34011008032	
10					
12	Gray; interbedded sandy gravel (GW), gravelly sand (SW) and below 11.3 minor silty sand (SM); Dense, wet. Black tarry oil in sandy beds 8.8-10.0 and 10.7-10.9. Smells like creosote or asphalt.	Stratified Drift	Sampled oily GW.	34011008031	
14					
16	Sediment lost during core recovery				
	End of Core	End of core	End of core	End of core	End of core

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 3-5 Rep 2

**Mudline elevation:** 20.9 ft (Corps lake datum)

**Maximum depth of retained sediment:** 5.7 ft  
**Percent recovery (on-deck):** 29%

**Core collection**      **Laboratory processing**  
**Date:** 8/13/2004      Aug. 13, 2004  
**Time:** 17:30              13:45

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0	Black grading down to gray; mixture of water, clay, wood and black tarry oil; Very soft, wet. Asphalt odor.	Upper recent lake deposits	Sampled gelatinous tarry material.	34011008058	
1	Dark olive gray; organic clay (OL) with a piece of wood; Very soft, wet. Black oil-stain from 1.7 to 1.8	Lower recent lake deposits			
2			Sampled black, oil-stained OL.	34011008057	
3			Sampled oily GW.	34011008056	
4	Dark gray; gravelly sand (SW) grading down to sandy gravel (GW); Dense, wet. Oil stains at 2.7.				
5	Sediment lost during core recovery.	Stratified Drift			
6	End of Core	End of core	End of core	End of core	End of core

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 3--1

**Mudline elevation:** -3.5 ft (Corps lake datum)

**Maximum depth of retained sediment:** 4.4 ft  
**Percent recovery (on-deck):** 82%

**Core collection**      **Laboratory processing**  
**Date:** 8/11/2004      Aug. 11, 2004  
**Time:** 10:42      14:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0					
1					
1					
2	Black; mixture of water, wood chips, silt, clay, sand, oil and trace gravel; most wood chips in top 0.3-ft; most silt and sand near bottom; Very soft (gelatinous to liquid in places), wet; smells like creosote or asphalt.	Upper recent deposits			
2					
3					
3			Sampled very oily interval.	34011008025	
4					
4	Sediment lost during core recovery.				
5	End of Core	End of core	End of core	End of core	End of core
5					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 3--2

**Mudline elevation:** 20.9 ft (Corps lake datum)

**Maximum depth of retained sediment:** 9.3 ft  
**Percent recovery (on-deck):** 69%

**Core collection**      **Laboratory processing**

**Date:** 8/11/2004      Aug. 11, 2004  
**Time:** 8:30              11:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0				34011008017	
1	Black grading down to dark greenish gray; sandy silt (ML) with wood chips and one shell; Very soft, wet. Black oil and sheen.	Upper recent lake deposits			
2					
3	Dark greenish gray; sandy gravel with silt (GW) or gravelly sand with silt (SW) with wood chips and root fibers; Very soft, wet. Black oil blebs in most of interval, oil coats root fibers; strong asphalt odor.	Upper recent lake deposits; possibly Gas Works Fill		34011008018	
4					
5			Sampled oily SW.	34011008020	
6	Dark gray; gravelly sand (SW) grading down to sand with gravel (SP); Dense, moist. Asphalt odor, some oil stuck on gravel.	Stratified Drift			
7				34011008019	
8	Sediment lost during core recovery; core tube bent and scratched.				
9					
10	End of Core	End of core	End of core	End of core	End of core

# Core Summary Log

**Project:** North Lake Union Sediment Survey

**Station:** 3--3

**Project No:** COS-NAPL.T5

**Maximum depth of retained sediment:** 7.2 ft

**Mudline elevation:** -18.5 ft (Corps lake datum)

**Percent recovery (on-deck):** 71%

**Core collection**      **Laboratory processing**

**Date:** 8/11/2004      Aug. 11, 2004

**Field Log:** J. LaManna

**Time:** 9:40      13:00

**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0					
	Gray (top 0.1-ft) and black mixture of clay, water, silt, wood fibers (possibly bark) and oil; Very soft, wet. Heavy oil 0.0-0.2 and 0.9-1.2; black oil appears to penetrate next lower interval.	Upper recent lake deposits	Sampled black, gelatinous, oily material.	34011008022	
1				Sampled black oily mud.	34011008024
2					
3					
	Dark olive gray; organic clay (OL) with trace fir needles; Very soft, wet. Abundant veins of black oil, most abundant at top of interval; oil content highest at top and bottom of interval. Did not observe veins from 3.8-4.5.	Lower recent lake deposits			
4					
5					
			Sampled black vein.	34011008023	
6					
	Black oily wood chunks; very little sediment. May be repenetration of surface material. However, boat crew reports refusal.	Provenance not interpreted.	Sampled black, viscous oil.	34011008021	
7					
	End of Core	End of core	End of core	End of core	End of core
8					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 3--4

**Mudline elevation:** -13.8 ft (Corps lake datum)

**Maximum depth of retained sediment:** 10.5 ft  
**Percent recovery (on-deck):** 59%

**Core collection**      **Laboratory processing**  
**Date:** 8/12/2004      Aug. 13, 2004  
**Time:** 15:32      12:30

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0					
2	Black grading down to dark gray; clay (CL) with water, wood fragments, oil and with black, angular gravel-sized grain that, crushed between the fingers, produce black fine sand and silt; may be lampblack. Very soft, wet. Smells like creosote or asphalt.	Upper recent lake deposits			
			Sampled black oil.	34011008055	
4					
			Sampled oily GW with bright sheen.	34011008054	
6	Dark gray sandy gravel (GW), f-c gravel, top of interval more sandy; Dense, wet. Black oil with bright sheen at 4.3; no oil in lower portion.	Stratified Drift			
8					
	Gray sandy gravel (GW). About 50% recovery and slumped in core tube.				
10	Sediment lost during core recovery.				
	End of Core	End of core	End of core	End of core	End of core
12					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 4-1 A

**Mudline elevation:** -3.7 ft (Corps lake datum)

**Maximum depth of retained sediment:** 7.4 ft  
**Percent recovery (on-deck):** 84%

**Core collection**      **Laboratory processing**  
**Date:** 8/10/2004      Aug. 10, 2004  
**Time:** 15:40              18:30

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0	Black; silt with fine sand (ML) and abundant wood fragments; Very soft, wet. Oily with asphalt odor.		Sampled black, gelatinous oily material.	34011008013	
1			Upper recent lake deposits		
2	Dark olive interbedded silt with fine sand (ML) and sandy silt (SM) with wood chips and fibers and a glass bottle at bottom of interval; Very soft, moist-wet. Oil and sheen 1.7-2.0.		Sampled oil stains.	34011008014	
3					
4					
5	Dark gray fine-medium sand (SP) with rounded fine gravel beds (SW) 0.1-ft thick at 3.4 and 4.6; Dense, moist. No odor, sheen or stains.	Stratified Drift	Sampled oily SW.	34011008015	
6					
7	Sediment lost during core recovery.				
8	End of Core	End of core	End of core	End of core	End of core

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 4-2 Rep 1

**Mudline elevation:** -15.4 ft (Corps lake datum)

**Maximum depth of retained sediment:** 1.8 ft  
**Percent recovery (on-deck):** 32%

**Core collection**      **Laboratory processing**  
**Date:** 8/10/2004      Aug. 10, 2004  
**Time:** 16:48              19:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0	Black; silty fine sand (SM) or sandy silt (ML), with clay and abundant wood chips; verysoft, wet. Oily with asphalt odor.	Upper recent lake deposits	Sampled black gelatinous oily material.	34011008016	
0					
0					
1					
1					
1	Sediment lost during core recovery.				
1					
2					
2	End of Core	End of core	End of core	End of core	End of core
2					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 4-3 Rep 1

**Mudline elevation:** -19.6 ft (Corps lake datum)

**Maximum depth of retained sediment:** 14.8 ft  
**Percent recovery (on-deck):** 86%

**Core collection**      **Laboratory processing**  
**Date:** 8/10/2004      Aug. 10, 2004  
**Time:** 14:20              17:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0		Upper recent lake deposits			
	Black grading down to dark gray; organic clay with silt, wood chips and black oil blebs; Very soft, wet. Asphalt odor.			34011008011	
2					
4					
6					
8	Very dark brown; organic clay (OL); Very soft, wet. No oil or stains.	Lower recent lake deposits		34011008012	
10					
12					
14	Sediment lost during recovery.	End of core	End of core	End of core	End of core
16					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 4--4

**Mudline elevation:** -19.6 ft (Corps lake datum)

**Maximum depth of retained sediment:** 19.3 ft  
**Percent recovery (on-deck):** 69%

**Core collection**      **Laboratory processing**  
**Date:** 8/13/2004      Aug. 13, 2004  
**Time:** 14:18              11:45

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0	Black; mixture of water, clay and wood fragments with oil stains and asphalt odor and with thin (0.02-ft) layer of gray silty clay at bottom of interval; Very soft, wet.	Upper recent lake deposits		34011008053	
5					
10	Dark gray grading down to dark olive gray organic clay (OL); Very soft, wet. Faint peaty odor. Oil not observed.	Lower recent lake deposits	No oil observed in sample.	34011008052	
15					
20	End of Core	End of core	End of core	End of core	End of core
25					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 5-1

**Mudline elevation:** -18.6 ft (Corps lake datum)

**Maximum depth of retained sediment:** 10.6 ft  
**Percent recovery (on-deck):** 79%

**Core collection**      **Laboratory processing**  
**Date:** 8/10/2004      Aug. 10, 2004  
**Time:** 9:00              15:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0				34011008007	
2	Black; organic clay with wood chips, sand and oil; Very soft (flows), wet. Strong hydrocarbon odor and black oil blebs.				
4					
6	Interval not logged; core did not encounter gray, dense, sandy gravel.				
8					
10					
12	End of Core	End of core	End of core	End of core	End of core

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 5-1 Rep 2

**Mudline elevation:** -18.1 ft (Corps lake datum)      **Maximum depth of retained sediment:** 16.0 ft  
**Percent recovery (on-deck):** 68%

**Core collection**      **Laboratory processing**  
**Date:** 8/10/2004      Aug. 10, 2004  
**Time:** 9:38      13:30

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
0	Black; mixture of water, organic clay, silt and wood chips; Very soft, wet. Oil sheen and asphalt or creosote odor.	Upper recent lake deposits		34011008001	
2	Dark gray silt (ML) with wood fragments and fibers and trace angular sand; Very soft, wet. Trace sheen.			34000118002	
4	Very dark brownish gray grading down to dark brown; organic clay (OL) with gray lamellae and with brown peaty lumps; Very soft, wet. No odor or sheen.			34011008003	
6				34011008004	
8	Olive brown; organic clay (OL) with trace roots; Very soft, wet. No sheen, slight reducing odor.	Lower recent lake deposits			
10					
12	Very dark brown organic clay (OL) with wood fragments and beds of gray fine to medium sand 0.05 to 0.1-ft thick; Very soft and very loose; wet. No odor or sheen.	Stratified Drift		34011008005	
14	Gray; well graded, sandy gravel (GW) with f-d sand and f-c gravel, with lumps of sandy silt (ML); loose, moist. No hydrocarbon odor or sheen.			34011008006	
16	Sediment lost during recovery. End of Core			End of core	End of core
18					

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

**Station:** 5-3 Rep 3

**Mudline elevation:** -14.2 ft (Corps lake datum)

**Maximum depth of retained sediment:** #DIV/0! ft  
**Percent recovery (on-deck):** 70%

**Core collection**      **Laboratory processing**  
**Date:** 8/10/2004      Aug. 10, 2004  
**Time:** 12:40              16:00

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna

	Visual Description of Sediment	Summary Interpretation	Sediment End of core	Primary Sample ID	Secondary Sample ID End of core
0					
1				34011008008	
1					
2	Black; silty clay with sand and wood fragments; Very soft, wet. Black oil blebs and strong asphalt odor.	Upper recent lake deposits			
2					
3					
3	Dark olive grading down to dark gray; organic clay (OL) and wood pieces near top of interval; upper contact gradational; Very soft, wet. No sheen or oil stains.	Lower recent lake deposits		34011008009	
4					
4	Dark gray sandy gravel (GW); Dense, moist to wet. No oil sheen or stains.	Stratified Drift			
5	Sediment to End of Core recovery.	End of core		34011008010	
5				End of core	

# Core Summary Log

**Project:** North Lake Union Sediment Survey  
**Project No:** COS-NAPL.T5

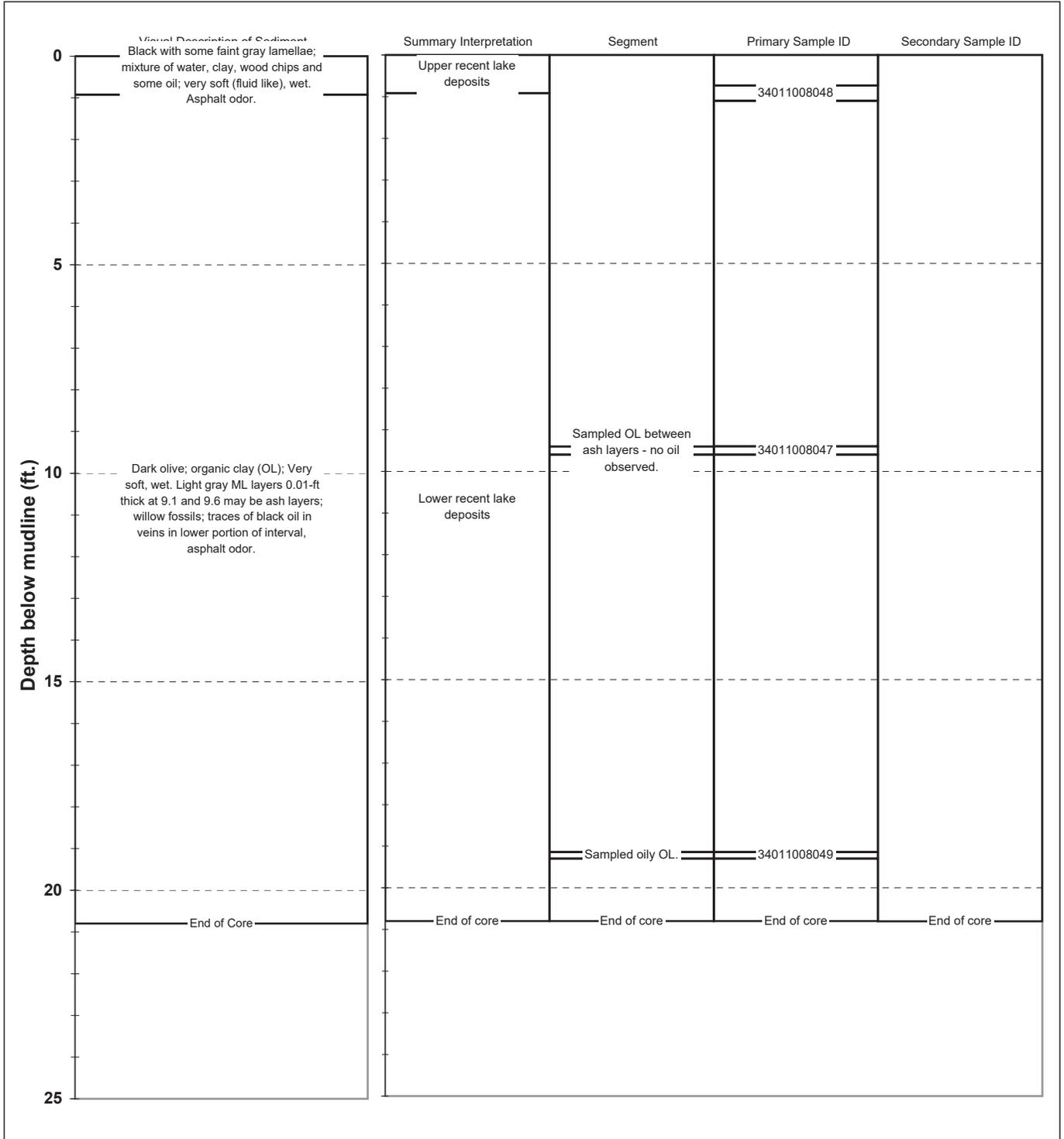
**Station:** 5--2

**Mudline elevation:** -20.1 ft (Corps lake datum)

**Maximum depth of retained sediment:** 20.8 ft  
**Percent recovery (on-deck):** 78%

**Core collection**      **Laboratory processing**  
**Date:** 8/12/2004      Aug. 12, 2004  
**Time:** 11:30              15:45

**Field Log:** J. LaManna  
**Summary Log:** J. LaManna





**Retec 2004/2005  
Phase 3 Eastern Study Area  
Sediment Investigation**

**Cores and Sheen Tests**

ESA Table K-2 Sheen and Ultraviolet Test Results from Subsurface Sediment Samples

Sample ID	Date of Tests	Sheen Test Results			UV Fluorescence Test Results				
		% Sheen	Sheen Color	Comments	% Fluorescence	Flourescence (Intensity)	Specks	NAPL	Class
NLU45-DC-S2	2/23/2005	90-95%	IR	streaky metallic water surface, sheen streaks up to 76 mm	75	moderate	moderate	none	B
NLU45-US-S1	2/23/2005	0%	—	none	100	faint	none	none	B
NLU45-US-S2	2/23/2005	5-10%	IR	streak dissipates quickly, 2-3 mm	85	moderate	few	none	B
NLU47-US-S1	2/23/2005	1%	—	sheen appears after settling	25	faint	few	none	B
NLU47-US-S2	2/23/2005	0%	—	none	0	none	none	none	C
NLU47-US-S3	2/23/2005	0%	—	none	0	none	none	none	C
NLU48-US-S2	2/23/2005	<5%	IR	small spotty sheen	10	faint	none	none	B
NLU48-US-S3	2/23/2005	80%	IR	dark brown blebs- does not dissipate, blebs up to 8 mm	50	faint	few	possible	B
NLU48-US-S4	2/23/2005	0%	—	none	0	none	none	none	C
NLU51-US-S1	2/23/2005	16-20%	IR	streaky sheen dissipates quickly	—	—	—	—	B
NLU51-US-S2	2/23/2005	20-30%	IR	trace blebs ~1 mm, metallic sheen ~25 mm	—	—	—	—	B
NLU51-US-S3	2/23/2005	0%	—	none	5	very faint	none	none	B
NLU52-US-S1	2/23/2005	0%	—	none	5	very faint	few	none	B
NLU52-US-S2	2/23/2005	5-10%	IR	streakysheen, dissapates quickly	75	faint	few	none	B
NLU52-US-S3	2/23/2005	1-2%	IR	very small, spotty sheen	0	none	none	none	C
NLU52-US-S4	2/23/2005	90-95%	IR	dark brown blebs 1-2 mm, metallic water sheen	30	moderate	few	yes	A
NLU52-US-S5	2/23/2005	100%	IR	dark brown blebs abundant, metallic water sheen	90	moderate	—	yes	A
NLU52-US-S6	2/23/2005	0%	—	none	0	none	none	none	C
NLU55-US-S1	2/23/2005	30-40%	IR	upon settling, slight to moderate sheen; HC-like odor	100	faint	abundant	yes	A
NLU55-US-S2	2/23/2005	80-90	IR	dark water, metallic sheen; dark brown staining on spoon	100	moderate	abundant	yes	A
NLU55-US-S3	2/23/2005	100%	IR	metallic water surface, dark brown blebs	75	—	—	yes	A
NLU55-US-S4	2/23/2005	90-95	IR	metallic water surface	100	moderate	none	none	B
NLU57-US-S1	2/23/2005	20-30%	IR	streaky, dissipates upon agitation	75	faint	moderate	none	B
NLU57-US-S2	2/23/2005	0%	—	none	0	none	none	none	C
NLU57-US-S3	2/23/2005	100%	IR	metallic water surface, dark brown blebs up to 6 mm	95	faint	—	yes	A
NLU57-US-S4	2/23/2005	0%	—	none	20	faint	none	none	B
NLU58-US-S1	2/23/2005	20-30%	IR	streaky, dissipates quickly, some dark brown blebs	40	moderate	moderate	none	B
NLU58-US-S2	2/23/2005	100%	IR	dark brown blebs, metallic water sheen	100	strong	—	none	A
NLU58-US-S3	2/23/2005	0%	—	none	70	faint	few	none	B
NLU59-US-S1/S2	2/23/2005	15%	—	streaky/spotty with black blebs up to 1 mm	50	moderate	few	none	B
NLU59-US-S3	2/23/2005	0%	—	none	0	none	none	none	C
NLU62-US-S1	2/23/2005	0%	—	none	2	none	few	none	C
NLU62-US-S2	2/23/2005	90-95%	IR	metallic water surface, HC-like odor	90	moderate	abundant	yes	A
NLU62-US-S3	2/23/2005	0%	—	none	0	none	trace	none	C
NLU63-US-S1	2/23/2005	10-20%	IR	slight streaky sheen, H2S-like odor	25	faint	some	none	B
NLU63-US-S2	2/23/2005	5%	IR	small spotty sheen 2-3 mm	100	moderate	—	none	B
NLU63-US-S3	2/23/2005	5%	—	blebs 5-8 mm, dark black water color	—	—	—	—	C
NLU64-US-S1	2/23/2005	30-40%	IR	spotty sheen, dissipates quickly	0	none	none	none	B
NLU64-US-S2	2/23/2005	0%	—	none	—	—	—	—	C
NLU64-US-S3	2/23/2005	0%	—	none	0	very faint	none	none	B
NLU65-US-S1	2/23/2005	5-10%	—	dark black streaky sheen, strong HC-like odor	60	moderate	some	yes	A
NLU65-US-S2	2/23/2005	0%	—	no sheen or NAPL apparent, slight HC-like odor	60	very faint	trace	none	B
NLU65-US-S3	2/23/2005	0%	—	none	0	none	none	none	C
NLU66-US-S1	2/23/2005	10-15%	IR	streaky and dissipates quickly	50	faint	some	none	B
NLU68-US-S1	2/23/2005	10-20%	IR	streaky sheen, blebs 5 mm, dark black water color	75	faint	few	none	B
NLU68-US-S2	2/23/2005	5-10%	IR	streaky sheen, very dark black water color	65	very faint	none	none	C
NLU68-US-S3	2/23/2005	0%	—	none	0	none	none	none	C
NLU69-US-S1	2/23/2005	5-10%	IR	streaky sheen	30	faint	few	none	B
NLU69-US-S2	2/23/2005	100%	IR	metallic water surface, dark water	70	faint	few	none	B
NLU69-US-S3	2/23/2005	100%	IR	metallic water surface, streaky	50	faint	some	yes	A
NLU69-US-S4	2/23/2005	0%	—	none	0	none	none	none	C
NLU70-US-S1	2/23/2005	1-2%	IR	one small sheen, 5-6 mm	60	faint	few	possible	B
NLU70-US-S2	2/23/2005	1-5%	IR	one small sheen, 5-6 mm	75	faint	—	none	B
NLU70-US-S3	2/23/2005	0%	—	none	15	very faint	none	none	B
NLU70-US-S4	2/23/2005	0%	—	none	0	none	none	none	C
NLU72-US-S1/S2	2/23/2005	15%	—	streaky/spotty with black blebs up to 2 mm	100	faint	some	none	B
NLU72-US-S3	2/23/2005	0%	—	none	0	none	none	none	C
NLU73-US-S1	2/23/2005	10%	—	streaky/spotty with black blebs up to 2 mm	85	moderate	abundant	possible	B
NLU73-US-S2	2/23/2005	3%	—	streak/spotty with black blebs up to 1 mm	90	faint	very few	none	B
NLU73-US-S3	2/23/2005	0%	—	none	0	none	none	none	C
NLU74-US-S1	2/23/2005	60-70%	IR	streaky metallic water surface	40	moderate	few	possible	B
NLU74-US-S2	2/23/2005	0%	—	none	60	faint	few	none	B
NLU74-US-S3	2/23/2005	0%	—	none	60	very faint	none	none	B
NLU75-US-S1	2/23/2005	20-30%	IR	streak dissipates quickly	—	—	—	—	C
NLU75-US-S2	2/23/2005	1%	IR	very small, spotty sheen	—	—	—	—	C
NLU75-US-S3	2/23/2005	1%	IR	very small, spotty sheen	—	—	—	—	C
NLU75-US-S4	2/23/2005	0%	—	none	—	—	—	—	C
NLU75-US-S5	2/23/2005	0%	—	none	—	—	—	—	C
NLU78-US-S1A	2/23/2005	5-10%	—	streaky/spotty sheen up to 1 mm	85	faint	few	none	B
NLU78-US-S1B	2/23/2005	25%	IR	partially IR, streaky/spotty with black blebs up to 5 mm in water and on side of jar, streaks up to 60 mm	75	moderate	few	none	B
NLU78-US-S2	2/23/2005	3%	—	black blebs on sides of jar up to 1 mm, sheen dissipates after settling	85	moderate	moderate	possible	B
NLU81b-DC-S1	2/23/2005	—	—	—	0	none	none	none	C
NLU81b-DC-S2	2/23/2005	—	—	—	90	faint	few	none	B

Notes:

Sheen Test

% sheen - percentage of surface area of water covered by sheen

Sheen color - dark brown, IR (iridescent)

Comments - summary of observations

UV Test

% fluorescence - the percentage of the sample which displays 'matrix glow'

Flourescence - descriptors include none, very faint, faint, moderate, and bright

Specks (intensity) - descriptors include none, trace, few, some, abundant

NAPL is confirmed under regular light and by other criteria; greater than 5% sheen.

Class - A = NAPL is apparent; B = NAPL is suspected; C = no NAPL present



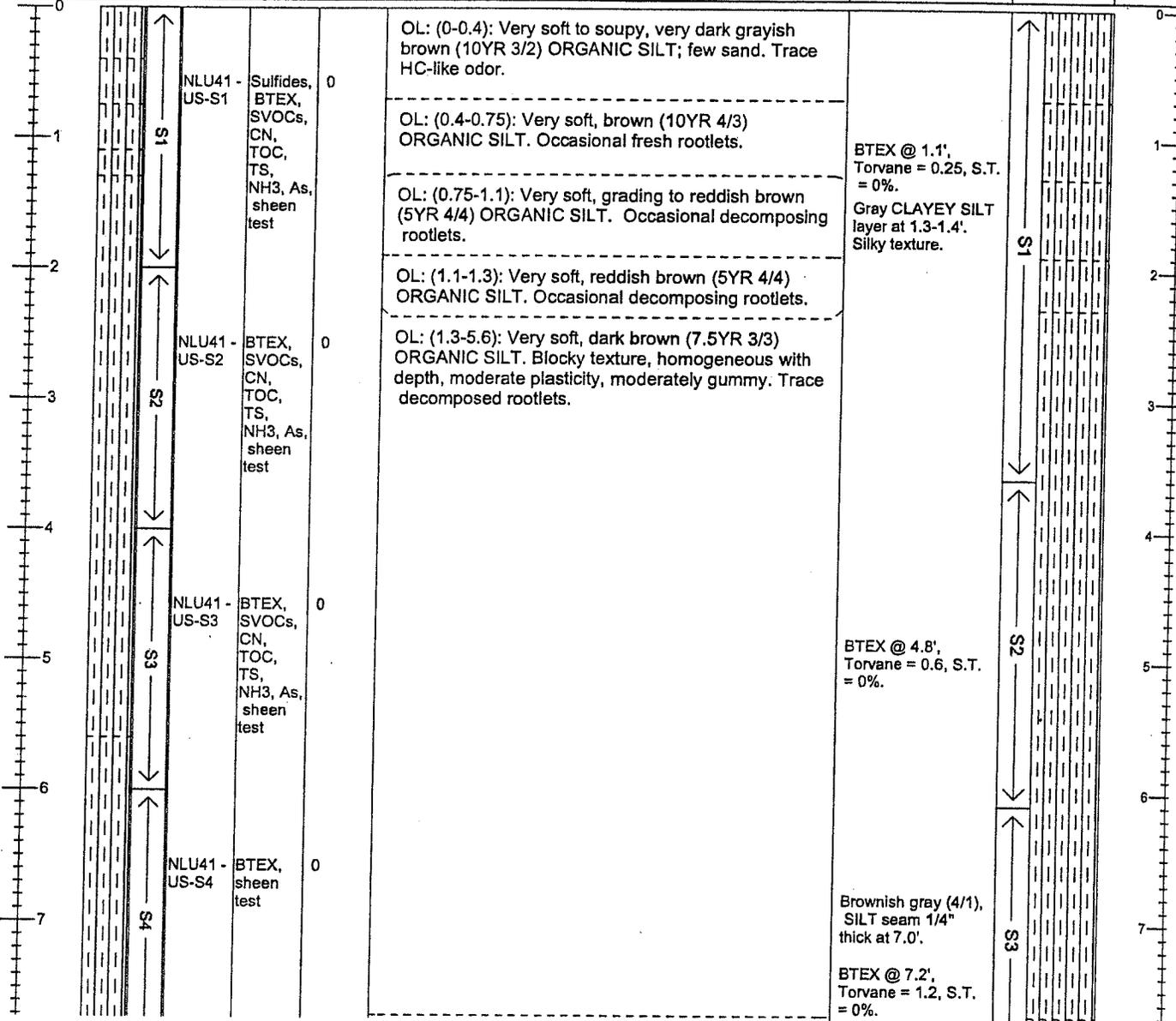
# Sediment Core Log

Sheet 1 of 2

Core: NLU41-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.1 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.07	Penetration Depth: 15.9 ft
Client: PSE	Water Depth (ft): 40.8	Sample Quality: Good
Collection Date: 12/14/2004	Mudline Elevation (ft): -20.73	Recovery In ft (%): 13.7 (86)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 37.51898 E./LONG: 122 20 14.72398	Process Date: 12/14/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2.	<b>Calculated Recovery</b> Sample Length/Penetration Length: 13.7/15.9 = 86 %
	No odor/sheen unless otherwise noted.	

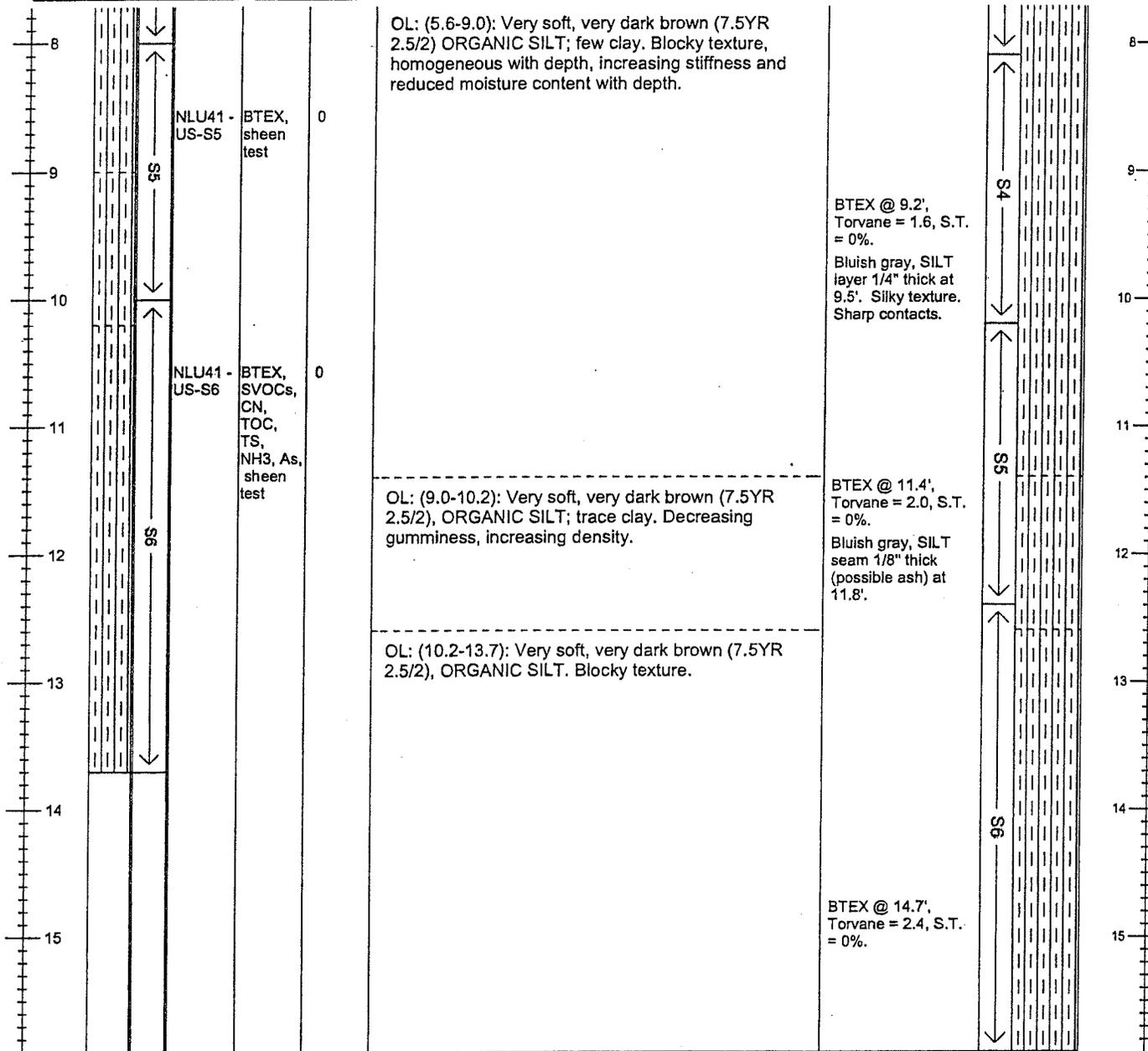


# Sediment Core Log

Sheet 2 of 2

Core: NLU41-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2.	<b>Calculated Recovery</b> Sample Length/Penetration Length:
	No odor/sheen unless otherwise noted.	13.7/ 15.9 = 86 %

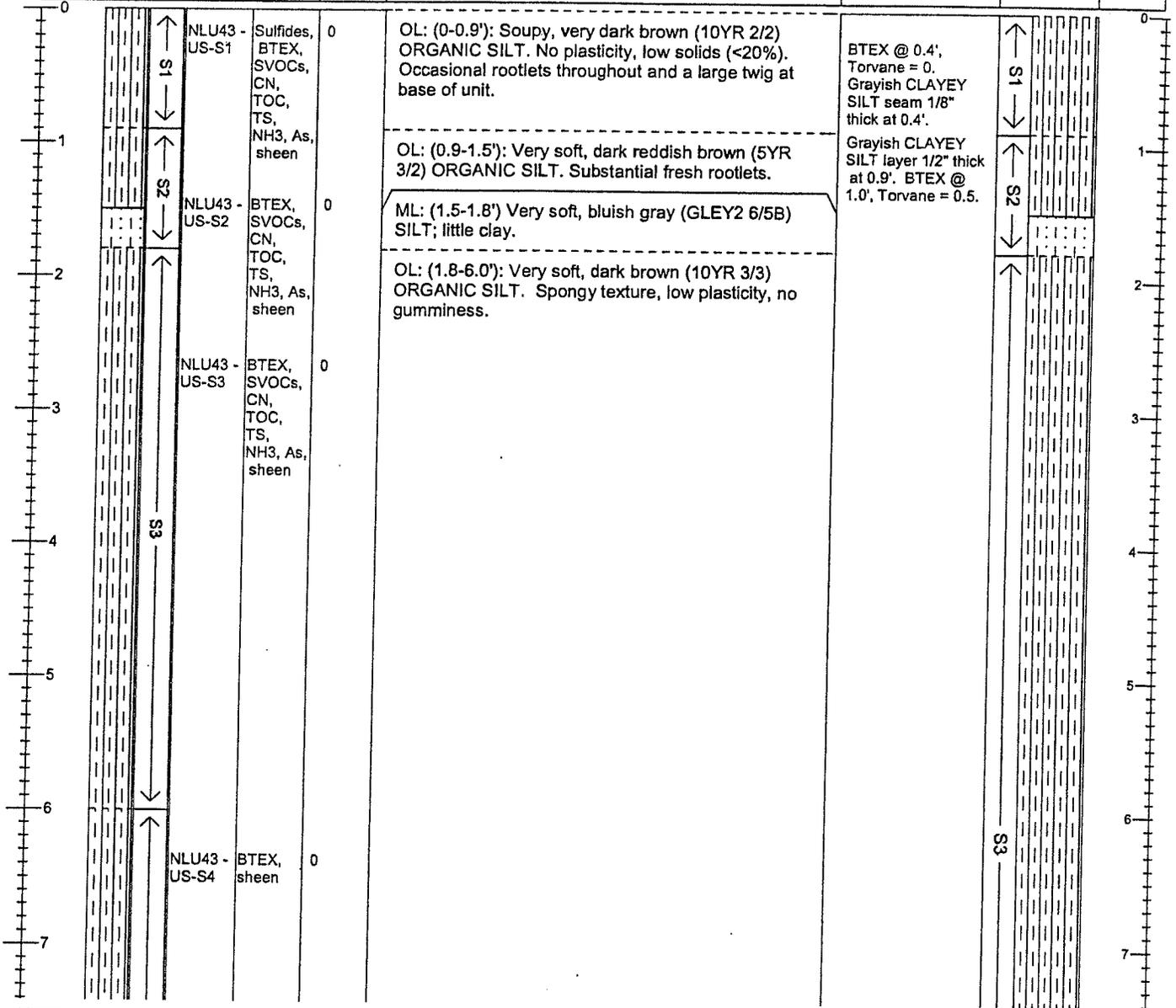


# Sediment Core Log

Core: NLU43-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 16.3 ft
Client: PSE	Water Depth (ft): 40.0	Sample Quality: Good
Collection Date: 12/14/2004	Mudline Elevation (ft): -19.91	Recovery in ft (%): 10.1 (62)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 33.83726 E./LONG: 122 20 14.70514	Process Date: 12/15/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description	Comments	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
					<b>Sediment Description</b> Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded			



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 Seattle, WA 98134-1162  
 Phone: (206) 624-9349  
 Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Core catcher removed, weight sinks into bottom 0.6 ft. No odor/sheen observed throughout core.

Calculated Recovery  
 Sample Length/Penetration Length:  
 10.1/16.3 = 62 %

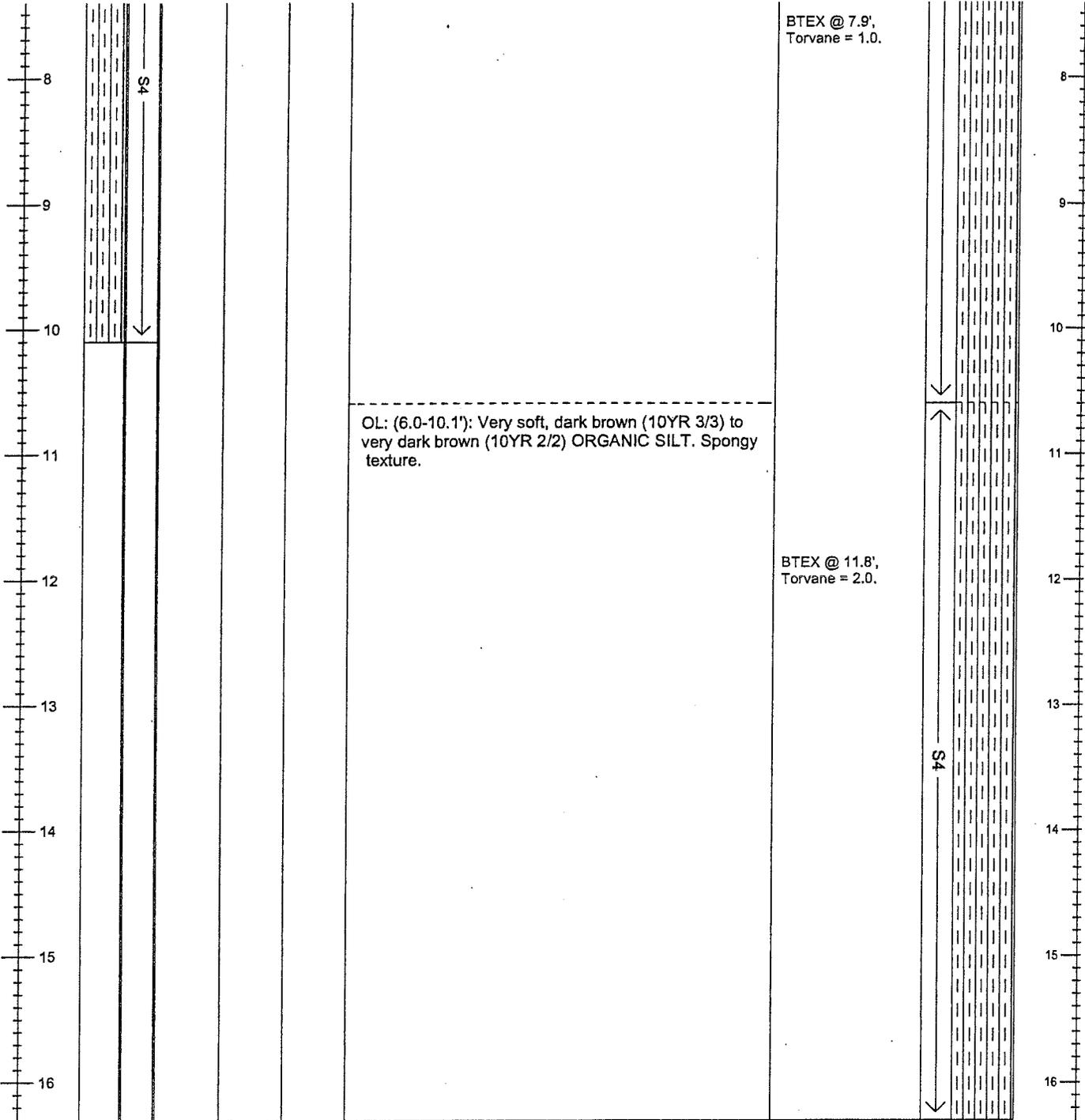


# Sediment Core Log

Sheet 2 of 2

Core: NLU43-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
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Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Core catcher removed, weight sinks into bottom 0.6 ft. No odor/sheen observed throughout core.

Calculated Recovery  
Sample Length/Penetration Length:  
10.1/16.3 = 62 %



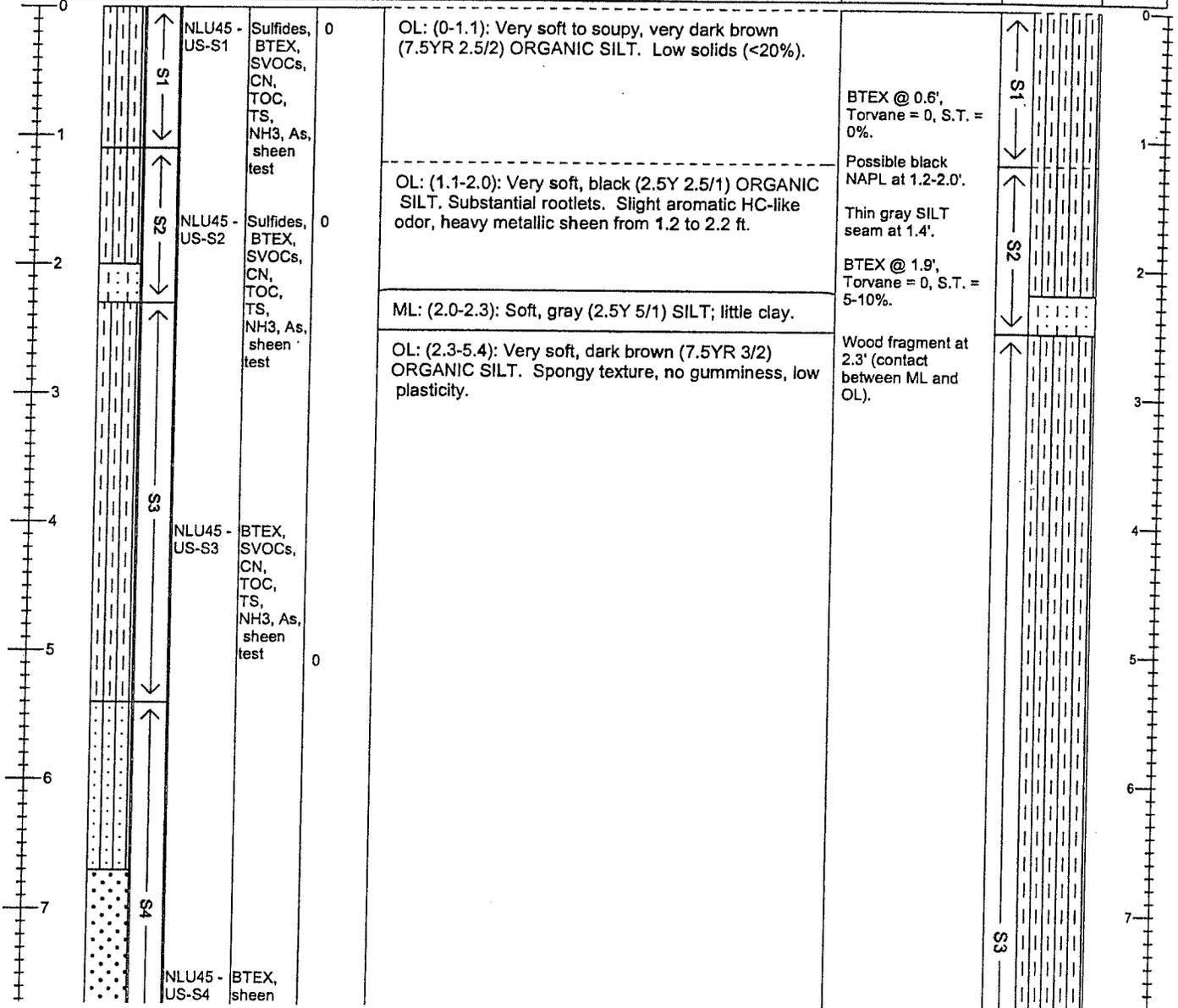
# Sediment Core Log

Sheet 1 of 2

Core: NLU45-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.6 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 16.4 ft
Client: PSE	Water Depth (ft): 41.7	Sample Quality: Good
Collection Date: 12/14/2004	Mudline Elevation (ft): -21.61	Recovery in ft (%): 8.6 (52)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 36.57704 E./LONG: 122 20 09.05856	Process Date: 12/15/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

**Remarks:** Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Core catcher removed, weight sinks into bottom 0.7 ft. No odor/sheen unless otherwise noted.

**Calculated Recovery**  
Sample Length/Penetration Length:  
8.6 / 16.4 = 52 %

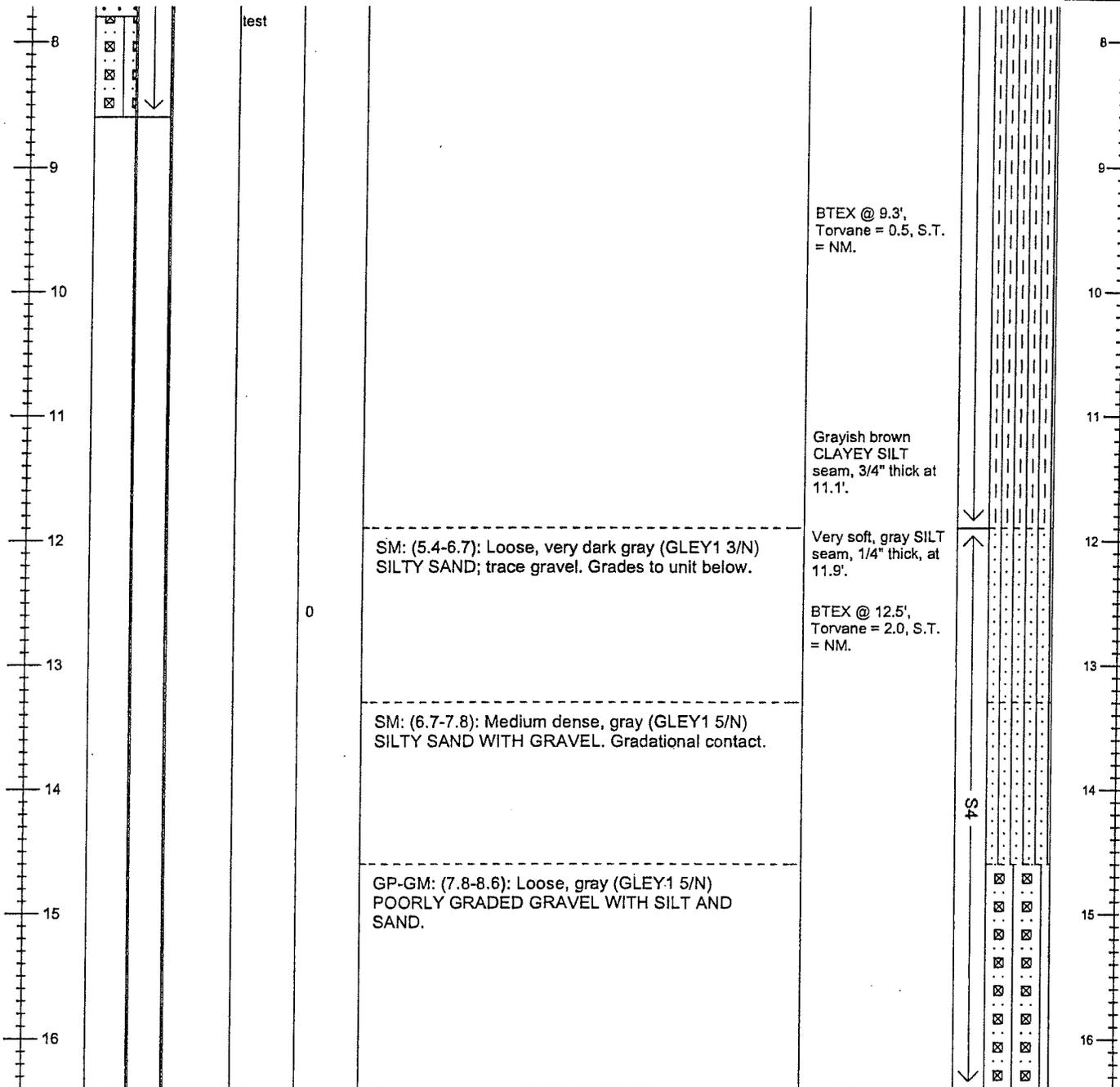


# Sediment Core Log

Sheet 2 of 2

Core: NLU45-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
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The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Remarks: <u>Large vane used in Torvane measurements, multiply</u>	Calculated Recovery
	<u>results by 0.2 kg/cm2. Core catcher removed, weight sinks</u> into bottom 0.7 ft. No odor/sheen unless otherwise noted.	Sample Length/Penetration Length: 8.6 / 16.4 = 52 %



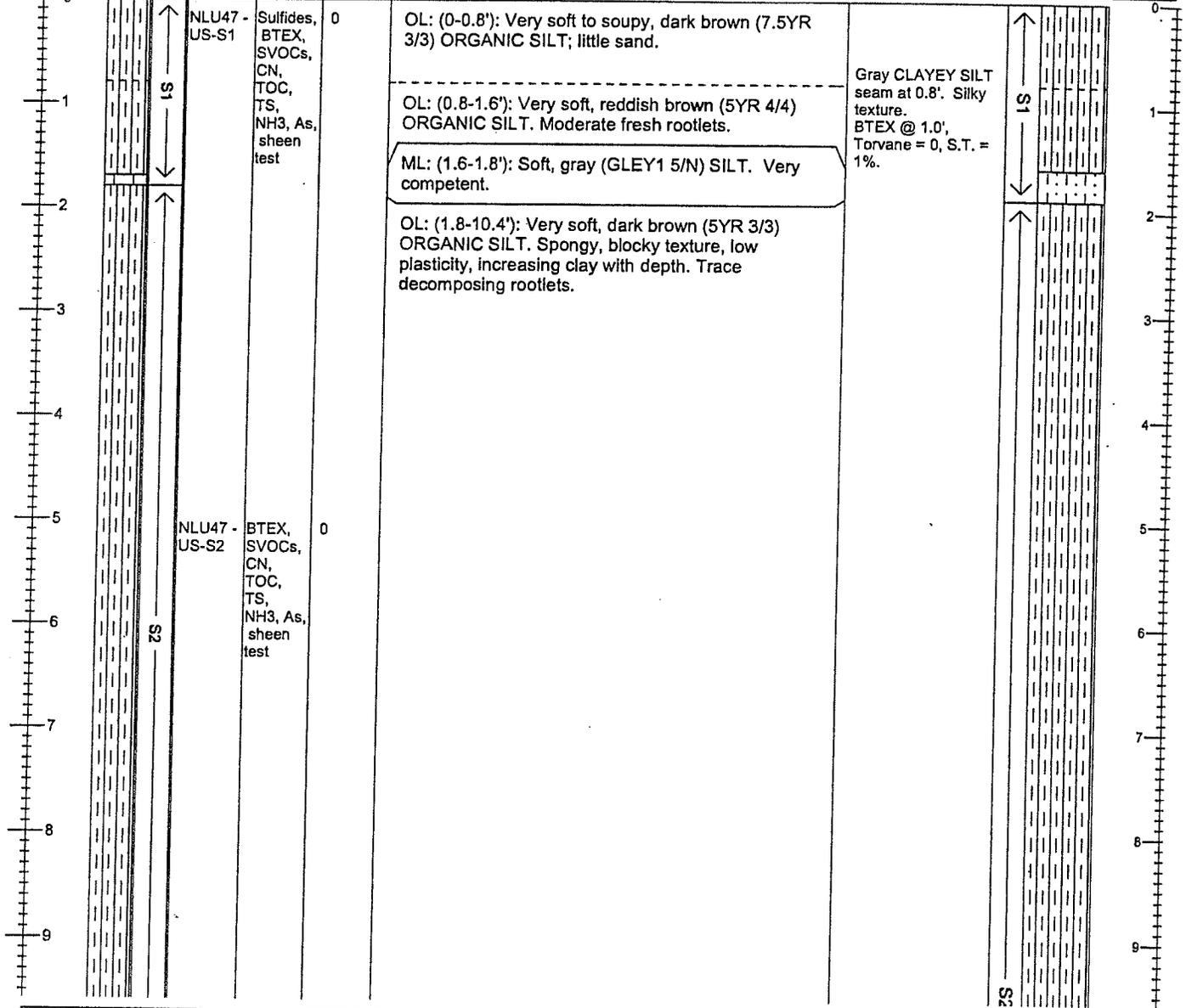
# Sediment Core Log

Sheet 1 of 2

Core: NLU47-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 21.0 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.08	Penetration Depth: 20.0 ft
Client: PSE	Water Depth (ft): 43.0	Sample Quality: Good
Collection Date: 12/17/2004	Mudline Elevation (ft): -22.92	Recovery in ft (%): 12.5 (63)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 33.72558 E./LONG: 122 20 03.71786	Process Date: 12/18/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: LBM, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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 Seattle, WA 98134-1162  
 Phone: (206) 624-9349  
 Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Weight sinks into bottom 0.7 ft.  
No odor/sheen observed throughout core.

Calculated Recovery  
 Sample Length/Penetration Length:  
 12.5/20.0 = 63 %

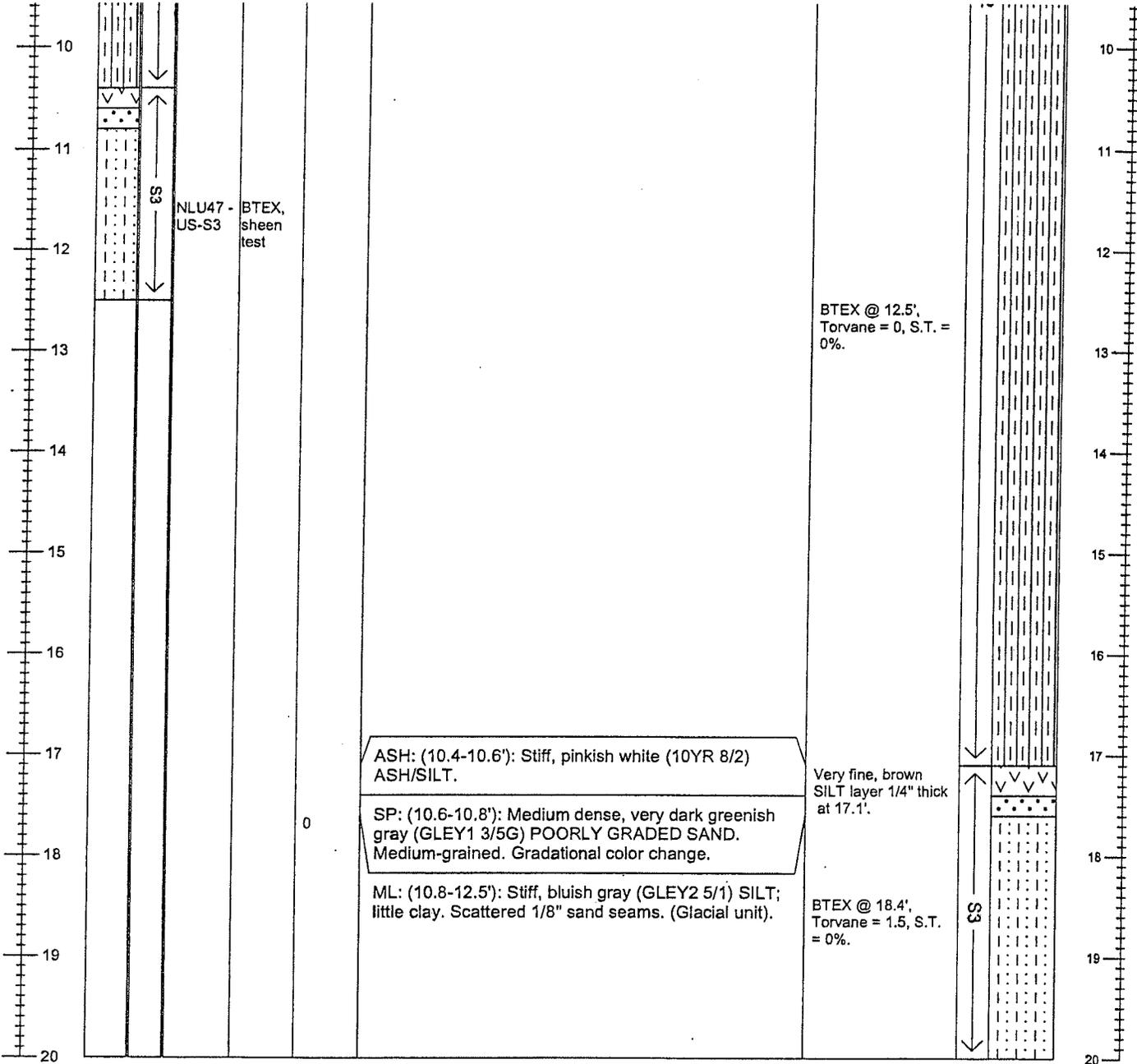


# Sediment Core Log

Sheet 2 of 2

Core: NLU47-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
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The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Weight sinks into bottom 0.7 ft.  
No odor/sheen observed throughout core.

Calculated Recovery  
Sample Length/Penetration Length:  
12.5/20.0 = 63 %



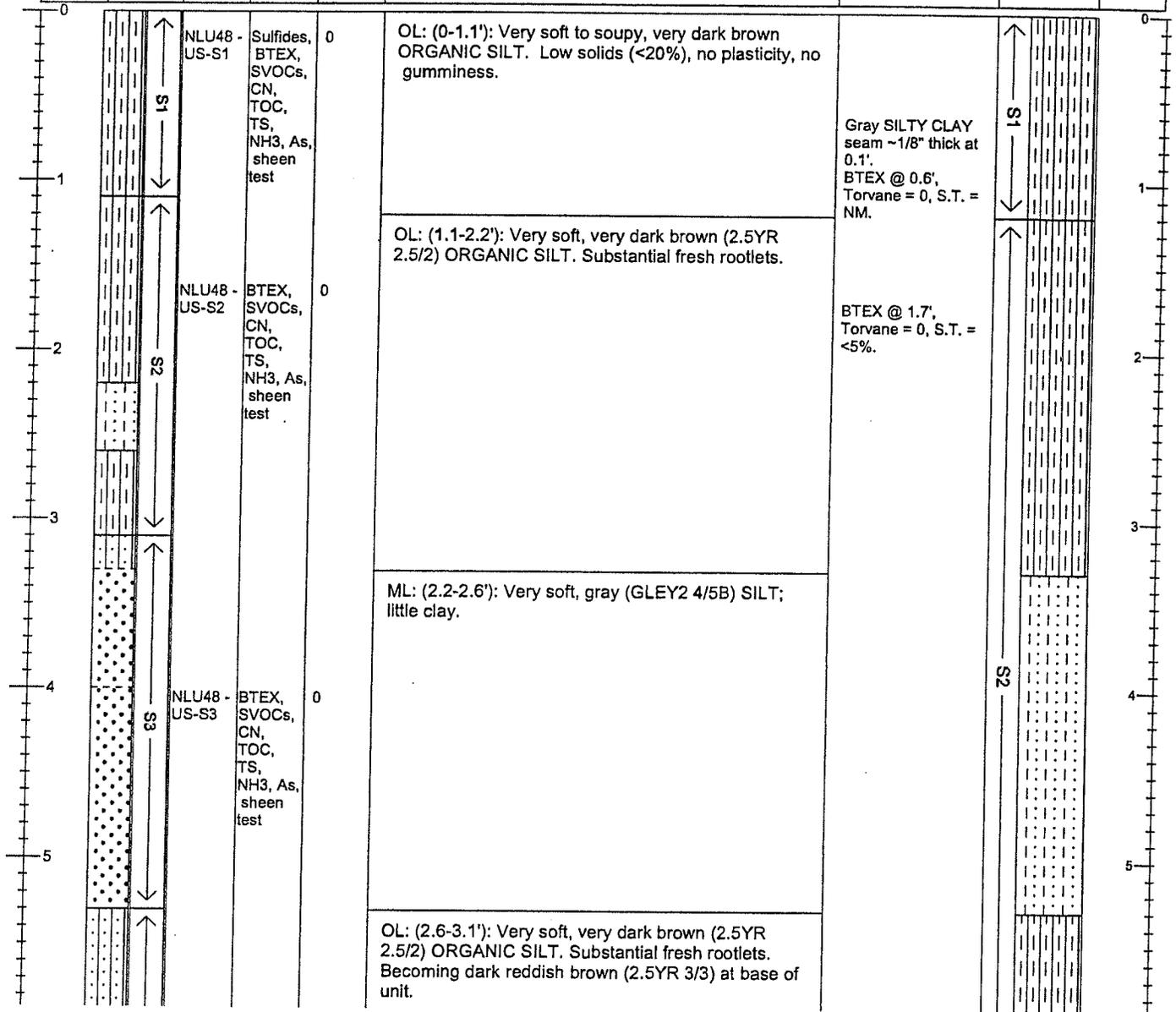
# Sediment Core Log

Sheet 1 of 2

Core: NLU48-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 9.9 ft
Client: PSE	Water Depth (ft): 40.7	Sample Quality: Good
Collection Date: 12/15/2004	Mudline Elevation (ft): -20.61	Recovery in ft (%): 6.7 (67)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 36.44505 E./LONG: 122 20 02.59860	Process Date: 12/15/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB, BHH

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Tape sinks into bottom 0.7 ft.  
No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
6.7 / 9.9 = 67 %



# Sediment Core Log

Sheet 2 of 2

Core: NLU48-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
6	S4	NLU48 - US-S4	BTEX, SVOCs, CN, TOC, TS, NH3, As, sheen test			NAPL in sandy layer at 6-7.8'.  Soft, gray SILTY CLAY layer 1/2" thick at 6.4'. Silky texture.		6
7					SM: (3.1-3.3'): Medium dense, dark gray (5YR 3/1) SILTY SAND; trace gravel. Slight aromatic HC-like odor. Grades into unit below.			7
					SM: (3.3-4.0'): Medium dense, dark gray (5YR 3/1) SILTY SAND WITH GRAVEL. Trace aromatic HC-like odor. Grades into unit below.	BTEX @ 7.0', Torvane = 2.0, S.T. = 80%.	S3	
8					SP: (4.0-5.3'): Very dense, gray (GLE2 5/5BG) POORLY GRADED SAND WITH GRAVEL; little silt. Gravel up to 1.5" and subrounded. Slight HC-like odor.			8
					SM: (5.3-6.7'): Dense, gray (GLE2 5/10BG), interbedded SAND and SILT. Interbeds ~0.75" to 1.25" thick. Sand is medium grained. No gravel below 9'.	BTEX @ 9.0', Torvane = 3.0, S.T. = 0%.	S4	9

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Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Tape sinks into bottom 0.7 ft.  
No odor/sheen unless otherwise noted.

**Calculated Recovery**  
Sample Length/Penetration Length:  
6.7 / 9.9 = 67 %

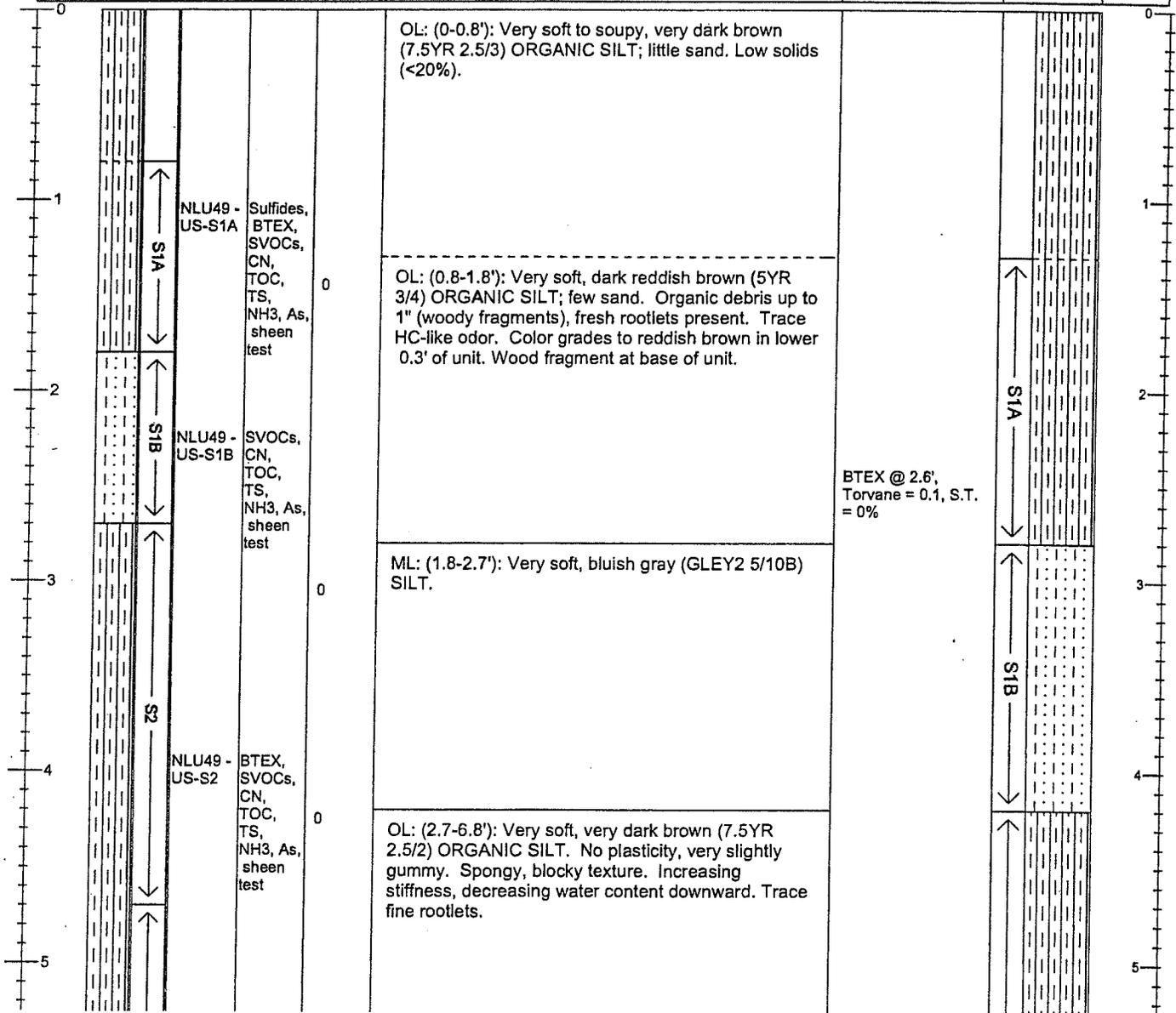


# Sediment Core Log

Core: NLU49-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 10.7 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.07	Penetration Depth: 10.1 ft
Client: PSE	Water Depth (ft): 45.6	Sample Quality: Good
Collection Date: 12/13/2004	Mudline Elevation (ft): -25.53	Recovery in ft (%): 6.8 (67)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 35.63192 E./LONG: 122 19 58.38304	Process Date: 12/14/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Remarks: Large vane used in Torvane measurements, multiply

results by 0.2 kg/cm2. Tape weight sinks into bottom 0.5 ft.

No odor/sheen unless otherwise noted.

Calculated Recovery

Sample Length/Penetration Length:

6.8 / 10.1 = 67 %

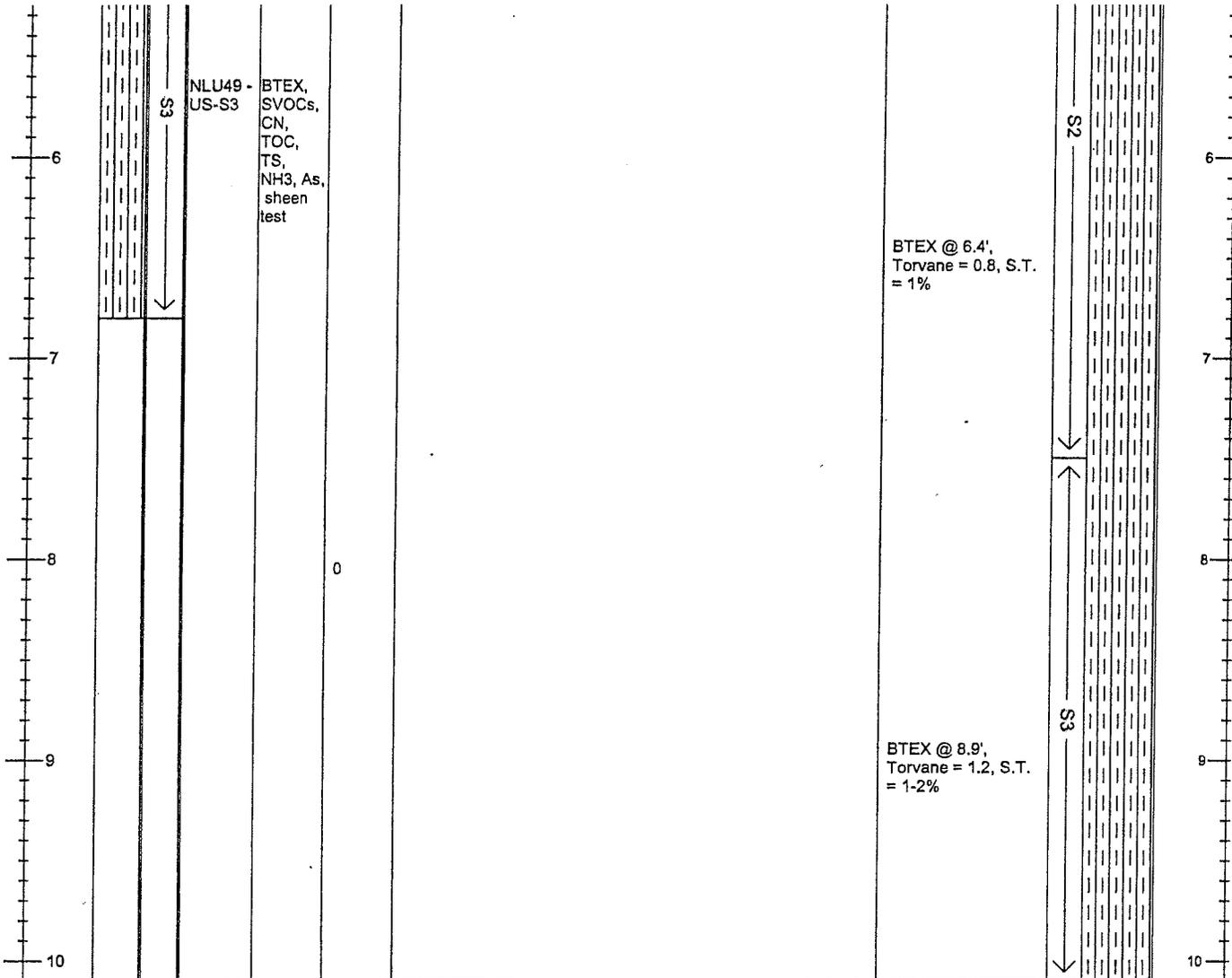


# Sediment Core Log

Sheet 2 of 2

Core: NLU49-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
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<p>The RETEC Group, Inc.          1011 SW Klickitat Way, Suite 207          Seattle, WA 98134-1162          Phone: (206) 624-9349          Fax: (206) 624-2839</p>	<p>Remarks: <u>Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Tape weight sinks into bottom 0.5 ft.</u></p> <p><u>No odor/sheen unless otherwise noted.</u></p>	<p><b>Calculated Recovery</b>          Sample Length/Penetration Length:          6.8 / 10.1 = 67 %</p>
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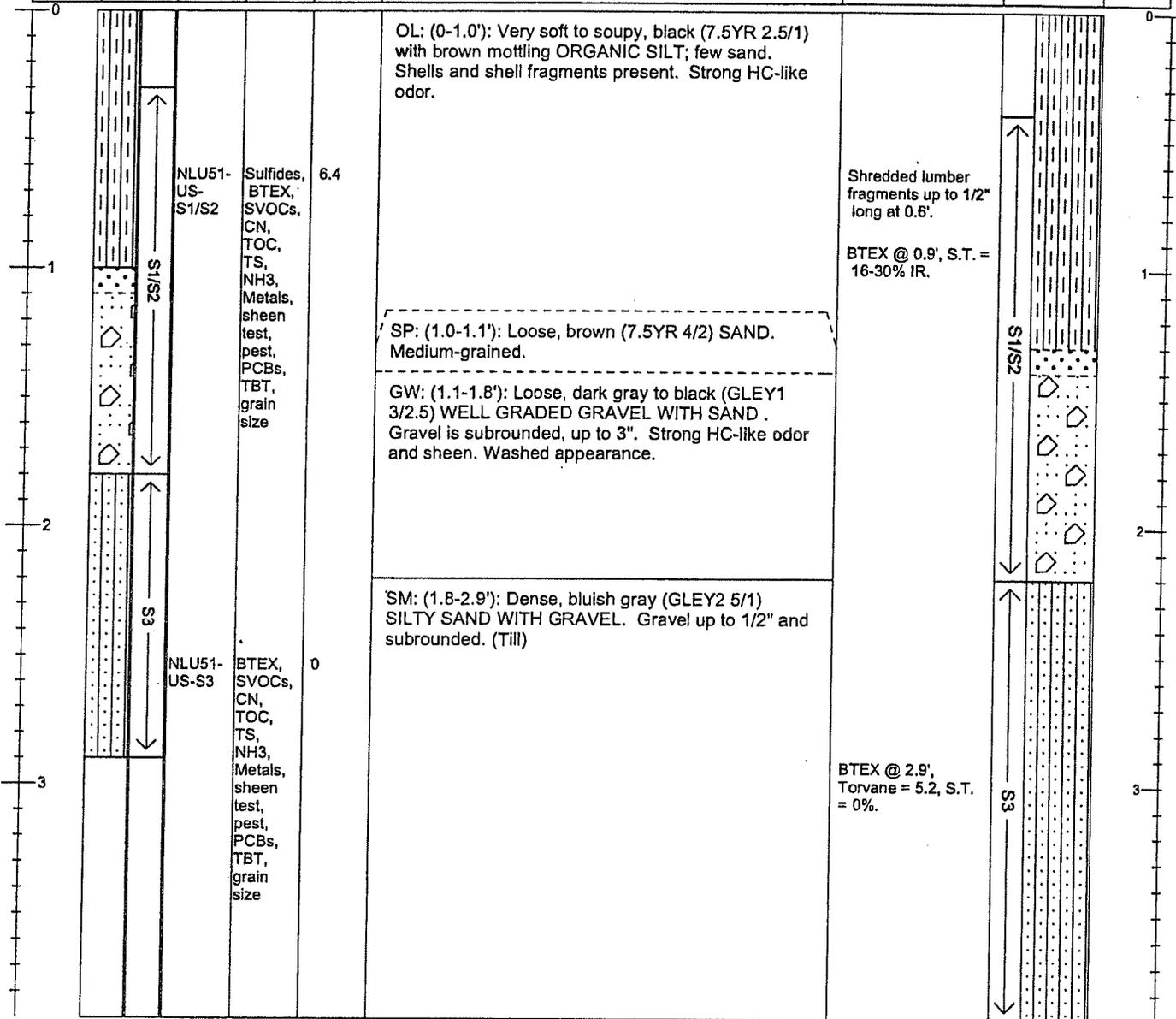
# Sediment Core Log

Sheet 1 of 1

Core: NLU51-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 3.9 ft
Client: PSE	Water Depth (ft): 16.0	Sample Quality: Good
Collection Date: 12/19/2004	Mudline Elevation (ft): 4.09	Recovery in ft (%): 2.9 (74)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 38.83606 E./LONG: 122 20 02.43388	Process Date: 12/20/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: LBM, AGF, BHH

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Phone: (206) 624-9349  
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**Remarks:** Large vane used in Torvane measurements, multiply results by 0.2 kg/cm<sup>2</sup>. Bottom sand and gravel, driven to refusal. No odor/sheen unless otherwise noted.

**Calculated Recovery**  
Sample Length/Penetration Length:  
2.9 / 3.9 = 74 %

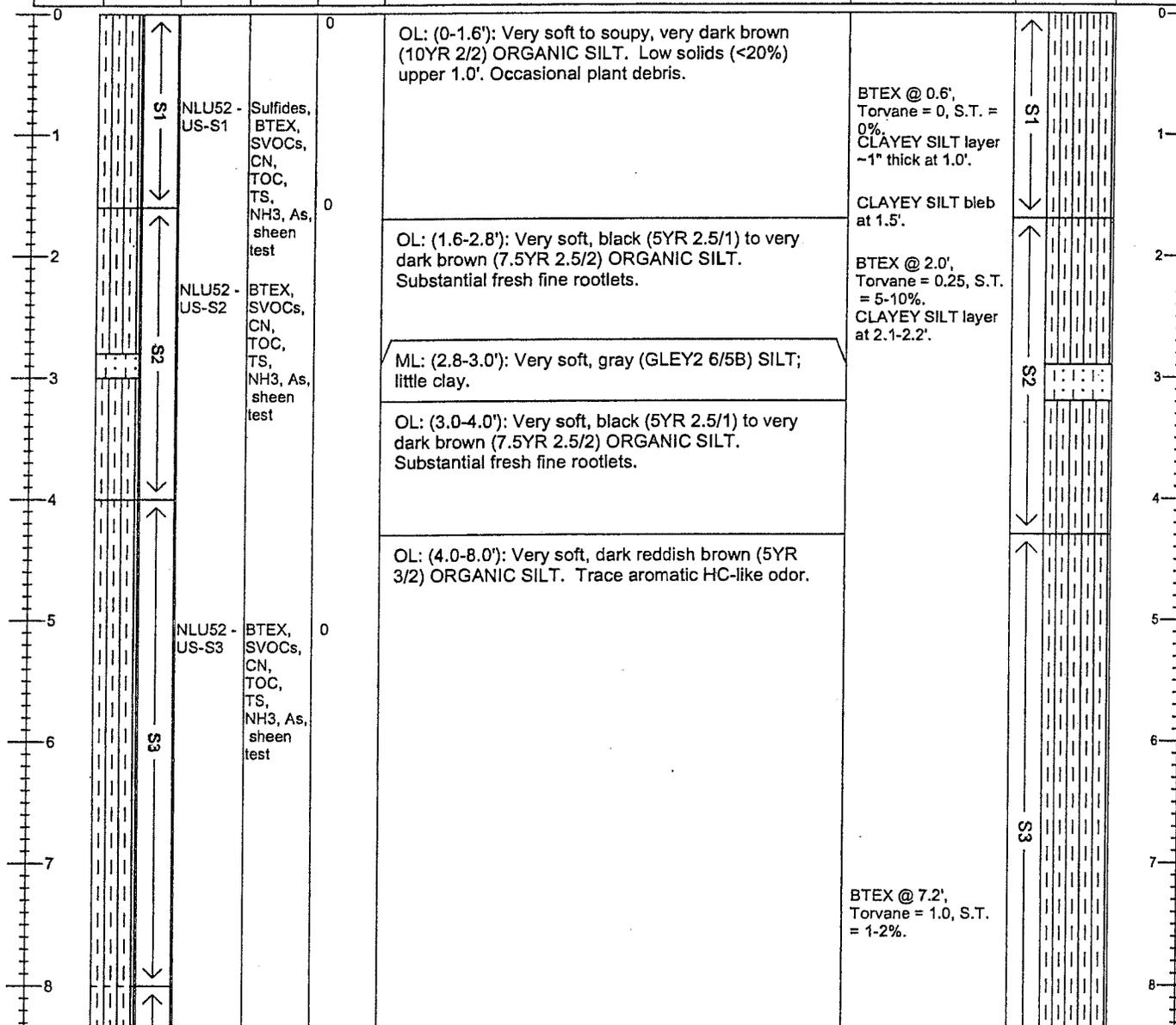


# Sediment Core Log

Core: NLU52-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.6 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.07	Penetration Depth: 16.4 ft
Client: PSE	Water Depth (ft): 38.3	Sample Quality: Good
Collection Date: 12/13/2004	Mudline Elevation (ft): -18.23	Recovery in ft (%): 13.5 (82)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 44.25878 E./LONG: 122 19 53.92825	Process Date: 12/15/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Remarks: Large vane used in Torvane measurements, multiply Calculated Recovery  
results by 0.2 kg/cm2. Tape weight sinks into bottom 0.5 ft. Core Sample Length/Penetration Length:  
tube 10 degrees off of vertical. No odor/sheen unless otherwise noted. 13.5/16.4 = 82 %

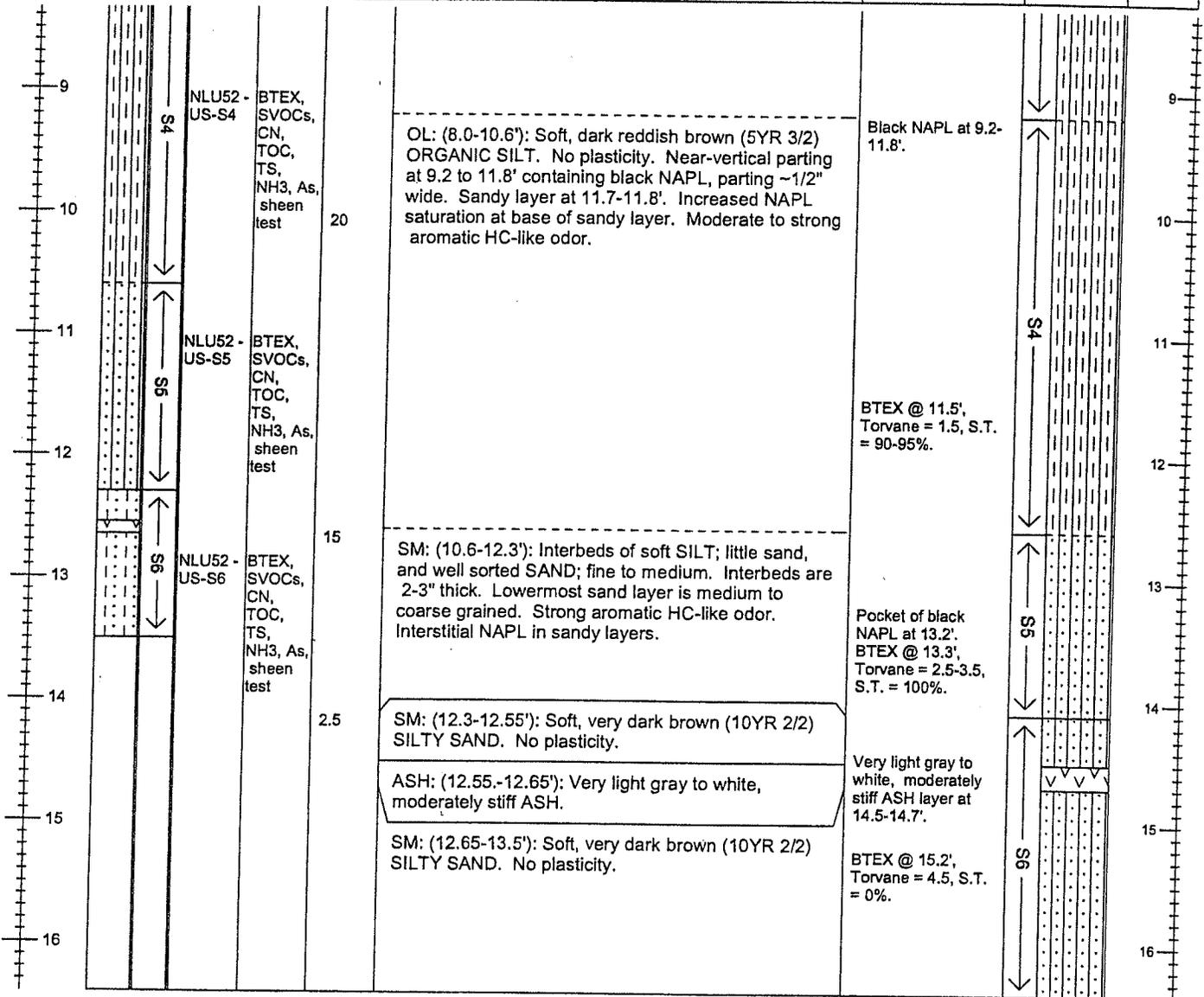


# Sediment Core Log

Sheet 2 of 2

Core: NLU52-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
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Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Tape weight sinks into bottom 0.5 ft. Core tube 10 degrees off of vertical. No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
13.5/16.4 = 82 %



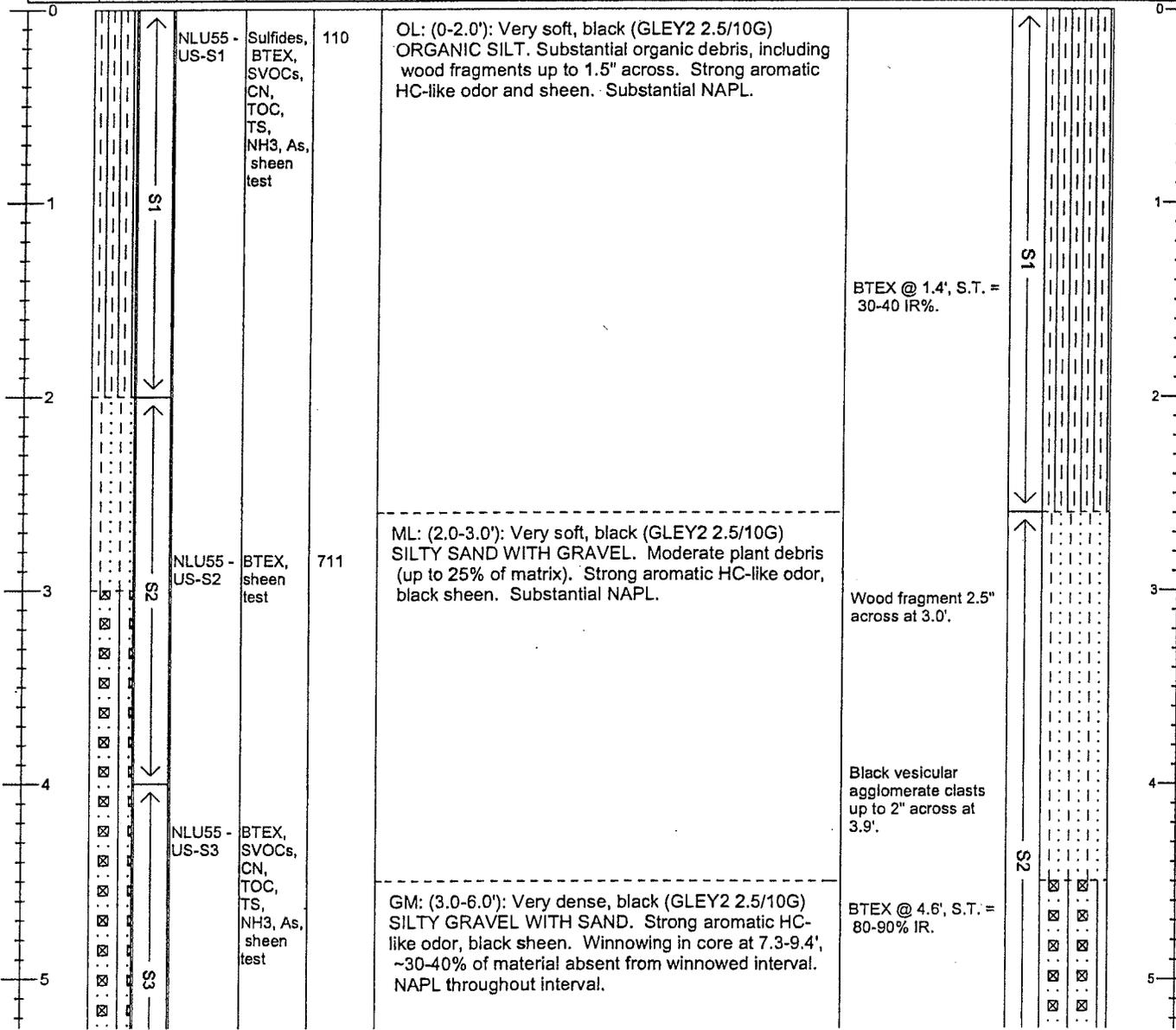
# Sediment Core Log

Sheet 1 of 2

Core: NLU55-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 10.5 ft
Client: PSE	Water Depth (ft): 12.4	Sample Quality: Fair
Collection Date: 12/15/2004	Mudline Elevation (ft): 7.69	Recovery in ft (%): 6.4 (61)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 44.62536 E./LONG: 122 19 57.57602	Process Date: 12/16/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB, BHH

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Remarks: Torvane measurements not collected.  
Surface dark gray fluffy silt.  
No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:  
 6.4 / 10.5 = 61 %



# Sediment Core Log

Sheet 2 of 2

Core: NLU55-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
6.0	S4	NLU55-US-S4	BTEX, SVOCs, CN, TOC, TS, NH3, As, sheen test	125				6.0
6.9						BTEX @ 6.9', S.T. = 100% IR.	S3	6.9
6.0 - 6.4				54	SM: (6.0-6.4'): Loose, black (GLEY2 3/BG) SILTY SAND; few gravel. Slight aromatic HC-like odor.	BTEX @ 10.0', S.T. = 90-95% IR.  Black NAPL present along edge of core, may have seeped down core tube from above.	S4	10.0

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Remarks: Torvane measurements not collected.

Surface dark gray fluffy silt.

No odor/sheen unless otherwise noted.

Calculated Recovery

Sample Length/Penetration Length:

6.4 / 10.5 = 61 %



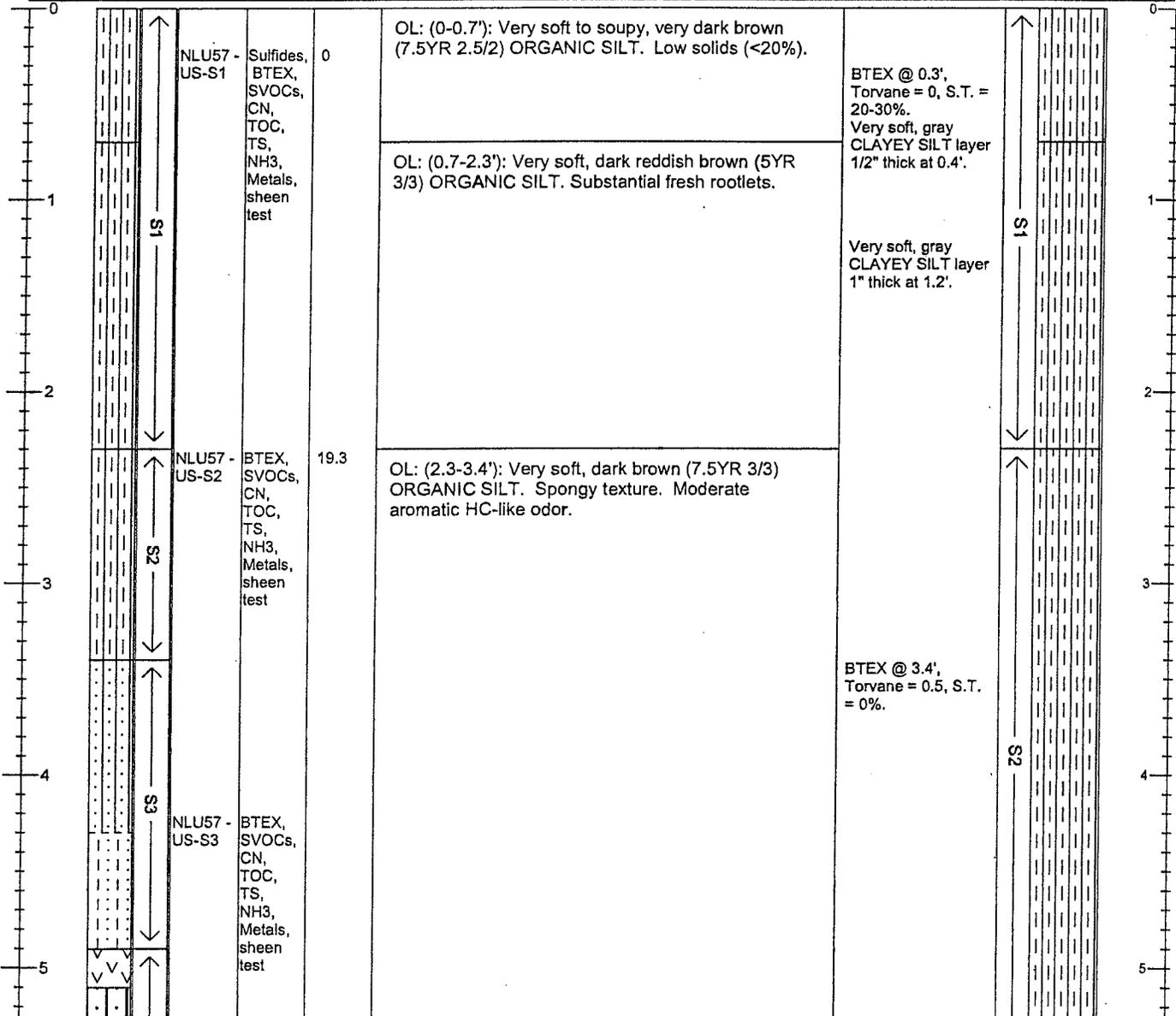
# Sediment Core Log

Sheet 1 of 2

Core: NLU57-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.6 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 11.6 ft
Client: PSE	Water Depth (ft): 37.2	Sample Quality: Good
Collection Date: 12/15/2004	Mudline Elevation (ft): -17.11	Recovery in ft (%): 7.5 (65)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 45.29379 E./LONG: 122 19 54.79068	Process Date: 12/16/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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The RETEC Group, Inc.  
 1011 SW Klickitat Way, Suite 207  
 Seattle, WA 98134-1162  
 Phone: (206) 624-9349  
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Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Driven to refusal.  
 No odor/sheen unless otherwise noted.

Calculated Recovery  
 Sample Length/Penetration Length:  
 7.5 / 11.6 = 65 %

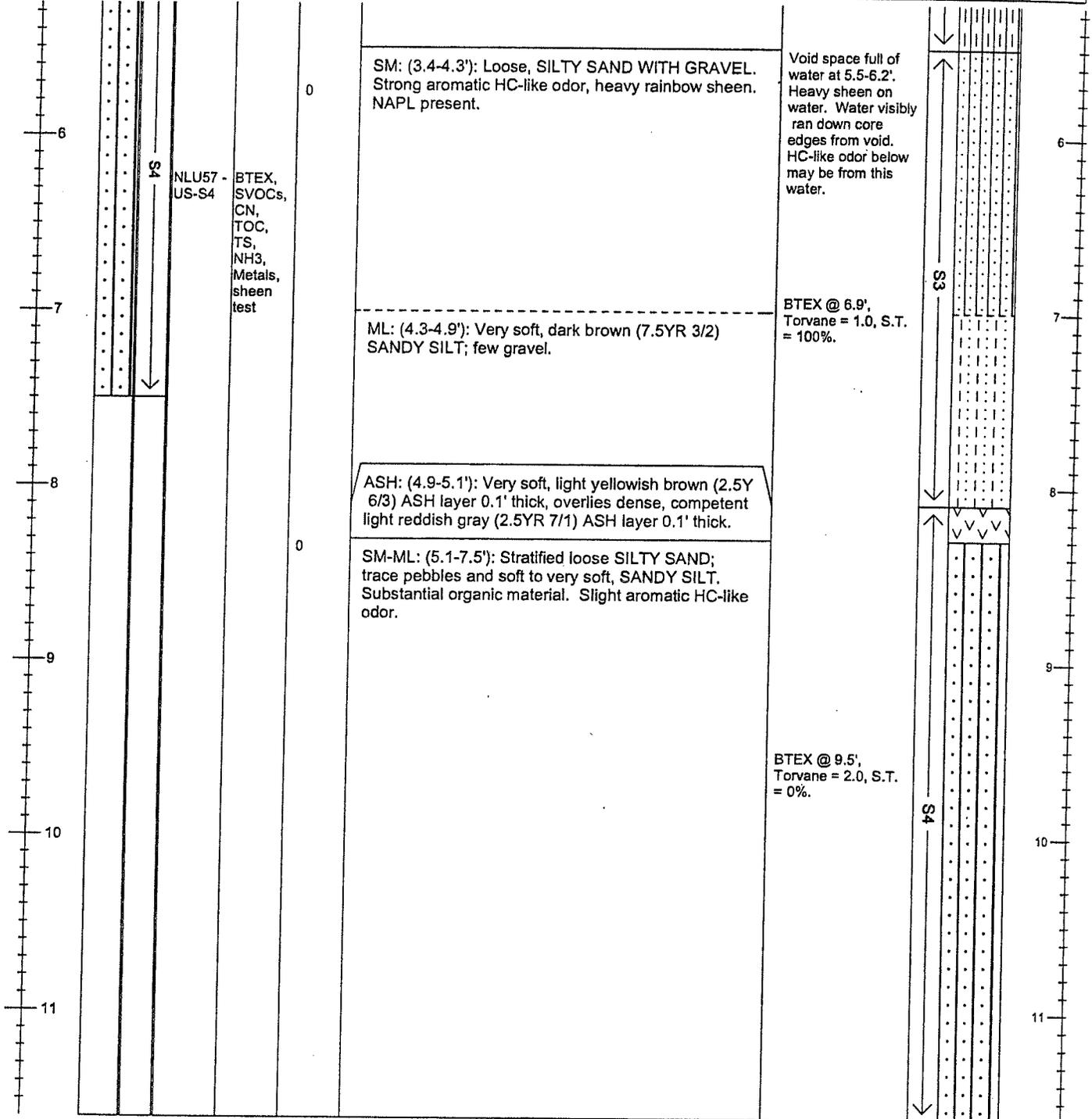


# Sediment Core Log

Sheet 2 of 2

Core: NLU57-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
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Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Driven to refusal.  
No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
7.5 / 11.6 = 65 %



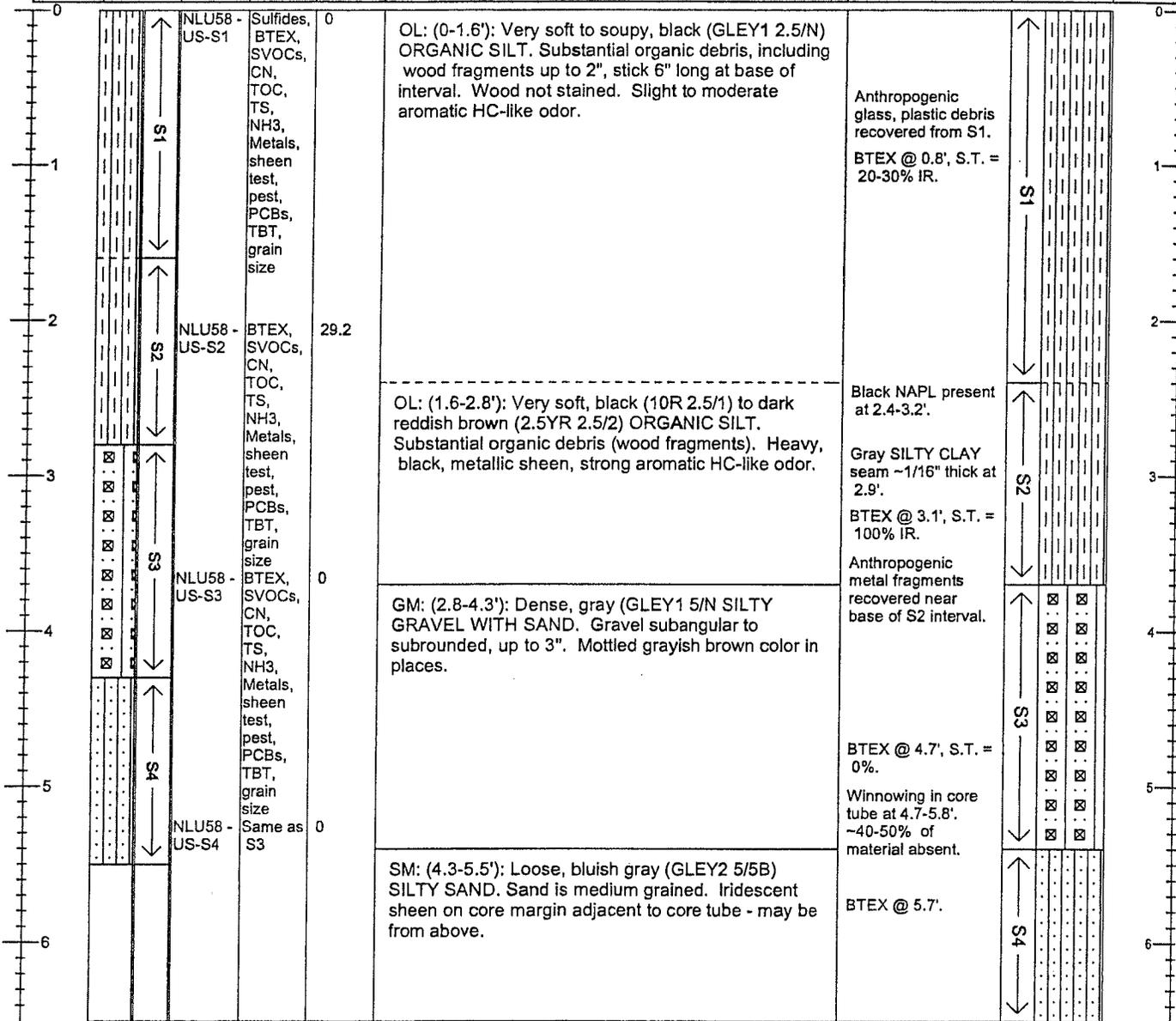
# Sediment Core Log

Sheet 1 of 1

Core: NLU58-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.6 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 6.5 ft
Client: PSE	Water Depth (ft): 5.5	Sample Quality: Good/Fair
Collection Date: 12/15/2004	Mudline Elevation (ft): 14.59	Recovery in ft (%): 5.5 (85)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 48.66796 E./LONG: 122 19 57.92629	Process Date: 12/16/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB, BHH

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Remarks: Torvane measurements not collected.

Driven to refusal.

No odor/sheen unless otherwise noted.

Calculated Recovery

Sample Length/Penetration Length:

5.5 / 6.5 = 85 %



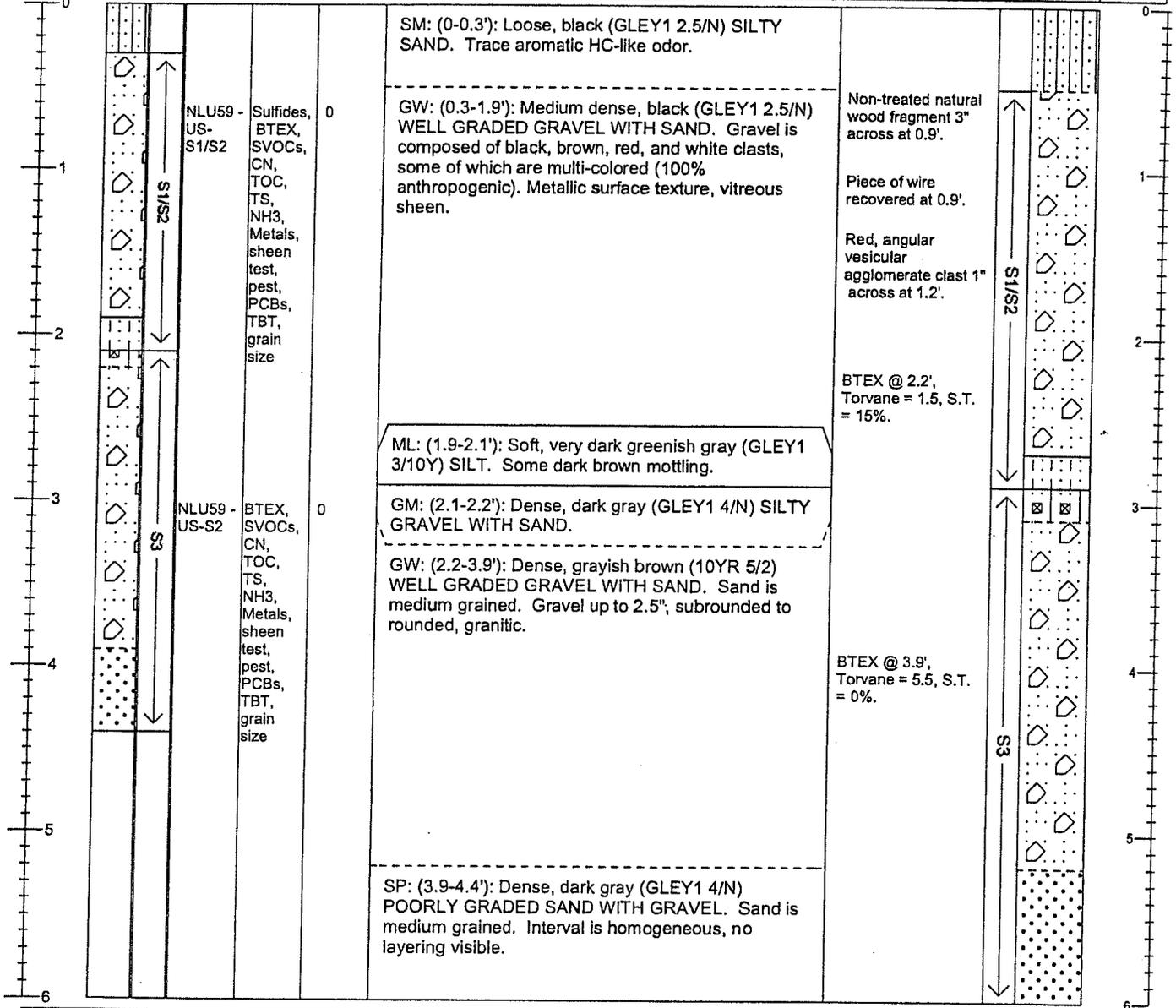
# Sediment Core Log

Sheet 1 of 1

Core: NLU59-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.08	Penetration Depth: 6.0 ft
Client: PSE	Water Depth (ft): 9.7	Sample Quality: Good
Collection Date: 12/17/2004	Mudline Elevation (ft): 10.38	Recovery in ft (%): 4.4 (73)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 47.67608 E./LONG: 122 19 56.78752	Process Date: 12/18/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: LBM, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Remarks: <u>Large vane used in Torvane measurements, multiply</u>	<b>Calculated Recovery</b> Sample Length/Penetration Length: 4.4 / 6.0 = 73 %
	<u>results by 0.2 kg/cm2. Surface is fairly firm with silt over sandy</u>	
	<u>angular gravel. Driven to refusal. No odor/sheen unless otherwise noted.</u>	

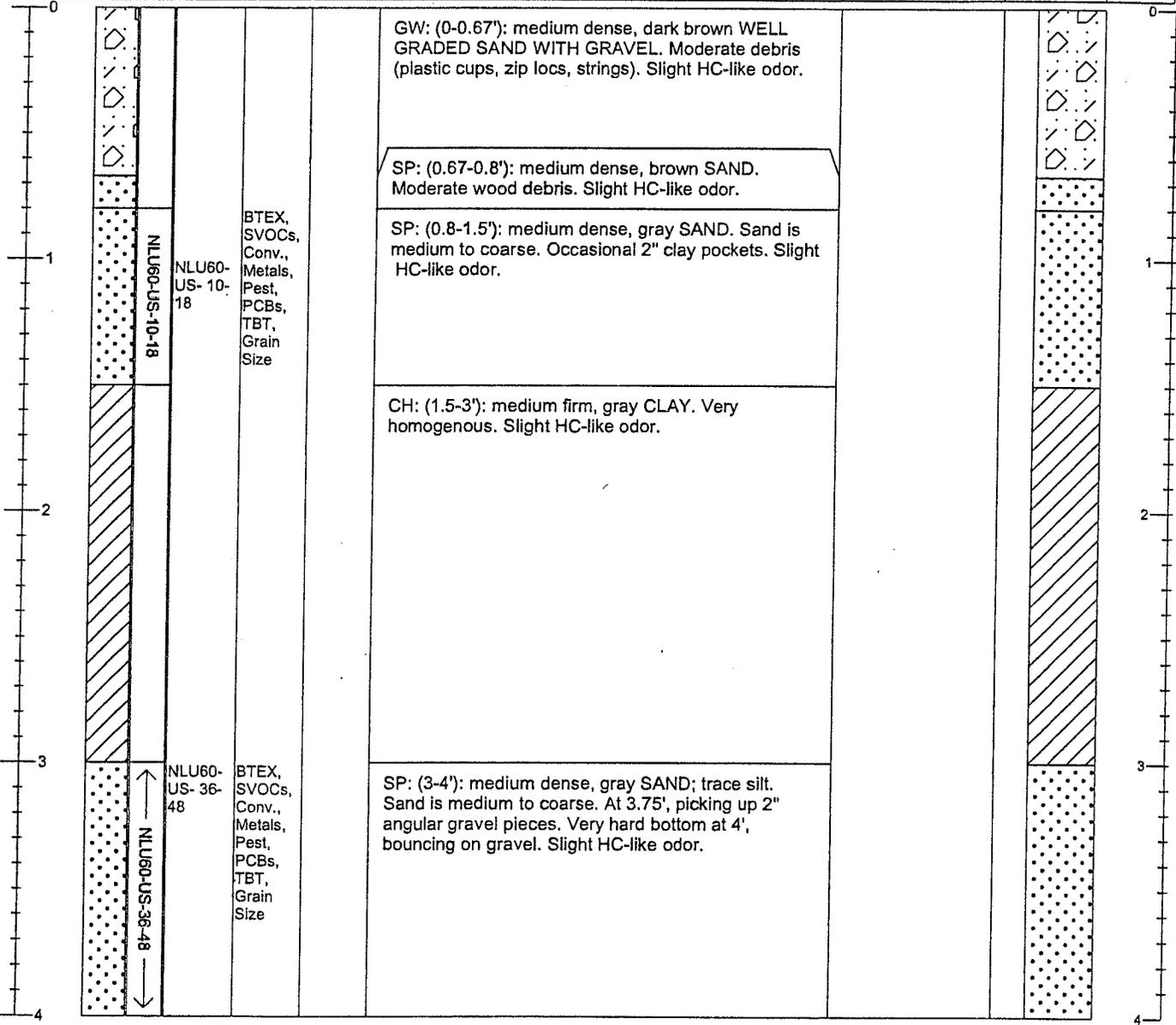


# Sediment Core Log

Sheet 1 of 1

Core: NLU60-US

Project: NLU Phase 3		Water Body Type: Lake	Tube Length: NA					
Project #: PSE10-18064-430		SW Elevation (ft)/Tide:	Penetration Depth: 4					
Client: PSE		Water Depth (ft): On shore	Sample Quality: Good					
Collection Date: 3/7/05		Mudline Elevation (ft): 20.6	Recovery in ft (%): 100					
Contractor: RETEC		N./LAT: 47 38 40.92 E./LONG: 122 20 01.35	Process Date: 03/07/05					
Vessel: Sampled on shore		Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Extrude					
Operator: NA		Method/Tube ID: Hand auger	Logged By: Nick Bacher					
Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)



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Remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Calculated Recovery  
Sample Length/Penetration Length:  
4 / 4 = 100 %



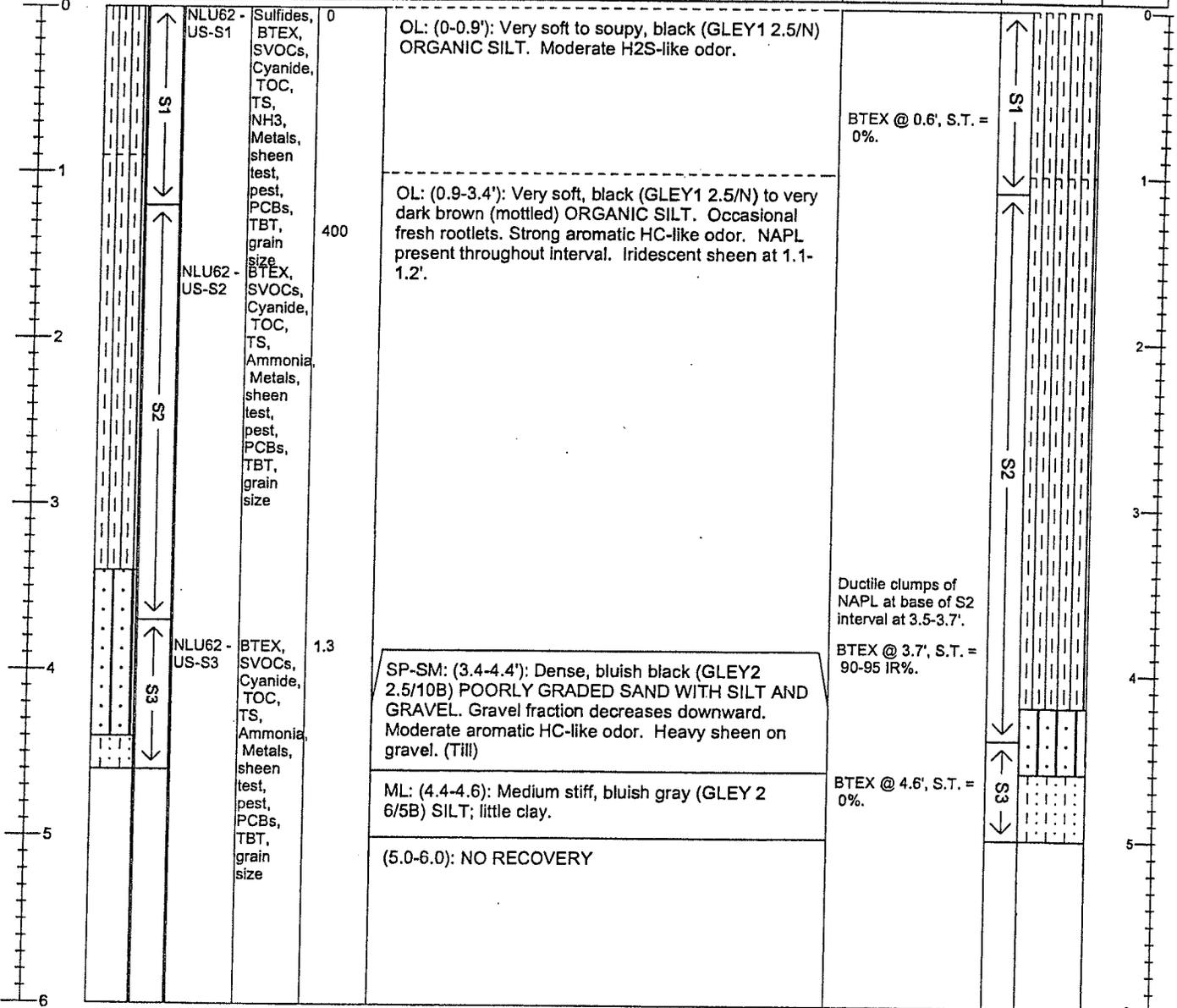
# Sediment Core Log

Sheet 1 of 1

Core: NLU62-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.6 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 6.0 ft
Client: PSE	Water Depth (ft): 24.6	Sample Quality: Good
Collection Date: 12/15/2004	Mudline Elevation (ft): -4.51	Recovery in ft (%): 4.6 (77)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 44.91396 E./LONG: 122 19 56.64948	Process Date: 12/16/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB, BHH

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Remarks: Torvane measurements not collected.	<b>Calculated Recovery</b> Sample Length/Penetration Length: 4.6 / 6.0 = 77 %
	NAPL on outside of core tube near tip.	
	No odor/sheen unless otherwise noted.	



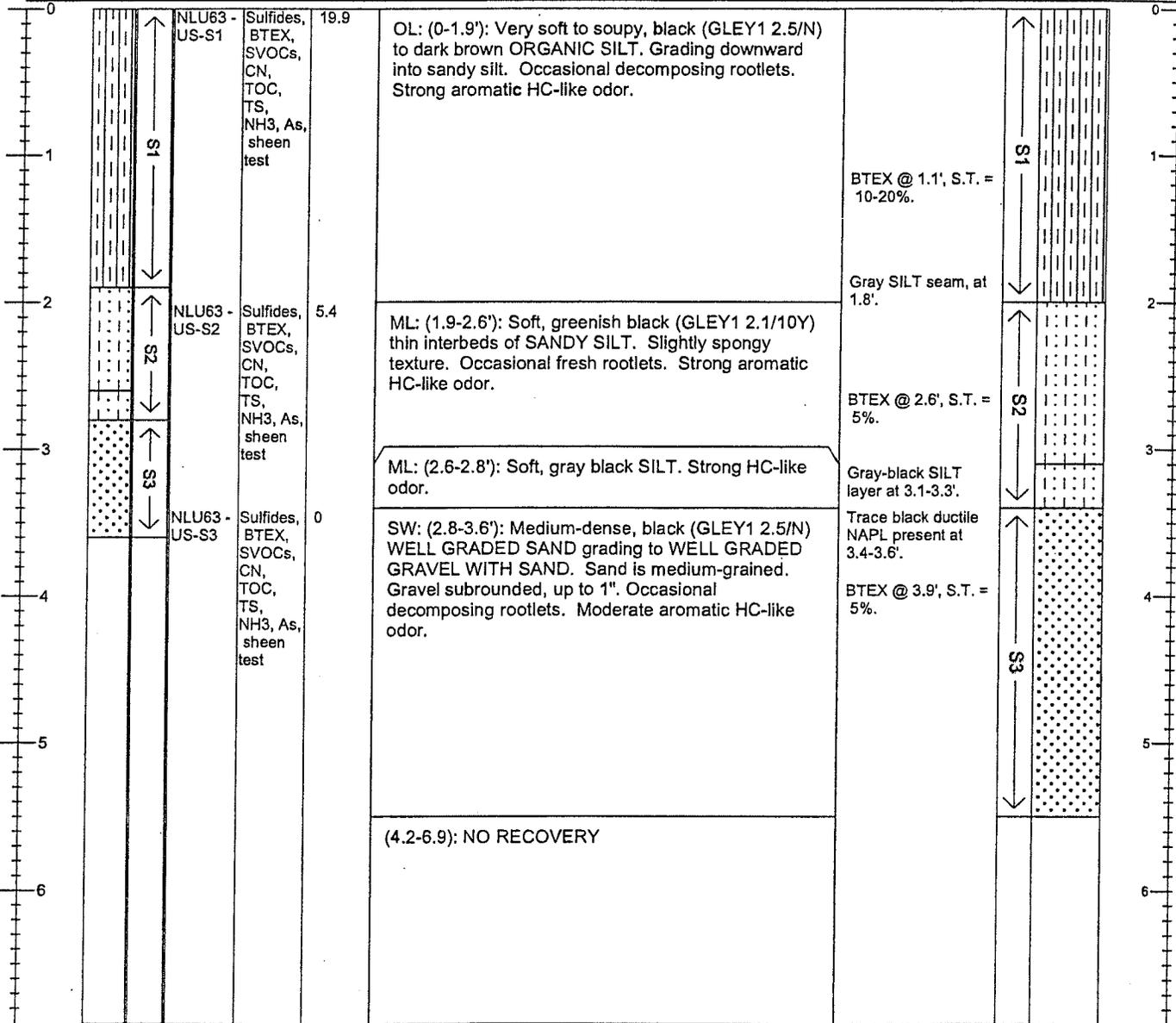
# Sediment Core Log

Sheet 1 of 1

Core: NLU63-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 21.0 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 5.5 ft
Client: PSE	Water Depth (ft): 37.0	Sample Quality: Good
Collection Date: 12/19/2004	Mudline Elevation (ft): -16.91	Recovery in ft (%): 3.6 (65)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 43.69244 E./LONG: 122 19 55.70862	Process Date: 12/20/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: LBM, AGF

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
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Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Torvane measurements not collected. Alternate station, ~75 ft E of original. Bottom is soft silt, driven to refusal.  
No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
3.6 / 5.5 = 65 %

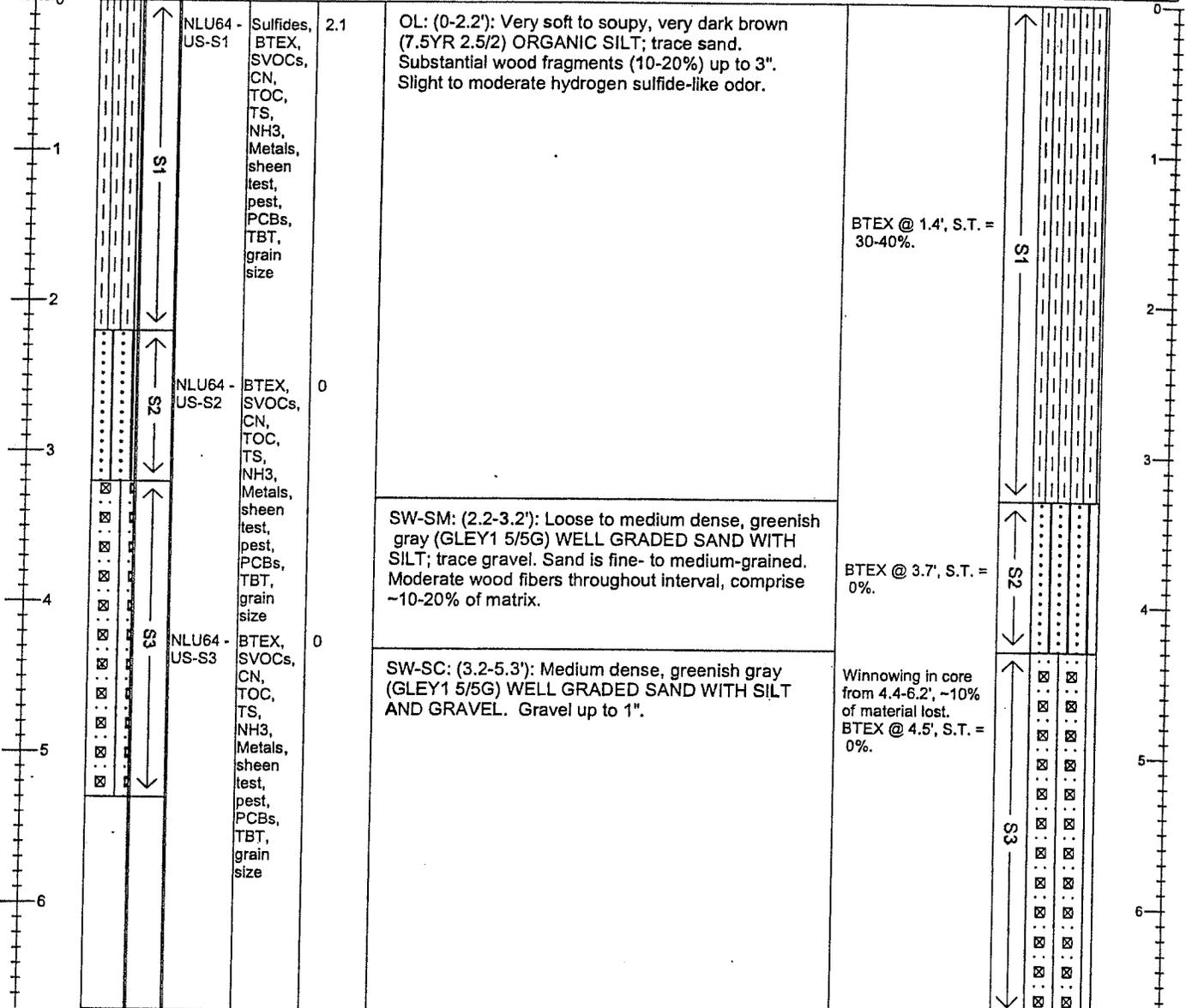


# Sediment Core Log

Core: NLU64-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 10.4 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 6.7 ft
Client: PSE	Water Depth (ft): 32.1	Sample Quality: Good
Collection Date: 12/16/2004	Mudline Elevation (ft): -12.01	Recovery in ft (%): 5.3 (79)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 39.52040 E./LONG: 122 20 11.91891	Process Date: 12/17/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Remarks: Torvane measurements not collected. Penetration tape  
sinks 0.5 ft into bottom. Driven to refusal.  
No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
**5.3 / 6.7 = 79 %**



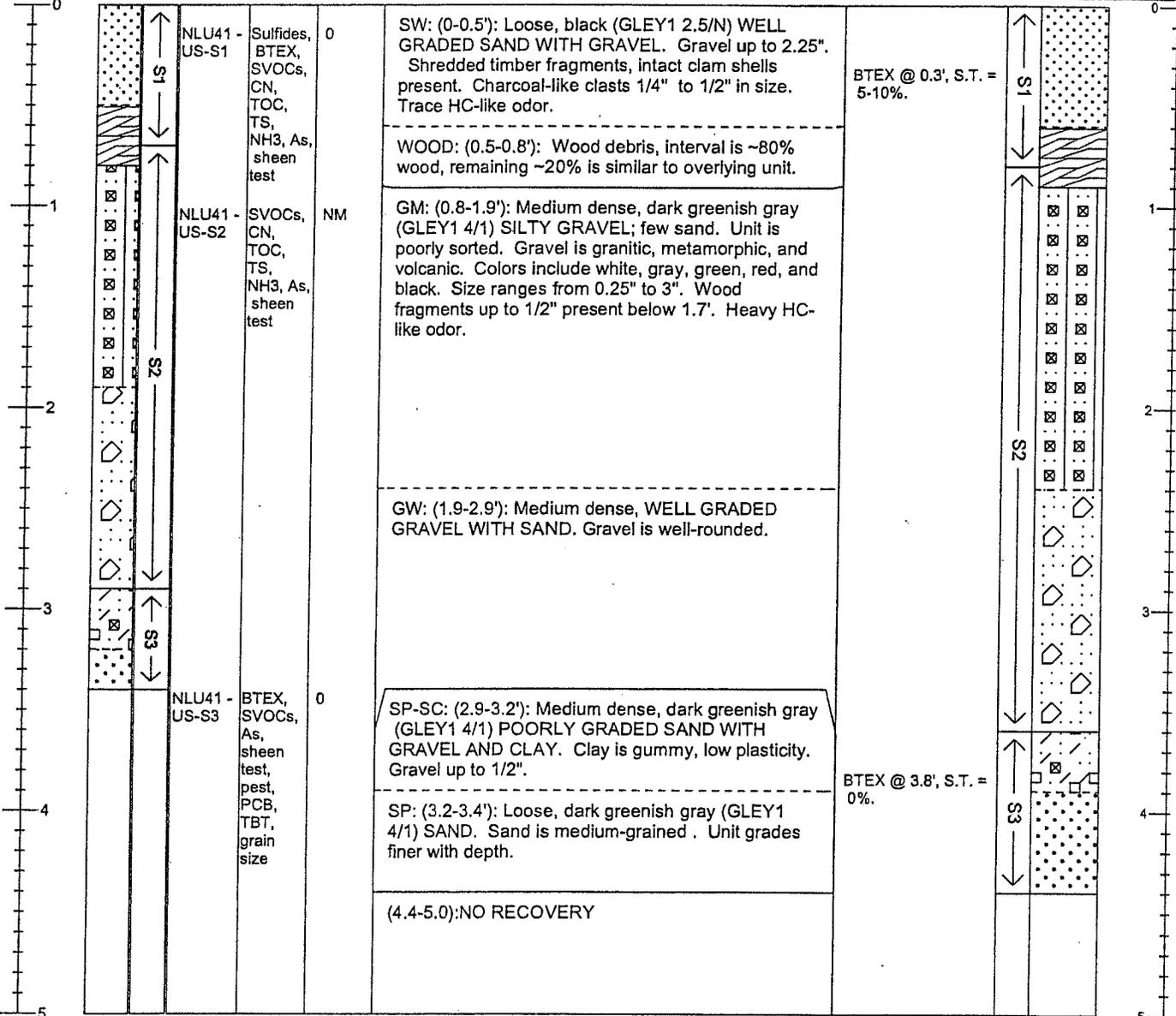
# Sediment Core Log

Sheet 1 of 1

Core: NLU65-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 4.4 ft
Client: PSE	Water Depth (ft): 10.0	Sample Quality: Fair
Collection Date: 12/19/2004	Mudline Elevation (ft): 10.09	Recovery in ft (%): 3.4 (77)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 39.96004 E./LONG: 122 20 09.27315	Process Date: 12/20/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: LBM, AGF

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Phone: (206) 624-9349  
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Remarks: Torvane measurements not collected. Cobbly bottom at station, moved offshore. Surface angular coarse sand with cobbles driven to refusal. No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
3.4 / 4.4 = 77 %



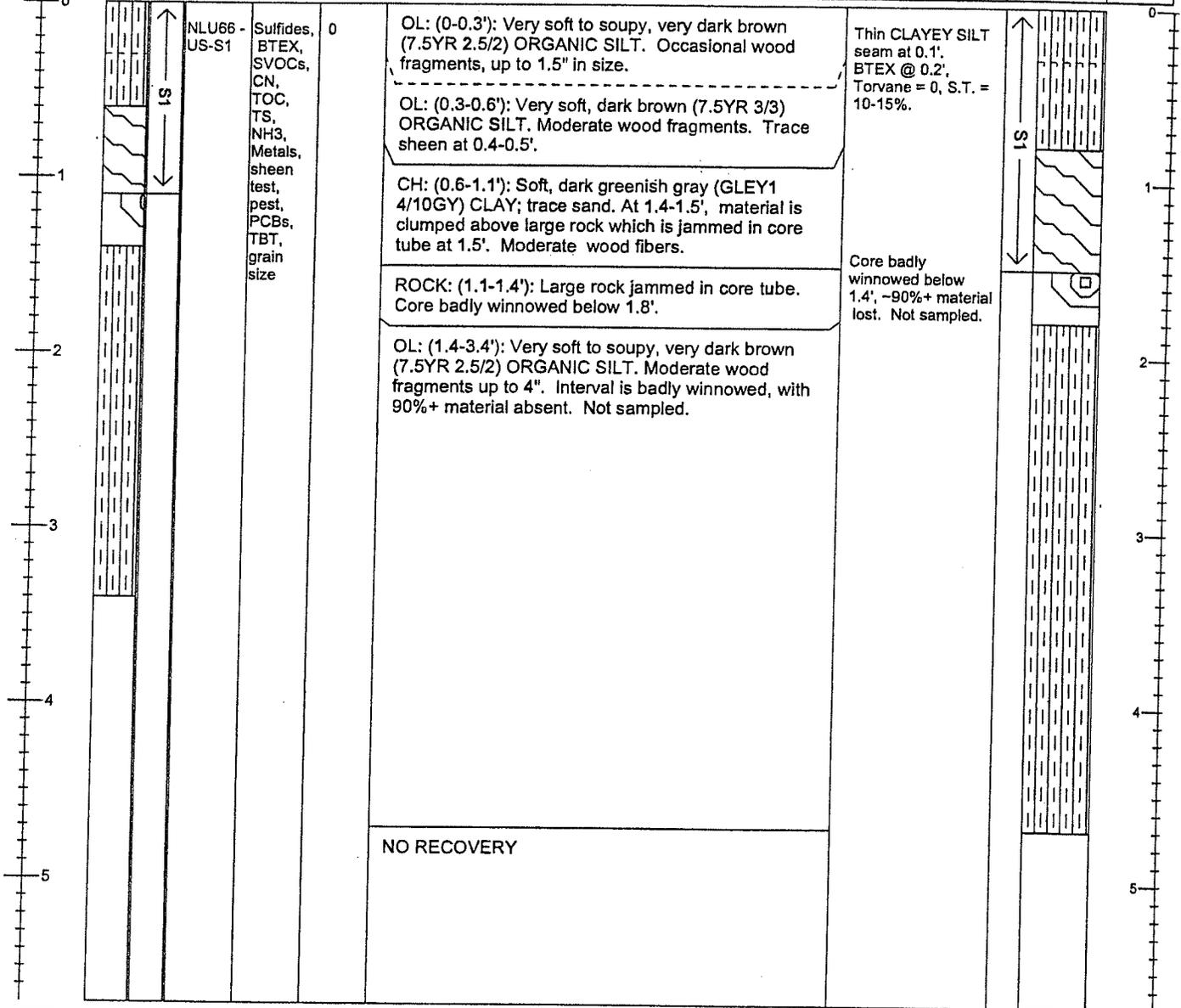
# Sediment Core Log

Sheet 1 of 1

Core: NLU66-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 5.7 ft
Client: PSE	Water Depth (ft): 34.7	Sample Quality: Poor
Collection Date: 12/16/2004	Mudline Elevation (ft): -14.61	Recovery in ft (%): 3.4 (60)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 38.14219 E./LONG: 122 20 10.88581	Process Date: 12/17/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, NPB, BHH

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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**Remarks:** Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Driven to refusal.  
No odor/sheen unless otherwise noted.

**Calculated Recovery**  
Sample Length/Penetration Length:  
3.4 / 5.7 = 60 %





# Sediment Core Log

Sheet 1 of 2

Core: NLU69-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 11.3 ft
Client: PSE	Water Depth (ft): 35.5	Sample Quality: Good
Collection Date: 12/14/2004	Mudline Elevation (ft): -15.41	Recovery in ft (%): 9.25 (82)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 42.04098 E./LONG: 122 19 56.68352	Process Date: 12/15/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
0	0 - 6.3	NLU69-US-S1	Sulfides, BTEX, SVOCs, CN, TOC, TS, NH3, As, sheen test	0	ML: (0-1.2'): Very soft to soupy, dark brown (7.5YR 3/2) SILT WITH SAND; trace clay. Low solids (<20%).	BTEX @ 0.4', Torvane = 0, S.T. = 5-10%. Gray SILT seam 1/8" thick at 0.4'.  Heavy sheen present at 1.0-5.5'.	0 - 6.3	0
6.3	6.3 - 7.5	NLU69-US-S2	BTEX, SVOCs, CN, TOC, TS, NH3, As, sheen test	6.3	OL: (1.2-2.0'): Very soft, black (GLE Y1 2.5/N) ORGANIC SILT. Moderate fresh rootlets. Strong HC-like odor.  ML: (2.0-3.1'): Very soft, black (GLE Y1 2.5/N) SILT; trace sand and clay. Heavy sheen. Thin gravel layer at 2.8'.	BTEX @ 2.0', Torvane = 0, S.T. = 100%.	6.3 - 7.5	6.3
7.5	7.5 - 11.3	NLU69-US-S3	BTEX, SVOCs, CN, TOC, TS, NH3, As, sheen test	75	ML: (3.1-3.25'): Soft, mottled gray (GLE Y1 5/N) SILT.  ML: (3.25-3.8'): Very soft, black (GLE Y1 2.5/N) SILT. Heavy sheen.  OL: (3.8-4.8'): Soft, dark brown (7.5YR 3/2) ORGANIC SILT. Compressible, spongy, blocky texture. Occasional decomposed rootlets. Small vertical veins are ~1/4", contain NAPL. NAPL saturation increases at base of interval, on top of underlying dense gravel unit.		7.5 - 11.3	7.5

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1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. No core catcher, tape sinks 0.5 ft into bottom  
Driven to refusal. No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
9.25/ 11.3 = 82 %

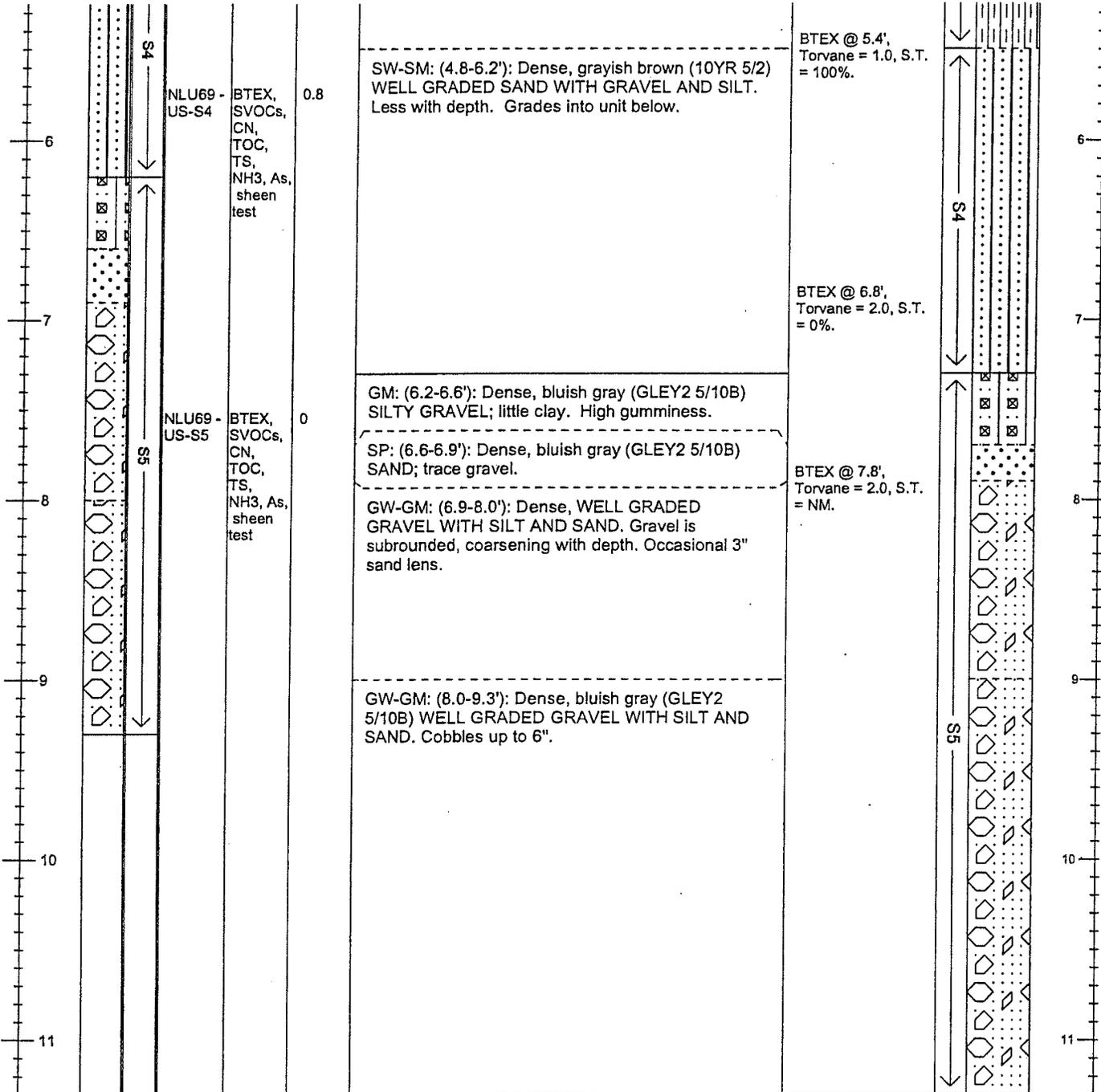


# Sediment Core Log

Sheet 2 of 2

Core: NLU69-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
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1011 SW Klickitat Way, Suite 207  
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Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply

Calculated Recovery

results by 0.2 kg/cm2. No core catcher, tape sinks 0.5 ft into bottom Sample Length/Penetration Length:

Driven to refusal. No odor/sheen unless otherwise noted.

9.25/11.3 = 82 %



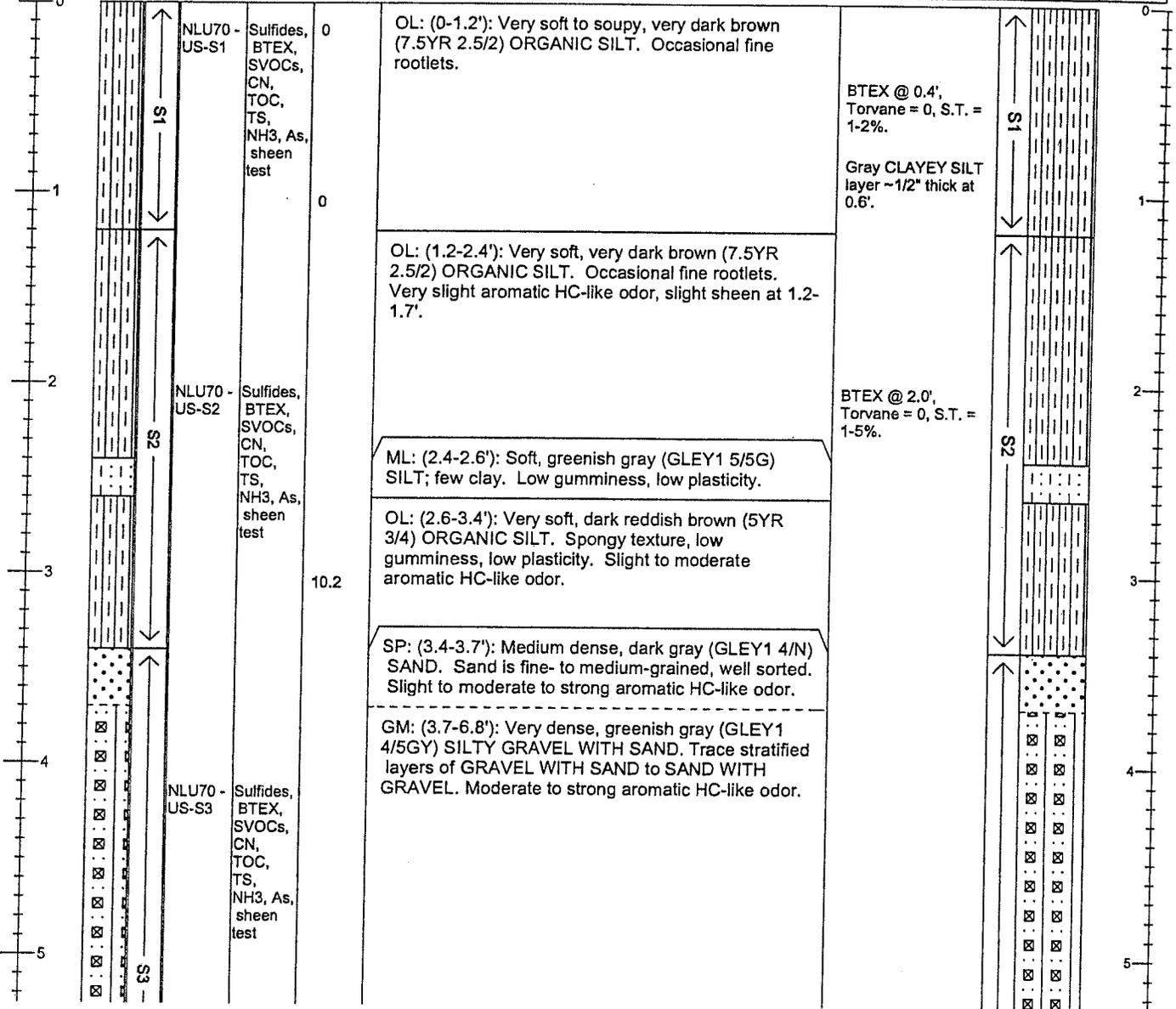
# Sediment Core Log

Sheet 1 of 2

Core: NLU70-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 10.1 ft
Client: PSE	Water Depth (ft): 39.9	Sample Quality: Good
Collection Date: 12/16/2004	Mudline Elevation (ft): -19.81	Recovery in ft (%): 8.0 (79)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 37.47298 E./LONG: 122 20 11.47995	Process Date: 12/17/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, NPB, BHH

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> Large vane used in Torvane measurements, multiply results by 0.2 kg/cm <sup>2</sup> . Driven to refusal.	<b>Calculated Recovery</b> Sample Length/Penetration Length: 8.0 / 10.1 = 79 %
	No odor/sheen unless otherwise noted.	



# Sediment Core Log

Sheet 2 of 2

Core: NLU70-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Elevation (ft)
6.0								6.0
7.0								7.0
8.0		NLU70-US-S4	Sulfides, BTEX, SVOCs, CN, TOC, TS, NH3, As, sheen test	12		BTEX @ 5.6', Torvane = 2.5, S.T. = 0%.		8.0
9.0					SW-SM: (6.8-8.0'): Loose, greenish gray (GLEY1 5/5GY) WELL GRADED SAND WITH SILT; trace gravel. Sand is fine-to medium-grained. Moderate aromatic HC-like odor.	BTEX @ 8.0', Torvane = 2.2, S.T. = 0%.		9.0
10.0					(9.2-10.1): VERY LOW RECOVERY AND WINNOWER.	Core winnowed at 9.2-10.1', ~40% of material absent.		10.0

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Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Driven to refusal.  
No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
8.0 / 10.1 = 79 %



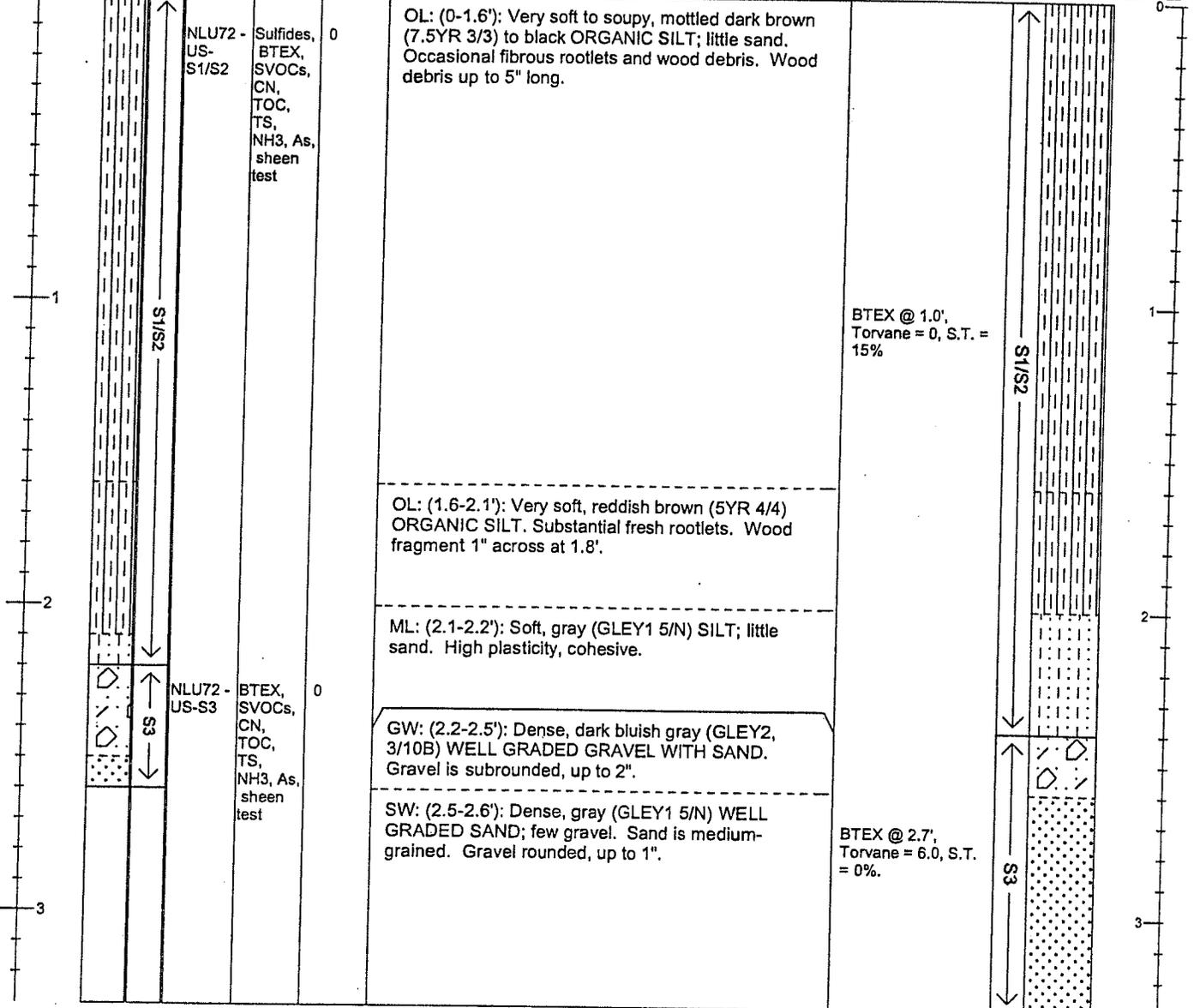
# Sediment Core Log

Sheet 1 of 1

Core: NLU72-US

Project: NLU Phase 3		Water Body Type: Lake	Tube Length: 21.0 ft
Project #: PSE10-18064-430		SW Elevation (ft)/Tide: 20.08	Penetration Depth: 3.3 ft
Client: PSE		Water Depth (ft): 31.3	Sample Quality: Fair
Collection Date: 12/17/2004		Mudline Elevation (ft): -11.22	Recovery in ft (%): 2.6 (79)
Contractor: MCS Environmental, Inc.		N./LAT: 47 38 37.66082 E./LONG: 122 20 01.72806	Process Date: 12/18/2004
Vessel: MCS Env. Mudmole Boat		Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell		Method/Tube ID: 4" square aluminum	Logged By: LBM, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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 Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply  
79  
 No odor/sheen observed throughout core.

Calculated Recovery  
 Sample Length/Penetration Length:  
 2.6 / 3.3 = 79 %



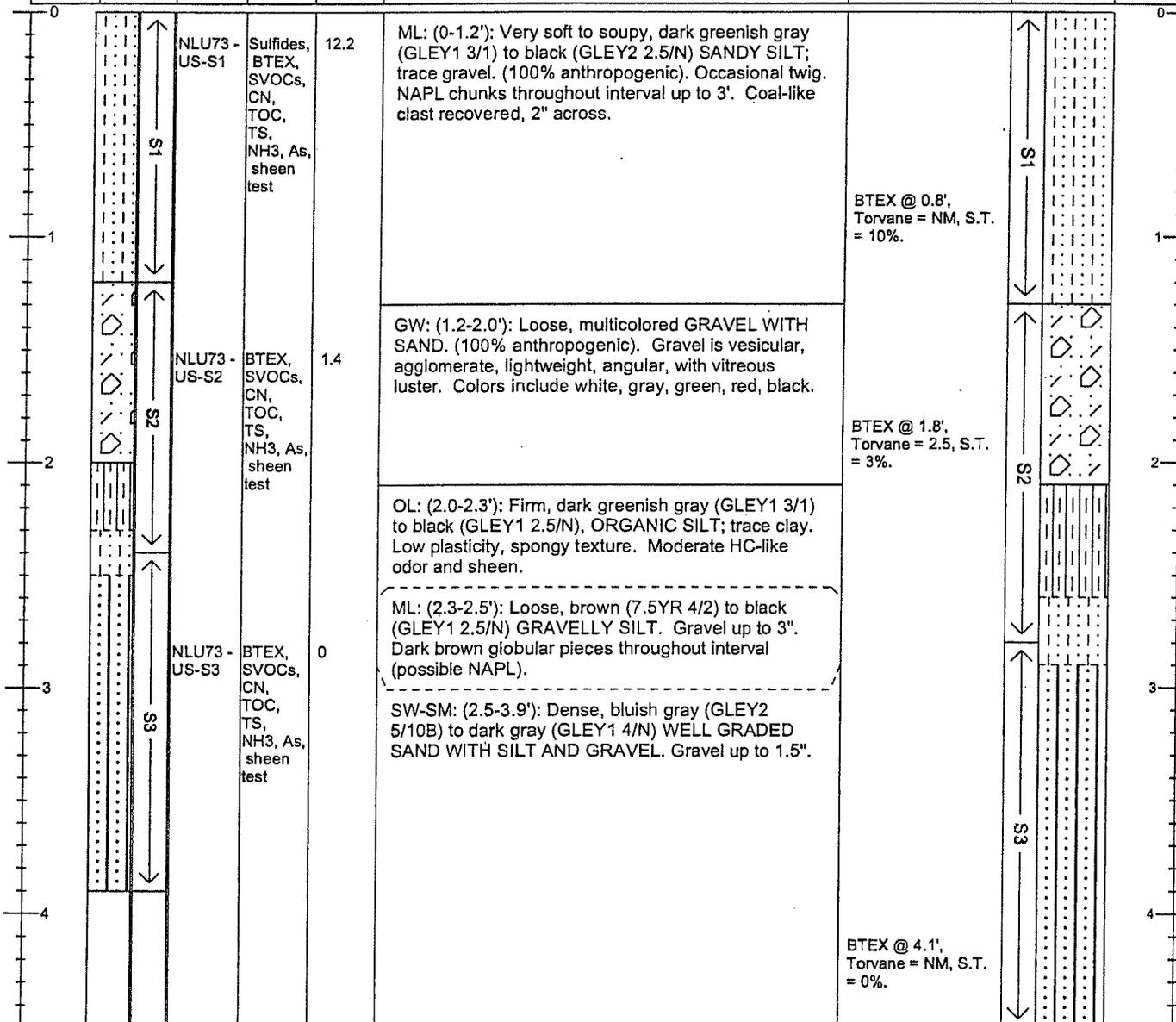
# Sediment Core Log

Sheet 1 of 1

Core: NLU73-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 15.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.08	Penetration Depth: 4.5 ft
Client: PSE	Water Depth (ft): 16.2	Sample Quality: Good
Collection Date: 12/17/2004	Mudline Elevation (ft): 3.88	Recovery in ft (%): 3.9 (87)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 46.52313 E./LONG: 122 19 56.63743	Process Date: 12/18/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: LBM, AGF

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Fax: (206) 624-2839

Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. No core catcher, driven to refusal.  
No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
3.9 / 4.5 = 87 %

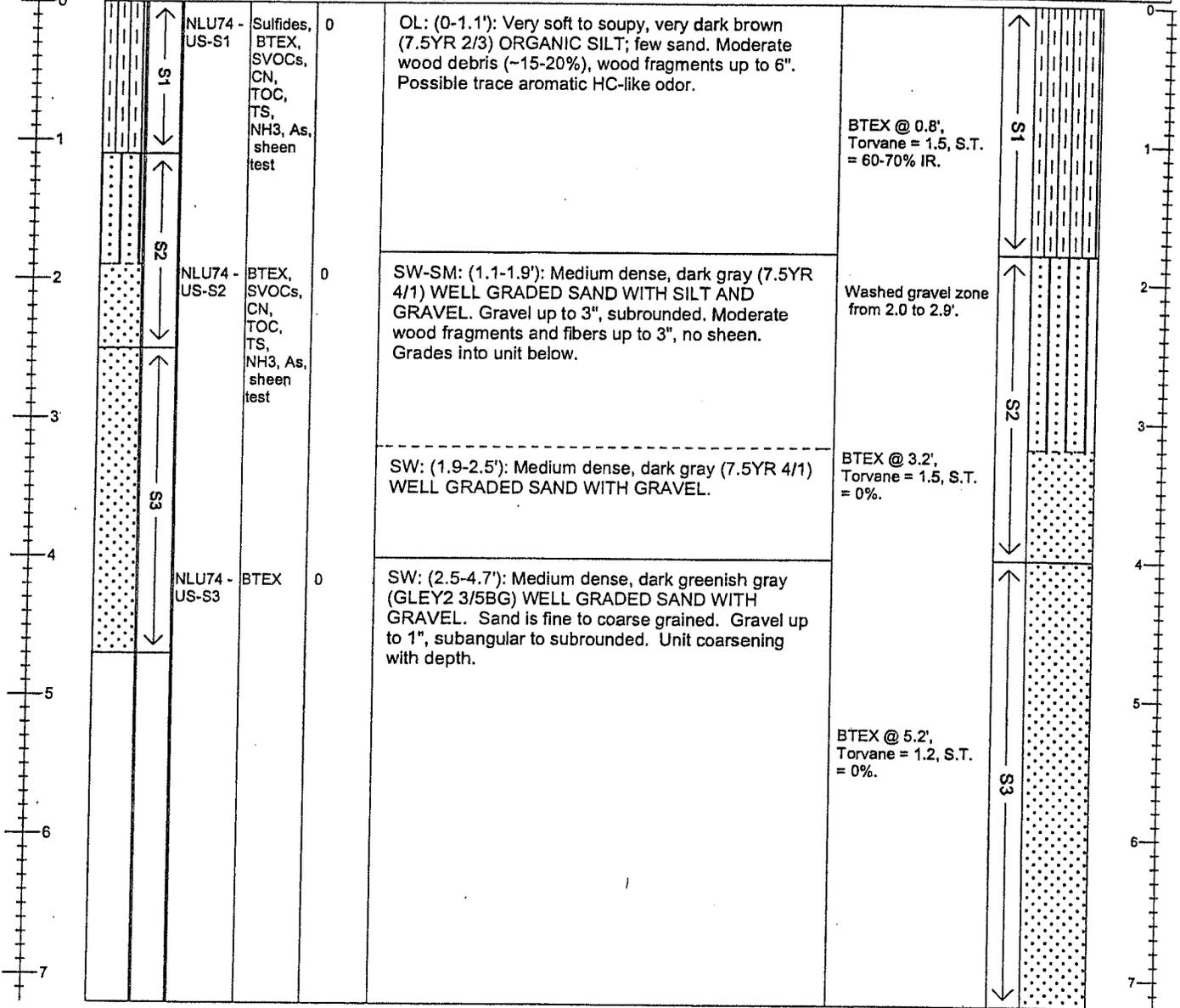


# Sediment Core Log

Core: NLU74-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.09	Penetration Depth: 7.2 ft
Client: PSE	Water Depth (ft): 23.8	Sample Quality: Good
Collection Date: 12/16/2004	Mudline Elevation (ft): -3.71	Recovery in ft (%): 4.7 (65)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 39.25756 E./LONG: 122 20 10.14387	Process Date: 12/17/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Penetration tape sinks 0.4' into bottom, driven to refusal. No odor/sheen unless otherwise noted.

Calculated Recovery  
Sample Length/Penetration Length:  
4.7 / 7.2 = 65 %



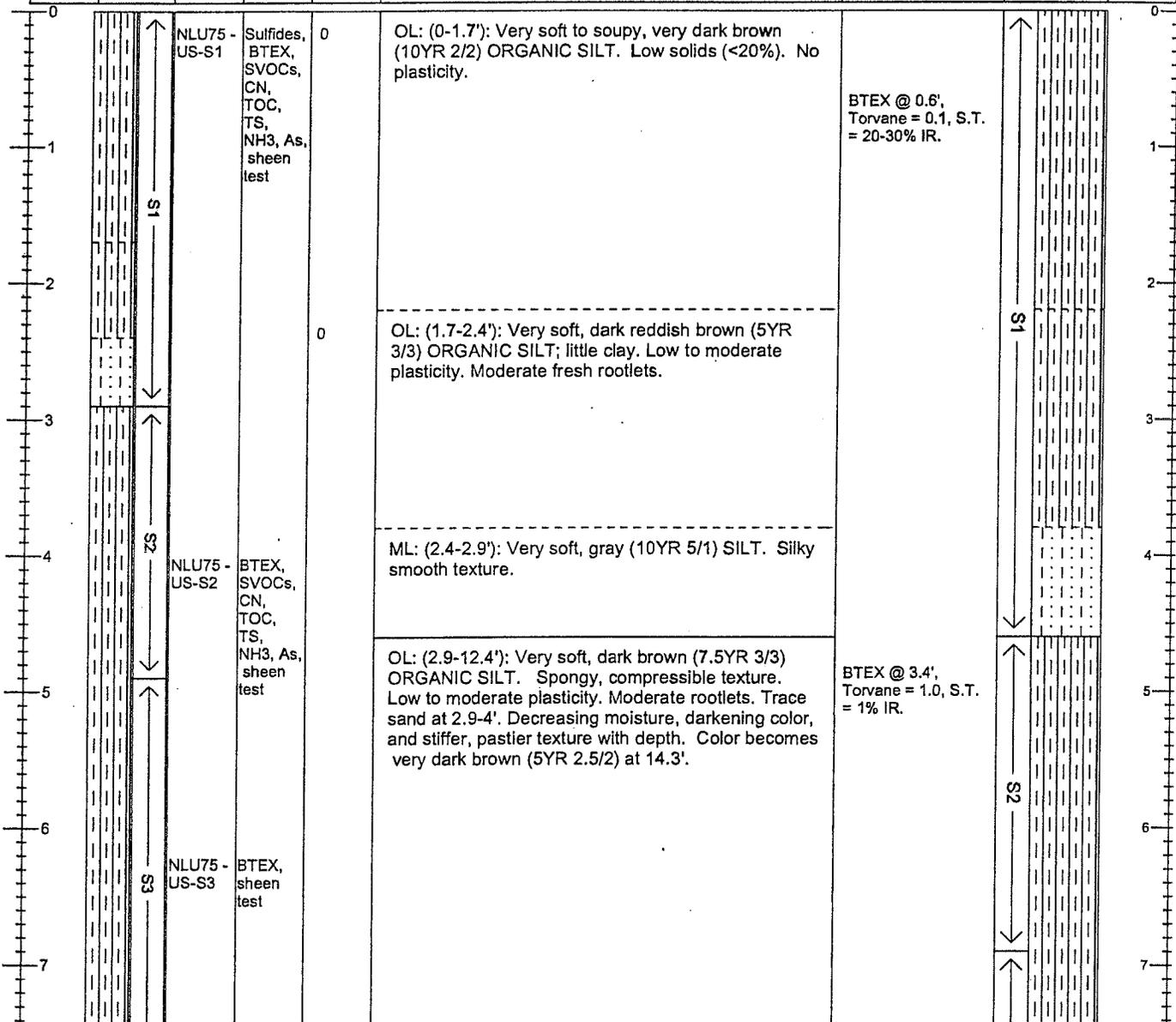
# Sediment Core Log

Sheet 1 of 2

Core: NLU75-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 16.5 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.07	Penetration Depth: 16.3
Client: PSE	Water Depth (ft): 43.4	Sample Quality: Good
Collection Date: 12/13/2004	Mudline Elevation (ft): -23.93	Recovery in ft (%): 13.1 (80)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 40.86828 E./LONG: 122 19 54.28338	Process Date: 12/14/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: CMG, AGF, NPB

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Tape sinks 0.7 ft into bottom.  
No odor/sheen observed throughout core.

Calculated Recovery  
Sample Length/Penetration Length:  
13.1/16.3 = 80 %

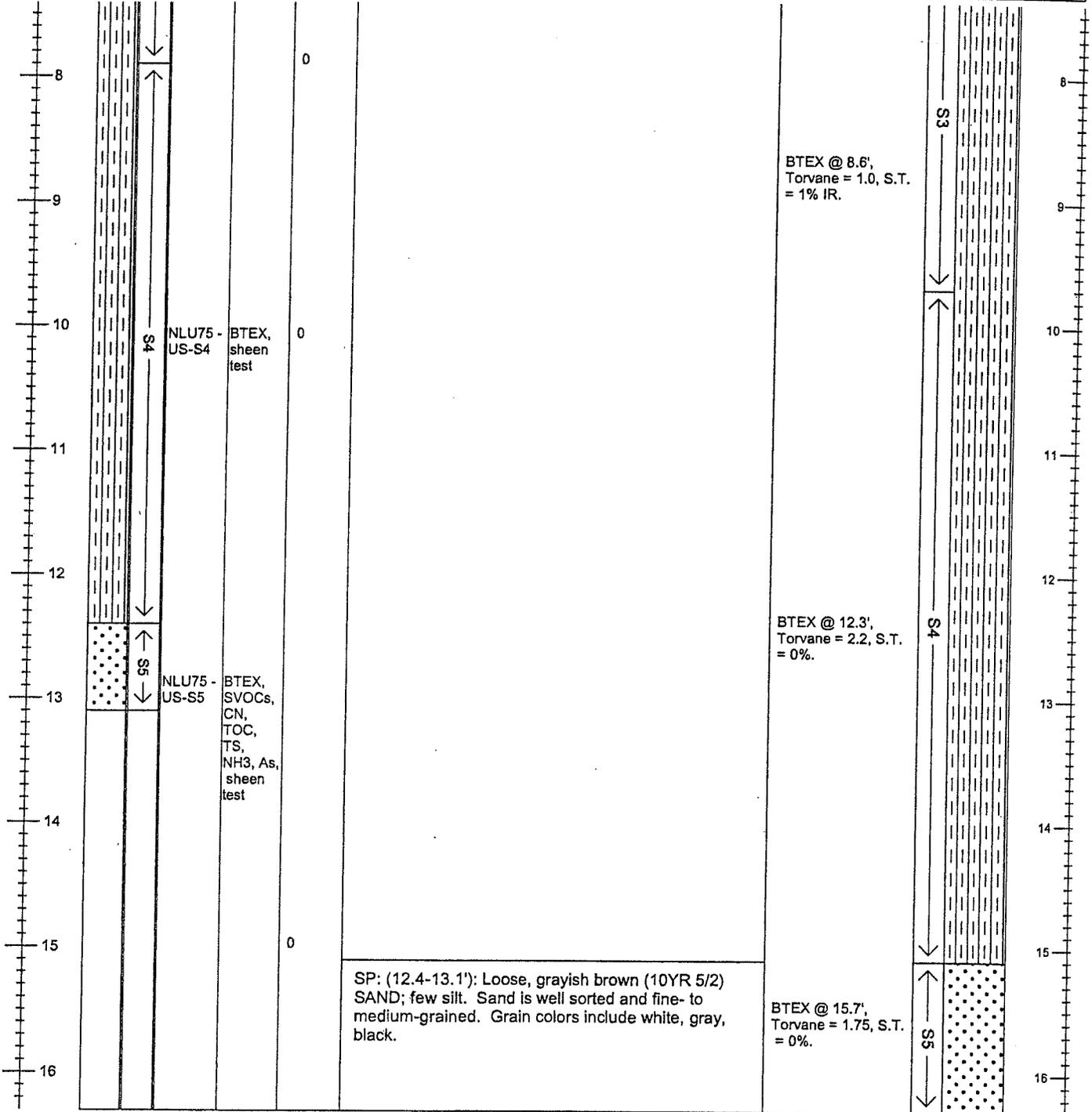


# Sediment Core Log

Sheet 2 of 2

Core: NLU75-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
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Remarks: Large vane used in Torvane measurements, multiply

results by 0.2 kg/cm2. Tape sinks 0.7 ft into bottom.

No odor/sheen observed throughout core.

Calculated Recovery

Sample Length/Penetration Length:

13.1/16.3 = 80 %



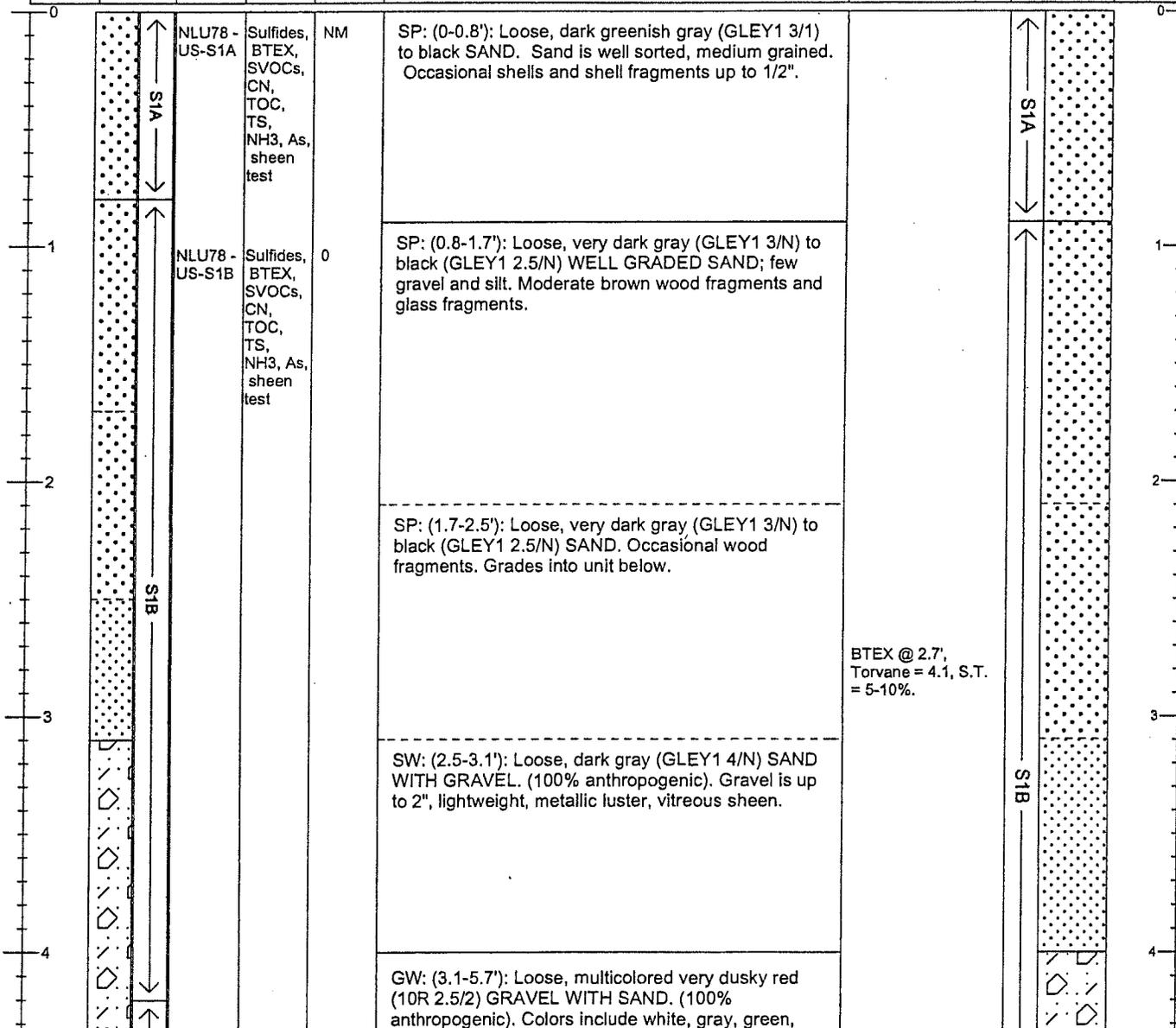
# Sediment Core Log

Sheet 1 of 2

Core: NLU78-US

Project: NLU Phase 3	Water Body Type: Lake	Tube Length: 10.8 ft
Project #: PSE10-18064-430	SW Elevation (ft)/Tide: 20.08	Penetration Depth: 9.4 ft
Client: PSE	Water Depth (ft): 1.1	Sample Quality: Good
Collection Date: 12/17/2004	Mudline Elevation (ft): 18.98	Recovery in ft (%): 6.4 (68)
Contractor: MCS Environmental, Inc.	N./LAT: 47 38 47.56607 E./LONG: 122 19 57.64620	Process Date: 12/18/2004
Vessel: MCS Env. Mudmole Boat	Horiz. Datum: NAD83 Vert. Datum: USACE Locks	Process Method: Cut tube
Operator: Gary Maxwell	Method/Tube ID: 4" square aluminum	Logged By: LBM, AGF

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Recovered depth interval in feet) Contacts are expanded	Comments Expanded Depths	Calc. In situ Depths (ft) & Graphic Log	Calc. In situ Depth (ft)
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Remarks: Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Wood debris on station - moved south.

68

Calculated Recovery  
Sample Length/Penetration Length:  
6.4 / 9.4 = 68 %



# Sediment Core Log

Core: NLU78-US

Recovered Depth (ft)	Recovered Interval	Sample #	Analysis	Headspace PID	Sediment Description Classification Scheme: USCS (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Elevation (ft)
5	S2	NLU78-US-S2	BTEX, SVOCs, CN, TOC, TS, NH3, As, sheen test	0	red, black. Gravel is up to 1", vitreous luster, vesicular, lightweight, angular, agglomerate. Sand is coarse-grained. HC-like odor, sheen.			5
6	S3	NLU78-US-S3	BTEX, SVOCs, CN, TOC, TS, NH3, As, sheen test	0		BTEX @ 5.9', Torvane = 2.5, S.T. = 25% IR.		6
7								7
8				0	GW: (5.7-6.2'): Loose, grayish brown (10YR 5/2) GRAVEL WITH SAND; few silt. (Till). Gravel is 1.5-2", subrounded.			8
9					SW: (6.2-6.4'): Dense, dark gray (GLE Y1 4/N) to bluish gray SAND WITH GRAVEL. (Till).	BTEX @ 8.5', Torvane = 2.5, S.T. = 3%.		9

The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Remarks:</b> Large vane used in Torvane measurements, multiply results by 0.2 kg/cm2. Wood debris on station - moved south.	<b>Calculated Recovery</b> Sample Length/Penetration Length:
	68	6.4 / 9.4 = 68 %

**Retec 2005**  
**Phase 3 Eastern Study Area**  
**Sediment Geotechnical Investigation**

**Hollow-stem Auger Borings**



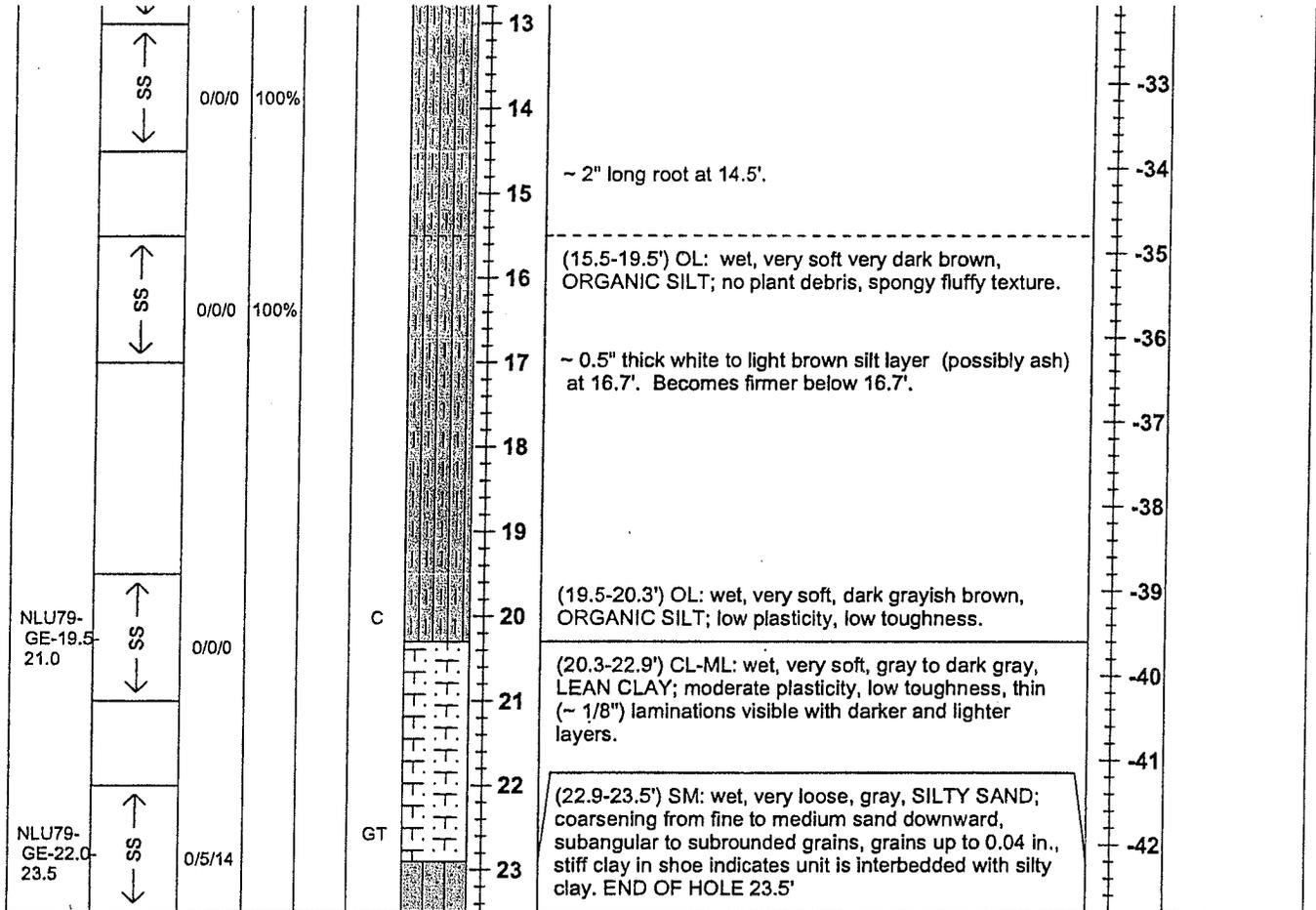


# Boring Log

Boring #: NLU79

Sheet 2 of 2

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	From 6 - 23.5', hole location moved slightly to N: 239085.491	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	E: 1271204.134 due to equipment malfunction. Dames		
	and Moore split spoon sampler & 300 lb hammer used.		
	Horizontal Datum: NAD83/91, Vertical Datum: USACE.		

VISUAL CORE LOG

Client:	<u>The Retec Group, Inc.</u>	Date:	<u>2/15/05</u>
Project:	<u>North Lake Union Geotech</u>	Sample Extruded by:	<u>HB</u>
Core No.:	<u>NLU79-GE-3.5-5.5</u>	Sample Logged by:	<u>HB</u>
Sample No.:	<u>HQ36A</u>	Type:	<u>Shelby</u>
Depth of Sample:	<u>3.5-5.5</u>	Diameter of Sample:	<u>2.85</u>
Sample Recovery:	<u>22.5</u>		

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
			3.5	Top of Recovery
				Soft, Brown, Fibrous Organic Silt
		Density	4.0	↓
	812.9	TVS		
		MC	4.5	
			5.0	3/4" Layer of Soft, Gray Clayey Silt
	144.2	MC		
				Bottom of Recovery



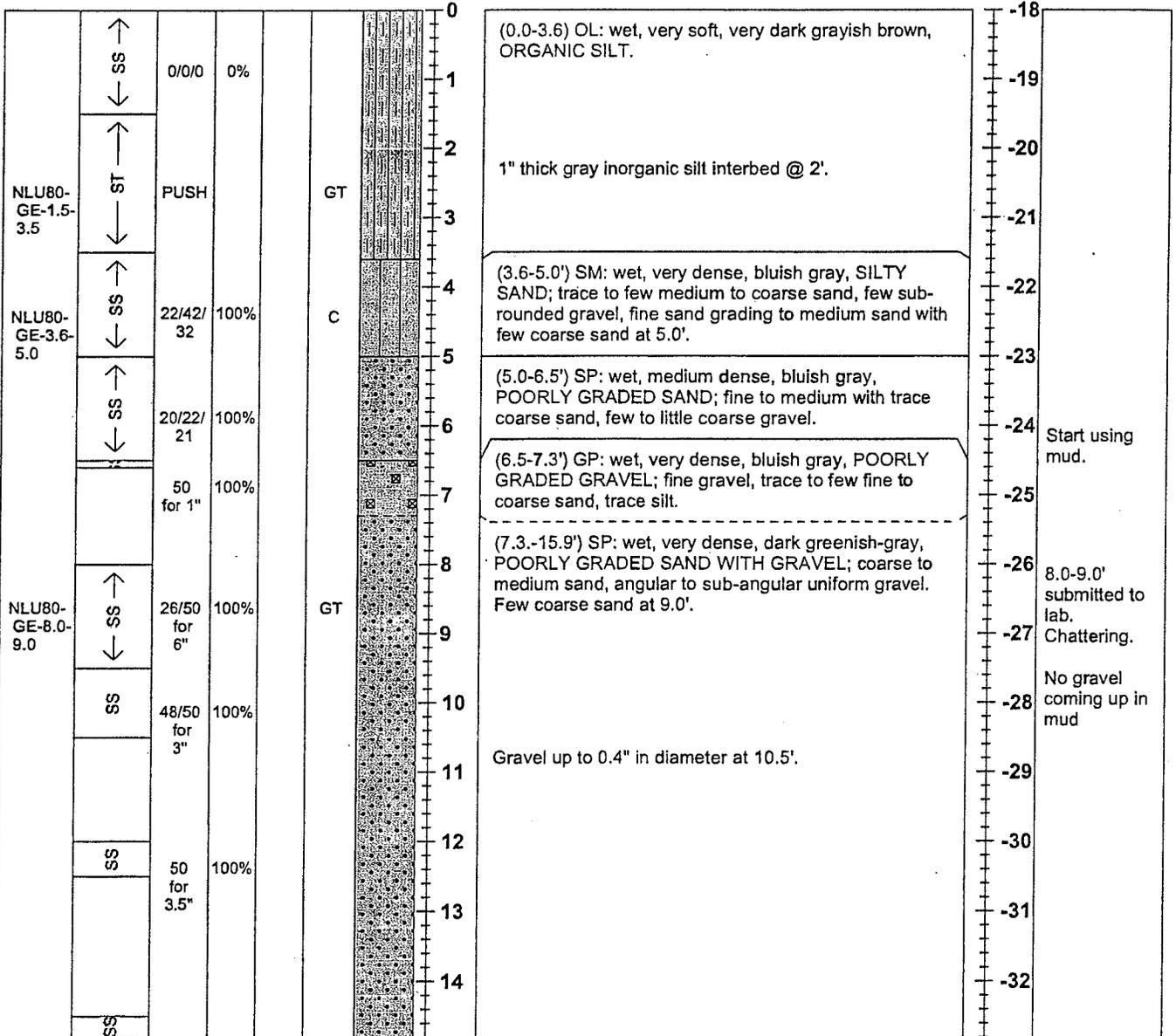
# Boring Log

Boring #: NLU80

Sheet 1 of 2

Project: North Lake Union	Operator: John Bennett	Location: SE of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 1270815.337 Easting: 238456.254
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.03 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 37.8 ft.
Start Date & Time: 1/18/2005 1015	Boring ID: 4 in.	Total Depth: 27.5 ft.
Finish Date & Time: 1/19/2005 0845	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler and 300 lb hammer used. Horizontal Datum: NAD83/91, Vertical Datum: USACE</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	No PID readings taken. Backfilled w/ grout through drill rods.		
	Remarks		

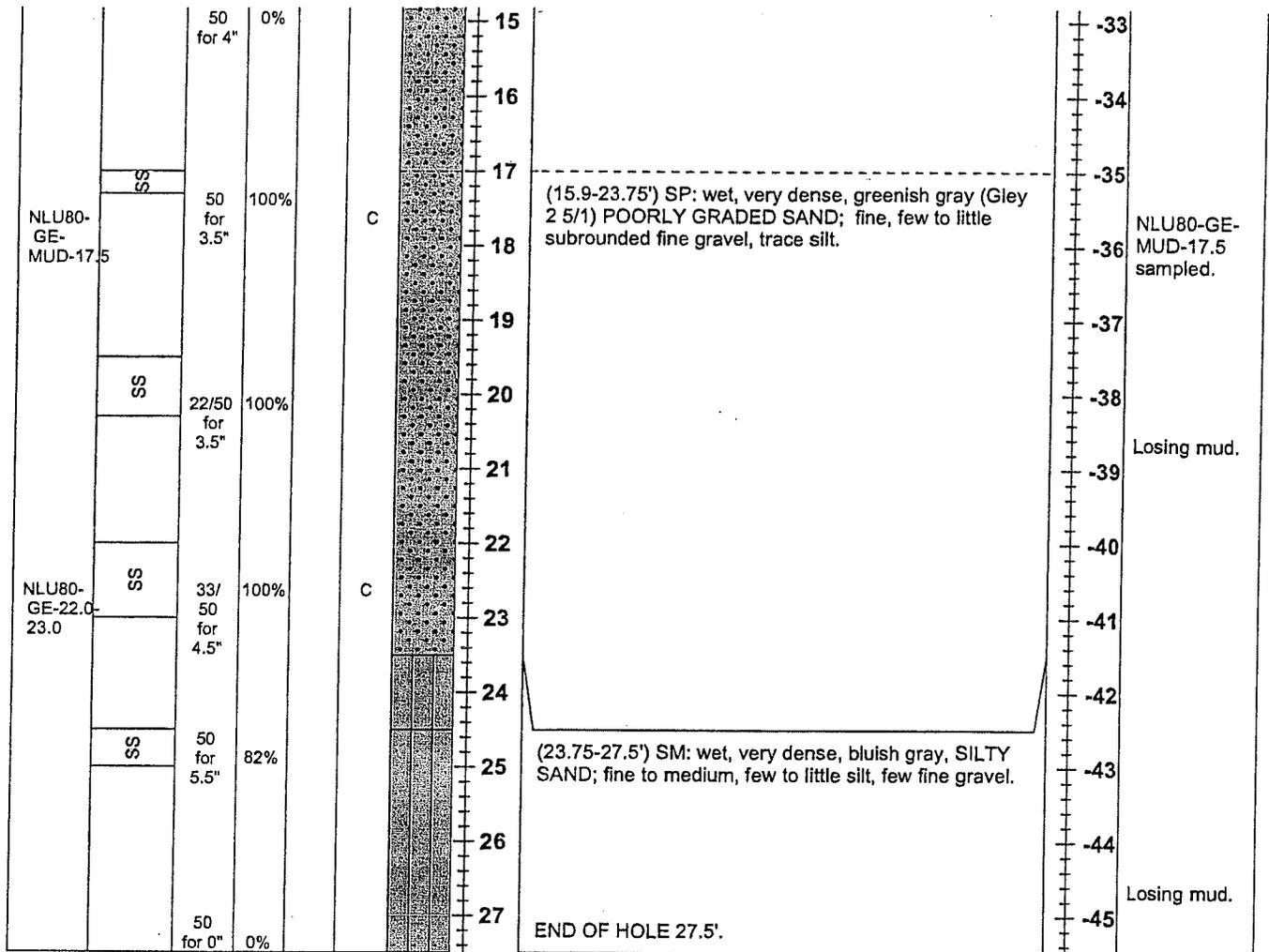


# Boring Log

Boring #: NLU80

Sheet 2 of 2

Sample							Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 inch	% Rec	PID (ppm)	Analysis						



<b>Remarks and Datum Used:</b>  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler and 300 lb hammer</b> used. Horizontal Datum: NAD83/91, Vertical Datum: USACE	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	No PID readings taken. Backfilled w/ grout through drill rods.		
	Remarks		

VISUAL CORE LOG

Client:	<u>The Retec Group, Inc.</u>	Date:	<u>2/15/05</u>
Project:	<u>North Lake Union Geotech</u>	Sample Extruded by:	<u>HB</u>
Core No.:	<u>NLU80-GE-1.5-3.5</u>	Sample Logged by:	<u>HB</u>
Sample No.:	<u>HQ36D</u>	Type:	<u>Shelby</u>
Depth of Sample:	<u>1.5-3.5</u>	Diameter of Sample:	<u>2.85</u>
Sample Recovery:	<u>11"</u>		

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	515.0		1.5	Top of Recovery
		MC		Soft, Brown, Fibrous Organic Silt
		Atter		
	456.1		2.0	Gray, Interbed, Inorganic
		TVS		Bottom of Recovery
			2.5	



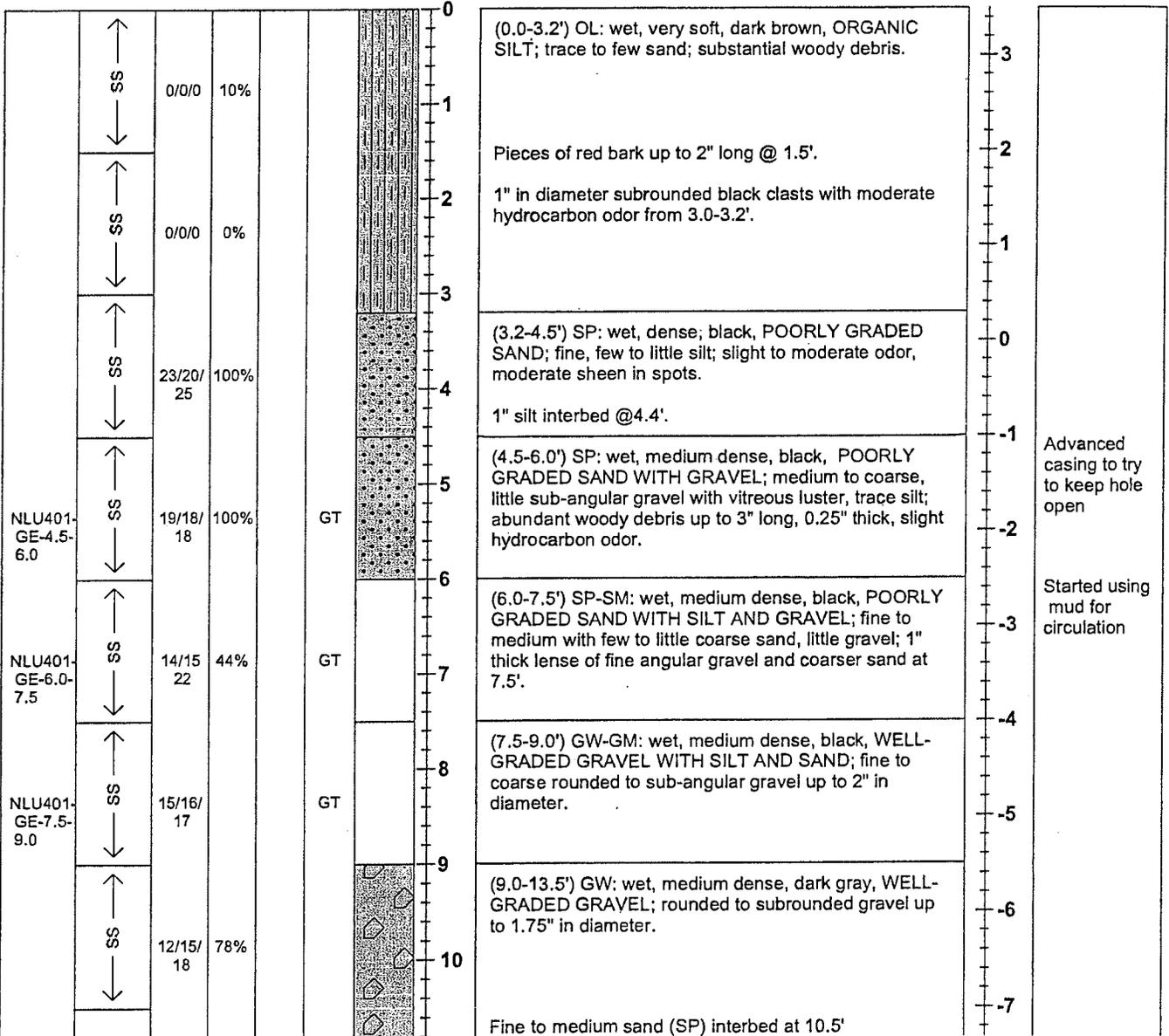
# Boring Log

Boring #: NLU401

Sheet 1 of 2

Project: North Lake Union	Operator: John Bennett	Location: East of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 239303.369 Easting: 1270917.59
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.01 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 16.53 ft.
Start Date & Time: 01/11/2005 1150	Boring ID: 4 in.	Total Depth: 19.5 ft.
Finish Date & Time: 01/11/2005 1545	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler</b> and 300 lb hammer used. Horizontal Datum: NAD83/91, Vertical Datum: USACE. Backfilled with grout through drill rods. Recovery not recorded 7.5-9.0' & 19.0-19.4'.	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
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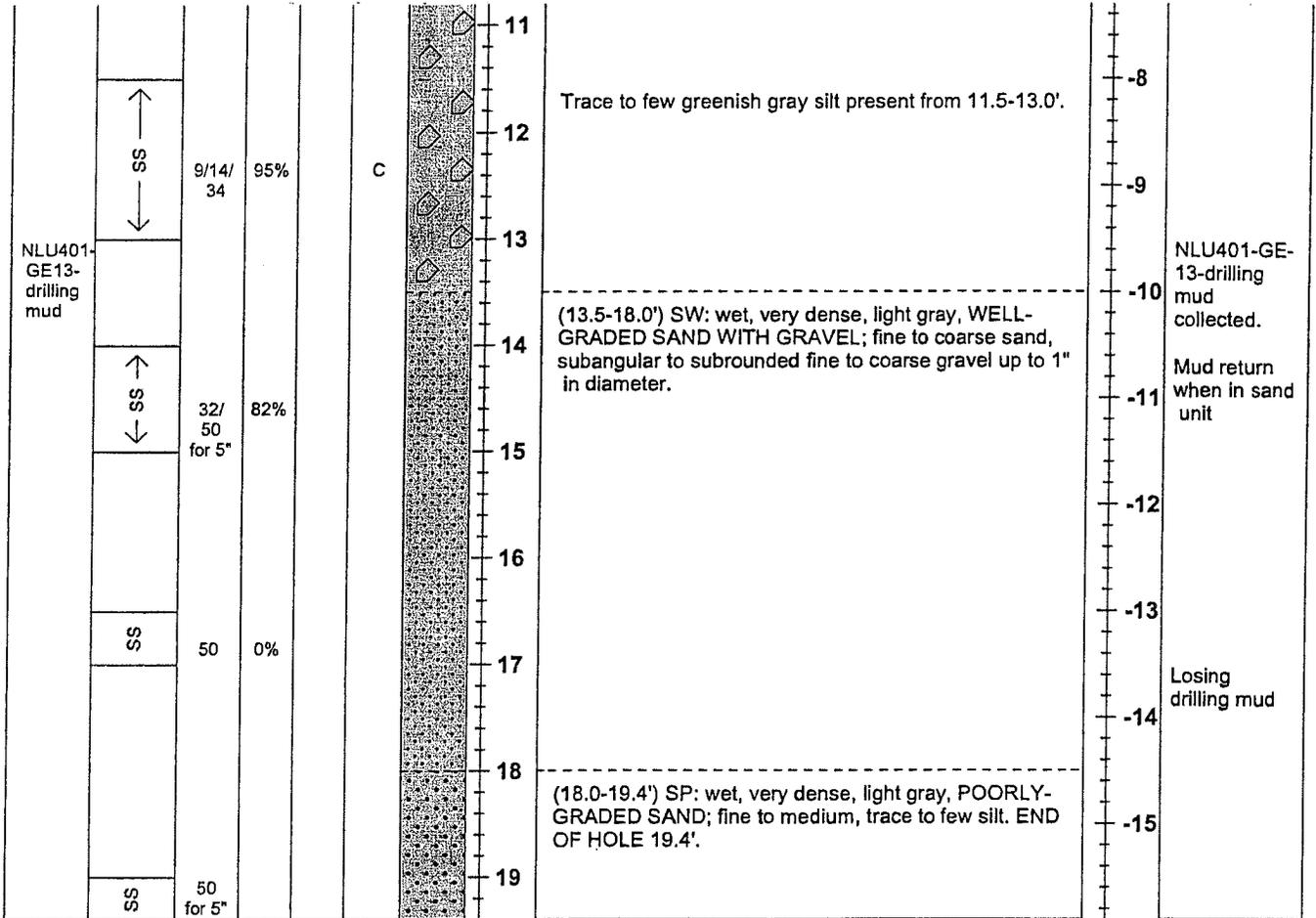


# Boring Log

Boring #: NLU401

Sheet 2 of 2

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b>  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>and 300 lb hammer used. Horizontal Datum: NAD83/91,</b>		
	<b>Vertical Datum: USACE. Backfilled with grout through</b>		
	<b>drill rods. Recovery not recorded 7.5-9.0' &amp; 19.0-19.4'.</b>		

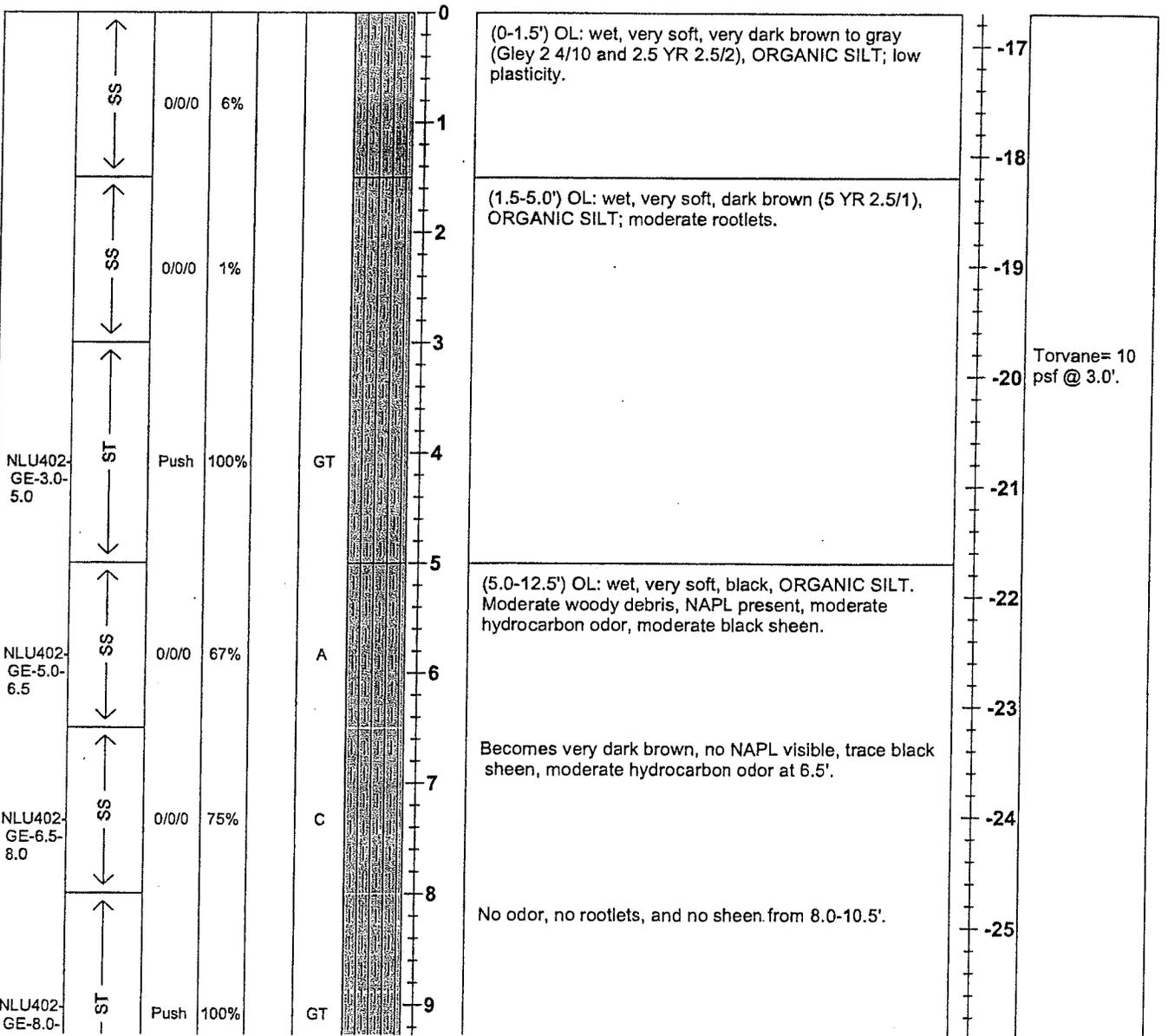


# Boring Log

Boring #: NLU402  
Sheet 1 of 3

Project: North Lake Union	Operator: John Bennett	Location: East of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 239173.880 Easting: 1271068.232
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.01 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 36.70 ft.
Start Date & Time: 1/10/2005 1530	Boring ID: 4 in.	Total Depth: 26.5 ft.
Finish Date & Time: 1/11/2005 1115	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



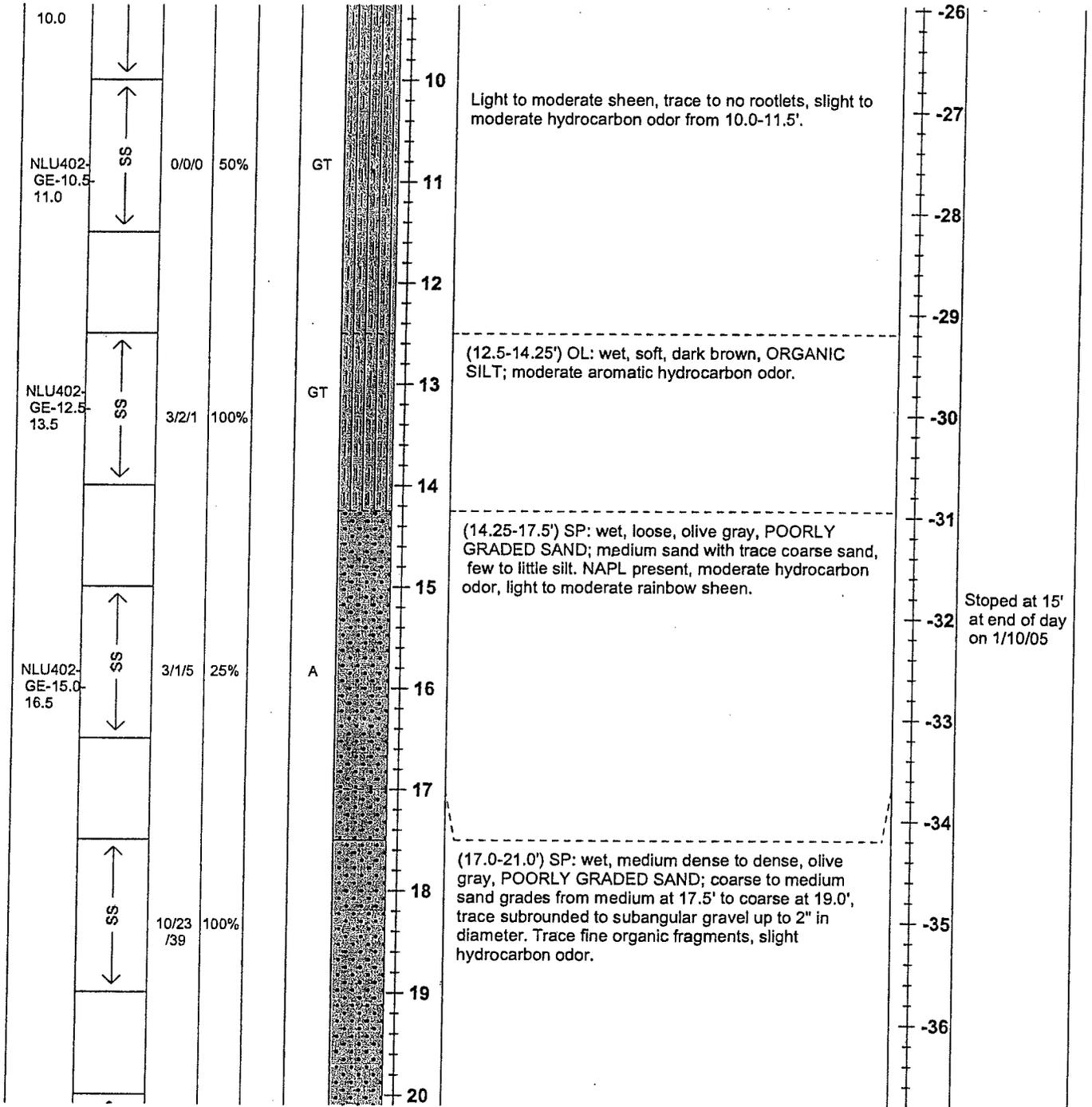
<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler and 300 lb hammer used.</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Horizontal Datum: NAD83/91, Vertical Datum: USACE.</b>		
	<b>Backfilled with grout through drilling rods.</b>		



# Boring Log

Boring #: NLU402  
Sheet 2 of 3

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



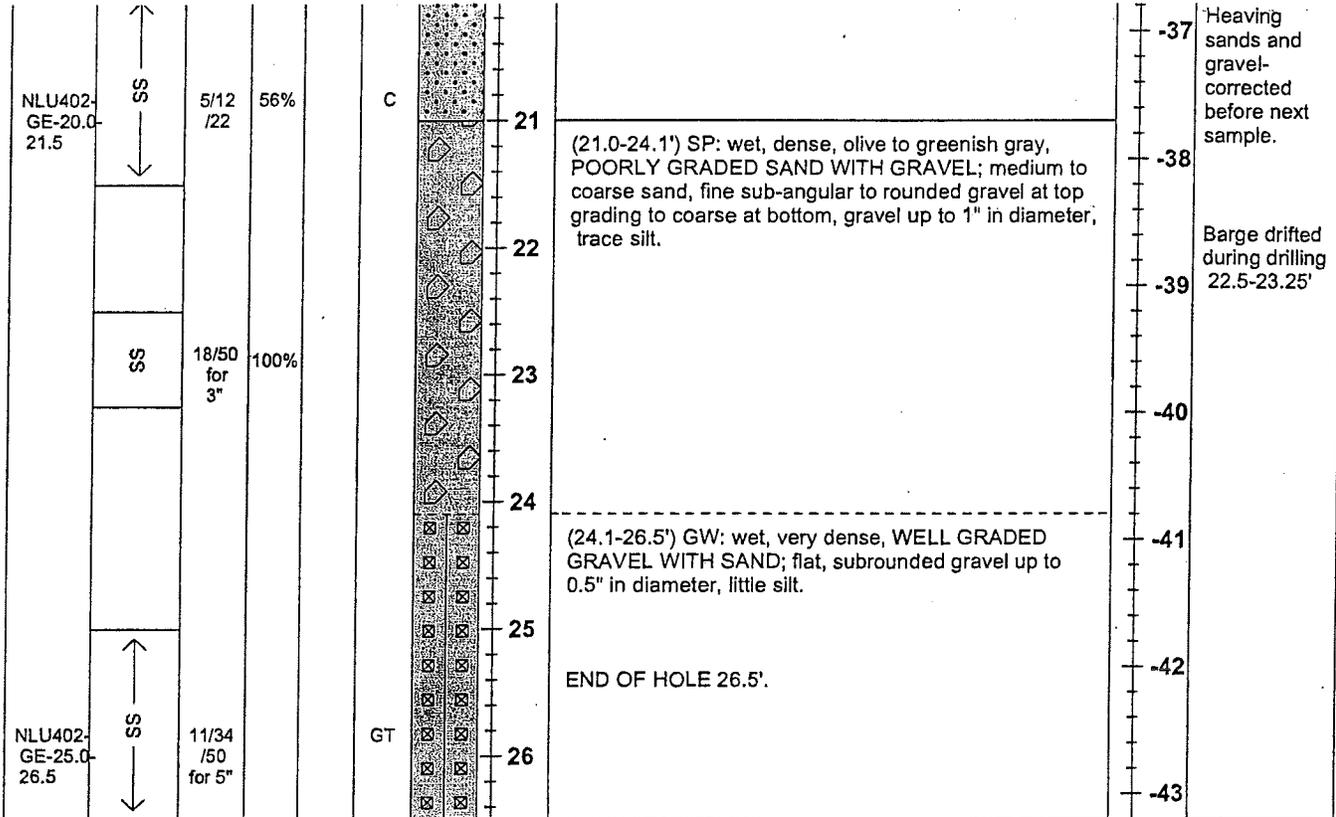
<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler and 300 lb hammer used. Horizontal Datum: NAD83/91, Vertical Datum: USACE.</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Backfilled with grout through drilling rods.</b>		



# Boring Log

Boring #: NLU402  
Sheet 3 of 3

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2639	Dames and Moore split spoon sampler and 300 lb hammer	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	used. Horizontal Datum: NAD83/91, Vertical Datum: USACE.		
	Backfilled with grout through drilling rods.		

VISUAL CORE LOG

Client:	<u>The Retec Group, Inc.</u>	Date:	<u>2/15/05</u>
Project:	<u>North Lake Union Geotech</u>	Sample Extruded by:	<u>HB</u>
Core No.:	<u>NLU402-GE-3.0-5.0</u>	Sample Logged by:	<u>HB</u>
Sample No.:	<u>HQ36I</u>	Type:	<u>Shelby</u>
Depth of Sample:	<u>3.0-5.0</u>	Diameter of Sample:	<u>2.85</u>
Sample Recovery:	<u>19"</u>		

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	265.4	MC	3.0	<p>Top of Recovery</p> <p>Soft, Brown, Fibrous Organic Silt</p>
	283.0	Consol	3.5	
			4.0	
	313.2	Density		
		TVS	4.5	
			5.0	Bottom of Recovery

VISUAL CORE LOG

Client:	<u>The Retec Group, Inc.</u>	Date:	<u>2/15/05</u>
Project:	<u>North Lake Union Geotech</u>	Sample Extruded by:	<u>HB</u>
Core No.:	<u>NLU402-GE-8.0-10.0</u>	Sample Logged by:	<u>HB</u>
Sample No.:	<u>HQ36J</u>	Type:	<u>Shelby</u>
Depth of Sample:	<u>8.0-10.0</u>	Diameter of Sample:	<u>2.85</u>
Sample Recovery:	<u>21"</u>		

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
			8.0	Top of Recovery
	676.1	TVS Density		Soft, Brown, Fibrous Organic Silt  ↓  Bottom of Recovery
			8.5	
	700.0	MC		
			9.0	
	768.1	MC		
			9.5	
			10.0	
			10.5	

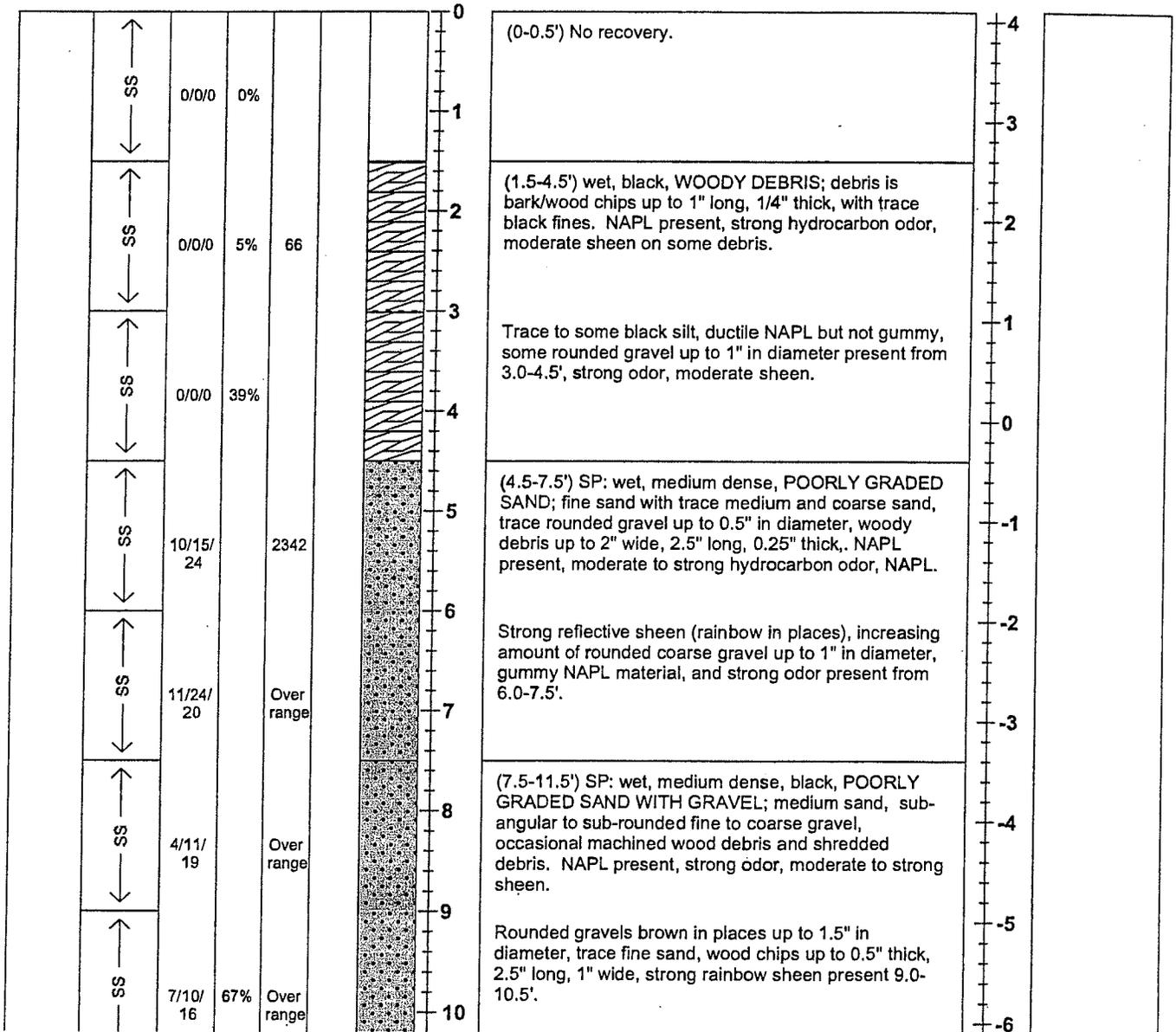


# Boring Log

Boring #: NLU403

Sheet 1 of 2

Project: North Lake Union		Operator: John Bennett		Location: East of Gas Works Park						
Project #: PSE10-18628-320		Drill Rig Type: B-59 Foremost		Northing: 239157.029 Easting: 1270877.493						
Client: Puget Sound Energy		Method: Mud Rotary		SW Elevation: 20.03 ft.						
Contractor: Boart Longyear/Holt Drilling		Casing ID: 5 in.		Water Depth: 15.95 ft.						
Start Date & Time: 01/12/2005 0920		Boring ID: 4 in.		Total Depth: 17.5 ft.						
Finish Date & Time: 01/12/2005 1500		Logged By: S. Albano		Grout: High Solids Bentonite Grout						
Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames &amp; Moore split spoon sampler &amp; 300 lb hammer used.</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Horizontal Datum: NAD83/91, Vertical Datum: USACE.</b>		
	<b>Casing advanced to bottom of hole. Recovery not recorded</b>		
	<b>4.5-9.0 ft. Backfilled through drill rods.</b>		



# Boring Log

Boring #: NLU403

Sheet 2 of 2

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					

	←						11		-7	Started using mud for circulation, chattering
	↕ SS ↕	25/36/50	67%				12	(11.0-13.5') SW: wet, very dense, dark gray to black, WELL GRADED SAND WITH GRAVEL; fine to medium sand, subrounded gravel up to 1" in diameter. NAPL present, less NAPL at 13.7', strong odor, reflective sheen.	-8	Losing mud
	↕ SS ↕	7/50	100%				13		-9	Chattering
	↕ SS ↕						14	(13.5-15.75') GP: wet, dense, olive gray, POORLY GRADED GRAVEL WITH SAND; subrounded to rounded gravel up to 1" in diameter, few silty clay. NAPL present, moderate rainbow sheen in places.	-10	
							15	No NAPL visible at 15.5'.	-11	
	↕ SS ↕	10/50	42%				16	(15.75-17.5') GM: wet, dense, greenish gray, SILTY GRAVEL; fine to coarse gravel, trace coarse sand, fines are moderately plastic, slight odor. (Glacial till). END OF HOLE 17.5'.	-12	Chattering.
	↕ SS ↕						17		-13	

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames &amp; Moore split spoon sampler &amp; 300 lb hammer used.</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Horizontal Datum: NAD83/91, Vertical Datum: USACE.</b>		
	<b>Casing advanced to bottom of hole. Recovery not recorded</b>		
	<b>4.5-9.0 ft. Backfilled through drill rods.</b>		

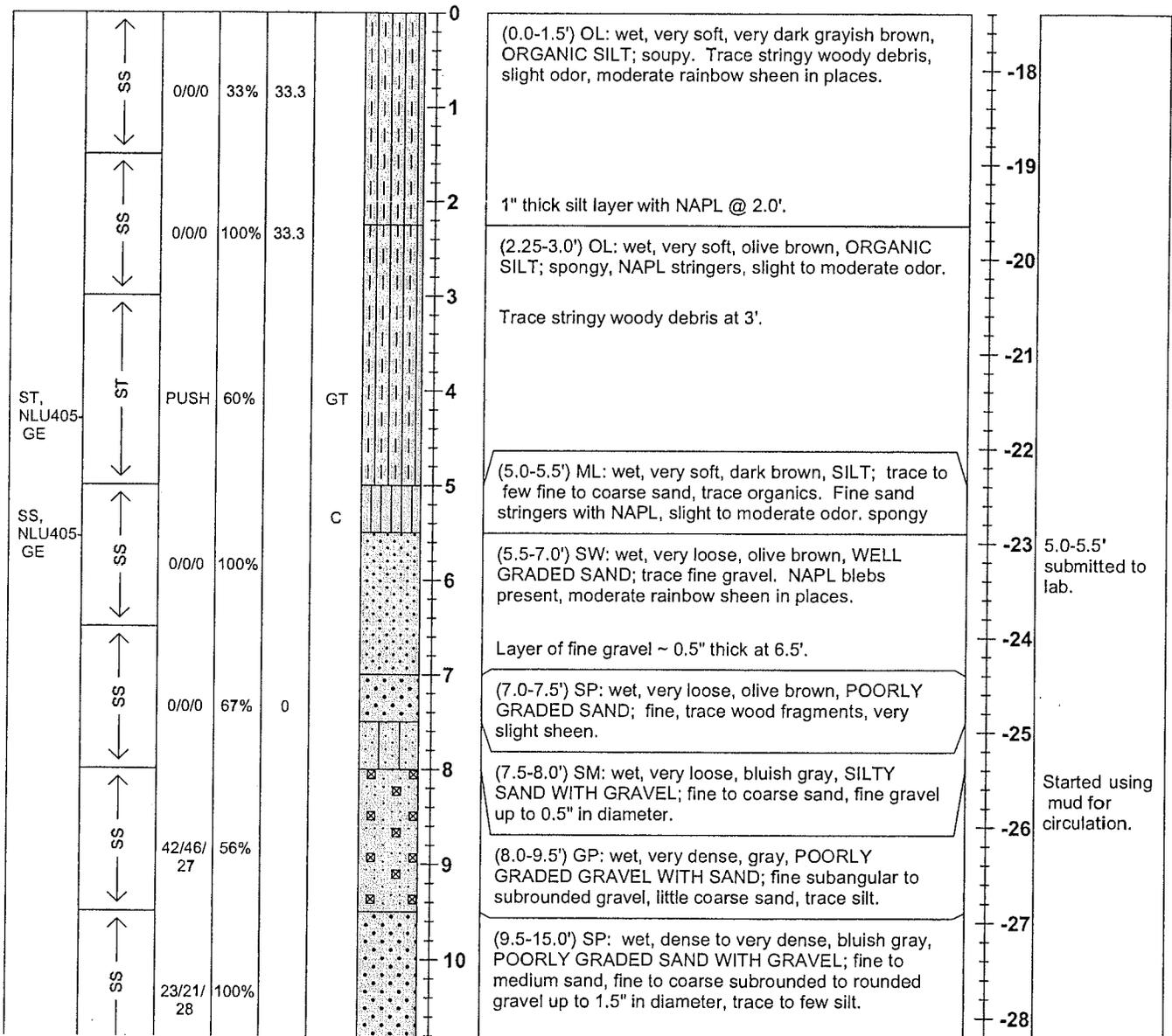


# Boring Log

Boring #: NLU405  
Sheet 1 of 2

Project: North Lake Union	Operator: John Bennett	Location: East of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 239087.749 Easting: 1271024.989
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.0 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 37.4 ft.
Start Date & Time: 01/19/2005 0915	Boring ID: 4 in.	Total Depth: 19.1 ft.
Finish Date & Time: 01/19/2005 1400	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler and 300 lb hammer</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>used. Horizontal Datum: NAD83/91, Vertical Datum: USACE.</b>		
	<b>Backfilled with 1 bag of grout through drilling rods.</b>		



# Boring Log

Boring #: NLU405

Sheet 2 of 2

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					

NLU405-MUD-16.5	←						11		-29	
	↕ SS ↕	34/30/31	100%				12	Lenses of salt and pepper colored medium sand from 12.0-13.5'.	-30	
	↕ SS ↕	29/50	100%				13		-31	
	↕ SS ↕	50 for 5"	0%				14		-32	
	↕ SS ↕	50 for 1"	0%				15	(15.0-19.1') SW-SM: wet, very dense, bluish gray, WELL GRADED SAND; few rounded fine gravel, few to little silt.	-33	
							16		-34	NLU405-MUD-16.5 collected.
							17		-35	
							18		-36	
							19	END OF HOLE 19.1'.		

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler and 300 lb hammer</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>used. Horizontal Datum: NAD83/91, Vertical Datum: USACE.</b>		
	<b>Backfilled with 1 bag of grout through drilling rods.</b>		

VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU405-GE-3-5  
 Sample No.: HQ37K  
 Depth of Sample: 3-5  
 Sample Recovery: 22

Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	558.7	MC	3.0	Top of Recovery
				Soft, Brown, Fibrous Organic Silt
			3.5	
			4.0	
	548.5	Density TVS	4.5	Pockets of Free Product
				Bottom of Recovery
			5.0	



# Boring Log

Boring #: NLU406  
Sheet 1 of 2

Project: North Lake Union	Operator: John Bennett	Location: SW of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 238886.304 Easting: 1270825.881
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.09 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 21.6 ft.
Start Date & Time: 01/17/2005 1340	Boring ID: 4 in.	Total Depth: 16.5 ft.
Finish Date & Time: 01/17/2005 1630	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					
NLU406-GE-3.0-4.5	SS 1/0/0	1/0/0	6%	166		0-1	(0-3.0') OL: wet, very soft, very dark brown, ORGANIC SILT; few to little fine sand. Trace plant debris. Slight hydrocarbon odor, some moderate rainbow sheen.	-2		
	SS 0/0/0	0/0/0	11%	33		1-2	Black vesicular homogenous light weight clasts (anthropogenic) and smooth rounded woody debris present from 1.5-3.0'.	-3	Mud started for circulation.	
NLU406-GE-3.5-4.5	SS 14/27/30	14/27/30	78%	0	GT	2-3	(3.0-3.5') GP: wet, dense, very dark brown, POORLY GRADED GRAVEL WITH SAND. Anthropogenic light weight clasts, woody debris rounded and smooth.	-4		
	SS 14/27/30	14/27/30	78%	0	GT	3-4	(3.5-5.0') GM: wet, dense, bluish gray, SILTY GRAVEL WITH SAND; fine to coarse gravel, fine to coarse sand, sheen on outside of sampler only.	-5		
	SS 21/20/12	21/20/12	78%	0		4-5	(5.0-6.0') SP: wet, medium, dense bluish gray, POORLY GRADED SAND WITH GRAVEL; coarse sand, fine subangular gravel up to 0.25" in diameter.	-6	Drill rig chattering.	
	SS 14/12/11	14/12/11	56%			5-7	(6.0-9.0') SC: wet, medium dense, bluish gray, CLAYEY SAND; fine to coarse sand, few coarse sub-rounded gravel, till-like texture.	-7		
	SS 19/21/26	19/21/26	17%			7-8	Subangular fine gravel present 7.5-9.0'.	-8		
						8-10		-9		
								-10		

Remarks and Datum Used:  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	300 lb hammer & Dames and Moore Sampler used.	Sample Type	Analysis
	Horizontal Datum: NAD83/91, Vertical Datum:	SS = Penetration Test	GT = Geotech
	USACE. Backfilled with 1 bag grout through drilling rods.	ST = Shelby Tube	C = Chemical
			A = Archive



# Boring Log

Boring #: NLU406

Sheet 2 of 2

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					
NLU406-GE-9.0-10.5	SS	22/34/33	89%				(9.0-16.0') ML: wet, very dense, bluish gray, SANDY SILT; low plasticity silt, fine to medium sand, trace fine rounded gravel. (Glacial till).	-9 -11 -12 -13 -14 -15 -16 -17 -18	Blow counts suspect @ 10'. Advancing casing to keep seal.  Chattering.  Mud loss.	
	SS	5/14/50 for 5"	0%							
	SS	50 for 5"	80%							
	SS	50 for 5.5"	100%							
							END OF HOLE 16.5'			

Remarks and Datum Used:  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	300 lb hammer & Dames and Moore Sampler used.	Sample Type SS = Penetration Test ST = Shelby Tube	Analysis GT= Geotech C= Chemical A= Archive
	Horizontal Datum: NAD83/91, Vertical Datum:		
	USACE. Backfilled with 1 bag grout through drilling rods.		



# Boring Log

Boring #: NLU408

Sheet 1 of 2

Project: North Lake Union		Operator: John Bennett		Location: SW of Gas Works Park	
Project #: PSE10-18628-320		Drill Rig Type: B-59 Foremost		Northing: 238584.197 Easting: 1269875.703	
Client: Puget Sound Energy		Method: Mud Rotary		SW Elevation: 20.09 ft.	
Contractor: Boart Longyear/Holt Drilling		Casing ID: 5 in.		Water Depth: 32.0 ft.	
Start Date & Time: 01/17/2005 0900		Boring ID: 4 in.		Total Depth: 29.0 ft.	
Finish Date & Time: 01/17/2005 1330		Logged By: S. Albano		Grout: High Solids Bentonite Grout	

ID	Depth Range (ft) & Type	Blows Per 6 inch	% Rec	PID (ppm)	Analysis	Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
	0-0.25' OL	0/0/0	0%				0	(0-2.25') OL: wet, very soft, very dark brown, ORGANIC SILT; spongy texture. Stringy plant debris, slight hydrocarbon odor, slight to moderate rainbow sheen. 0-1.5' assumed to be OL based on similar drilling conditions.	-12	
	0.25-3.0' SM	7/10/12	78%	0			2	(2.25-3.0') SM: wet, medium dense, bluish gray, SILTY SAND; fine to coarse sand, trace round to subrounded gravel up to 2" in diameter, slight hydrocarbon odor. Sharp contact with overlying OL.	-14	
NLU408-GE-3.0-4.5	3.0-4.5' SP	7/12/15	100%			GT	4	(3.0-6.0') SP: wet, medium dense, bluish gray, POORLY GRADED SAND; fine, trace silt, trace coarse gravel up to 0.5" in diameter. Abundant brown woody debris, slight to no odor.	-16	Started using mud for circulation at 4.5'.
	4.5-6.0' SP	11/14/18	78%	0			5	No woody debris below 4.5'.	-17	
NLU408-GE-6.0-7.5	6.0-7.5' GP	8/18/22	78%			C	7	(6.0-9.0') GP: wet, medium dense, very dark bluish gray, POORLY GRADED GRAVEL WITH SAND; fine gravel, fine to coarse sand.	-18	
NLU408-GE-7.5-9.0	7.5-9.0' SP	23/35/48	56%			GT	8	Coarse sand percentage increases and coarse sub-angular to sub-rounded gravel present between 7.5-9.0'.	-20	
	9.0-13.5' SP	4/8/12	100%				10	(9.0-13.5') SP: wet, medium dense to dense, dark bluish gray POORLY GRADED SAND; fine with trace medium sand, trace silt, trace coarse gravel up to 1.5" in diameter.	-22	
	13.5-26.0' SP	19/21/32	100%			GT	12	Becomes dense.	-24	
NLU408-GE-11.3-13.0	11.3-13.0' SP	32/39/45	100%				14	(13.5-26.0') SP: wet, dense to very dense, bluish gray POORLY GRADED SAND; fine to medium, trace fine subrounded gravel up to 0.5" in diameter.	-26	Reset seal.

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	300 lb hammer & Dames and Moore Sampler used.	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	Horizontal Datum: NAD83/91, Vertical Datum: USACE.		
	Backfilled w/ 3/4 bag of grout through drilling rods.		
	No recovery noted for 24-25.5'.		



# Boring Log

Boring #: NLU408

Sheet 2 of 2

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 inch	% Rec	PID (ppm)	Analysis					

NLU408- GE-28.5- 29.0	SS	32/30/ 28	100%				16		-28	
	SS	36/38/ 42	72%				17		-29	
	SS	27/28/ 26	100%				18		-30	
	SS	25/46/ 50 for 5.5"					19		-31	
	SS	40/50 for 5.5"	100%				20	Few 0.25" silt interbeds at 20'.	-32	
	SS	50 for 5.5"	100%				21	Interbedded layers of fine and coarse sand starting at 21.5'.	-33	Some chattering
	SS						22		-34	
	SS						23		-35	Chattering
	SS						24	Becomes very dense and stratified with alternating coarse sand, fine sand, medium sand starting at 24.0'.	-36	
	SS						25		-37	
					26	(26.0-28.1') SW: wet, very dense, bluish gray, WELL GRADED SAND WITH GRAVEL; fine to coarse, little sub-rounded fine gravel.	-38			
					27		-39			
					28	(28.1-29.0') SM: wet, very dense, bluish gray, POORLY GRADED SAND WITH SILT; fine, little silt. (Glacial till). END OF HOLE 29.0'.	-40	Rig chattering.		
					29					

<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>300 lb hammer &amp; Dames and Moore Sampler used.</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Horizontal Datum: NAD83/91, Vertical Datum: USACE.</b>		
	<b>Backfilled w/ 3/4 bag of grout through drilling rods.</b>		
	<b>No recovery noted for 24-25.5'.</b>		

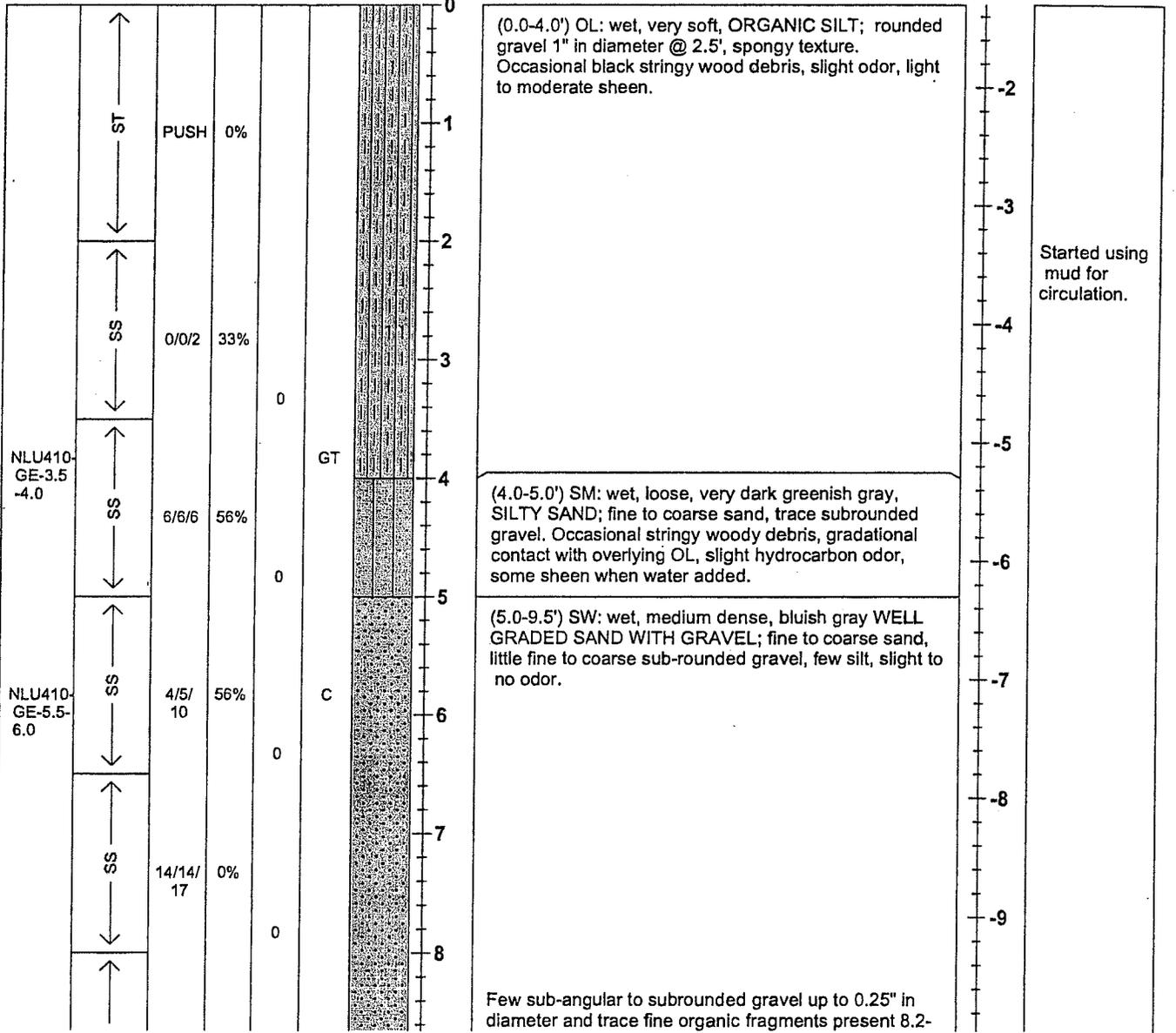


# Boring Log

Boring #: NLU410  
Sheet 1 of 3

Project: North Lake Union	Operator: John Bennett	Location: South of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 238547.766 Easting: 1270163.184
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.05 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 21.3 ft.
Start Date & Time: 01/14/2005 0930	Boring ID: 4 in.	Total Depth: 24.25 ft.
Finish Date & Time: 01/14/2005 1610	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames &amp; Moore split spoon sampler &amp; 300 lb hammer used.</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Horizontal Datum: NAD83/91, Vertical Datum: USACE. Backfilled</b>		
	<b>w/ 1 bag grout through drilling rods.</b>		



# Boring Log

Boring #: NLU410

Sheet 2 of 3

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					

NLU410-GE-8.25-9.5	SS	8/13/15	61%	0	GT	9.5'		-10	
	SS	6/9/16	72%	0	GT	(9.5-12.5')	SP: wet, medium dense, POORLY GRADED SAND WITH GRAVEL; fine to coarse sand, some fine subrounded to rounded gravel up to 2" in diameter.	-11	Chattering.
	SS	4/8/17	89%	0	GT	(12.5-13.75')	SP: wet, medium dense, bluish gray, POORLY GRADED SAND; fine, few gravel.	-14	Chattering.
	SS	24/27/32	67%	0	GT	(13.75-16.5')	SW: wet, dense, bluish gray, WELL GRADED SAND, trace to few subrounded to rounded gravel, gravel supported by sand matrix.	-15	Hard drilling @ 14'.
NLU410-MUD	MUD	50 for 5"	100%	0		(16.5-18.5')	SM: wet, very dense, bluish gray, SILTY SAND; few subrounded to rounded gravel.	-18	NLU410-GE-MUD-16.0 sampled. Chattering, rig shaking.
						(18.5-24.25')	ML: wet, hard, dark bluish gray, CLAYEY	-20	

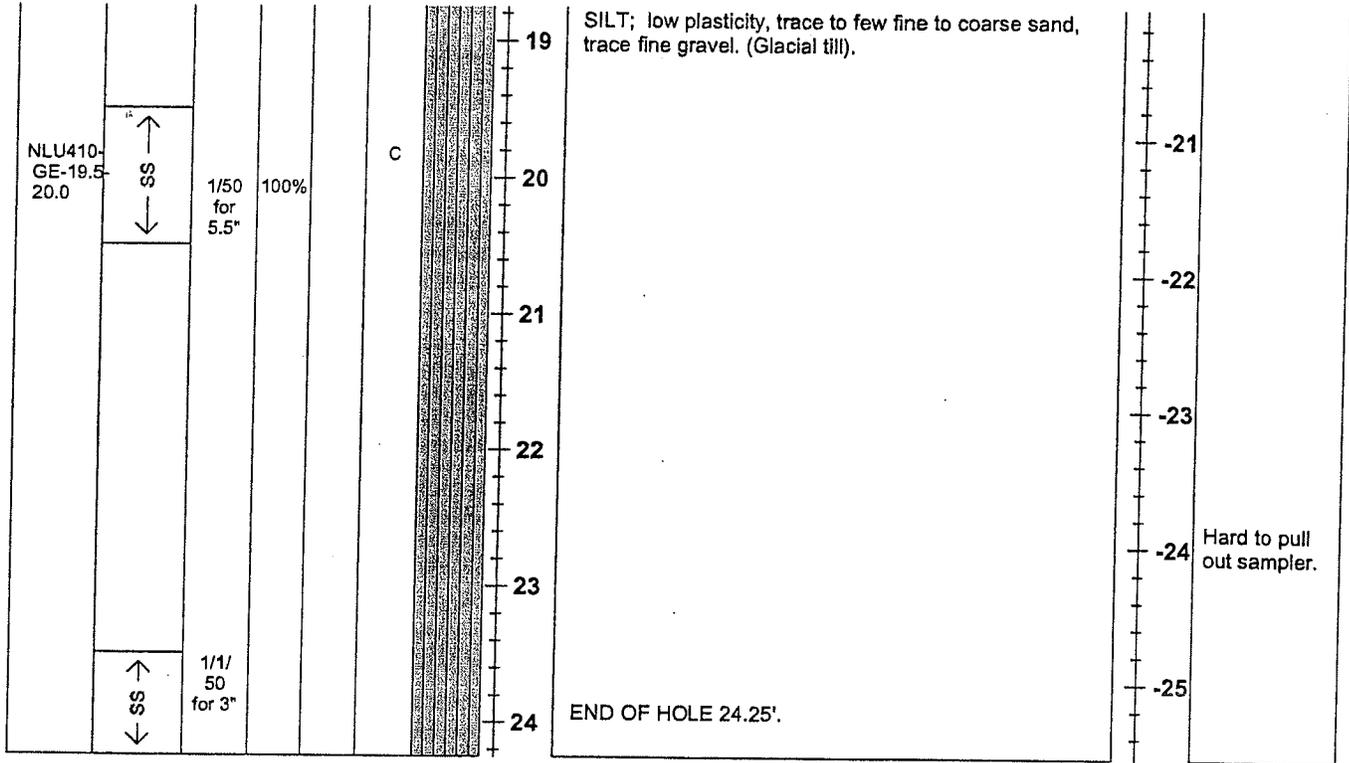
<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames &amp; Moore split spoon sampler &amp; 300 lb hammer used.</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Horizontal Datum: NAD83/91, Vertical Datum: USACE. Backfilled w/ 1 bag grout through drilling rods.</b>		



# Boring Log

Boring #: NLU410  
Sheet 3 of 3

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames &amp; Moore split spoon sampler &amp; 300 lb hammer used.</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Horizontal Datum: NAD83/91, Vertical Datum: USACE. Backfilled</b>		
	<b>w/ 1 bag grout through drilling rods.</b>		



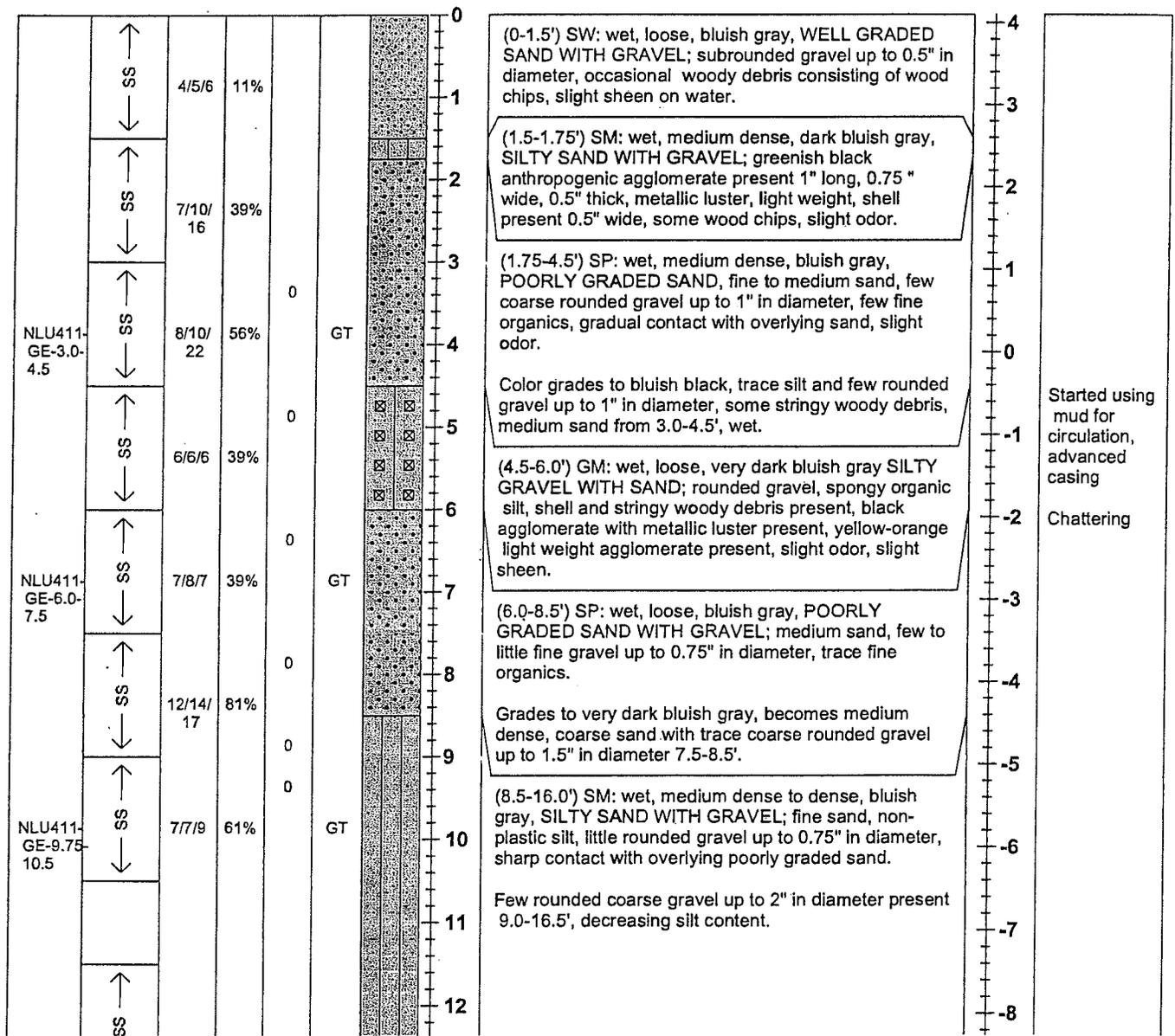
# Boring Log

Boring #: NLU411

Sheet 1 of 2

Project: North Lake Union	Operator: John Bennett	Location: South of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 238559.372 Easting: 1270418.887
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.01 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 15.95 ft.
Start Date & Time: 01/13/2005 1100	Boring ID: 4 in.	Total Depth: 22.25 ft.
Finish Date & Time: 01/13/2005 1530	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler used. 300 lb hammer</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>used until 19.5', then 140 lb hammer used. Horizontal Datum:</b>		
	<b>NAD83/91, Vertical Datum: USACE. Backfilled with high solids bentonite grout through drilling rods.</b>		

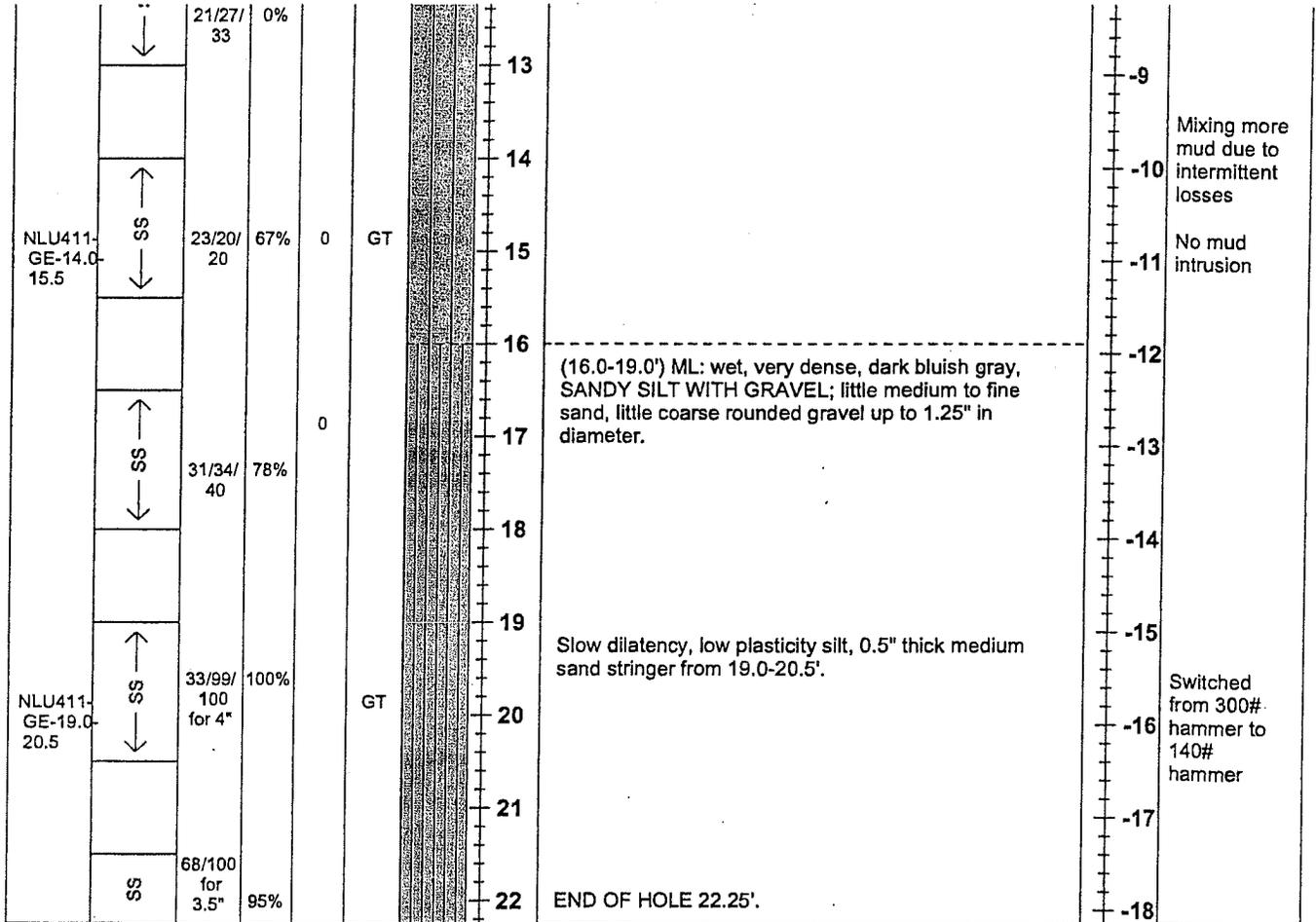


# Boring Log

Boring #: NLU411

Sheet 2 of 2

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b>  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler used. 300 lb hammer</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical .A= Archive
	<b>used until 19.5', then 140 lb hammer used. Horizontal Datum:</b>		
	<b>NAD83/91, Vertical Datum: USACE. Backfilled with high solids</b>		
	<b>benonite grout through drilling rods.</b>		



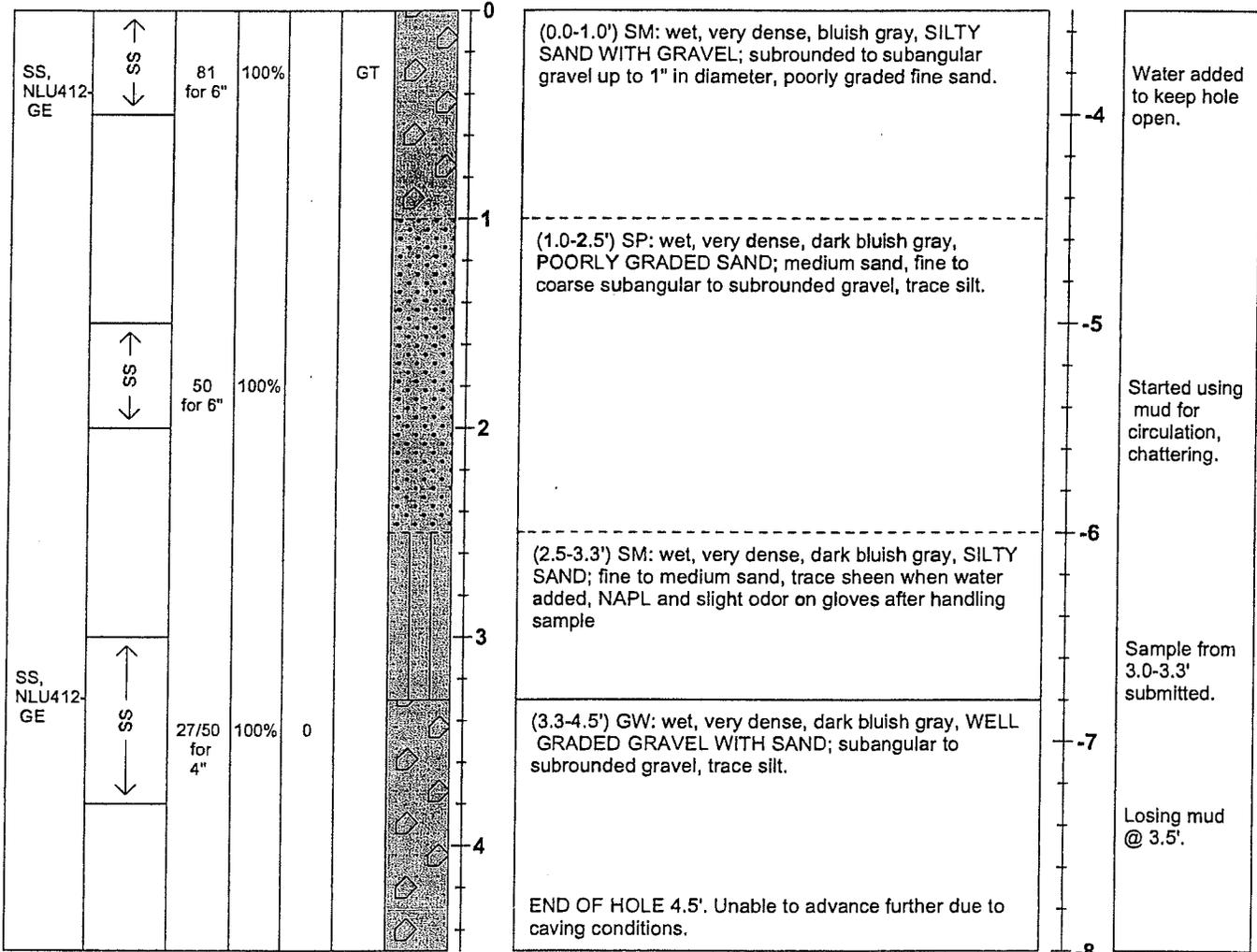
# Boring Log

Boring #: NLU412

Sheet 1 of 1

Project: North Lake Union	Operator: John Bennett	Location: SE of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 238561.305 Easting: 1270756.132
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.01 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 23.55 ft.
Start Date & Time: 01/13/2005 0830	Boring ID: 4 in.	Total Depth: 4.5 ft.
Finish Date & Time: 01/13/2005 1010	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler and 300 lb hammer used. Horizontal Datum: NAD83/91, Vertical Datum: USACE.</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Backfilled with &lt; 1 bag grout through drilling rods.</b>		

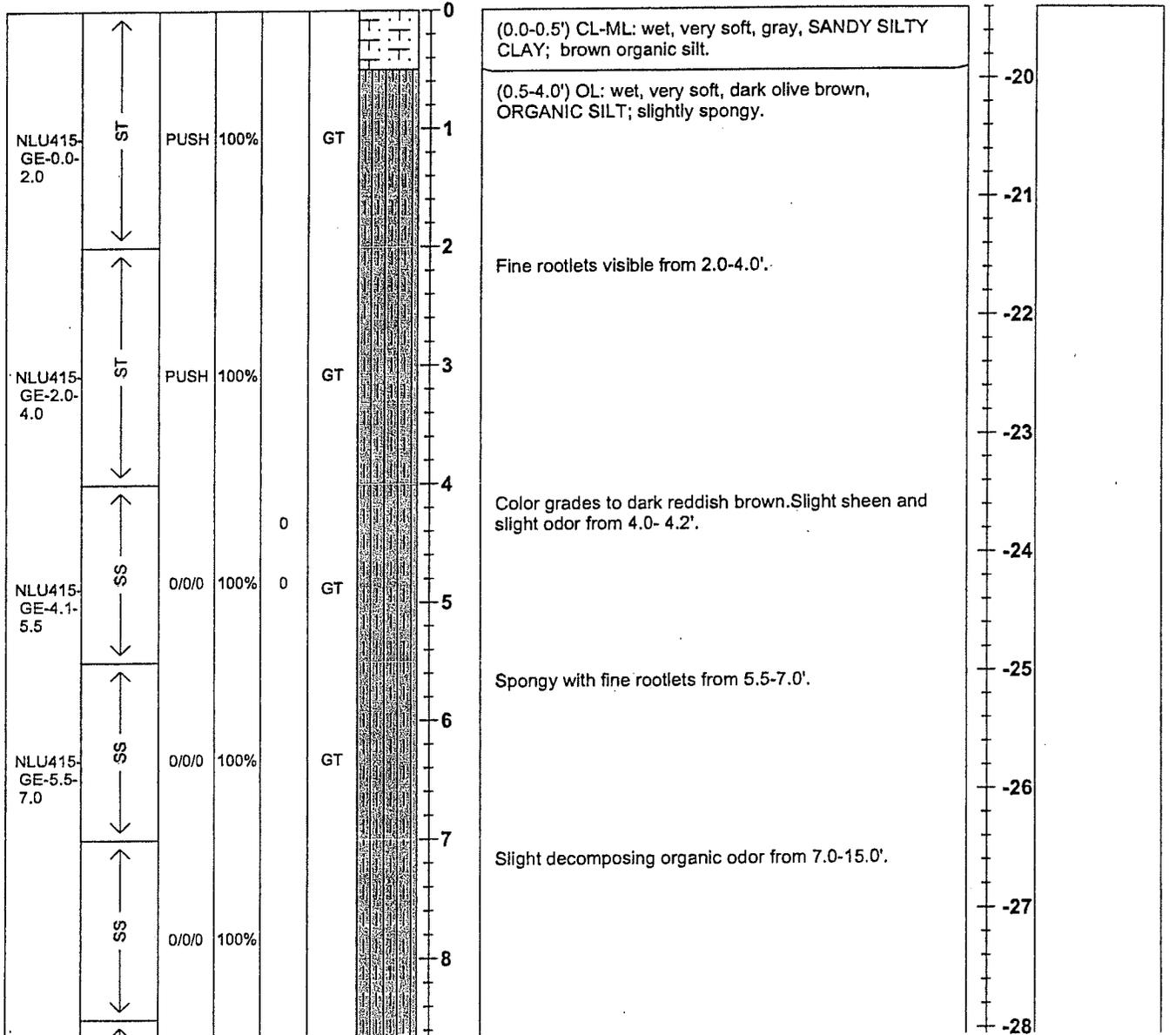


# Boring Log

Boring #: NLU415  
Sheet 1 of 2

Project: North Lake Union	Operator: John Bennett	Location: SW of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 238081.978 Easting: 1269667.243
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.01 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 39.43 ft.
Start Date & Time: 01/20/2005 0915	Boring ID: 4 in.	Total Depth: 15.0 ft.
Finish Date & Time: 01/20/2005 1120	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b>  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Dames and Moore split spoon sampler and 300 lb hammer	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	used. Horizontal Datum: NAD83/91, Vertical Datum: USACE.		
	Backfilled with 1 bag grout through drilling rods.		
	No mud used.		

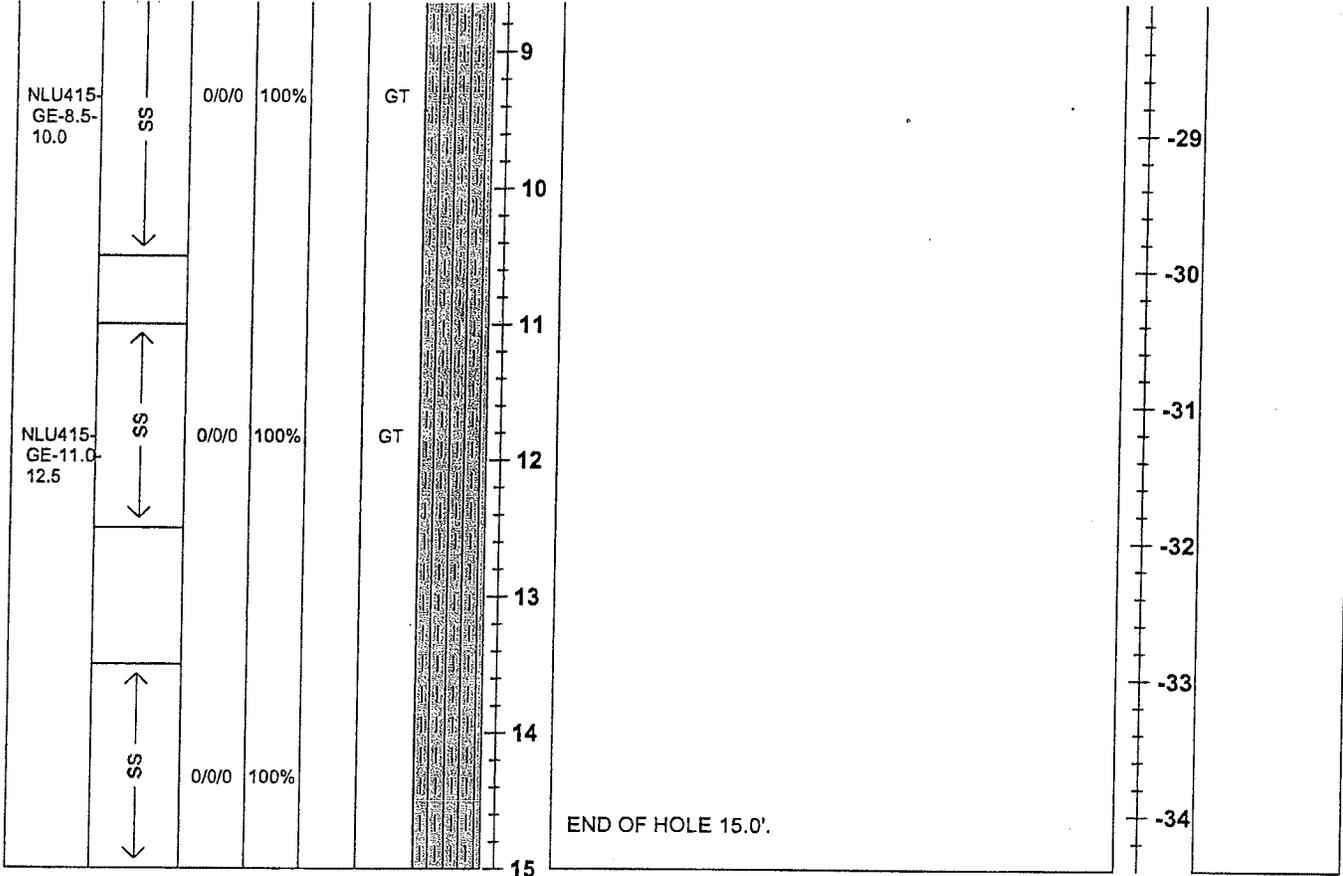


# Boring Log

Boring #: NLU415

Sheet 2 of 2

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler and 300 lb hammer</b>	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>used. Horizontal Datum: NAD83/91, Vertical Datum: USACE.</b>		
	<b>Backfilled with 1 bag grout through drilling rods.</b>		
	<b>No mud used.</b>		

VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU415-GE-0-2  
 Sample No.: HQ37L  
 Depth of Sample: 0-2  
 Sample Recovery: 20"

Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	159.0		0.0	Top of Recovery Soft, Gray Silty Clay Mottled with Brown Organic Silt
		Consol	0.5	
	326.9		1.0	Soft, Brown, Fibrous Organic Silt
		TVS Density		
	825.1		1.5	Very Soft Brown Organic Silt
		MC		Bottom of Recovery
			2.0	

VISUAL CORE LOG

Client:	<u>The Retec Group, Inc.</u>	Date:	<u>2/15/05</u>
Project:	<u>North Lake Union Geotech</u>	Sample Extruded by:	<u>HB</u>
Core No.:	<u>NLU415-GE-2-4</u>	Sample Logged by:	<u>HB</u>
Sample No.:	<u>HQ37M</u>	Type:	<u>Shelby</u>
Depth of Sample:	<u>2-4</u>	Diameter of Sample:	<u>2.85</u>
Sample Recovery:	<u>21.5"</u>		

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description	
			2.0	<p style="text-align: center;">Top of Recovery</p> <p style="text-align: center;">Soft, Brown, Fibrous Organic Silt</p> <div style="text-align: center;"> </div> <p style="text-align: center;">Bottom of Recovery</p>	
	809.2	Density			
		MC			
	794.3	MC	2.5		
		MC	3.0		
	778.7	MC	3.5		
		TVS			

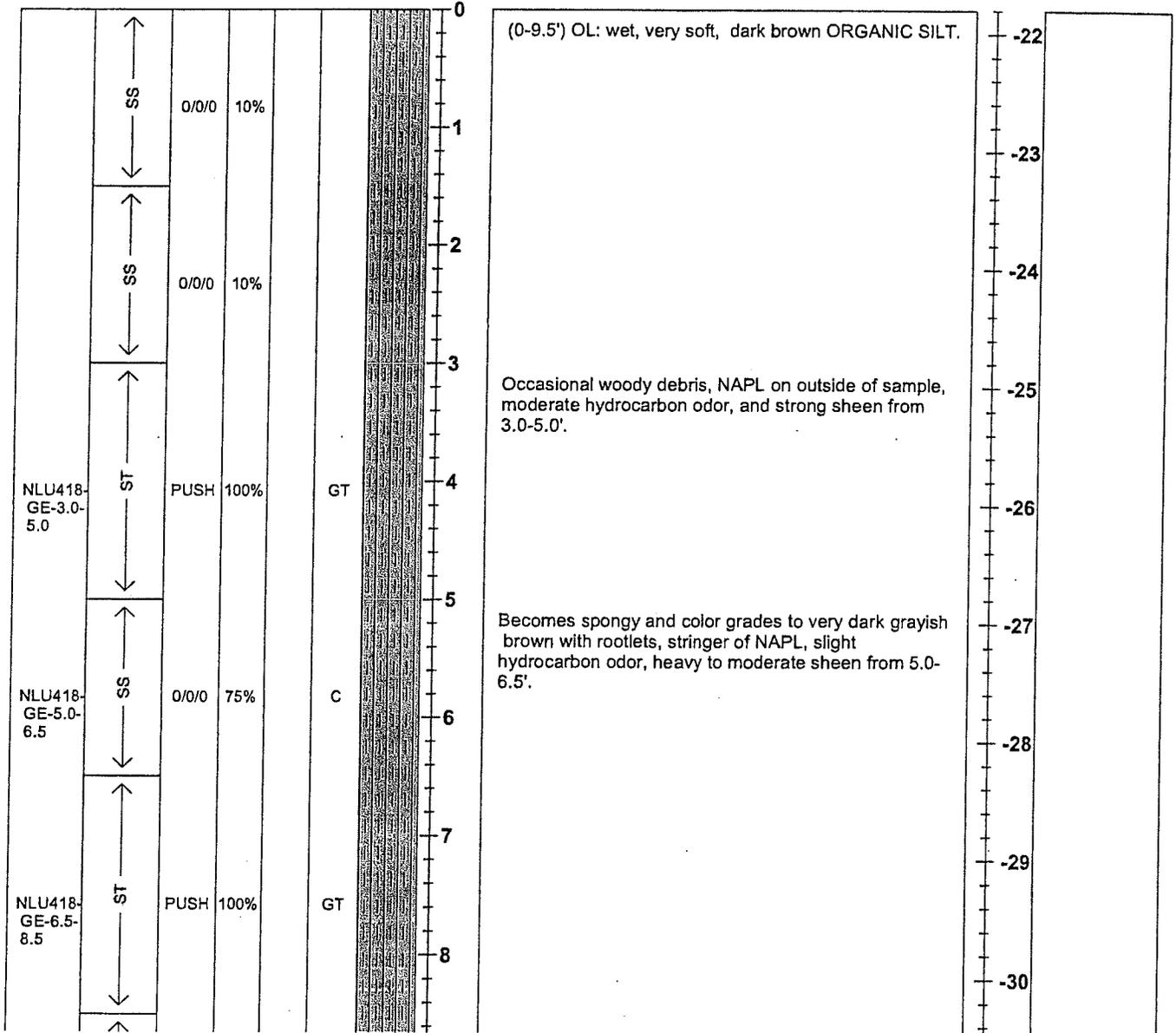


# Boring Log

Boring #: NLU418  
Sheet 1 of 2

Project: North Lake Union	Operator: John Bennett	Location: South of Gas Works Park
Project #: PSE10-18628-320	Drill Rig Type: B-59 Foremost	Northing: 238186.633 Easting: 1270439.555
Client: Puget Sound Energy	Method: Mud Rotary	SW Elevation: 20.00 ft.
Contractor: Boart Longyear/Holt Drilling	Casing ID: 5 in.	Water Depth: 41.8 ft.
Start Date & Time: 01/19/2005 1430	Boring ID: 4 in.	Total Depth: 15.0 ft.
Finish Date & Time: 01/19/2005 1602	Logged By: S. Albano	Grout: High Solids Bentonite Grout

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme: USCS	Elevation (ft.)	Comments
ID	Depth Range (ft) & Type	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					



<b>Remarks and Datum Used:</b> The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Dames and Moore split spoon sampler and 300 lb hammer	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	used. Horizontal Datum: NAD83/91, Vertical Datum: USACE.		
	Backfilled with 1 bag grout through drilling		
	rods. Recovery not recorded for 12.5-15.0'. PID not working.		

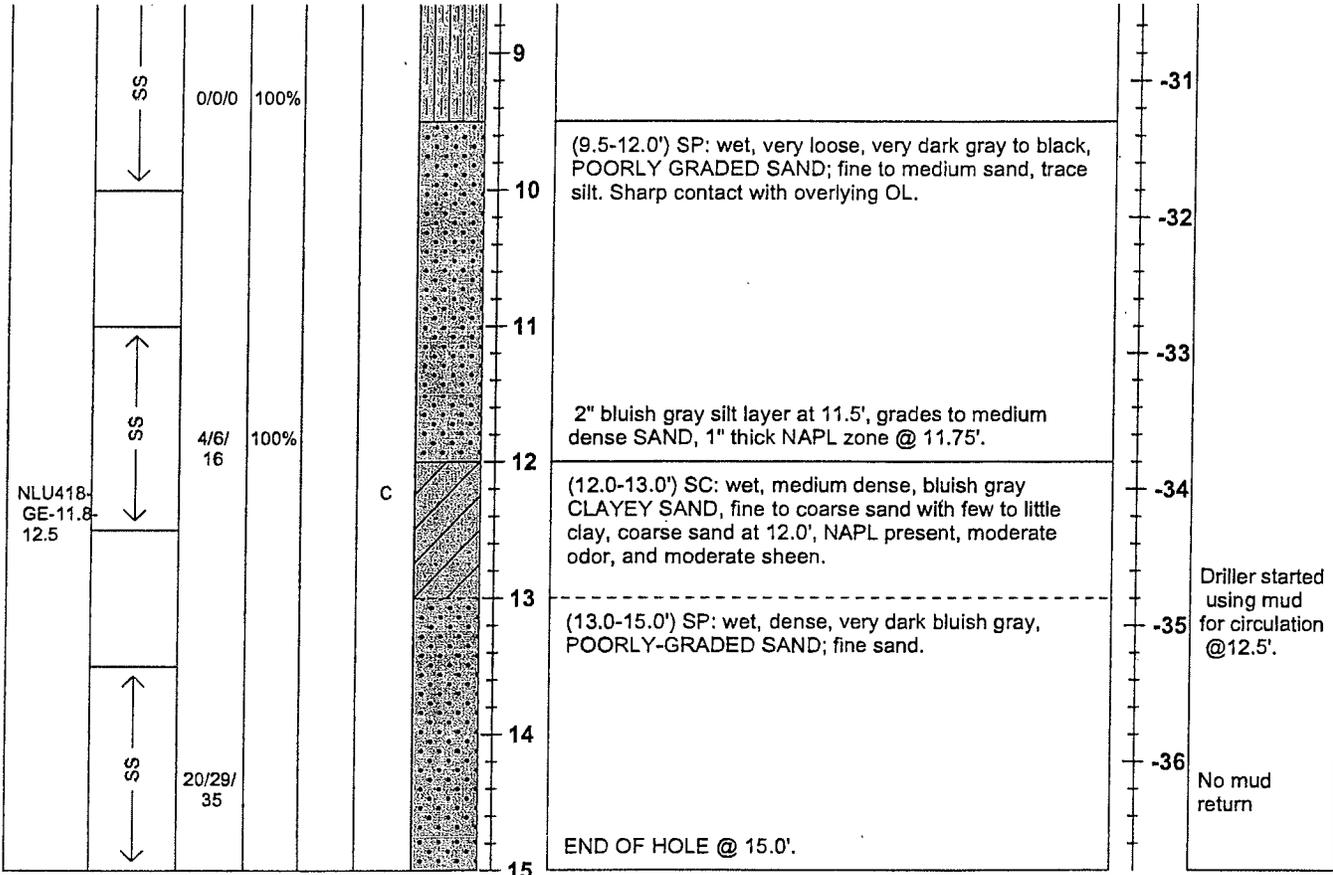


# Boring Log

Boring #: NLU418

Sheet 2 of 2

Sample						Graphic	Depth (ft.)	Soil and Rock Description Classification Scheme:	Elevation (ft.)	Comments
ID	Depth Range (ft) & ID	Blows Per 6 Inch	% Rec	PID (ppm)	Analysis					

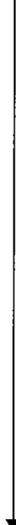


<b>Remarks and Datum Used:</b>  The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	<b>Dames and Moore split spoon sampler and 300 lb hammer</b> used. Horizontal Datum: NAD83/91, Vertical Datum: USACE.	<b>Sample Type</b> SS = Penetration Test ST = Shelby Tube	<b>Analysis</b> GT= Geotech C= Chemical A= Archive
	<b>Backfilled with 1 bag grout through drilling</b>		
	<b>rods. Recovery not recorded for 12.5-15.0'. PID not working.</b>		

VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU418-GE-3-5  
 Sample No.: HQ37N  
 Depth of Sample: 3-5  
 Sample Recovery: 20"

Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	837.0		3.0	Top of Recovery Soft, Brown, Fibrous Organic Silt  Bottom of Recovery
		TVS		
		MC		
	409		3.5	
			4.0	
		Density		
		MC		
		Consol	4.5	

VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU418-GE-6.5-8.5  
 Sample No.: HQ370  
 Depth of Sample: 6.5-8.5  
 Sample Recovery: 20"

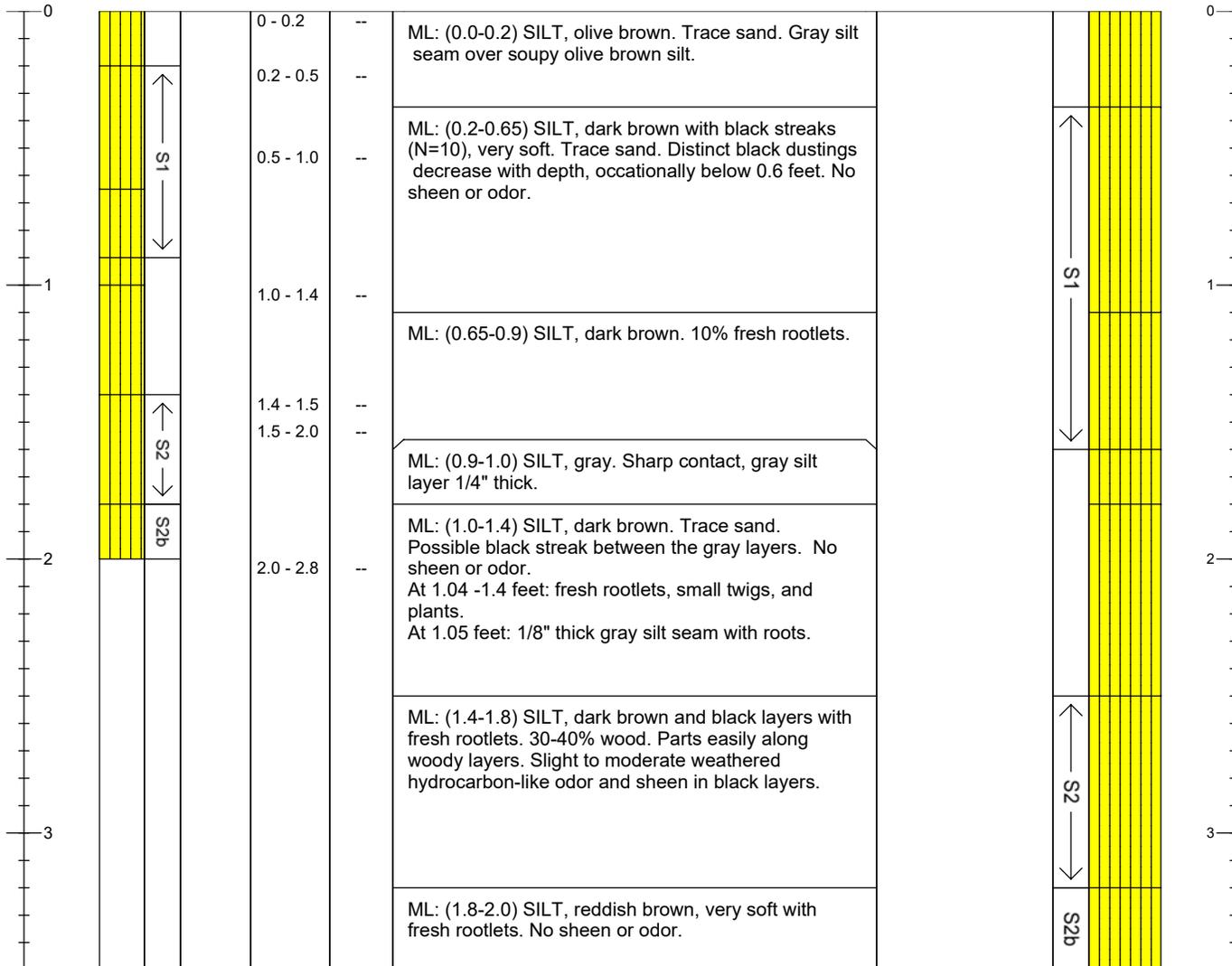
Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	699.8	TVS MC	3.0 3.5	Top of Recovery Soft, Brown, Fibrous Organic Silt  Bottom of Recovery
	637.7	Density MC	4.0 4.5	

**AECOM 2005**  
**Phase 3 Eastern Study Area**  
**Sediment Investigation**

**Diver Cores**

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>4.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>18.63</b>	Penetration Depth (feet): <b>3.5</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>39.6</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>02/02/2005</b>		Mudline Elevation (ft): <b>-20.97</b>	Recovery in feet: <b>2.0</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1270062.13</b> E./LONG: <b>238345.81</b>	Process Date: <b>02/02/2005</b>				
Vessel: <b>--</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: <b>--</b>				
Operator: <b>--</b>		Method/Tube ID: <b>3" polycarbonate diver push core</b>	Logged By: <b>ALF, S. Ashurst</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



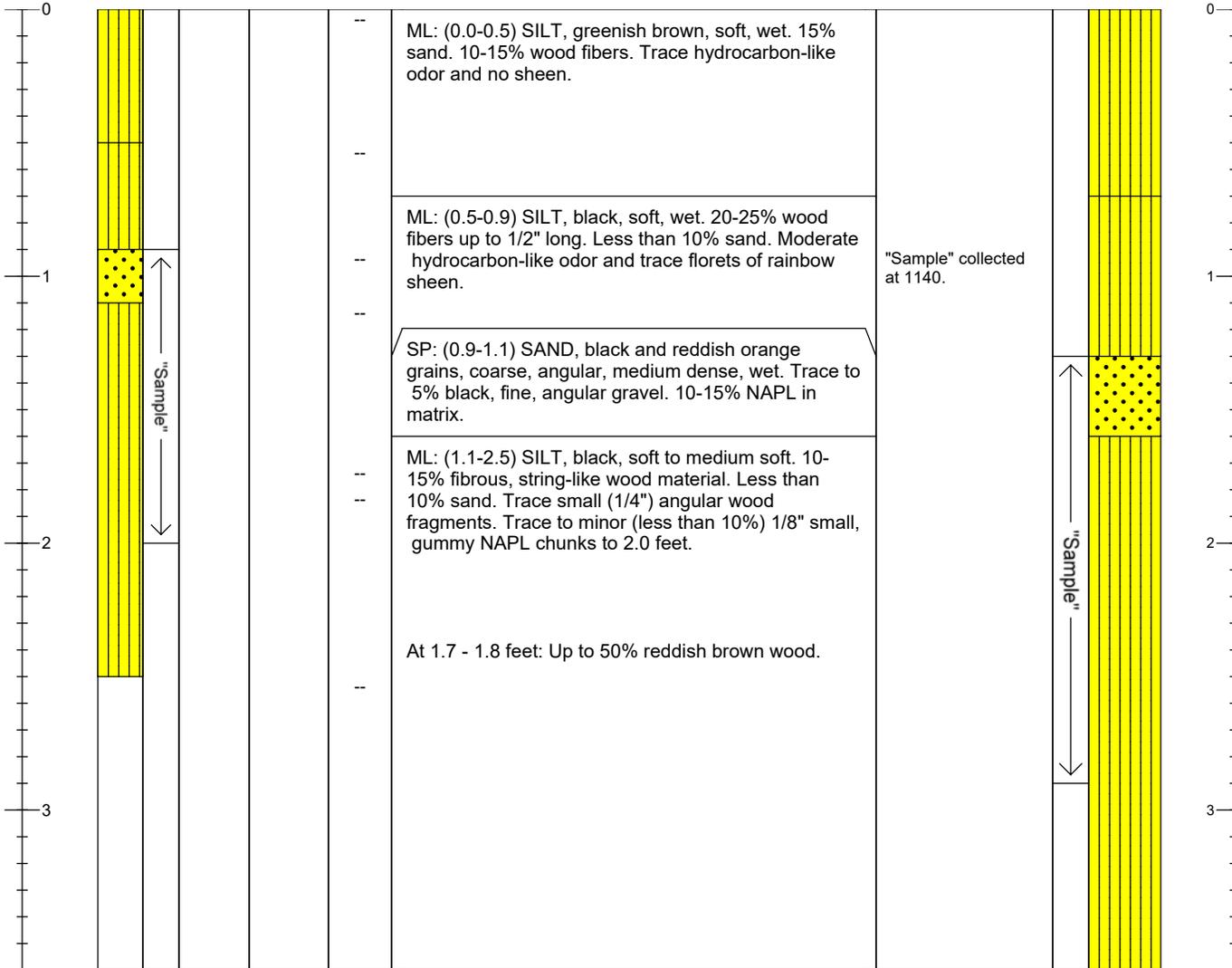
**AECOM**  
 710 2nd Ave, Ste 1000  
 Seattle, WA 98104  
 Phone: (206) 624-9349  
 Fax: (206) 623-3793

No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

**2.0 / 3.5 = 57 %**

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>4.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>~20</b>	Penetration Depth (feet): <b>3.6</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>9.87</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>02/16/2005</b>		Mudline Elevation (ft): <b>10.13</b>	Recovery in feet: <b>2.5</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1270858</b> E./LONG: <b>239143</b>	Process Date: --				
Vessel: --		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: --				
Operator: --		Method/Tube ID: <b>3" polycarbonate diver push core</b>	Logged By: <b>N. Bacher</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



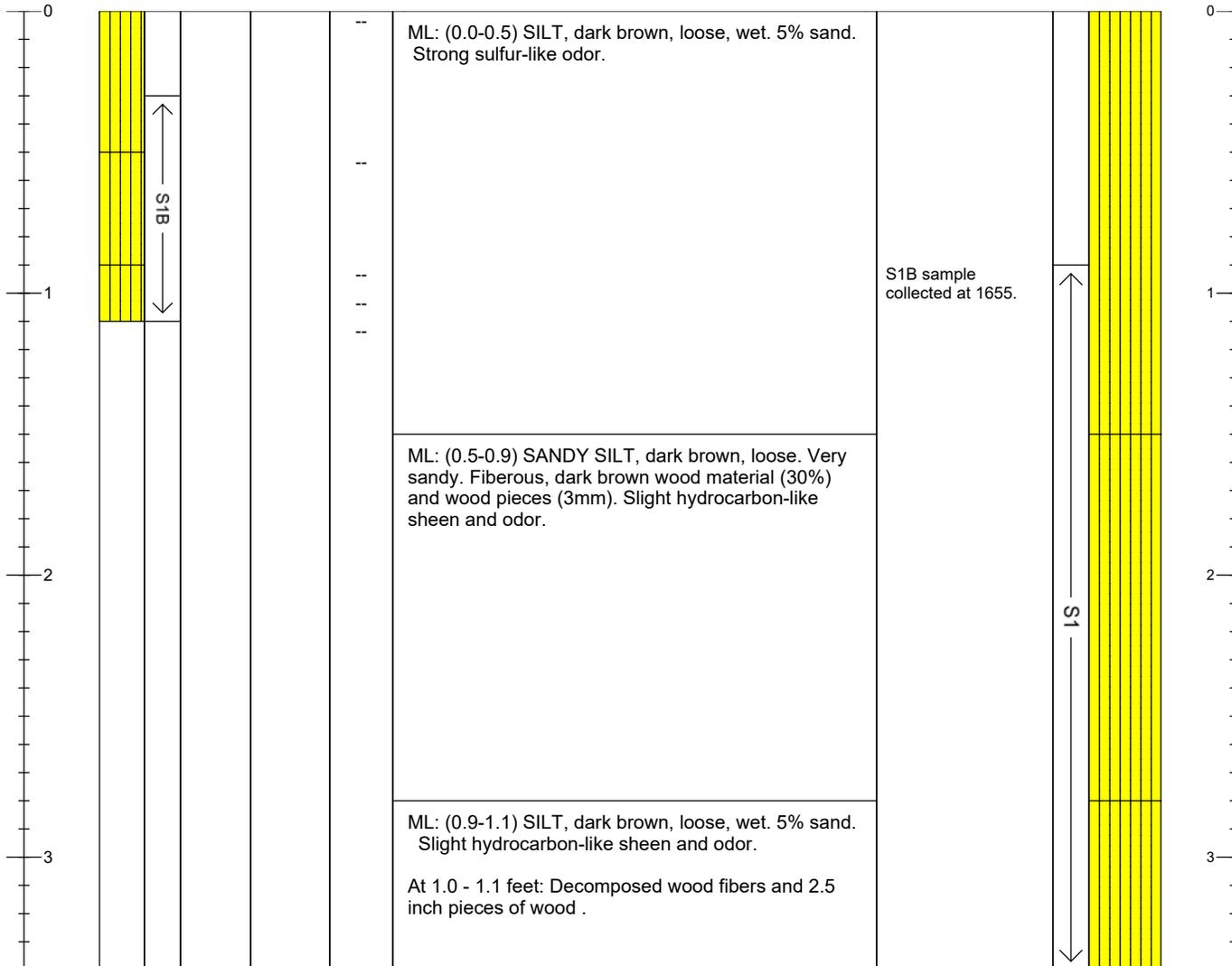
**AECOM**  
 710 2nd Ave, Ste 1000  
 Seattle, WA 98104  
 Phone: (206) 624-9349  
 Fax: (206) 623-3793

No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

**2.5 / 3.6 = 69 %**

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>6.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>22.43</b>	Penetration Depth (feet): <b>3.4</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>7.4</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>01/18/2005</b>		Mudline Elevation (ft): <b>15.03</b>	Recovery in feet: <b>1.1</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1270843.63</b> E./LONG: <b>239551.72</b>	Process Date: <b>01/18/2005</b>				
Vessel: <b>--</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: <b>--</b>				
Operator: <b>--</b>		Method/Tube ID: <b>3" polycarbonate divers core</b>	Logged By: <b>L.M. &amp; D.B.</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



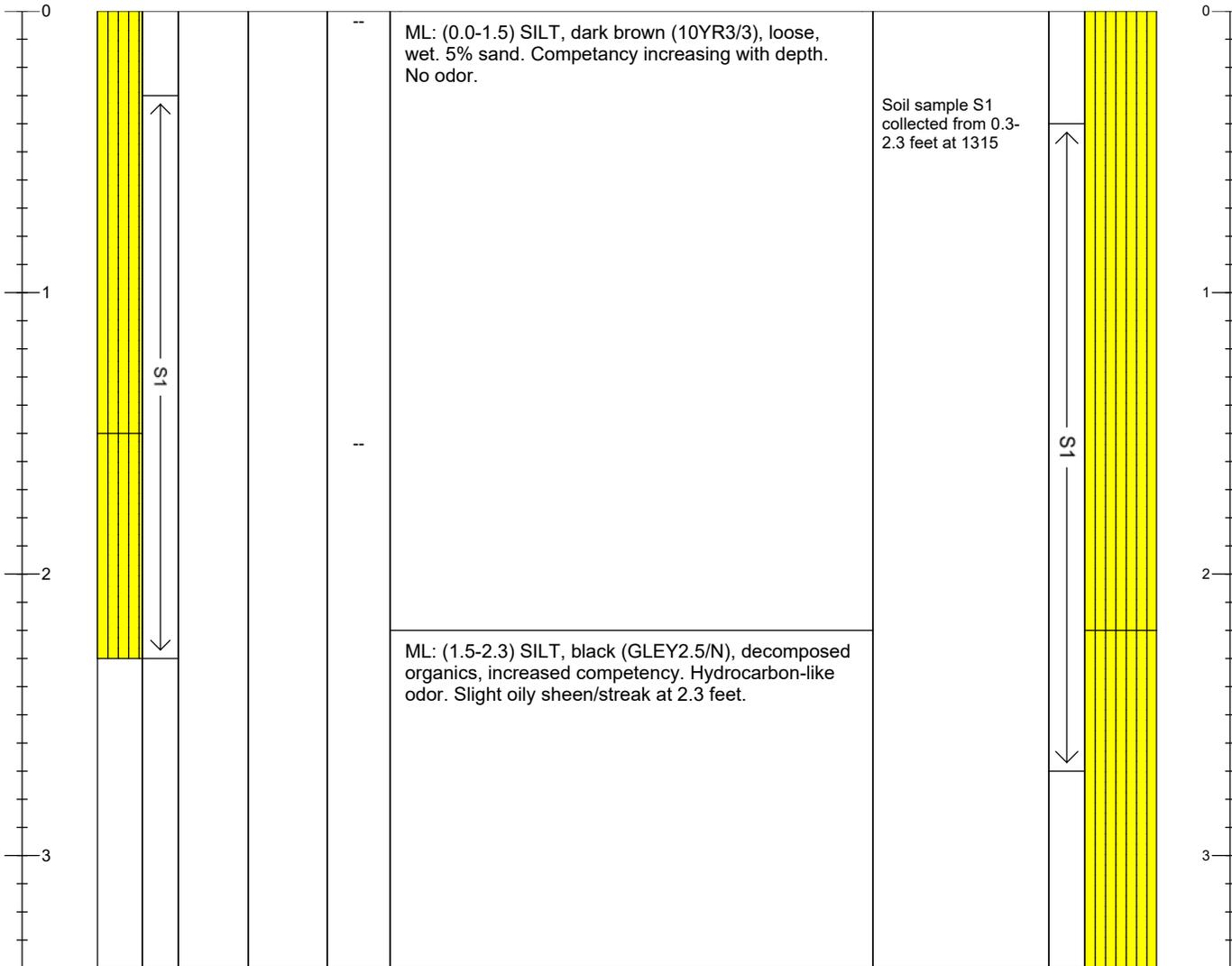
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 Fax: (206) 623-3793

No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

$1.1 / 3.4 = 32 \%$

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>6.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>22.64</b>	Penetration Depth (feet): <b>3.4</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>30.7</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>01/20/2005</b>		Mudline Elevation (ft): <b>-8.06</b>	Recovery in feet: <b>2.3</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1270929.63</b> E./LONG: <b>239105.61</b>	Process Date: <b>01/20/2005</b>				
Vessel: <b>--</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: <b>--</b>				
Operator: <b>--</b>		Method/Tube ID: <b>3" round polycarbonate</b>	Logged By: <b>L.M.</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



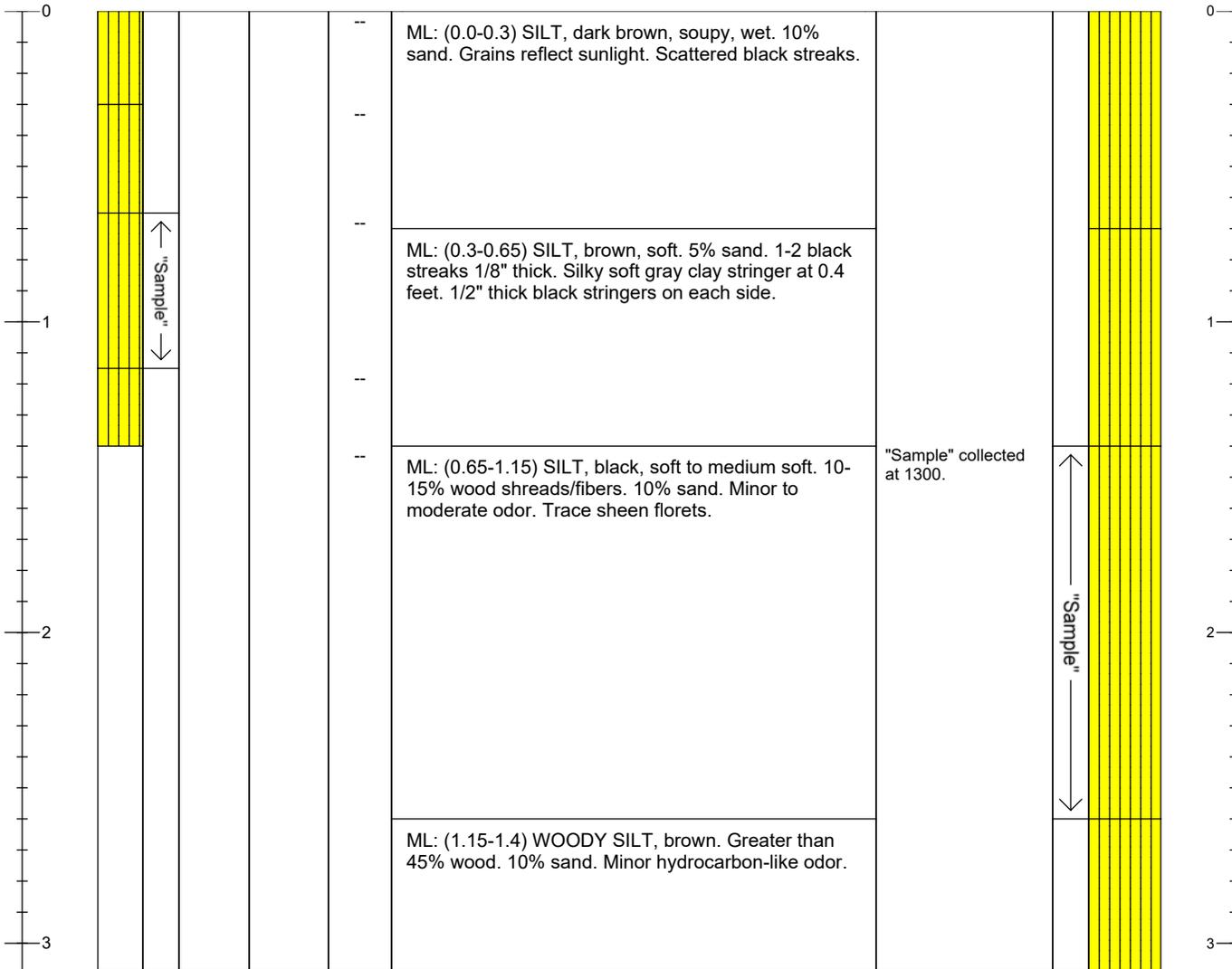
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 Fax: (206) 623-3793

No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

**2.3 / 3.4 = 68 %**

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>6.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>22.13</b>	Penetration Depth (feet): <b>3.09</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>33.2</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>02/17/2005</b>		Mudline Elevation (ft): <b>-11.07</b>	Recovery in feet: <b>1.4</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1269863.38</b> E./LONG: <b>238653.09</b>	Process Date: --				
Vessel: --		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: --				
Operator: --		Method/Tube ID: <b>3" polycarbonate diver push core</b>	Logged By: <b>N. Bacher</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



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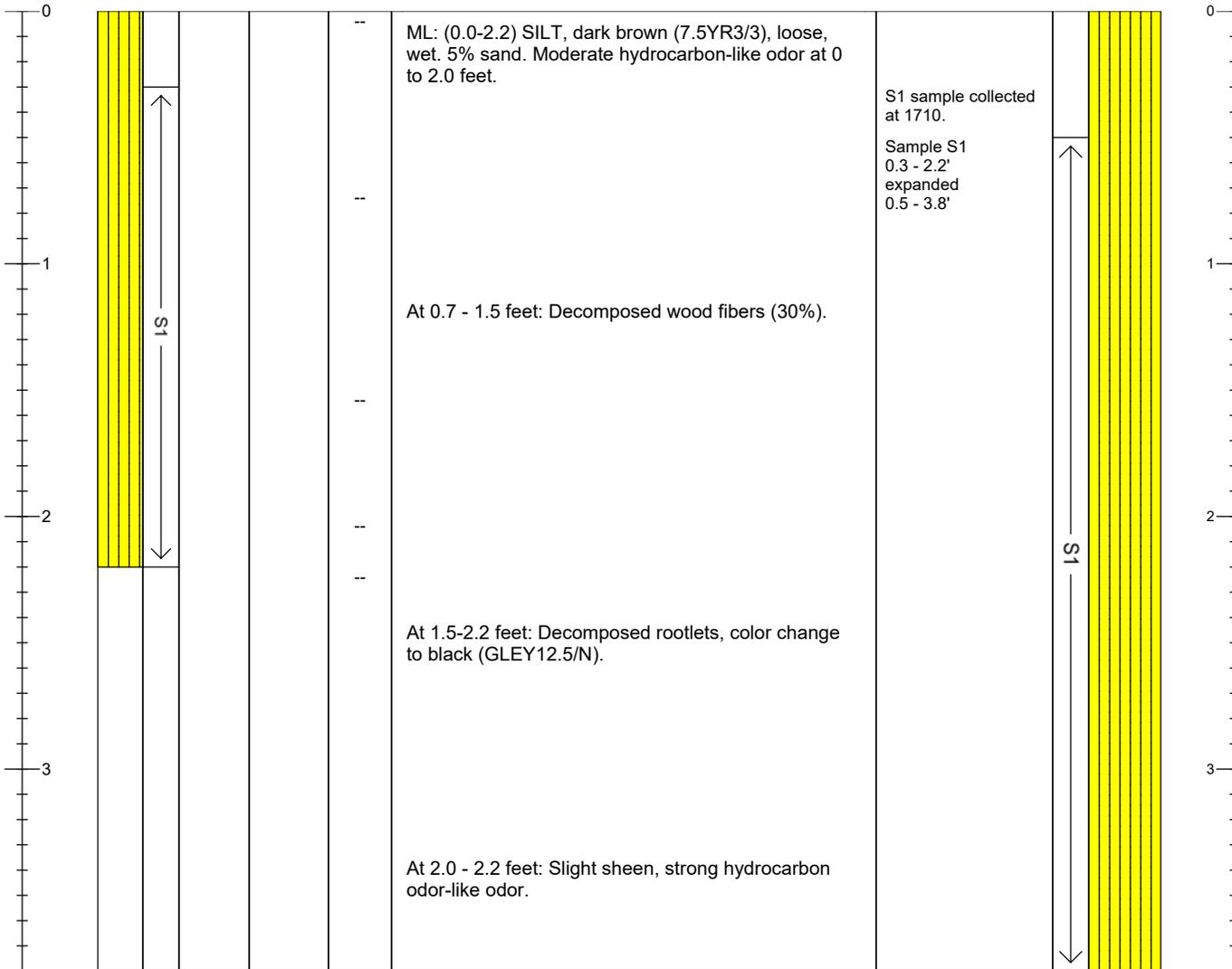
No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

**1.4 / 3.09 = 45 %**



Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>4.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>20.23</b>	Penetration Depth (feet): <b>3.8</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>35.2</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>01/19/2005</b>		Mudline Elevation (ft): <b>-14.97</b>	Recovery in feet:				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1270914</b> E./LONG: <b>238880</b>	Process Date: <b>01/19/2005</b>				
Vessel: <b>--</b>		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: <b>--</b>				
Operator: <b>--</b>		Method/Tube ID: <b>3" polybarbonate divers tube</b>	Logged By: <b>L.M. and D.B.</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



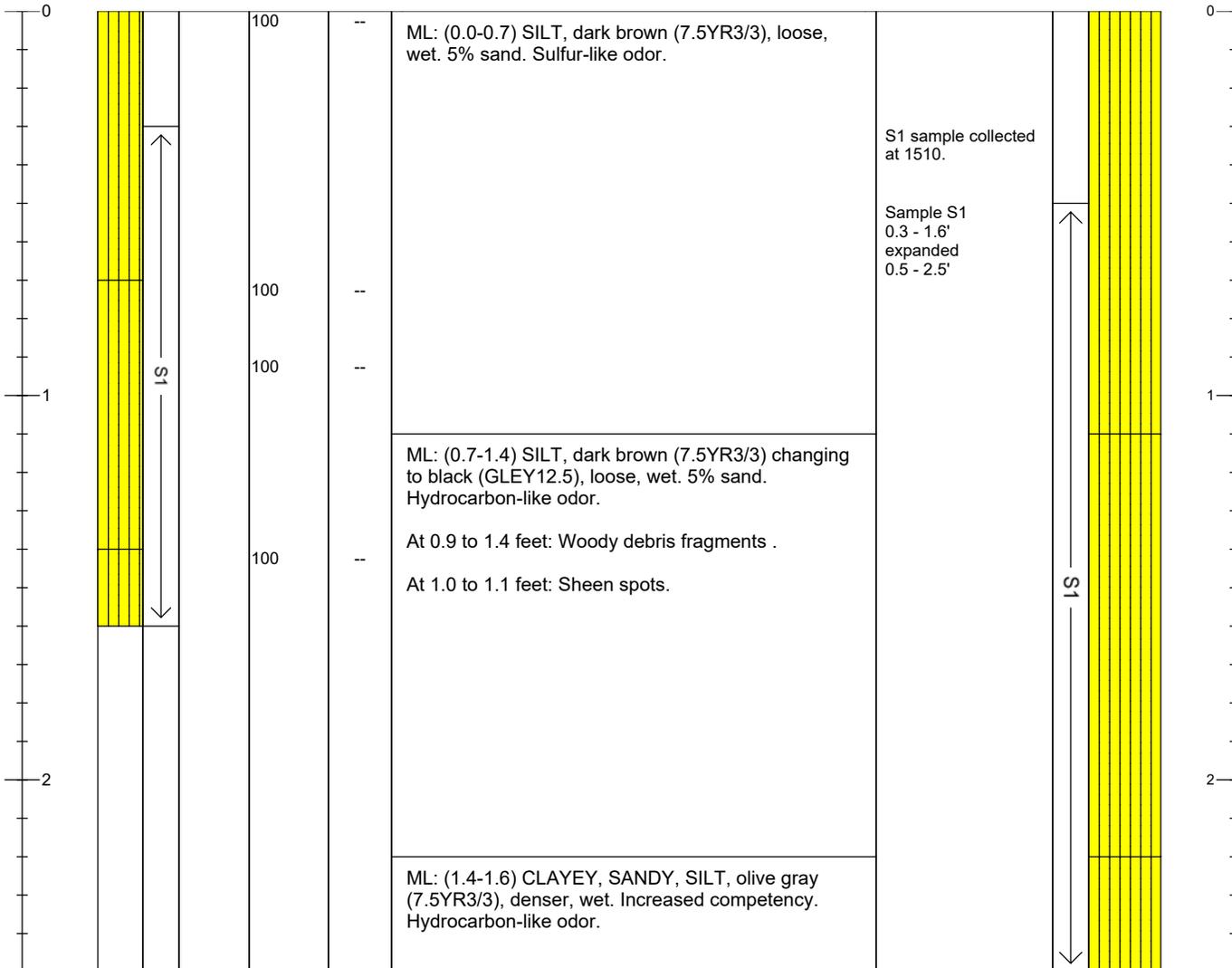
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 Fax: (206) 623-3793

No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

**2.2 / 3.8 = 58 %**

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>4.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>20.41</b>	Penetration Depth (feet): <b>2.5</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>31.8</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>01/19/2005</b>		Mudline Elevation (ft): <b>-11.39</b>	Recovery in feet: <b>1.6</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1270556.13</b> E./LONG: <b>238431.58</b>	Process Date: --				
Vessel: --		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: --				
Operator: --		Method/Tube ID: <b>3" polycarbonate divers core</b>	Logged By: <b>L.M. and D.B.</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



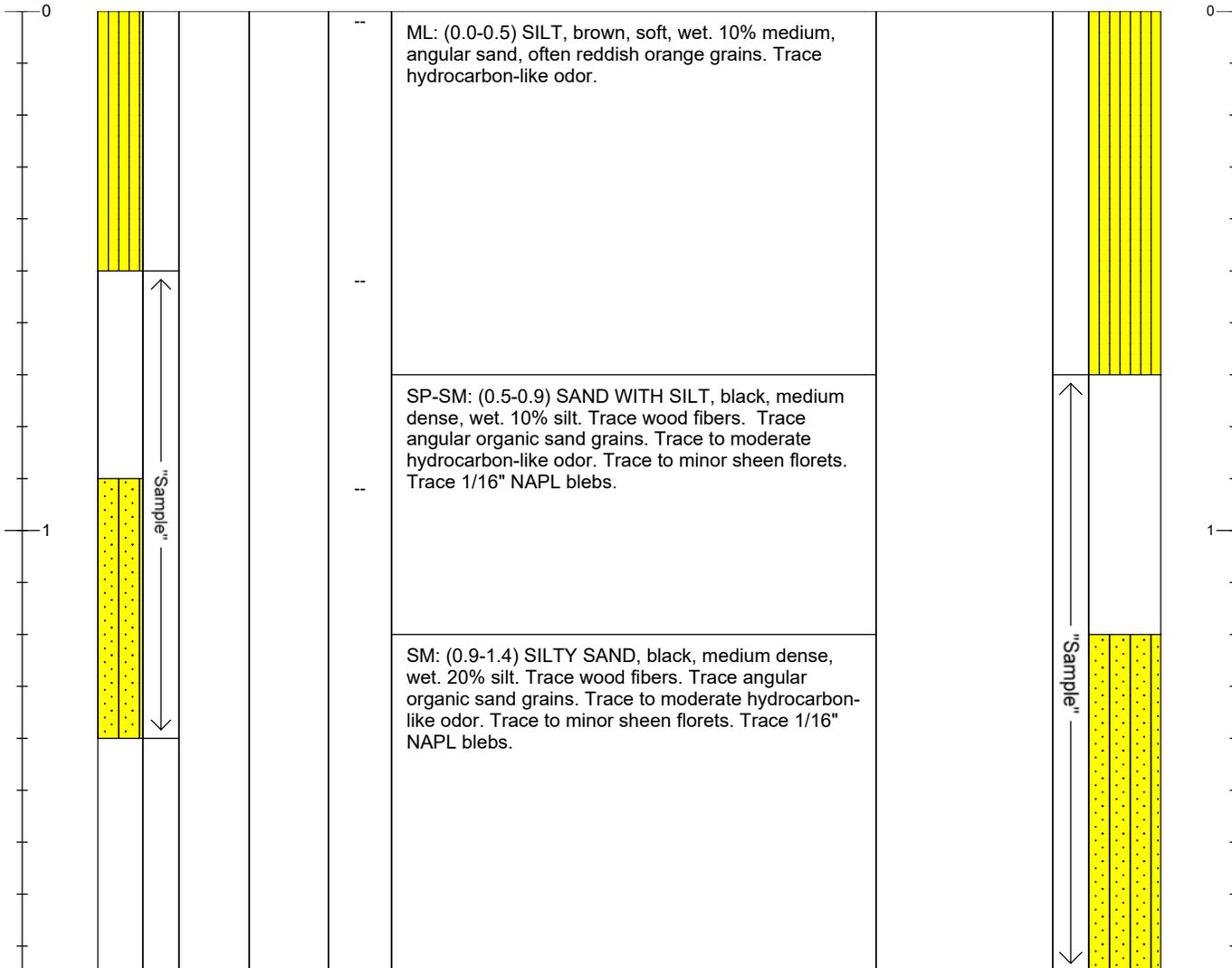
**AECOM**  
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 Seattle, WA 98104  
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 Fax: (206) 623-3793

No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

**1.6 / 2.5 = 64 %**

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>4.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>22.76</b>	Penetration Depth (feet): <b>1.85</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>18.9</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>02/17/2005</b>		Mudline Elevation (ft): <b>3.86</b>	Recovery in feet: <b>1.4</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1270926</b> E./LONG: <b>239334</b>	Process Date: --				
Vessel: --		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: --				
Operator: --		Method/Tube ID: <b>3" polycarbonate divers tube</b>	Logged By: <b>N. Bacher</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



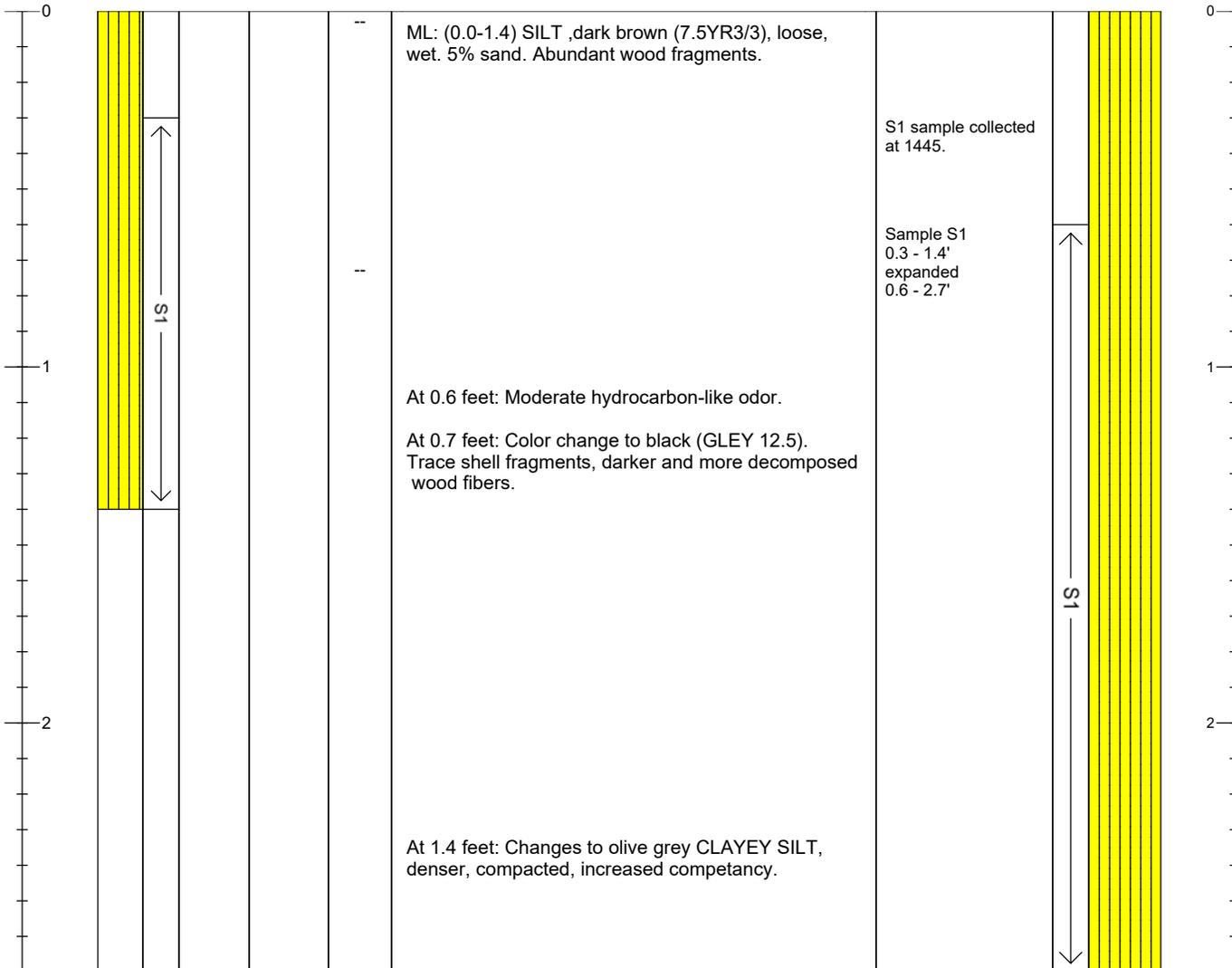
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No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

**1.4 / 1.85 = 76 %**

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>5.2</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>20.48</b>	Penetration Depth (feet): <b>2.7</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>17</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>01/19/2005</b>		Mudline Elevation (ft): <b>3.48</b>	Recovery in feet: <b>1.4</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1270969.25</b> E./LONG: <b>239520.16</b>	Process Date: --				
Vessel: --		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: --				
Operator: --		Method/Tube ID: <b>3" polycarbonate divers core</b>	Logged By: <b>L.M. and D.B.</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



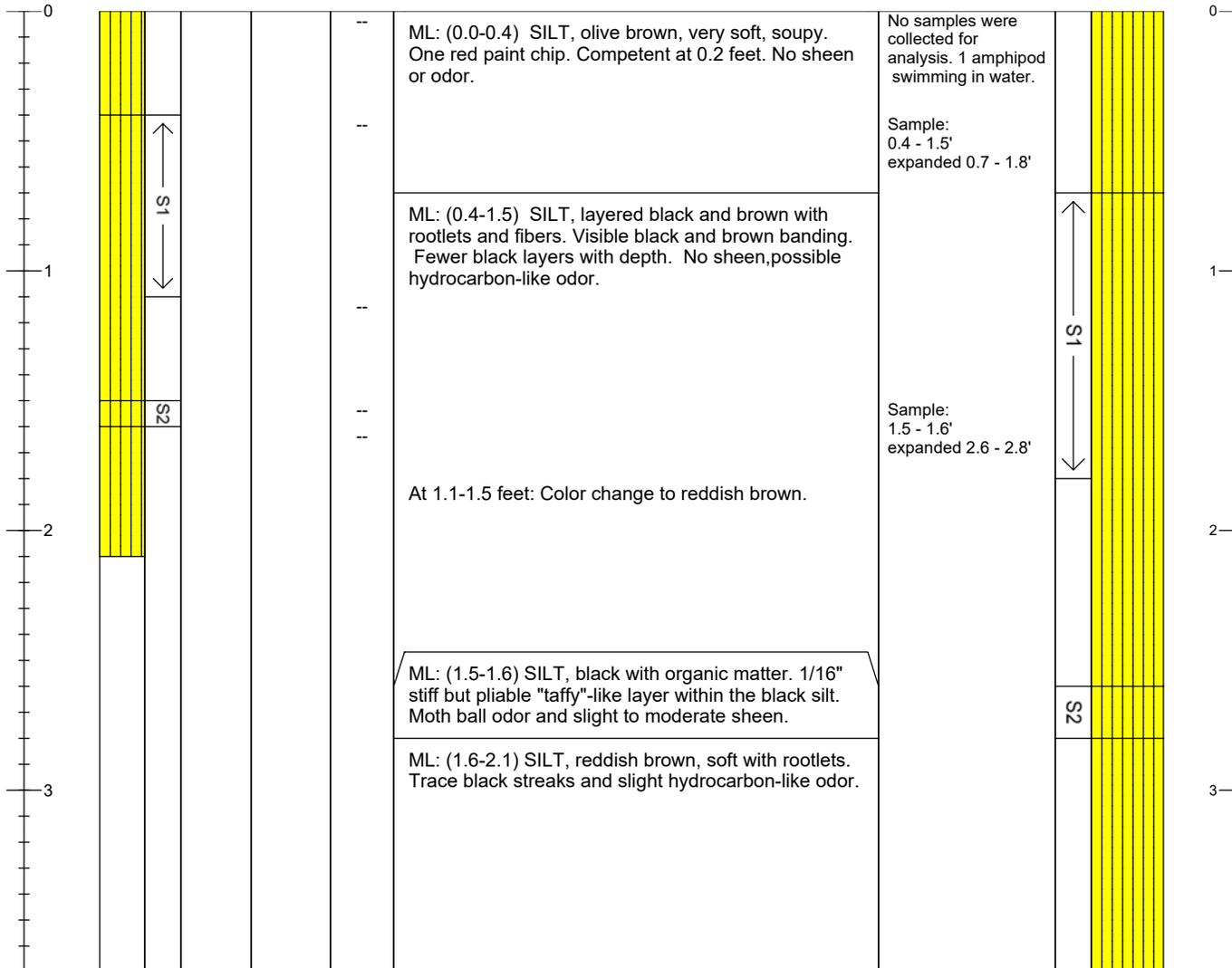
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 Fax: (206) 623-3793

No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

$1.4 / 2.7 = 52 \%$

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Lake</b>	Tube Length (ft): <b>4.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>21.51</b>	Penetration Depth (feet): <b>3.7</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>37.2</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>02/02/2005</b>		Mudline Elevation (ft): <b>-15.69</b>	Recovery in feet: <b>2.1</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1271203.12</b> E./LONG: <b>239401.25</b>	Process Date: --				
Vessel: --		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: --				
Operator: --		Method/Tube ID: <b>3" polycarbonate divers core</b>	Logged By: <b>ALF and S. Ashurst</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



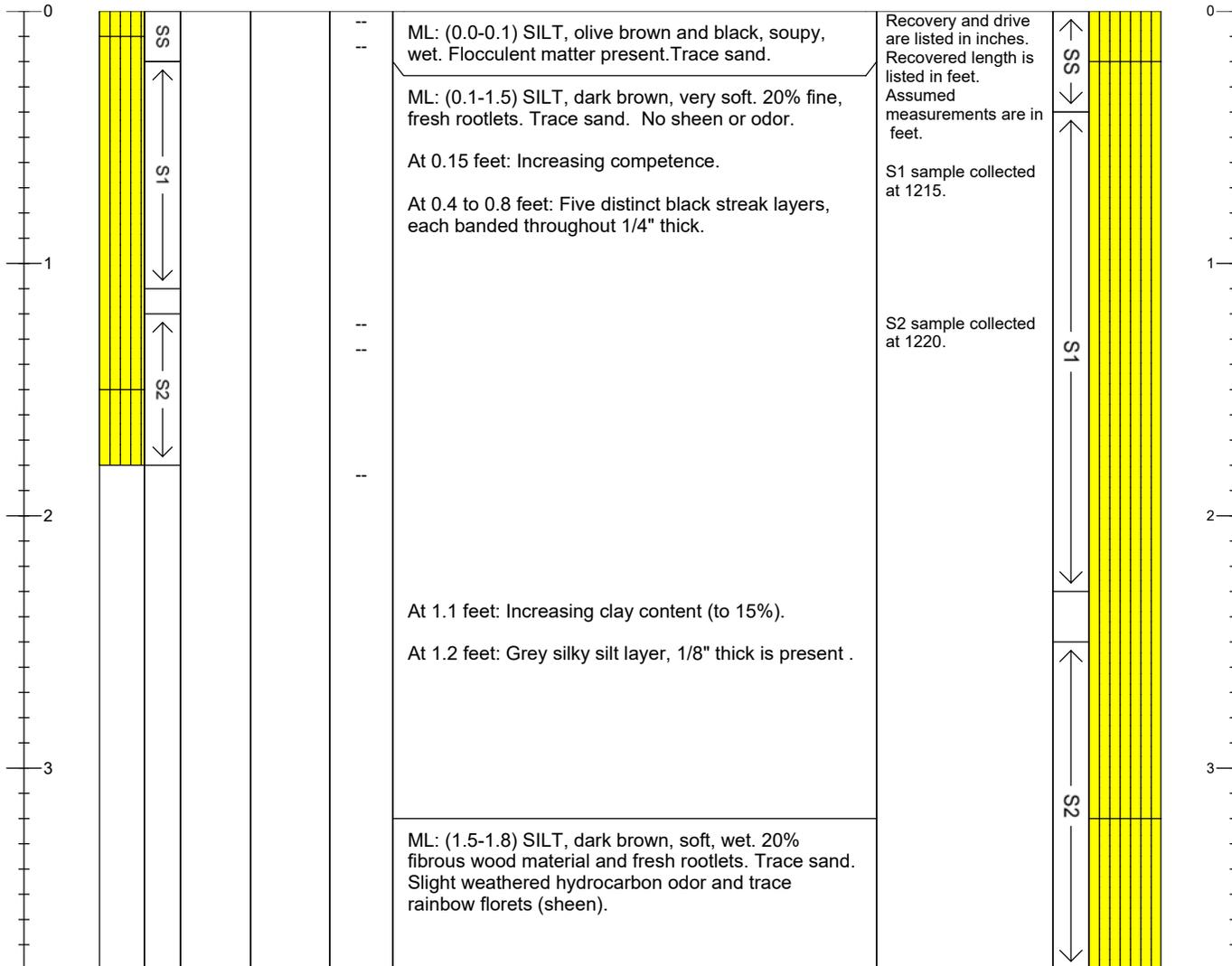
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No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

**2.1 / 3.7 = 57 %**

Project: <b>NLU Phase 3</b>		Water Body Type: <b>Marine</b>	Tube Length (ft): <b>4.0</b>				
Project #: <b>PSE10-18628</b>		Water Elevation (ft)/Tide: <b>20.71</b>	Penetration Depth (feet): <b>3.8</b>				
Client: <b>Puget Sound Energy</b>		Water Depth (ft): <b>0</b>	Sample Quality: <b>Good</b>				
Collection Date: <b>02/04/2005</b>		Mudline Elevation (ft): <b>-15.69</b>	Recovery in feet: <b>1.8</b>				
Contractor: <b>Research Support Services</b>		N./LAT: <b>1271203.12</b> E./LONG: <b>239401.25</b>	Process Date: --				
Vessel: --		Horiz. Datum: <b>NAD83</b> Vert. Datum: <b>USCOE Locks</b>	Process Method: --				
Operator: --		Method/Tube ID: <b>3" polycarbonate divers core</b>	Logged By: <b>ALF and N. Bacher</b>				
Recovered Depth (feet)	Recovered Interval	Sample	Sample Interval	Headspace PID	<b>Lithology</b> Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in inches with parentheses)	<b>Comments</b> Expanded Depths	Calc. In-situ Depth (ft) & Graphic Log



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No odor/sheen unless otherwise noted.

**Calculated Recovery**  
 Sample Length/Penetration Length:

**1.8 / 3.8 = 47 %**

**Floyd|Snider 2005  
Western Study Area  
Sediment Investigation**

**Cores**

## Core Summary Log

Project: Gas Works Sediment-Western Study Area  
 Project No: 3400542.002

Station: GWS-EC01

Mudline elevation: -19.9 ft (Corps lake datum)

Maximum depth of retained sediment: 20.1 ft  
 Percent recovery (on-deck): 76%

Core collection: 5/18/2005 13:01  
 Laboratory processing: 5/18/2005 0:00  
 Position: N238271 E1269512 (NAD83 SPC WAN)  
 Field Log: John LaManna  
 Summary Log: John LaManna

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0	Thinly bedded to laminated brown organic silt and gray clay, with some wood fragments and fibers. Very soft; wet.	Upper recent lake deposits	OH/Cl		
1					
2					
3				GWS-EC01-0025	
4					
5					
6					
7					
8					
9					
10				GWS-EC01-0090	
11	Dark brown, organic silt with sand; amorphous with trace plant fibers; massive. Very soft; moist to wet.	Lower recent lake deposits	OH		
12					
13					
14					
15					
16					
17					
18					
19				GWS-EC01-0172	
20	End of Core	End of core	End of core	End of core	End of core
21					

# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC02

**Mudline elevation:** -20.3 ft (Corps lake datum)

**Maximum depth of retained sediment:** 19.9 ft

**Percent recovery (on-deck):** 61%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238520	<b>E1269647</b>	<b>(NAD83 SPC WAN)</b>
<b>Date:</b>	5/19/2005	5/19/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	8:41	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0		Upper recent lake deposits	CL/OH		
	<p style="text-align: center;">↑</p> <p>(0-1.1) Laminated gray clay, gray silty clay, black oily clay, and dark reddish brown organic silt with wood fragments, wood fibers and sand. Slight oil odor in black lamellae. Very soft; wet. Some gas vesicles.</p>			GWS-EC02-0025	
5					
	<p>Dark gray grading down to dark brown organic silt with sand to sandy organic silt. Very soft; wet. No oil, no sheen, no chemical odor.</p>	Lower recent lake deposits	OH	GWS-EC02-0100	
10					
				GWS-EC02-0175	
15					
20	End of Core	End of core	End of core	End of core	End of core

## Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC03

**Maximum depth of retained sediment:** 20.3 ft

**Mudline elevation:** -19.9 ft (Corps lake datum)

**Percent recovery (on-deck):** 70%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238690	E1269515	(NAD83 SPC WAN)
<b>Date:</b>	5/19/2005	5/19/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	10:28	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0	↑	Upper recent lake deposits	OH/CL		
	(0-0.9) Interbedded and laminated; dark reddish brown, organic silt and gray, dark gray and black, silty clay with few wood fibers and sand. Black oil stains and oil odor. Very soft; wet.			GWS-EC03-0015	
5				GWS-EC03-0055	
				GWS-EC03-0078	
10	Dark gray grading down to dark brown, sandy organic silt to organic silt with sand. Very soft; wet to moist. Smells oily but smell decreases with depth. Bottom smells oily. Black oil veinlets at 10.7-ft.	Lower recent lake deposits	OH	GWS-EC03-0110	
				GWS-EC03-0137	
				GWS-EC03-0173	
20	End of Core	End of core	End of core	End of core	End of core
25					

## Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC04

**Mudline elevation:** -19.1 ft (Corps lake datum)

**Maximum depth of retained sediment:** 6.9 ft  
**Percent recovery (on-deck):** 51%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238646	<b>E1269721</b>	<b>(NAD83 SPC WAN)</b>
<b>Date:</b>	5/17/2005	5/17/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	10:30	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0					
1	Black clay with undecayed wood fragments; trace oil sheen. Very soft, wet.	Upper recent lake deposits	CL?		
2	Gray clay with silt. Very soft; wet. No oil.	Upper recent lake deposits	CL?		
3					
4	Dark brown, sandy organic silt to organic silt with sand. Very soft; wet. Slight asphalt odor.	Lower recent lake deposits	OH	GWS-EC04-0023	
5					
6	Interbedded dark brown, sandy organic silt and poorly graded sand. Some medium and coarse angular sand grains, few quartz sand grains. Trace black oil in sand bed; asphaltic odor. Igneous rock stuck in catcher suggests refusal in stratified drift.	Lower recent lake deposits	OH/SP		
7	End of Core	End of core	End of core	End of core	End of core
8					

## Core Summary Log

Project: Gas Works Sediment-Western Study Area  
 Project No: 3400542.002

Station: GWS-EC05

Mudline elevation: -7.7 ft (Corps lake datum)

Maximum depth of retained sediment: 5.7 ft  
 Percent recovery (on-deck): 75%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238693	<b>E1269888</b>	<b>(NAD83 SPC WAN)</b>
<b>Date:</b>	5/16/2005	5/16/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	13:10	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0					
1	Black; well graded silty sand with gravel wood chips oil and water.		SM		
2					
3	Void filled with oily water.	Entire core appears to have been disturbed during recovery and is no longer representative of in situ stratigraphy.		(no samples collected)	
4	Very dark gray to dark brownish gray; silty sand with gravel and some wood fragments. City.		SM		
5	Poorly graded gravel at bottom grading up to poorly graded sand. Wood debris at top.		GP/SP		
6	End of Core	End of core	End of core	End of core	End of core
7					

# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC05R4

**Mudline elevation:** -10.2 ft (Corps lake datum)

**Maximum depth of retained sediment:** 7.7 ft  
**Percent recovery (on-deck):** 58%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238680	<b>E1269868</b>	<b>(NAD83 SPC WAN)</b>
<b>Date:</b>	5/20/2005	5/20/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	12:50	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0	Dark gray slurry of water, clay, silt, wood chips and oil. Asphalt odor.		CL?		
1					
2	Black mixture of clay, water, oil, wood fragments and sand. Gelatinous. OVER 0.1 ft dark reddish brown organic silt or clay. Very soft, wet. Gelatinous.	Upper recent lake deposits	CL?/OH? (0.1 ft)		
3					
4	Gray and black; poorly bedded mixture of silt; black oil; wood fibers, wood debris, and water. Very loose, wet. Oil sheen.		ML?	(no samples collected)	
5	Gray; silty gravel. Very loose; wet.	Stratified drift.	GM		
6	Gray; sandy silt with gravel and some interbeds of silty fine sand. Dense; moist to wet. No oil.		ML		
7	Gray; poorly graded gravelly fine sand with rounded gravel, silt. Dense. No oil.	Stratified drift or possibly, glacially overridden sediment.	SP		
8	Gray; silty fine sand. Dense; moist to wet. No oil.		SM		
9	End of Core	End of core	End of core	End of core	End of core

# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC06

**Mudline elevation:** -11.8 ft (Corps lake datum)

**Maximum depth of retained sediment:** 8.1 ft

**Percent recovery (on-deck):** 71%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238765	E1269800	(NAD83 SPC WAN)
<b>Date:</b>	5/16/2005	5/16/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	11:16	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0					
1					
2	Black grading down to dark olive gray; mixture of water, sand, silt, clay, wood fragments, and oil. 0.3 ft of laminated clay over abundant wood chips and gravelly sand in bottom. Very soft; wet. Blebs of black oil. Asphalt odor.	Upper recent lake deposits	ML		
3				GWS-EC06-0023	
4				GWS-EC06-0038	
5	Dark gray and black; poorly graded gravelly sand; with black oil from 4.5 ft to 4.7 ft and 6.5 ft to 6.7 ft (on top of clay layers); one oil-saturated undecayed wood fragment 0.3-ft long. Loose; wet.	Recessional Stratified Drift?	SP		
6				GWS-EC06-0056	
7	Gray; lean clay bed overlying gray, poorly graded sand with gravel and a rounded cobble. Cobble is granodiorite.	Stratified drift.	CL/GW		
8				End of core	End of core
9					

# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC07

**Mudline elevation:** -2.5 ft (Corps lake datum)

**Maximum depth of retained sediment:** 7.7 ft

**Percent recovery (on-deck):** 84%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N239035	E1269642	(NAD83 SPC WAN)
<b>Date:</b>	5/16/2005	5/16/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	10:07	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0					
	Black; emulsion of water, wood chips, oil and sand. Gelatinous to semi-solid. Very soft; wet. Asphalt odor.	Upper recent lake deposit	(NA)		
1					
	Very dark olive brown; stratified, well-graded sand with silt and gravel. Trace wood fragments, possible brick fragments. Thin bed of black grit at 1.9. Oily. Very loose; wet.	Fill	SW-SM	GWS-EC07-0013	
2					
	Black; silty sand with little clay and trace gravel, at bottom of interval, fine to coarse gravel; trace wood fragments and glass. Blebs of black oil.	Fill or disturbed lake deposit mixed with debris	SM	GWS-EC07-0034	
3					
				GWS-EC07-0046	
4					
	Gray; beds of clay, over poorly graded sand, over gravel with sand, over silty sand. Medium dense; wet. Some oil sheen on sand bed.	Stratified drift	CL/SP/GW/SM	GWS-EC07-0056	
5					
6					
	End of Core	End of core	End of core	End of core	End of core
7					
8					
9					

## Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC07DUP

**Mudline elevation:** -1.6 ft (Corps lake datum)

**Maximum depth of retained sediment:** 8.0 ft  
**Percent recovery (on-deck):** 78%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N239033	<b>E1269643</b>	<b>(NAD83 SPC WAN)</b>
<b>Date:</b>	5/16/2005	5/16/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	14:36	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0					
1					
2					
3					
4	This core is a duplicate of core GWS-EC07. The tube and sediment were transversely sectioned for permeability testing and were not logged.	(NA)	(NA)		
5				GWS-EC07DUP-0050	
6				GWS-EC07DUP-0055	
7				GWS-EC07DUP-0064	
8	End of Core	End of core	End of core	End of core	End of core
9					

## Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC08

**Mudline elevation:** -19.8 ft (Corps lake datum)

**Maximum depth of retained sediment:** 15.6 ft  
**Percent recovery (on-deck):** 85%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238894	E1269444	(NAD83 SPC WAN)
<b>Date:</b>	5/16/2005	5/16/2005	<b>Field Log:</b>	John LaManna	
<b>Time:</b>	13:54	0:00	<b>Summary Log:</b>	John LaManna	

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0		Upper recent lake deposits	OH/CL		
2	(0-1.2) Laminated, dark brown; organo silt and very dark gray silty clay, with wood fragments and sand overlying black grading down to gray, silty clay, with wood fragments. Oily. Very soft; wet.			GWS-GC08-0008	
4				GWS-GC08-0028	
6				GWS-GC08-0048	
8	Grayish brown grading down to yellowish brown; organic silt with sand to sandy organic silt, trace plant fibers. Very soft; moist to wet. Moisture content decreases with depth. Smells oily. Oil veinlets at 6.3 ft and 6.7 ft.	Lower recent lake deposits	OH	GWS-GC08-0068	
10				GWS-GC08-0100	
12				GWS-GC08-0129	
14					
16	End of Core	End of core	End of core	End of core	End of core
18					

## Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

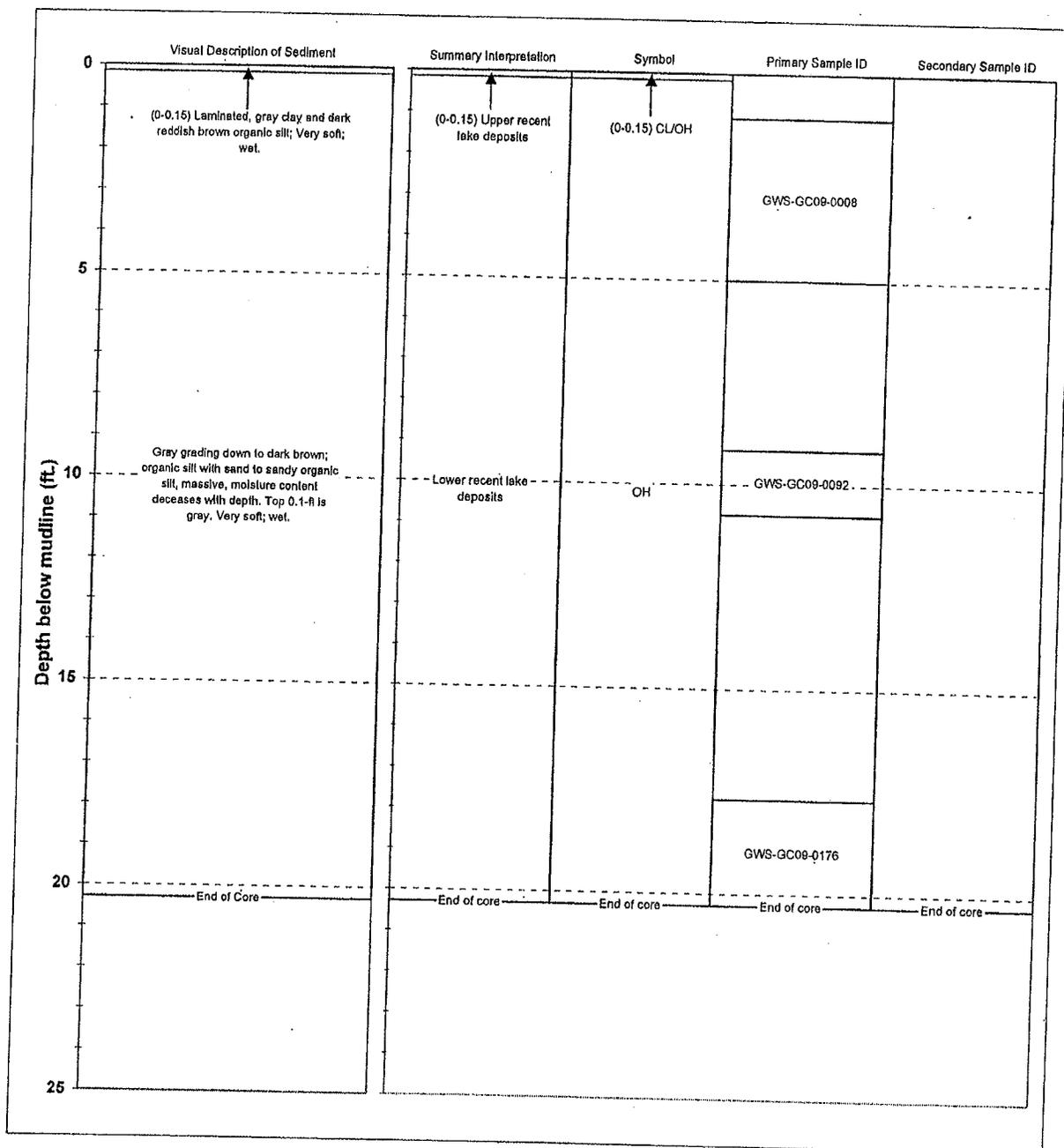
**Station:** GWS-EC09

**Mudline elevation:** -19.6 ft (Corps lake datum)

**Maximum depth of retained sediment:** 20.3 ft  
**Percent recovery (on-deck):** 76%

**Core collection:** 5/19/2005  
**Laboratory processing:** 5/19/2005  
**Date:** 5/19/2005  
**Time:** 11:06

**Position:** N238842 E1269353 (NAD83 SPC WAN)  
**Field Log:** John LaManna  
**Summary Log:** John LaManna



## Core Summary Log

Project: Gas Works Sediment-Western Study Area  
 Project No: 3400542.002

Station: **GWS-EC09DUP/EC24**

Mudline elevation: -19.7 ft (Corps lake datum)

Maximum depth of retained sediment: 20.3 ft  
 Percent recovery (on-deck): 77%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b>	N238845	E1269353	(NAD83 SPC WAN)
<b>Date:</b>	5/20/2005	5/20/2005	<b>Field Log:</b>	John LaManna		
<b>Time:</b>	10:35	0:00	<b>Summary Log:</b>	John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0					
	(0-0.45) Organic silt, clay, wood fragments, water and oil (asphalt odor) overlying laminated, dark brown organic silt and gray clay with silt. Very soft; wet.	Upper recent lake deposits	OH/CL	GWS-EC-0008	
5					
	Gray grading down to dark brown, sandy organic silt to organic silt with sand, amorphous, massive, water content decreases with depth, trace visible plant parts. Gray color in top 0.3 ft. Very soft; wet. No odor in most of this interval; no odor at bottom	Lower recent lake deposits	OH	GWS-EC-0082	
10					
15					
20	End of Core	End of core	End of core	End of core	End of core
25				GWS-EC-0176	

# Core Summary Log

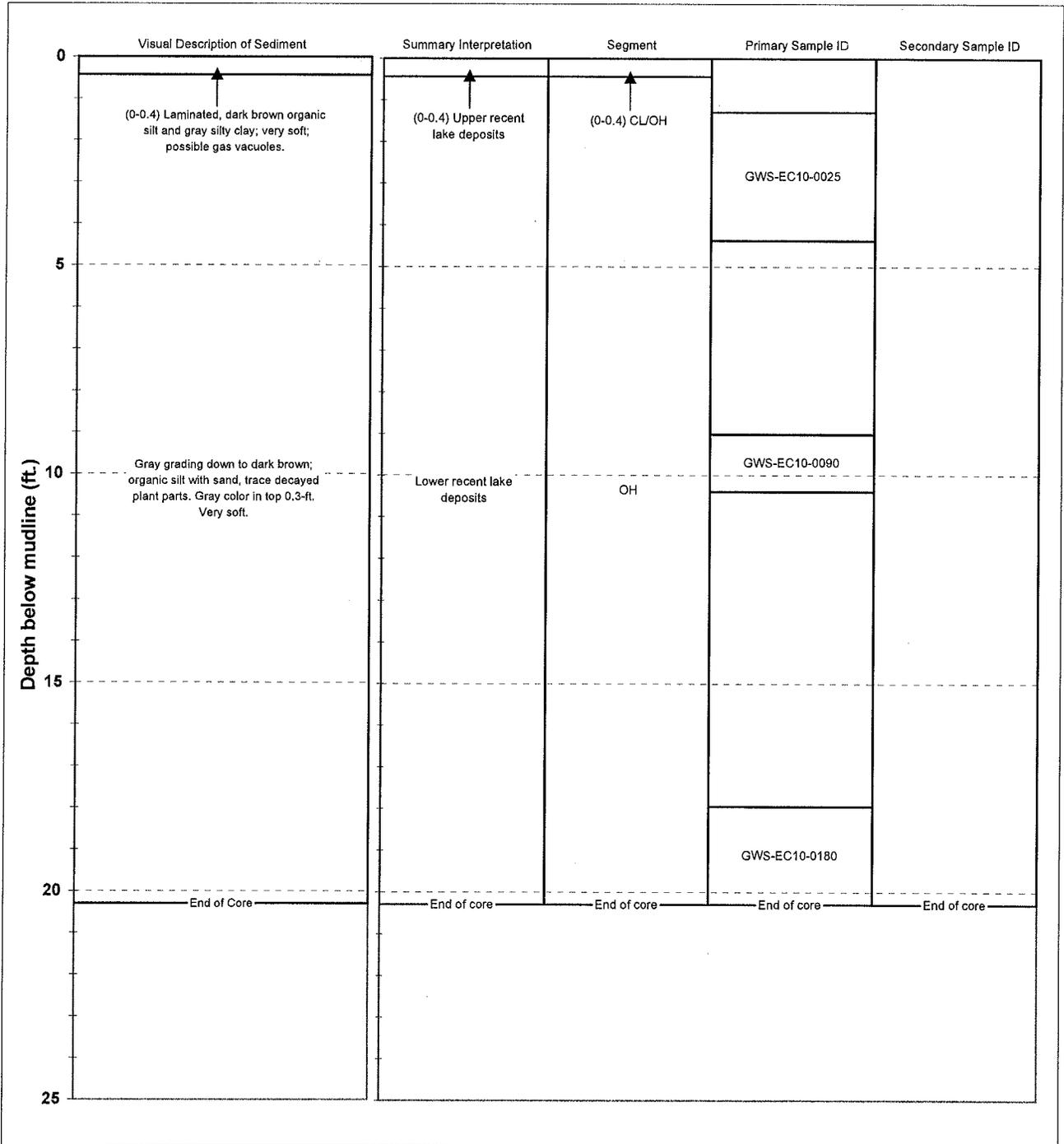
**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC10

**Mudline elevation:** -19.5 ft (Corps lake datum)

**Maximum depth of retained sediment:** 20.3 ft  
**Percent recovery (on-deck):** 82%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238540	E1269116	(NAD83 SPC WAN)
<b>Date:</b>	5/18/2005	5/18/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	13:55	0:00	<b>Summary Log:</b> John LaManna		



## Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC11

**Mudline elevation:** 19.3 ft (Corps lake datum)      **Maximum depth of retained sediment:** 8.8 ft  
**Percent recovery (on-deck):** 69%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N239263	<b>E1269530</b>	<b>(NAD83 SPC WAN)</b>
<b>Date:</b>	5/16/2005	5/16/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	9:15	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0					
1	Dark gray poorly graded sand with gravel overlying dark gray silty sand with gravel (some subangular); trace porcelain, wood and glass fragments. No chemical odor.	Fill	SP/SM		
2					
3				GWS-EC11-0019	
4					
5	Dark grayish brown, poorly-graded, fine sand with trace rounded gravel and trace coarse sand, a lump of organics or decayed wood; fine gravel size lump of tarry sand with asphalt odor.	Fill	SP	GWS-EC11-0048	
6					
7					
8	Dark brown silt; 0.1 ft thick over dark brown wood fragments.	Fill	ML	GWS-EC11-0067	
9	End of Core	End of core	End of core	End of core	End of core
10					

## Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC11Dup/EC-23

**Mudline elevation:** 19.5 ft (Corps lake datum)      **Maximum depth of retained sediment:** 7.8 ft  
**Percent recovery (on-deck):** 68%

**Core collection Date:** 5/17/2005      **Laboratory processing Date:** 5/17/2005  
**Time:** 12:56      0:00  
**Position:** N239262      E1269530      (NAD83 SPC WAN)  
**Field Log:** John LaManna  
**Summary Log:** John LaManna

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0	Gray; poorly graded fine sand. No chemical odor, no oil.	Fill	SP		
1	Gray; poorly graded fine sand with silt and gravel (rounded and angular), with glass and with undecayed wood. No oil, no chemical odor.	Fill	SP-SM		
2					
3				GWS-EC23-0019	
4					
5	Gray, with strong brown mottles toward bottom of interval; poorly graded fine sand with silt and trace coarse gravel and a dark brown silt lump. More oxidized in bottom 0.5-ft.	Fill	SP-SM	GWS-EC23-0048	
6					
7	(7.4-7.8) Laminated, brown silty fine sand and sandy silt, grading down to gravel with silt and wood chips.			GWS-EC23-0067	
8	↓ End of Core	Fill End of core	GW/GM End of core	End of core	End of core
9					

# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC12

**Mudline elevation:** -19.0 ft (Corps lake datum)

**Maximum depth of retained sediment:** 15.5 ft

**Percent recovery (on-deck):** 73%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N239177	E1269370	(NAD83 SPC WAN)
<b>Date:</b>	5/17/2005	5/17/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	8:46	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0		Upper recent lake deposits	Cl		
2	<p>(0-0.7 ft) Black to gray emulsion of water, oil, silt and clay. Gray clay at bottom of interval. Very soft; wet.</p>			GWS-EC12-0008	
4					
6				GWS-EC12-0043	
8	<p>Dark gray and black organic silt with sand and oil grading to dark brown organic silt with sand; amorphous, massive, trace decayed plant parts. Very soft; moist to wet. No oil below a depth of 1.2 ft.</p>	Lower recent lake deposits	OH	GWS-EC12-0064	
10				GWS-EC12-0084	
12					
14	<p>Dark brown sandy organic silt interbedded with thin beds of poorly graded fine and medium sand. Trace angular (with sharp edges), tabular, coarse sand-sized rock or shell fragments with sand. Oil in sand beds.</p>	Lower recent lake deposits	OH/SP	GWS-EC12-0108	
16	End of Core	End of core	End of core	End of core	End of core
18					

# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

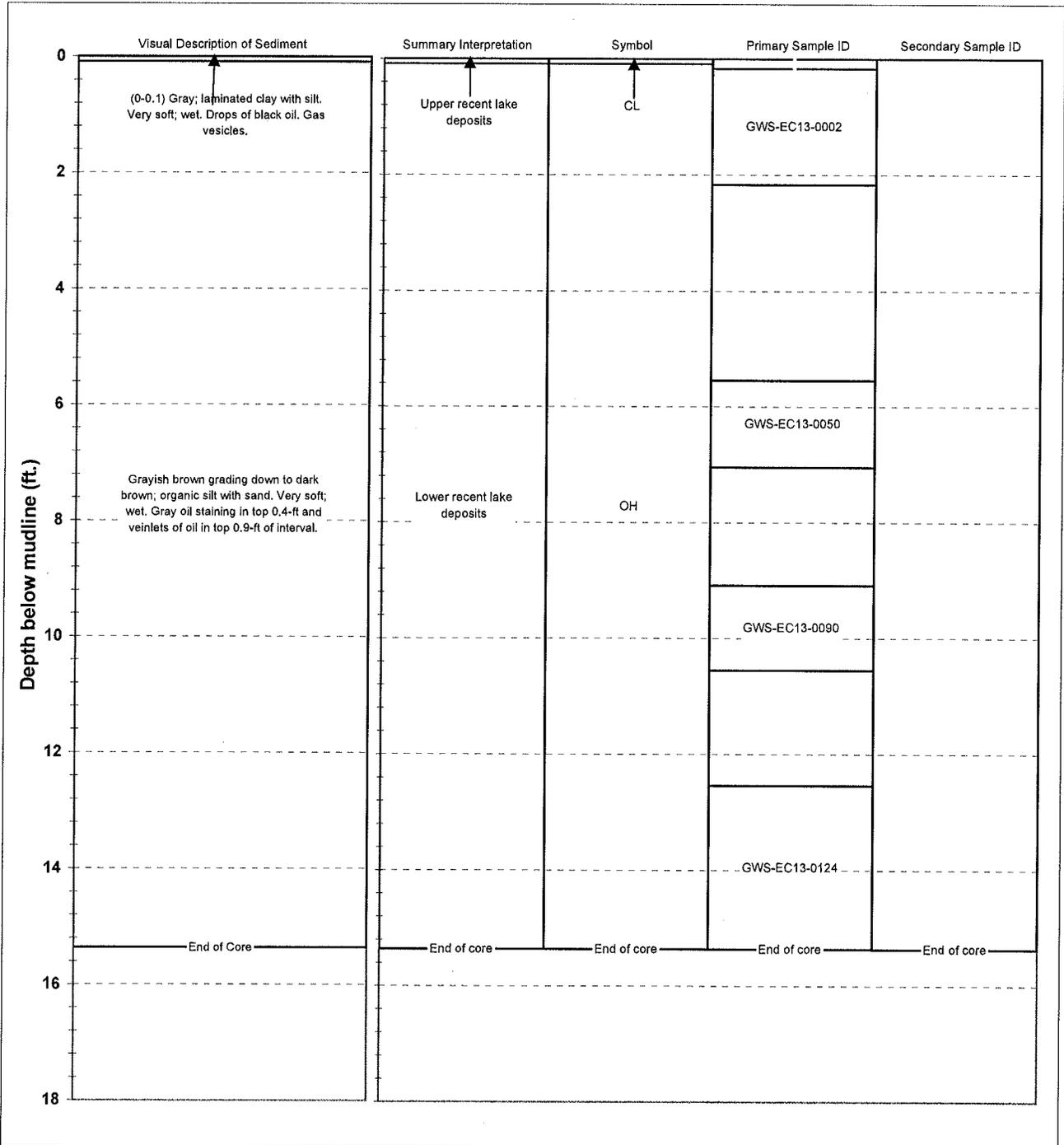
**Station:** GWS-EC13

**Mudline elevation:** -20.4 ft (Corps lake datum)

**Maximum depth of retained sediment:** 15.4 ft

**Percent recovery (on-deck):** 73%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N239061	E1269278	(NAD83 SPC WAN)
<b>Date:</b>	5/17/2005	5/17/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	9:39	0:00	<b>Summary Log:</b> John LaManna		



## Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC14

**Mudline elevation:** -20.5 ft (Corps lake datum)

**Maximum depth of retained sediment:** 15.8 ft  
**Percent recovery (on-deck):** 71%

**Core collection**  
**Date:** 5/17/2005  
**Time:** 13:35

**Laboratory processing**  
**Date:** 5/17/2005  
**Time:** 0:00

**Position:** N239240  
**Field Log:** John LaManna  
**Summary Log:**

E1269295 (NAD83 SPC WAN)

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0	Black mixture of water, clay, oil overlying slightly laminated gray clay with black oil blebs. Slight asphalt odor. Gas vesicles.	Upper recent lake deposits	CL		
2				GWS-EC14-0008	
4	Brownish gray grading down to dark brown sandy organic silt with light brown, 0.2-ft thick gray sandy silt bed, about 6-ft below top contact. Gray color at top 0.5-ft may be oil staining. Very soft; moist to wet.	Lower recent lake deposits	OH	GWS-EC14-0042	
6					
8				GWS-EC14-0068	
12				GWS-EC14-0112	
16	End of Core	End of core	End of core	End of core	End of core
18					

# Core Summary Log

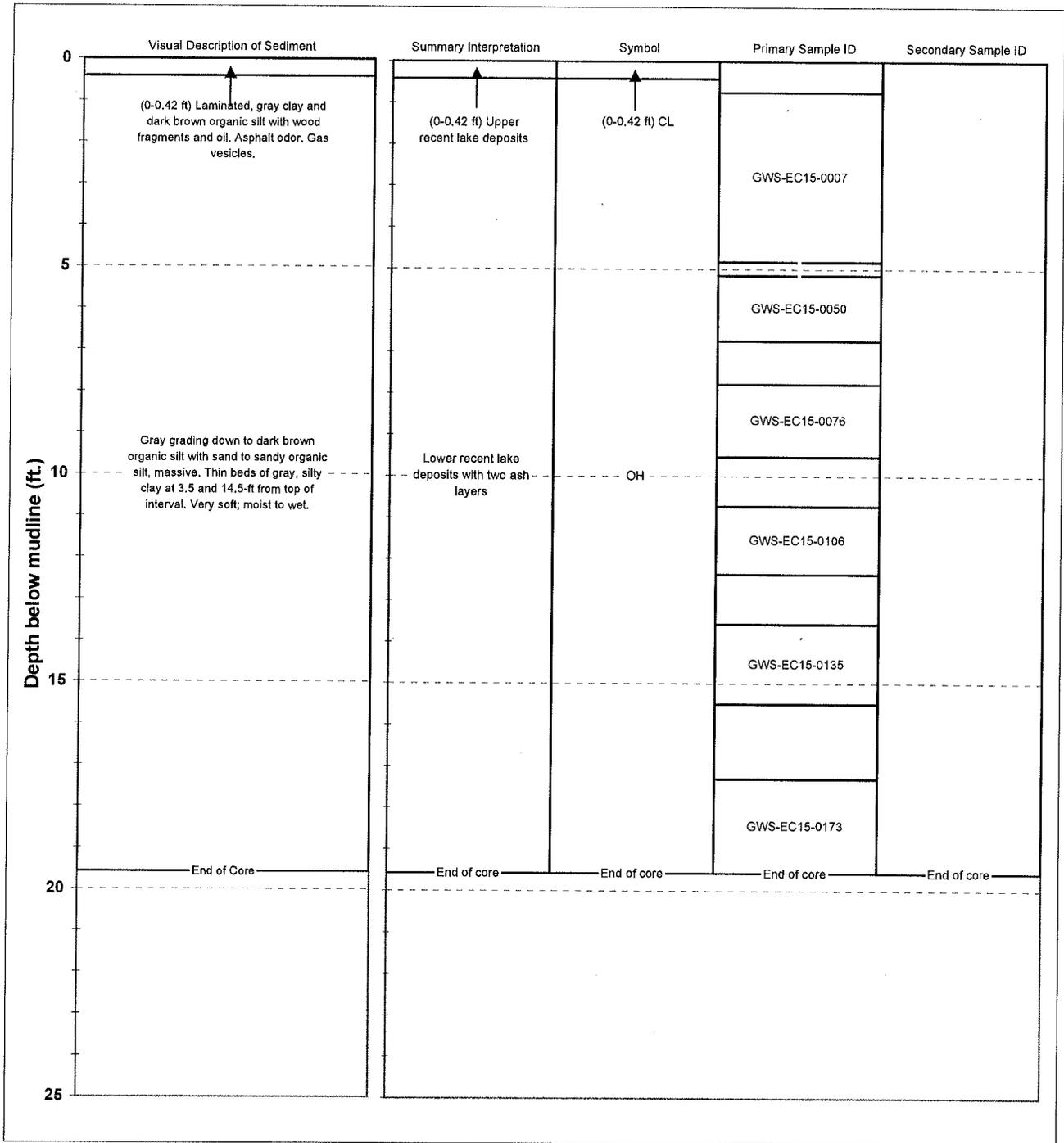
**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC15

**Mudline elevation:** -19.3 ft (Corps lake datum)

**Maximum depth of retained sediment:** 19.6 ft  
**Percent recovery (on-deck):** 71%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N239001	E1269161	(NAD83 SPC WAN)
<b>Date:</b>	5/20/2005	5/20/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	9:30	0:00	<b>Summary Log:</b> John LaManna		



# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC16

**Mudline elevation:** -19.0 ft (Corps lake datum)

**Maximum depth of retained sediment:** 20.0 ft

**Percent recovery (on-deck):** 74%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b>	N238874	E1268806	(NAD83 SPC WAN)
<b>Date:</b>	5/18/2005	5/18/2005	<b>Field Log:</b>	John LaManna		
<b>Time:</b>	10:58	0:00	<b>Summary Log:</b>	John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0	Very dark grading down to gray clay. Very soft; wet. No oil sheen or odor.	Upper recent lake deposits	CL		
				GWC-EC16-0010	
5	Dark brown organic silt with sand. Very soft; moist to wet.	Lower recent lake deposits	OH		
				GWC-EC16-0066	
				GWC-EC16-0173	
10					
15					
20	End of Core	End of core	End of core	End of core	End of core
25					

## Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC17

**Mudline elevation:** -19.1 ft (Corps lake datum)

**Maximum depth of retained sediment:** 20.1 ft  
**Percent recovery (on-deck):** 74%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238760	E1269052	(NAD83 SPC WAN)
<b>Date:</b>	5/20/2005	5/20/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	8:25	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0	↑	↑	↑		
	(0-0.44 ft) Interbedded, dark brownish gray organic clay with silt. Trace wood; no oil, sheen or chemical odor.	(0-0.44 ft) Upper recent lake deposits	(0-0.44 ft) OL	GWS-EC17-0009	
5				GWS-EC17-0055	
10	Dark grayish brown grading down to dark brown; organic silt with sand to sandy organic silt. Grayish color in upper 0.3-ft. Very soft; wet. No oil, sheen or chemical odor.	Lower recent lake deposits	OH	GWS-EC17-0125	
15				GWS-EC17-0178	
20	End of Core	End of core	End of core	End of core	End of core
25					

# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

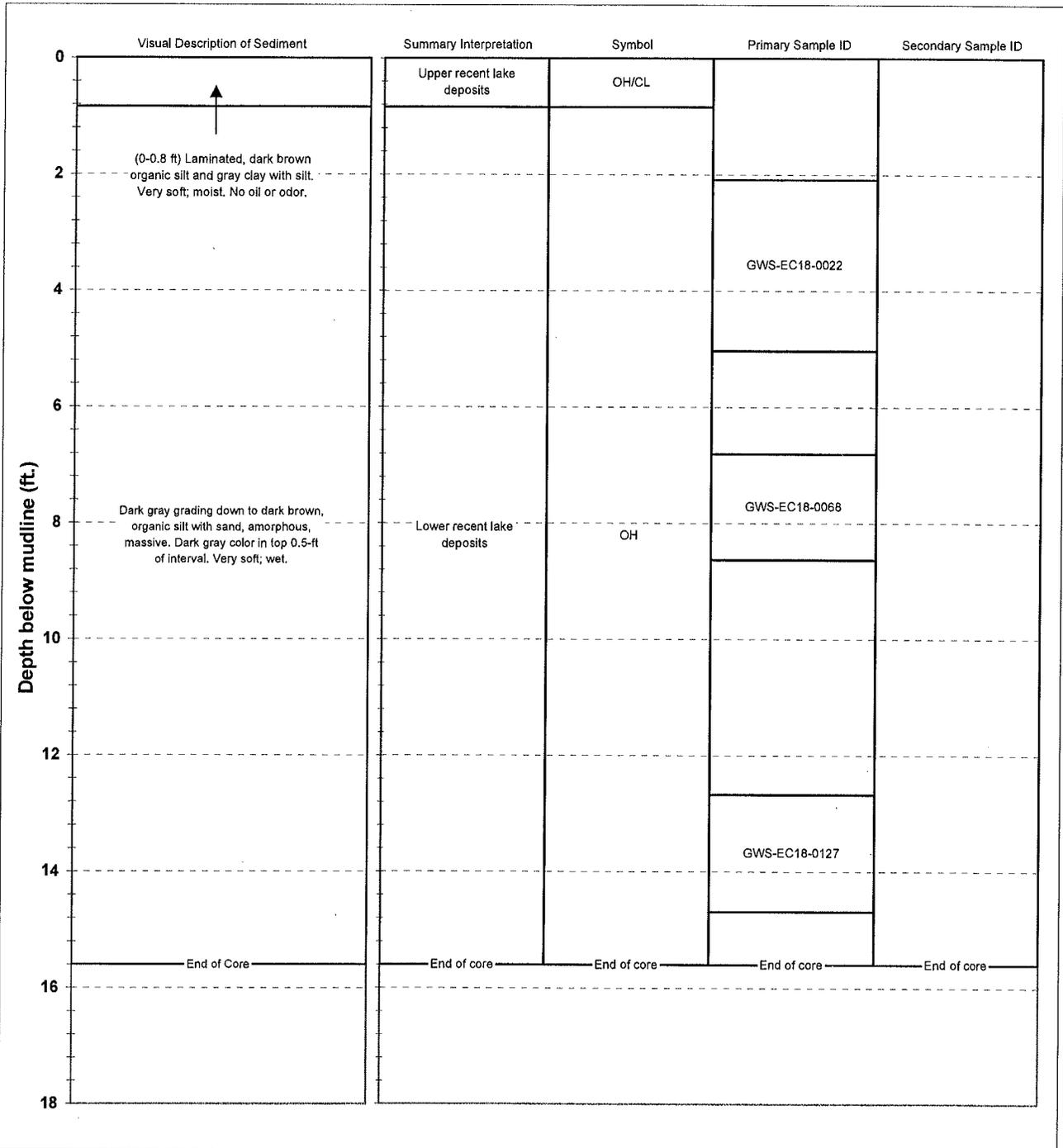
**Station:** GWS-EC18

**Mudline elevation:** -19.5 ft (Corps lake datum)

**Maximum depth of retained sediment:** 15.6 ft

**Percent recovery (on-deck):** 70%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N239112	E1268852	(NAD83 SPC WAN)
<b>Date:</b>	5/20/2005	5/20/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	11:15	0:00	<b>Summary Log:</b> John LaManna		



# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC19

**Mudline elevation:** -19.1 ft (Corps lake datum)

**Maximum depth of retained sediment:** 20.3 ft  
**Percent recovery (on-deck):** 79%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N239034	E1268729	(NAD83 SPC WAN)
<b>Date:</b>	5/18/2005	5/18/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	9:07	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0			CL/OL		
	(0-0.65) Thinly bedded, gray clay and dark brownish gray organic clay. Trace oil sheen at mud line.	(0-0.65) Upper Recent Lake Deposits		GWS-EC19-0010	
5					
	Dark brown sandy organic silt to organic silt with sand. Very soft; wet. Top contact gradational. No oil or odor.	Lower recent lake deposits	OH	GWS-EC19-0080	
10					
				GWS-EC19-0160	
15					
20	End of Core	End of core	End of core	End of core	End of core
25					

# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC20

**Mudline elevation:** -19.5 ft (Corps lake datum)

**Maximum depth of retained sediment:** 13.9 ft  
**Percent recovery (on-deck):** 69%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238479	E1269361	(NAD83 SPC WAN)
<b>Date:</b>	5/19/2005	5/19/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	9:38	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0		Upper recent lake deposits	CL/OH		
2	<p style="text-align: center;">↑</p> <p>(0-0.8 ft) Laminated, dark red-brown organic silt and gray to black clay(?). Trace wood fibers. Very soft; wet. Some gas vesicles. No odors.</p>			GWC-EC20-0018	
4					
6				GWC-EC20-0058	
8	<p>Gray grading down to dark brown organic silt with sand. Gray color and trace gas vacuoles in top 0.5-ft. Very soft; moist to wet.</p>	Lower recent lake deposits	OH		
10					
12				GWC-EC20-0128	
14	End of Core	End of core	End of core	End of core	End of core
16					

# Core Summary Log

**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC21

**Mudline elevation:** -18.8 ft (Corps lake datum)      **Maximum depth of retained sediment:** 20.3 ft  
**Percent recovery (on-deck):** 77%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238265	E1269126	(NAD83 SPC WAN)
<b>Date:</b>	5/18/2005	5/18/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	12:10	0:00	<b>Summary Log:</b> John LaManna		

	Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
0					
				GWS-EC21-0006	
5					
	Dark brown sandy organic silt to organic silt with sand. Thin beds of gray clay at 9.4 ft and at bottom of core.	Lower recent lake deposits with two ash layers	OH	GWS-EC21-0050	
10					
15					
				GWS-EC21-0177	
20	End of Core	End of core	End of core	End of core	End of core
25					

# Core Summary Log

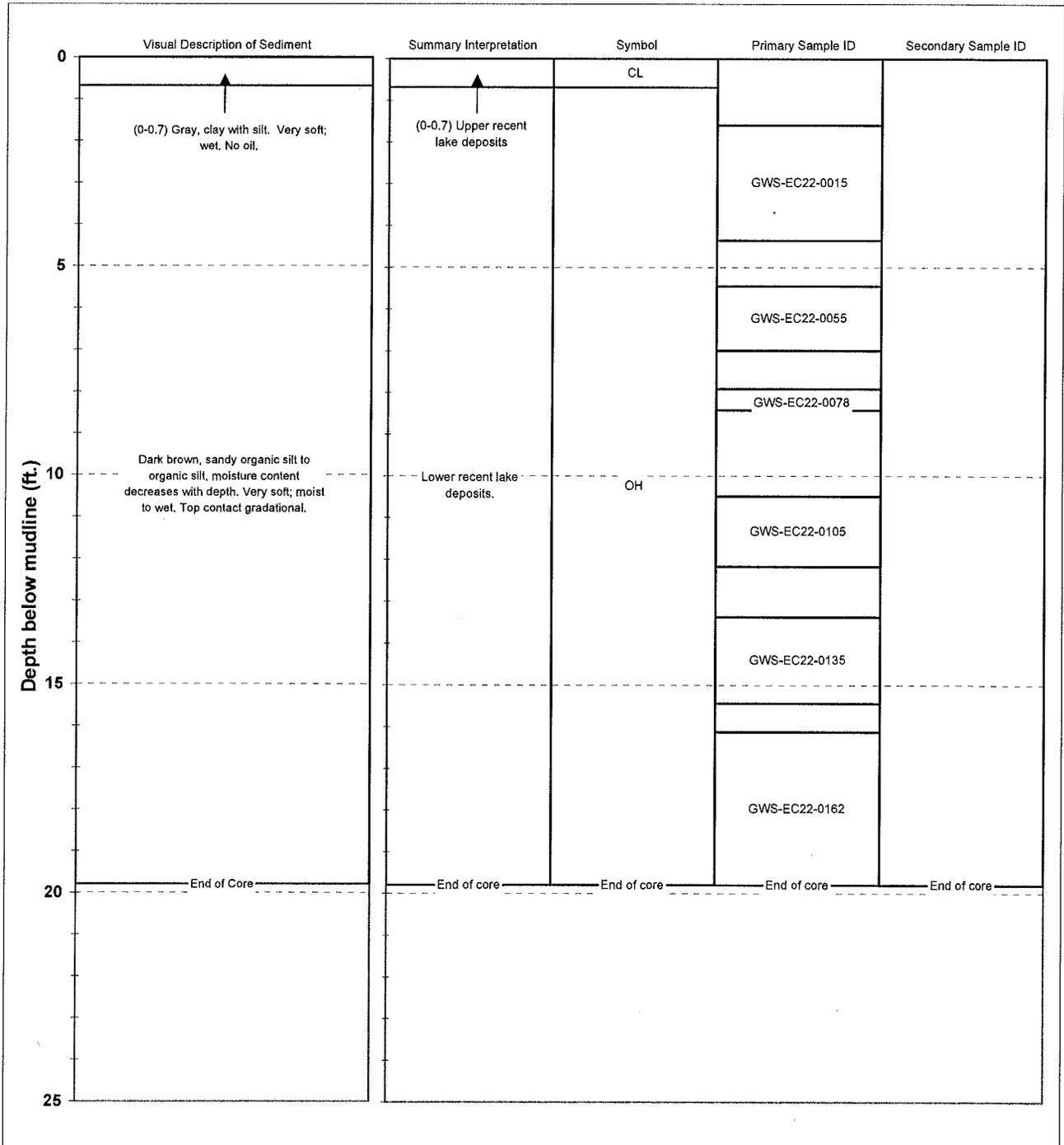
**Project:** Gas Works Sediment-Western Study Area  
**Project No:** 3400542.002

**Station:** GWS-EC22

**Mudline elevation:** -17.8 ft (Corps lake datum)

**Maximum depth of retained sediment:** 19.8 ft  
**Percent recovery (on-deck):** 73%

	<b>Core collection</b>	<b>Laboratory processing</b>	<b>Position:</b> N238694	E1268638	(NAD83 SPC WAN)
<b>Date:</b>	5/17/2005	5/17/2005	<b>Field Log:</b> John LaManna		
<b>Time:</b>	14:25	0:00	<b>Summary Log:</b> John LaManna		



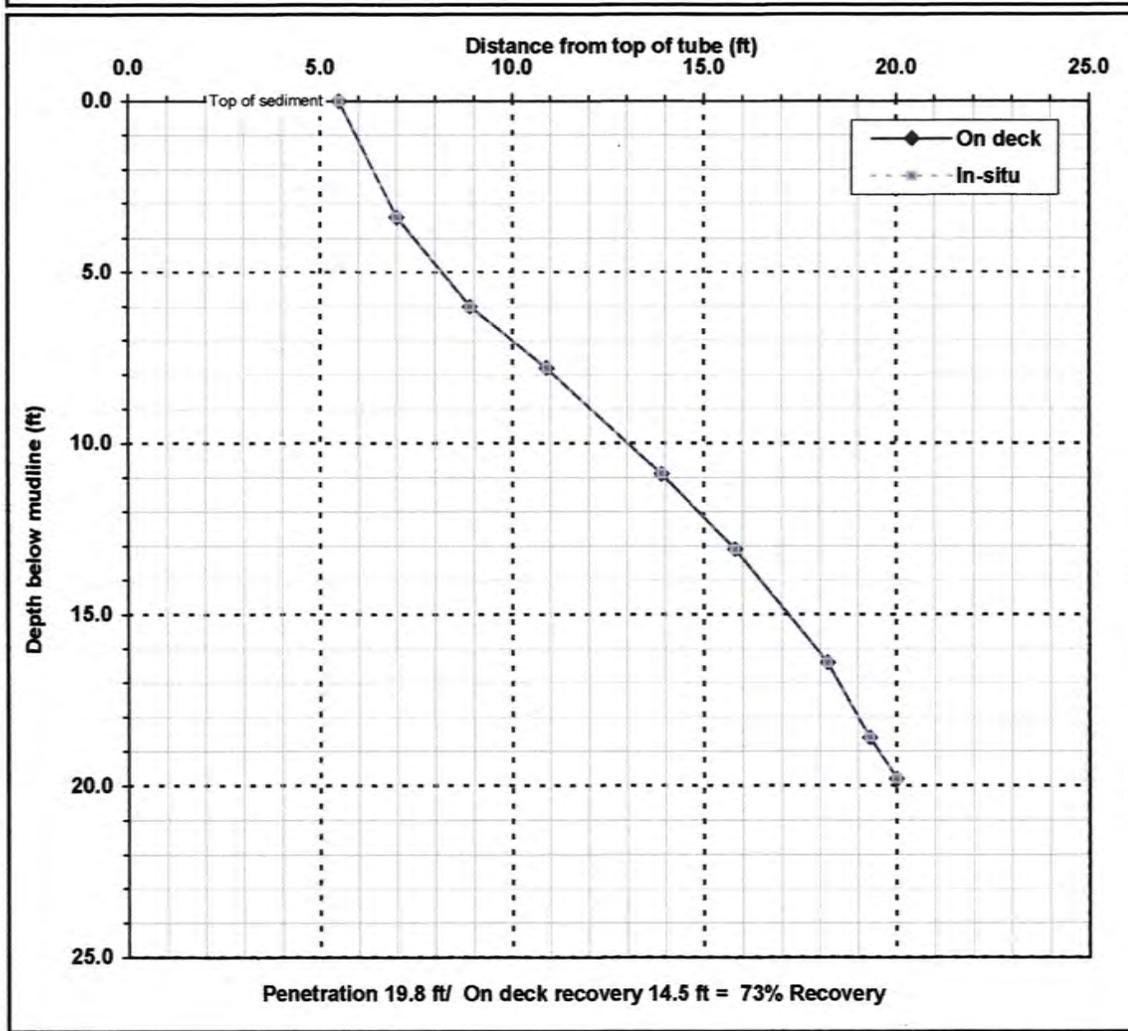
# Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC22  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      238694      Northing  
**Date:** 5/17/2005      **Time:** 14:25      1268638      Easting  
**Water depth:** 39.7 ft      **Mudline:** -17.8 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-3.4	1.5	44%	Mudline	5.5
3.4-6	1.9	73%	0.5	5.72
6-7.8	2	111%	1	5.94
7.8-10.9	3	97%	1.5	6.16
10.9-13.1	1.9	86%	2	6.38
13.1-16.4	2.4	73%	2.5	6.60
16.4-18.6	1.1	50%	3	6.82
18.6-19.8	0.7	58%	3.5	7.07
			4	7.44
			4.5	7.80
			5	8.17
			5.5	8.53
			6	8.90
			6.5	9.46
			7	10.01
			7.5	10.57
			8	11.09
			8.5	11.58
			9	12.06
			9.5	12.55
			10	13.03
			10.5	13.51
			11	13.99
			11.5	14.42
			12	14.85
			13	15.71
			14	16.45
			15	17.18
			16	17.91
			17	18.50
			18	19.00



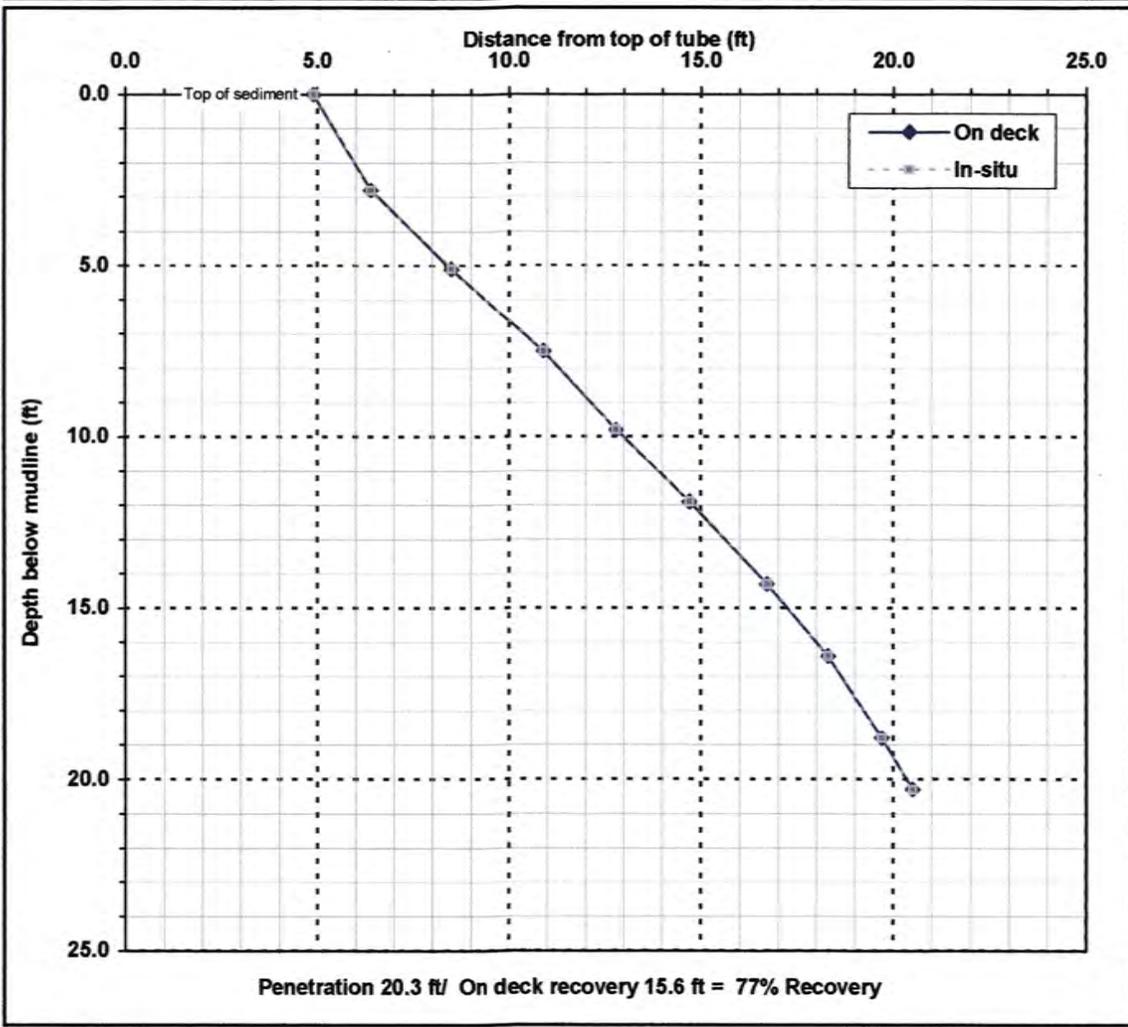
# Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC21  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      238265      Northing  
**Date:** 5/18/2005      **Time:** 12:10      1269126      Easting  
**Water depth:** 40.7 ft      **Mudline:** -18.8 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-2.8	1.5	54%	Mudline	4.9
2.8-5.1	2.1	91%	0.5	5.17
5.1-7.5	2.4	100%	1	5.44
7.5-9.8	1.9	83%	1.5	5.70
9.8-11.9	1.9	90%	2	5.97
11.9-14.3	2	83%	2.5	6.24
14.3-16.4	1.6	76%	3	6.58
16.4-18.8	1.4	58%	3.5	7.04
18.8-20.3	0.8	53%	4	7.50
			4.5	7.95
			5	8.41
			5.5	8.90
			6	9.40
			6.5	9.90
			7	10.40
			7.5	10.90
			8	11.31
			8.5	11.73
			9	12.14
			9.5	12.55
			10	12.98
			10.5	13.43
			11	13.89
			11.5	14.34
			12	14.78
			13	15.62
			14	16.45
			15	17.23
			16	18.00
			17	18.65
			18	19.23



# Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area

**Station:** GWS-EC20

**Project No:** 3400542.002

**Position:** NAD 83

WA N

**Collected by:** GSM

238479

Northing

**Date:** 5/19/2005

**Time:** 9:38

1269361

Easting

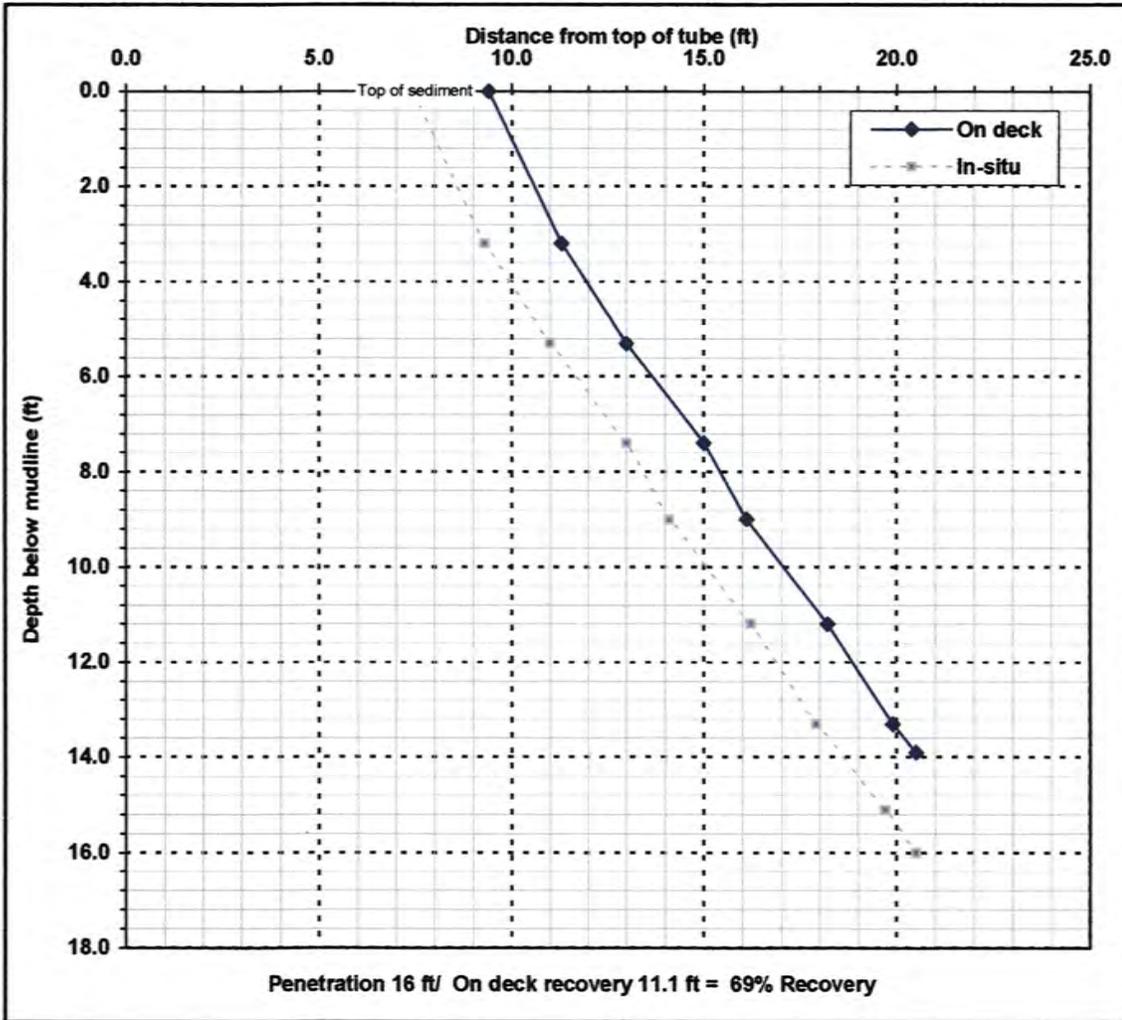
**Water depth:** 41.4 ft      **Mudline:** -19.5 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy

Driven to refusal, lost sediment out of bottom on recovery

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-3.2	1.9	59%	Mudline	9.4
3.2-5.3	1.7	81%	0.5	9.70
5.3-7.4	2	95%	1	9.99
7.4-9	1.1	69%	1.5	10.29
9-11.2	2.1	95%	2	10.59
11.2-13.3	1.7	81%	2.5	10.88
13.3-15.1	1.8	100%	3	11.18
15.1-16	0.8	89%	3.5	11.54
			4	11.95
			4.5	12.35
			5	12.76
			5.5	13.19
			6	13.67
			6.5	14.14
			7	14.62
			7.5	15.07
			8	15.41
			8.5	15.76
			9	16.10
			9.5	16.58
			10	17.05
			10.5	17.53
			11	18.01
			11.5	18.44
			12	18.85
			13	19.66
			14	No sample
			15	No sample
			16	No sample
			17	No sample
			18	No sample



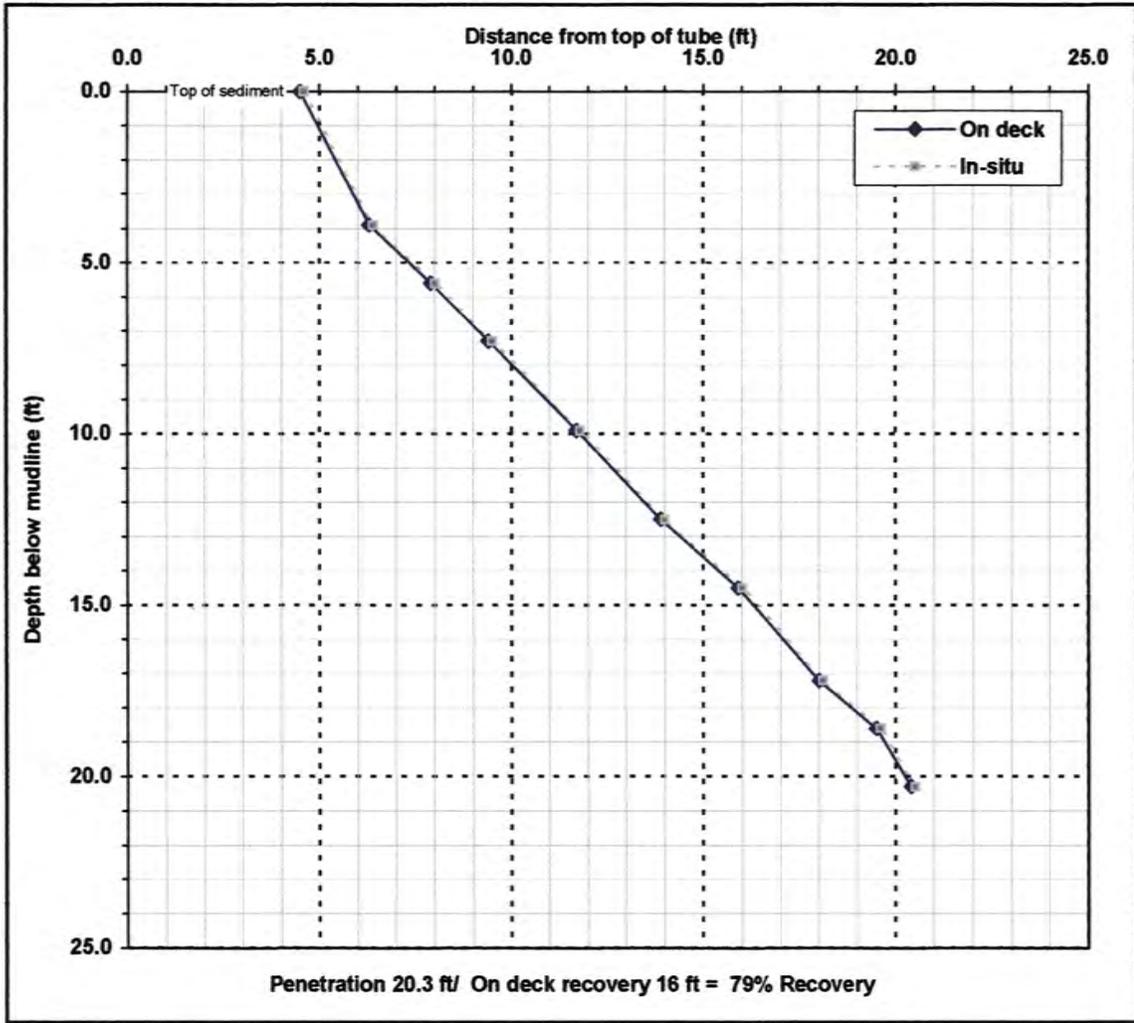
# Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC19  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      239034      Northing  
**Date:** 5/18/2005      **Time:** 9:07      1268729      Easting  
**Water depth:** 41.0 ft      **Mudline:** -19.1 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-3.9	1.8	46%	Mudline	4.5
3.9-5.6	1.6	94%	0.5	4.73
5.6-7.3	1.5	88%	1	4.96
7.3-9.9	2.3	88%	1.5	5.19
9.9-12.5	2.2	85%	2	5.42
12.5-14.5	2	100%	2.5	5.65
14.5-17.2	2.1	78%	3	5.88
17.2-18.6	1.5	107%	3.5	6.12
18.6-20.3	0.9	53%	4	6.39
			4.5	6.86
			5	7.34
			5.5	7.81
			6	8.25
			6.5	8.69
			7	9.14
			7.5	9.58
			8	10.02
			8.5	10.46
			9	10.90
			9.5	11.35
			10	11.78
			10.5	12.21
			11	12.63
			11.5	13.05
			12	13.48
			13	14.40
			14	15.40
			15	16.29
			16	17.07
			17	17.84
			18	18.86



## Mudmole™ Bore Log

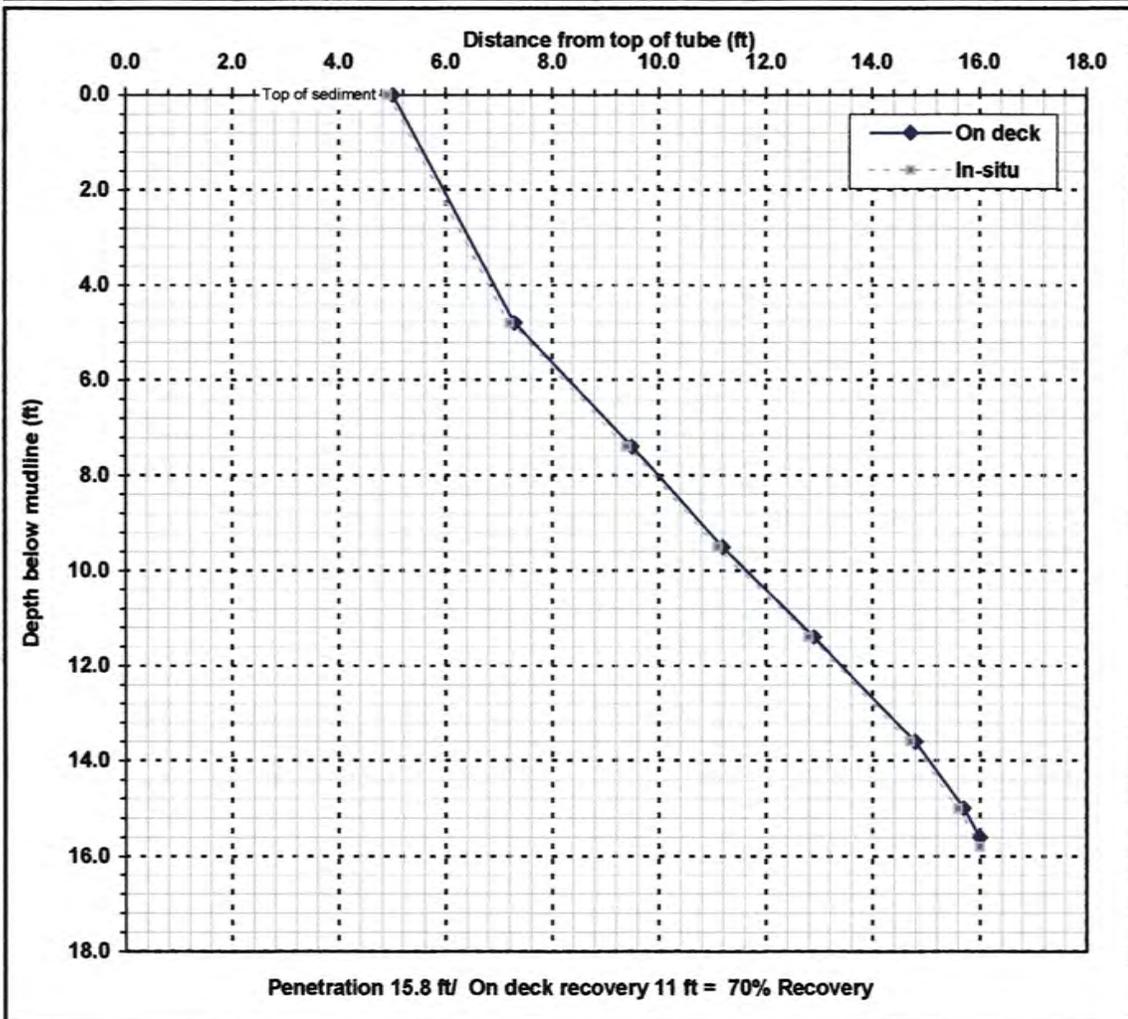
<b>Project:</b> Gas Works Sediment-Western Study Area	<b>Station:</b> GWS-EC18	
<b>Project No:</b> 3400542.002	<b>Position:</b> NAD 83	WA N
<b>Collected by:</b> GSM	239112	Northing
<b>Date:</b> 5/20/2005	<b>Time:</b> 11:15	Easting
<b>Water depth:</b> 41.4 ft	<b>Mudline:</b> -19.5 ft (Corps lake datum)	

Place Field ID Label Here

**Weather/Comments:** Cloudy

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
---------------------------	------------------------	------------------

Depth below mudline (ft)	Distance from top of tube (ft)
--------------------------	--------------------------------



0-4.8	2.3	48%
4.8-7.4	2.2	85%
7.4-9.5	1.7	81%
9.5-11.4	1.7	89%
11.4-13.6	1.9	86%
13.6-15	0.9	64%
15-15.8	0.4	50%

Mudline	5
0.5	5.24
1	5.48
1.5	5.72
2	5.96
2.5	6.20
3	6.44
3.5	6.68
4	6.92
4.5	7.16
5	7.47
5.5	7.89
6	8.32
6.5	8.74
7	9.16
7.5	9.58
8	9.99
8.5	10.39
9	10.80
9.5	11.20
10	11.65
10.5	12.09
11	12.54
11.5	12.99
12	13.42
13	14.28
14	15.06
15	15.70
16	No sample
17	No sample
18	No sample

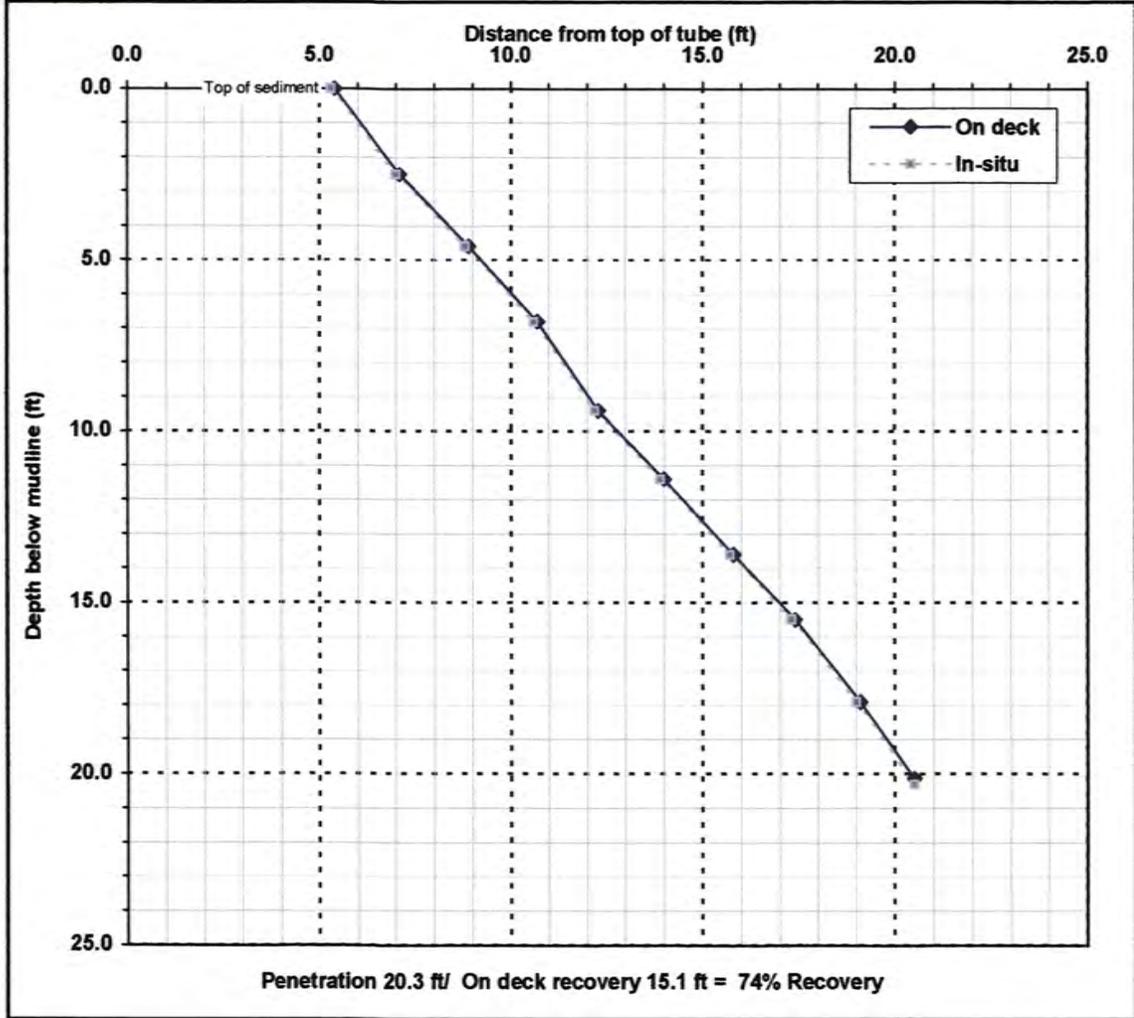
## Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC17  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      238760      Northing  
**Date:** 5/20/2005      **Time:** 8:25      1269052      Easting  
**Water depth:** 41.0 ft      **Mudline:** -19.1 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
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0-2.5	1.7	68%	Mudline	5.4
2.5-4.6	1.8	86%	0.5	5.74
4.6-6.8	1.8	82%	1	6.08
6.8-9.4	1.6	62%	1.5	6.42
9.4-11.4	1.7	85%	2	6.76
11.4-13.6	1.8	82%	2.5	7.10
13.6-15.5	1.6	84%	3	7.53
15.5-17.9	1.7	71%	3.5	7.96
17.9-20.3	1.5	62%	4	8.39
			4.5	8.81
			5	9.23
			5.5	9.64
			6	10.05
			6.5	10.45
			7	10.82
			7.5	11.13
			8	11.44
			8.5	11.75
			9	12.05
			9.5	12.39
			10	12.81
			10.5	13.24
			11	13.66
			11.5	14.08
			12	14.49
			13	15.31
			14	16.14
			15	16.98
			16	17.75
			17	18.46
			18	19.16

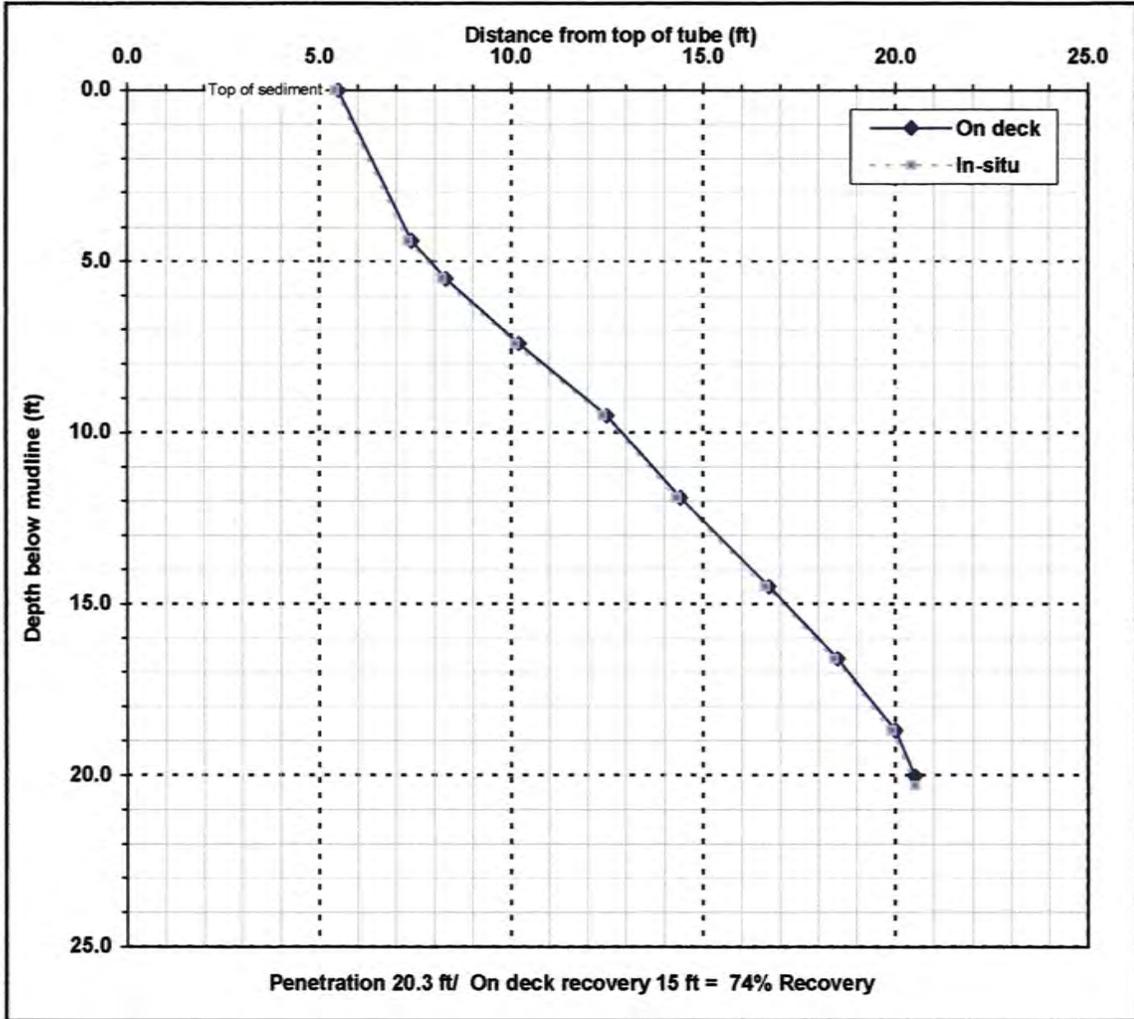
## Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC16  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      238874      Northing  
**Date:** 5/18/2005      **Time:** 10:58      1268806      Easting  
**Water depth:** 40.9 ft      **Mudline:** -19.0 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Rain

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
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0-4.4	1.9	43%	Mudline	5.5
4.4-5.5	0.9	82%	0.5	5.72
5.5-7.4	1.9	100%	1	5.93
7.4-9.5	2.3	110%	1.5	6.15
9.5-11.9	1.9	79%	2	6.36
11.9-14.5	2.3	88%	2.5	6.58
14.5-16.6	1.8	86%	3	6.80
16.6-18.7	1.5	71%	3.5	7.01
18.7-20.3	0.6	37%	4	7.23
			4.5	7.48
			5	7.89
			5.5	8.30
			6	8.80
			6.5	9.30
			7	9.80
			7.5	10.31
			8	10.86
			8.5	11.40
			9	11.95
			9.5	12.50
			10	12.90
			10.5	13.29
			11	13.69
			11.5	14.08
			12	14.49
			13	15.37
			14	16.26
			15	17.13
			16	17.99
			17	18.79
			18	19.50

## Mudmole™ Bore Log

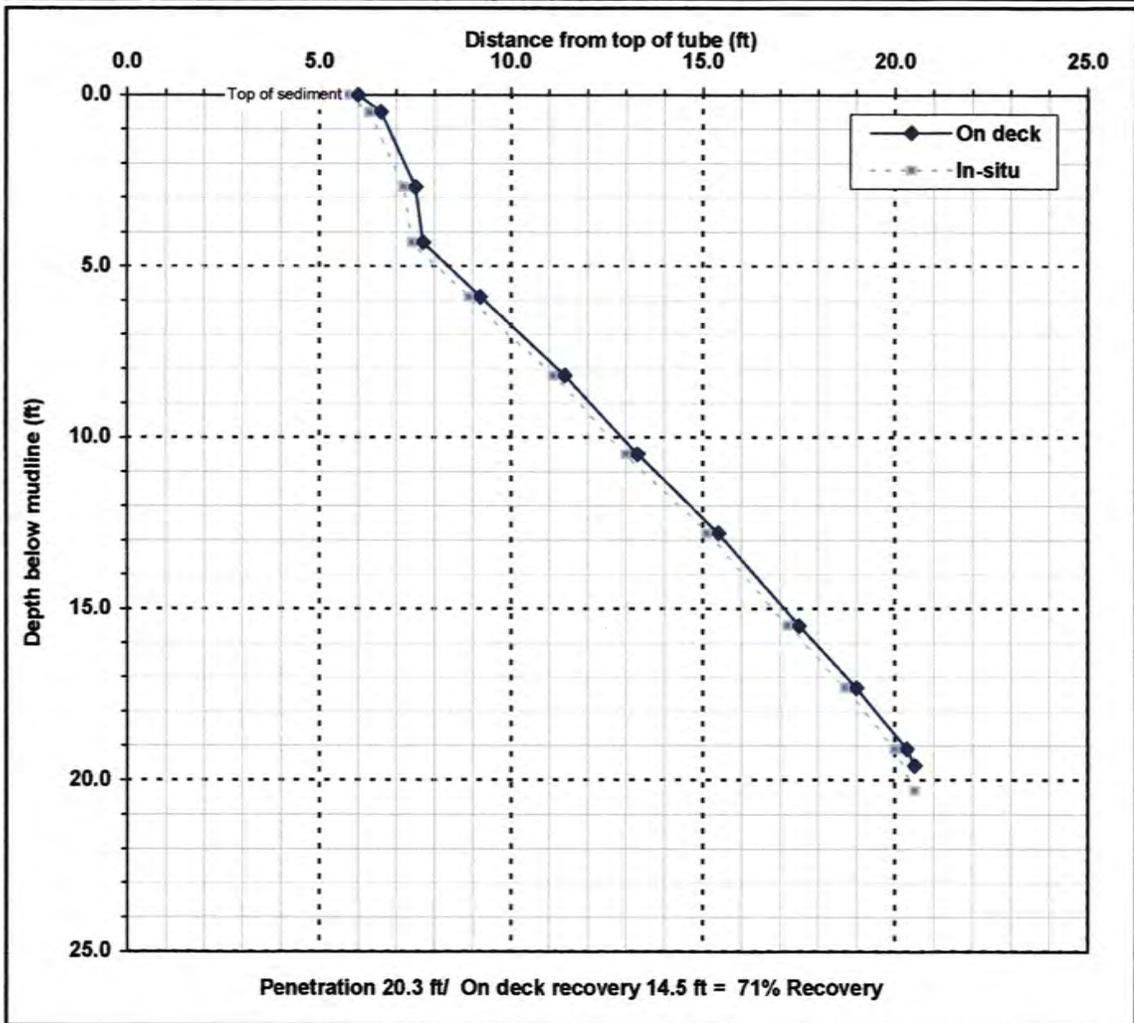
**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC15  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      239001      Northing  
**Date:** 5/20/2005      **Time:** 9:30      1269161      Easting  
**Water depth:** 41.2 ft      **Mudline:** -19.3 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** N/A  
 Station blocked by moored boats; oil sheen during extraction

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
---------------------------	------------------------	------------------

Depth below mudline (ft)	Distance from top of tube (ft)
--------------------------	--------------------------------



0-0.5	0.6	120%
0.5-2.7	0.9	41%
2.7-4.3	0.2	12%
4.3-5.9	1.5	94%
5.9-8.2	2.2	96%
8.2-10.5	1.9	83%
10.5-12.8	2.1	91%
12.8-15.5	2.1	78%
15.5-17.3	1.5	83%
17.3-19.1	1.3	72%
19.1-20.3	0.5	42%

Mudline	6
0.5	6.60
1	6.80
1.5	7.01
2	7.21
2.5	7.42
3	7.54
3.5	7.60
4	7.66
4.5	7.89
5	8.36
5.5	8.83
6	9.30
6.5	9.77
7	10.25
7.5	10.73
8	11.21
8.5	11.65
9	12.06
9.5	12.47
10	12.89
10.5	13.30
11	13.76
11.5	14.21
12	14.67
13	15.56
14	16.33
15	17.11
16	17.92
17	18.75
18	19.51

# Mudmole™ Bore Log

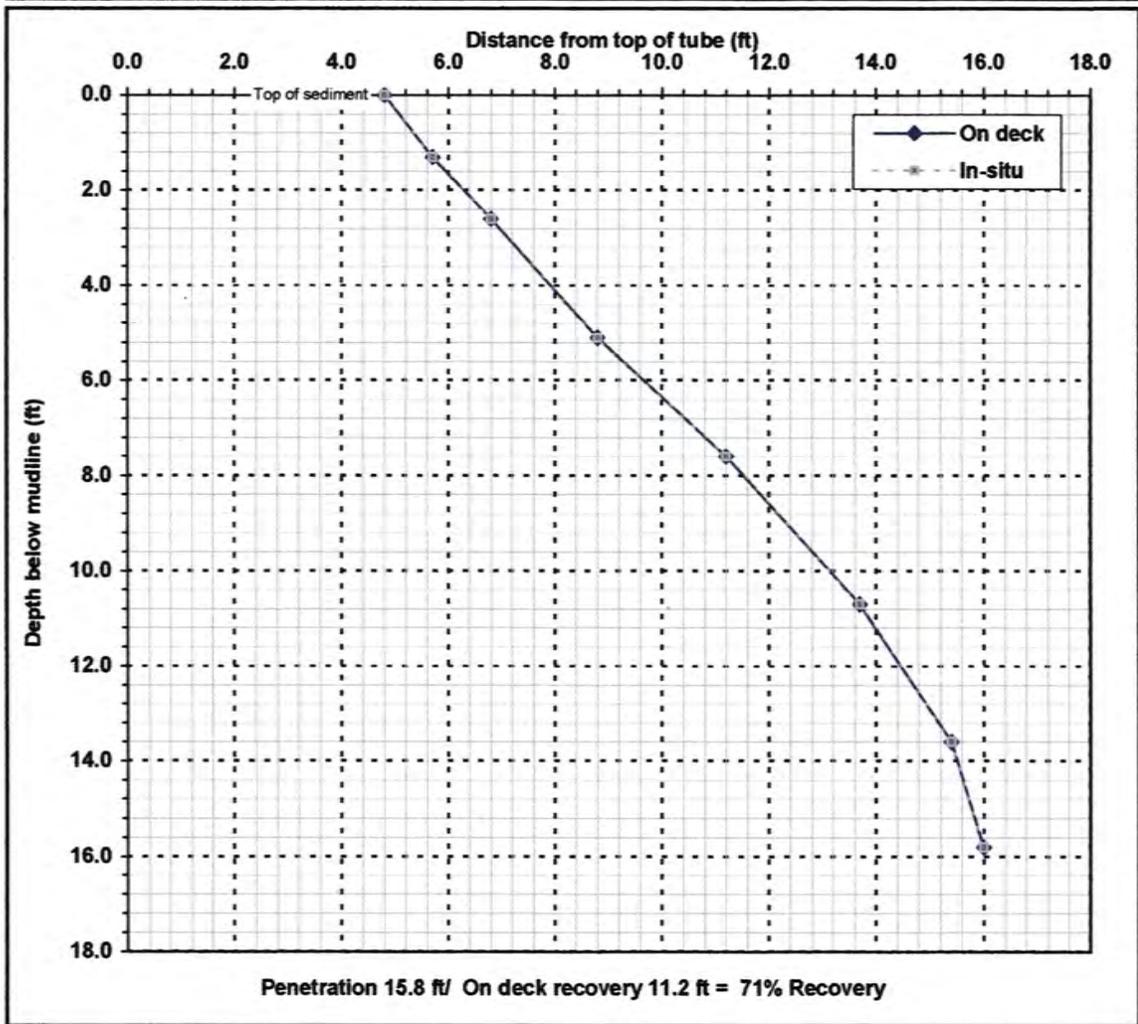
**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC14  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      239240      Northing  
**Date:** 5/17/2005      **Time:** 13:35      1269295      Easting  
**Water depth:** 42.4 ft      **Mudline:** -20.5 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy  
 Heavy sheen during extraction, tied to ship

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
---------------------------	------------------------	------------------

Depth below mudline (ft)	Distance from top of tube (ft)
--------------------------	--------------------------------



0-1.3	0.9	69%
1.3-2.6	1.1	85%
2.6-5.1	2	80%
5.1-7.6	2.4	96%
7.6-10.7	2.5	81%
10.7-13.6	1.7	59%
13.6-15.8	0.6	27%

Mudline	4.8
0.5	5.15
1	5.49
1.5	5.87
2	6.29
2.5	6.72
3	7.12
3.5	7.52
4	7.92
4.5	8.32
5	8.72
5.5	9.18
6	9.66
6.5	10.14
7	10.62
7.5	11.10
8	11.52
8.5	11.93
9	12.33
9.5	12.73
10	13.14
10.5	13.54
11	13.88
11.5	14.17
12	14.46
12.5	14.76
13	15.05
13.5	15.34
14	15.51
14.5	15.65
15	15.78

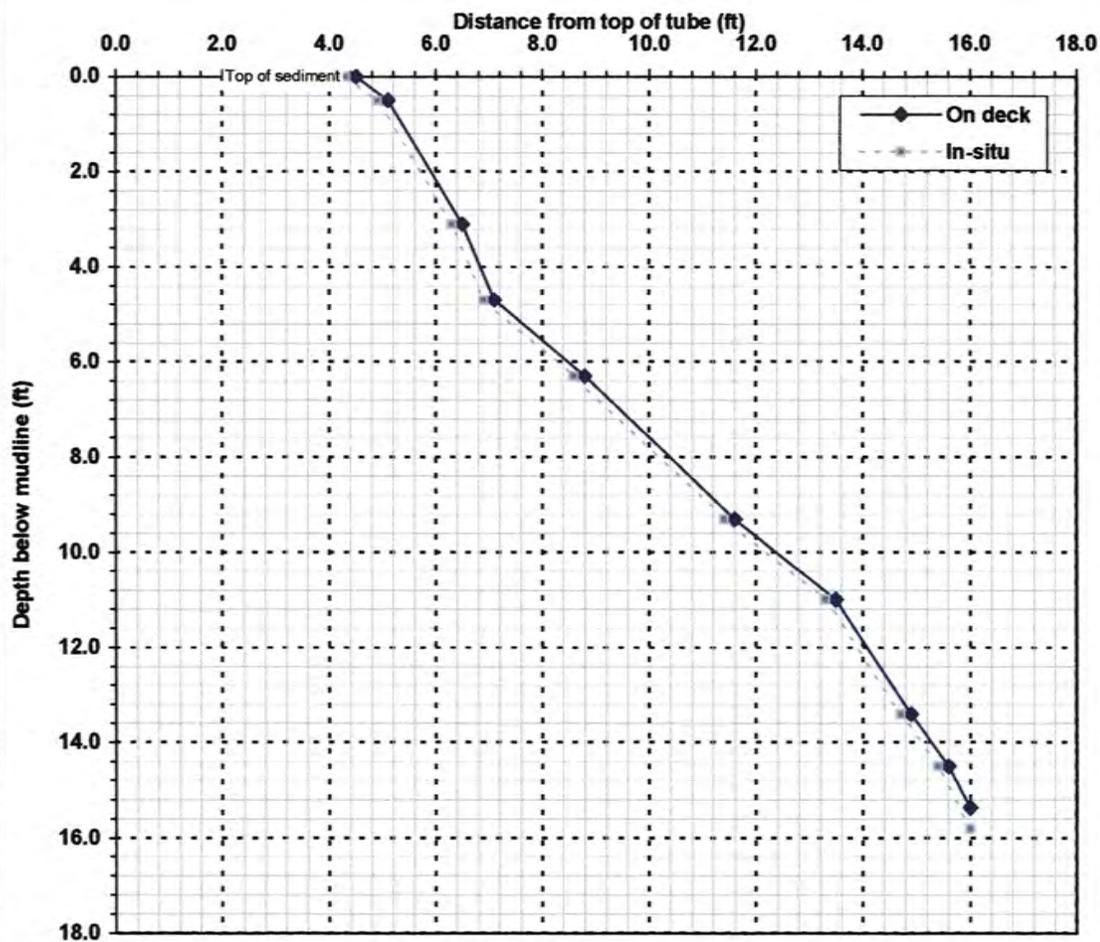
# Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC13  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      239061      Northing  
**Date:** 5/17/2005      **Time:** 9:39      1269278      Easting  
**Water depth:** 42.3 ft      **Mudline:** -20.4 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy  
Tied to barge, Sheen when extracted

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-0.5	0.6	120%	Mudline	4.5
0.5-3.1	1.4	54%	0.5	5.10
3.1-4.7	0.6	38%	1	5.37
4.7-6.3	1.7	106%	1.5	5.64
6.3-9.3	2.8	93%	2	5.91
9.3-11	1.9	112%	2.5	6.18
11-13.4	1.4	58%	3	6.45
13.4-14.5	0.7	64%	3.5	6.65
14.5-15.8	0.6	46%	4	6.84
			4.5	7.03
			5	7.42
			5.5	7.95
			6	8.48
			6.5	8.99
			7	9.45
			7.5	9.92
			8	10.39
			8.5	10.85
			9	11.32
			9.5	11.82
			10	12.38
			10.5	12.94
			11	13.50
			11.5	13.79
			12	14.08
			12.5	14.38
			13	14.67
			13.5	14.96
			14	15.28
			14.5	15.60
			15	15.83



Penetration 15.8 ft/ On deck recovery 11.5 ft = 73% Recovery

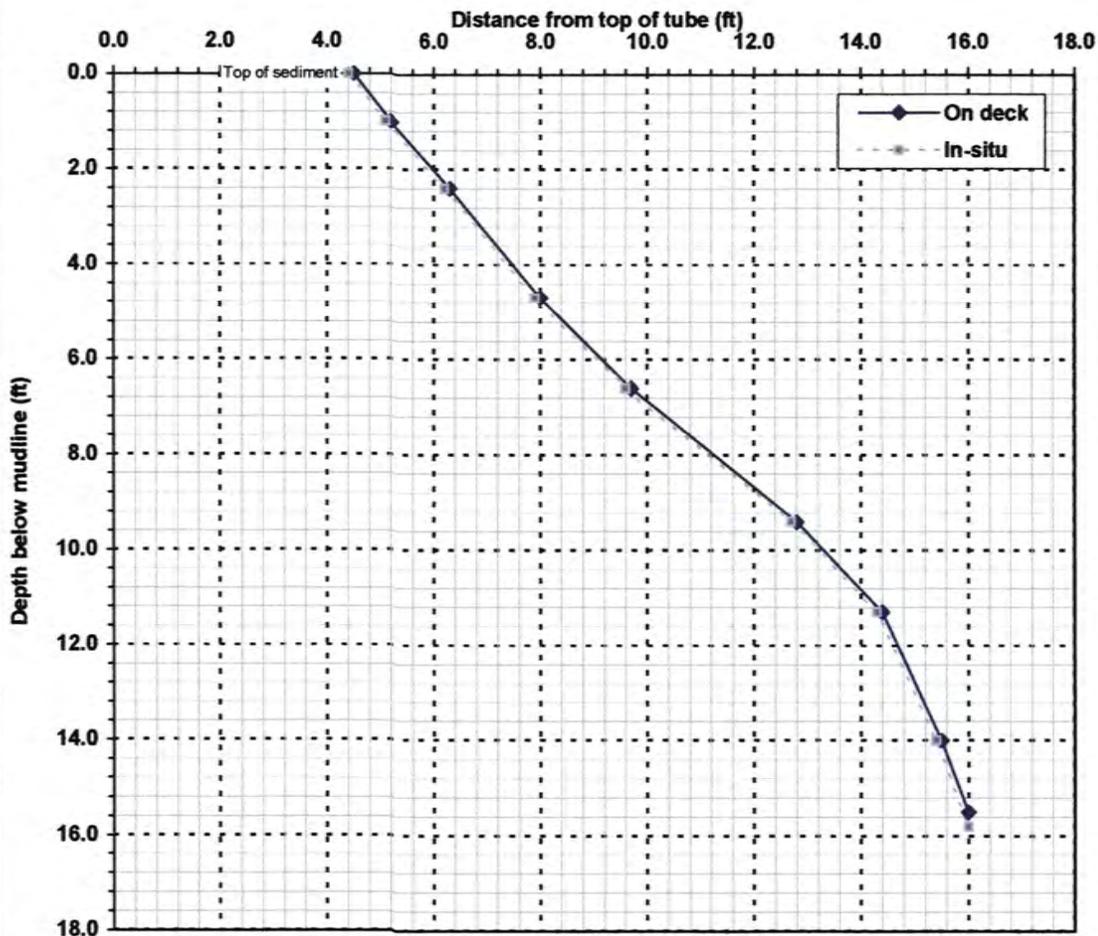
# Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC12  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      239177      Northing  
**Date:** 5/17/2005      **Time:** 8:46      1269370      Easting  
**Water depth:** 40.9 ft      **Mudline:** -19.0 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Partly cloudy  
 Heavy oil sheen when pulling core

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-1	0.7	70%	Mudline	4.5
1-2.4	1.1	79%	0.5	4.85
2.4-4.7	1.7	74%	1	5.20
4.7-6.6	1.7	89%	1.5	5.59
6.6-9.4	3.1	111%	2	5.99
9.4-11.3	1.6	84%	2.5	6.37
11.3-14	1.1	41%	3	6.74
14-15.8	0.6	33%	3.5	7.11
			4	7.48
			4.5	7.85
			5	8.27
			5.5	8.72
			6	9.16
			6.5	9.61
			7	10.14
			7.5	10.70
			8	11.25
			8.5	11.80
			9	12.36
			9.5	12.88
			10	13.31
			10.5	13.73
			11	14.15
			11.5	14.48
			12	14.69
			12.5	14.89
			13	15.09
			13.5	15.30
			14	15.50
			14.5	15.67
			15	15.83



Penetration 15.8 ft/ On deck recovery 11.5 ft = 73% Recovery

# Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC11Dup  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      239262      Northing  
**Date:** 5/17/2005      **Time:** 12:56      1269530      Easting  
**Water depth:** 2.4 ft      **Mudline:** 19.5 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy

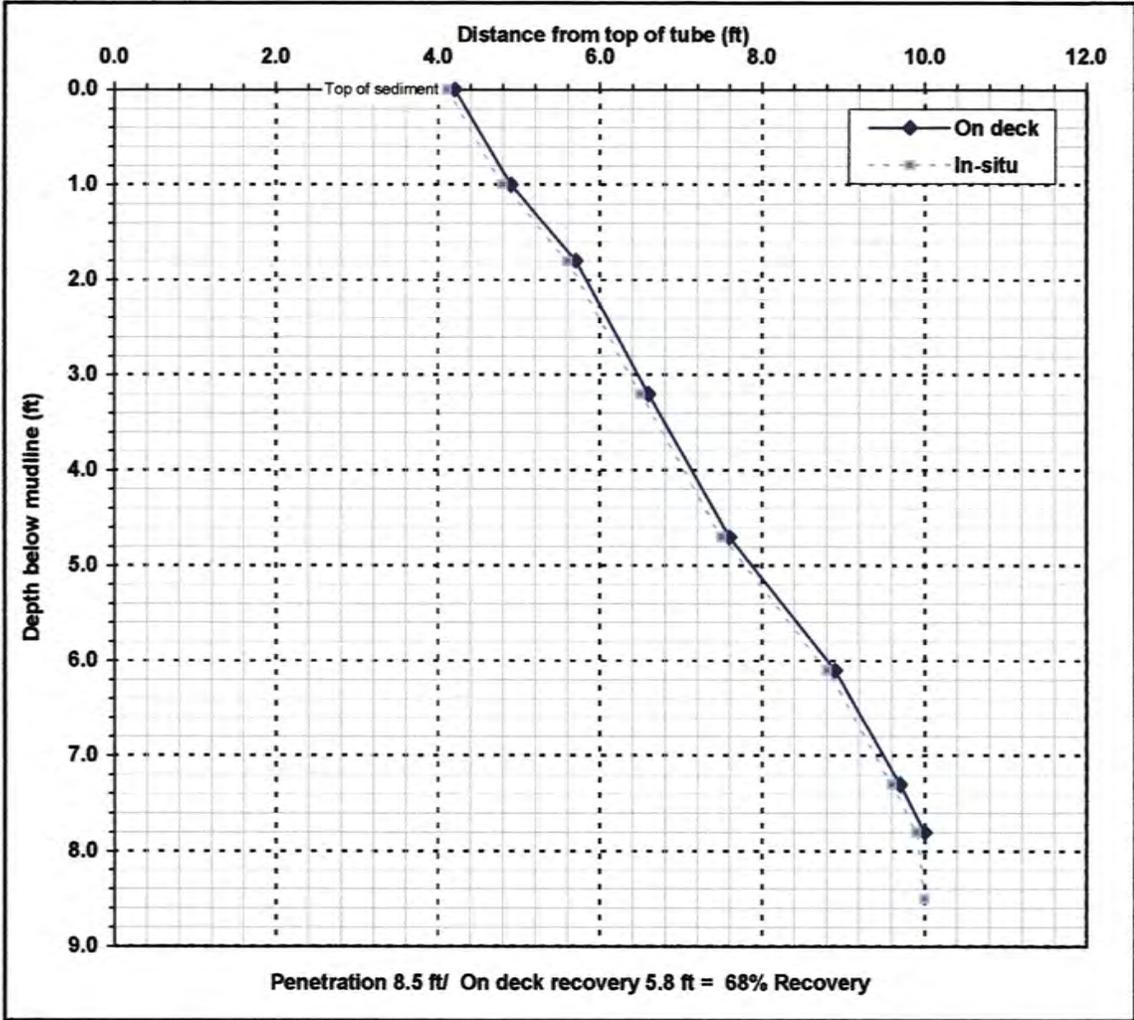
Driven to refusal

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
---------------------------	------------------------	------------------

Depth below mudline (ft)	Distance from top of tube (ft)
--------------------------	--------------------------------

0-1	0.7	70%
1-1.8	0.8	100%
1.8-3.2	0.9	64%
3.2-4.7	1	67%
4.7-6.1	1.3	93%
6.1-7.3	0.8	67%
7.3-7.8	0.3	60%
7.8-8.5	0.1	14%

Mudline	4.2
0.5	4.55
1	4.90
1.5	5.40
2	5.83
2.5	6.15
3	6.47
3.5	6.80
4	7.13
4.5	7.47
5	7.88
5.5	8.34
6	8.81
6.5	9.17
7	9.50
7.5	9.82
8	No sample
8.5	No sample
9	No sample
9.5	No sample
10	No sample
10.5	No sample
11	No sample
11.5	No sample
12	No sample
12.5	No sample
13	No sample
13.5	No sample
14	No sample
14.5	No sample
15	No sample



## Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area

**Station:** GWS-EC11

**Project No:** 3400542.002

**Position:** NAD 83

WA N

**Collected by:** GSM

239263

Northing

**Date:** 5/16/2005

**Time:** 9:15

1269530

Easting

**Water depth:** 2.6 ft

**Mudline:** 19.3 ft (Corps lake datum)

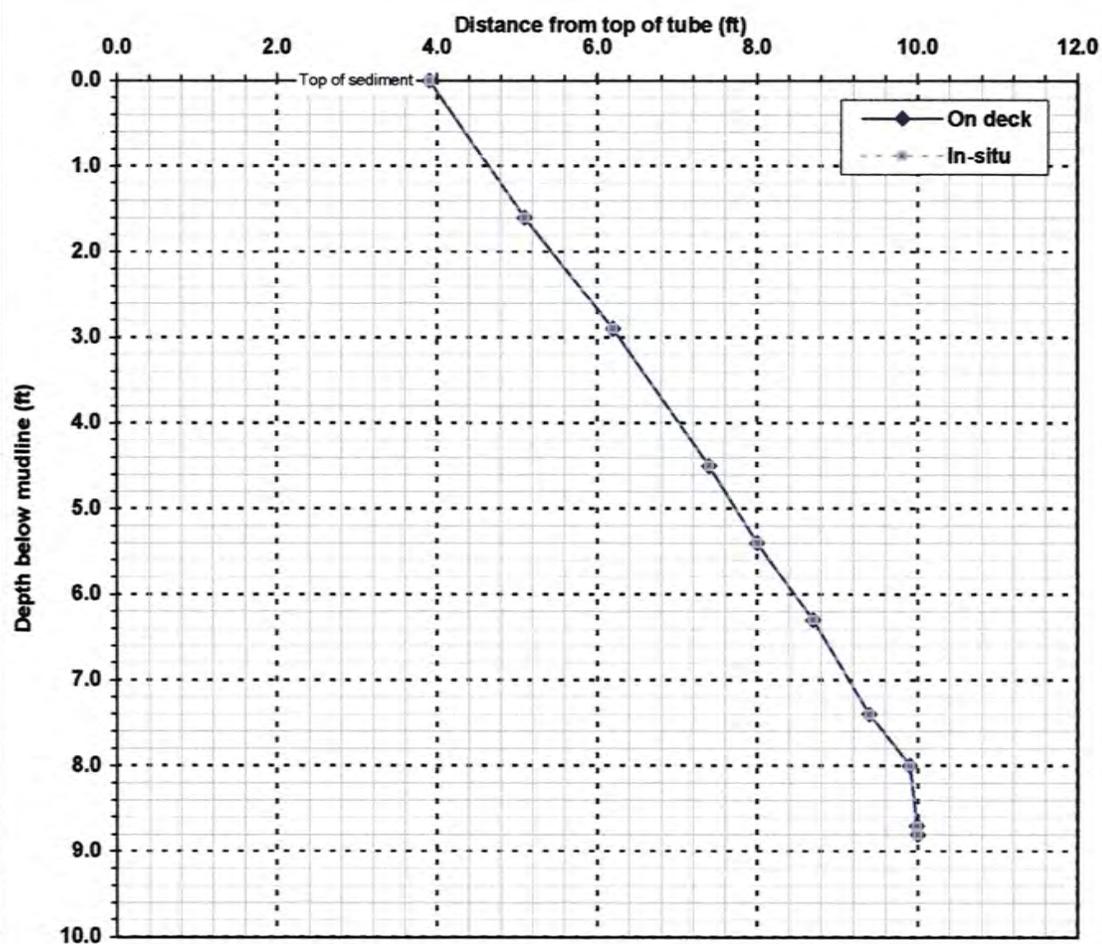
Place Field ID Label Here

**Weather/Comments:** Cloudy

Driven to refusal, Revised location

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
0-1.6	1.2	75%
1.6-2.9	1.1	85%
2.9-4.5	1.2	75%
4.5-5.4	0.6	67%
5.4-6.3	0.7	78%
6.3-7.4	0.7	64%
7.4-8	0.5	83%
8-8.7	0.09	13%
8.7-8.8	0.01	10%

Depth below mudline (ft)	Distance from top of tube (ft)
Mudline	3.9
0.5	4.28
1	4.65
1.5	5.03
2	5.44
2.5	5.86
3	6.28
3.5	6.65
4	7.03
4.5	7.40
5	7.73
5.5	8.08
6	8.47
6.5	8.83
7	9.15
7.5	9.48
8	9.90
8.5	9.96
9	No sample
9.5	No sample
10	No sample
10.5	No sample
11	No sample
11.5	No sample
12	No sample
12.5	No sample
13	No sample
13.5	No sample
14	No sample
14.5	No sample
15	No sample



Penetration 8.8 ft/ On deck recovery 6.1 ft = 69% Recovery

# Mudmole™ Bore Log

Project: Gas Works Sediment-Western Study Area

Station: **GWS-EC10**

Project No: 3400542.002

Position: NAD 83

Collected by: GSM

238540

WA N

Date: 5/18/2005

Time: 13:55

1269116

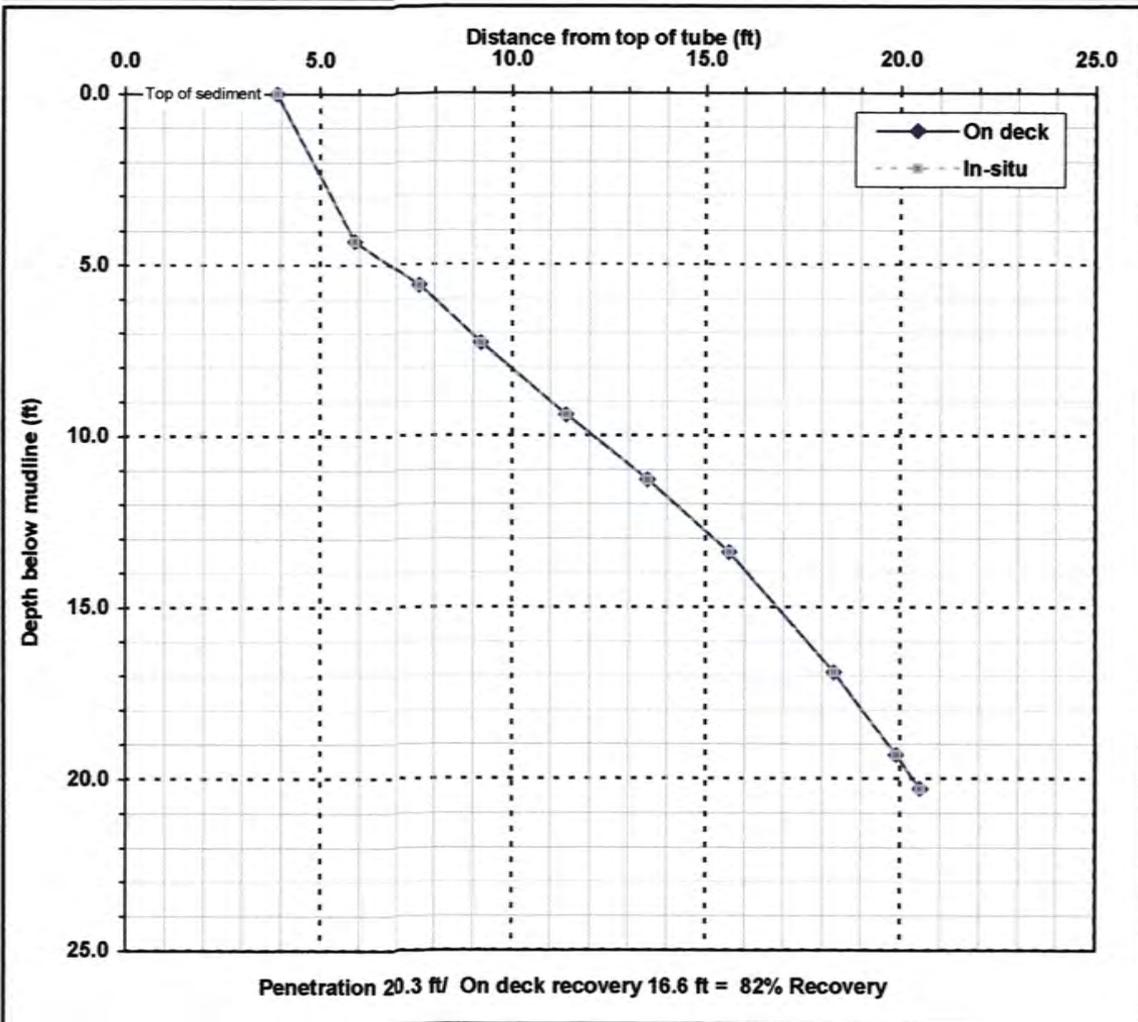
Northing

Easting

Water depth: 41.4 ft      Mudline: -19.5 ft (Corps lake datum)

Place Field ID Label Here

Weather/Comments: N/A



Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-4.3	2	47%	Mudline	3.9
4.3-5.6	1.7	131%	0.5	4.13
5.6-7.3	1.6	94%	1	4.37
7.3-9.4	2.2	105%	1.5	4.60
9.4-11.3	2.1	111%	2	4.83
11.3-13.4	2.1	100%	2.5	5.06
13.4-16.9	2.7	77%	3	5.30
16.9-19.3	1.6	67%	3.5	5.53
19.3-20.3	0.6	60%	4	5.76
			4.5	6.16
			5	6.82
			5.5	7.47
			6	7.98
			6.5	8.45
			7	8.92
			7.5	9.41
			8	9.93
			8.5	10.46
			9	10.98
			9.5	11.51
			10	12.06
			10.5	12.62
			11	13.17
			11.5	13.70
			12	14.20
			13	15.20
			14	16.06
			15	16.83
			16	17.61
			17	18.37
			18	19.03

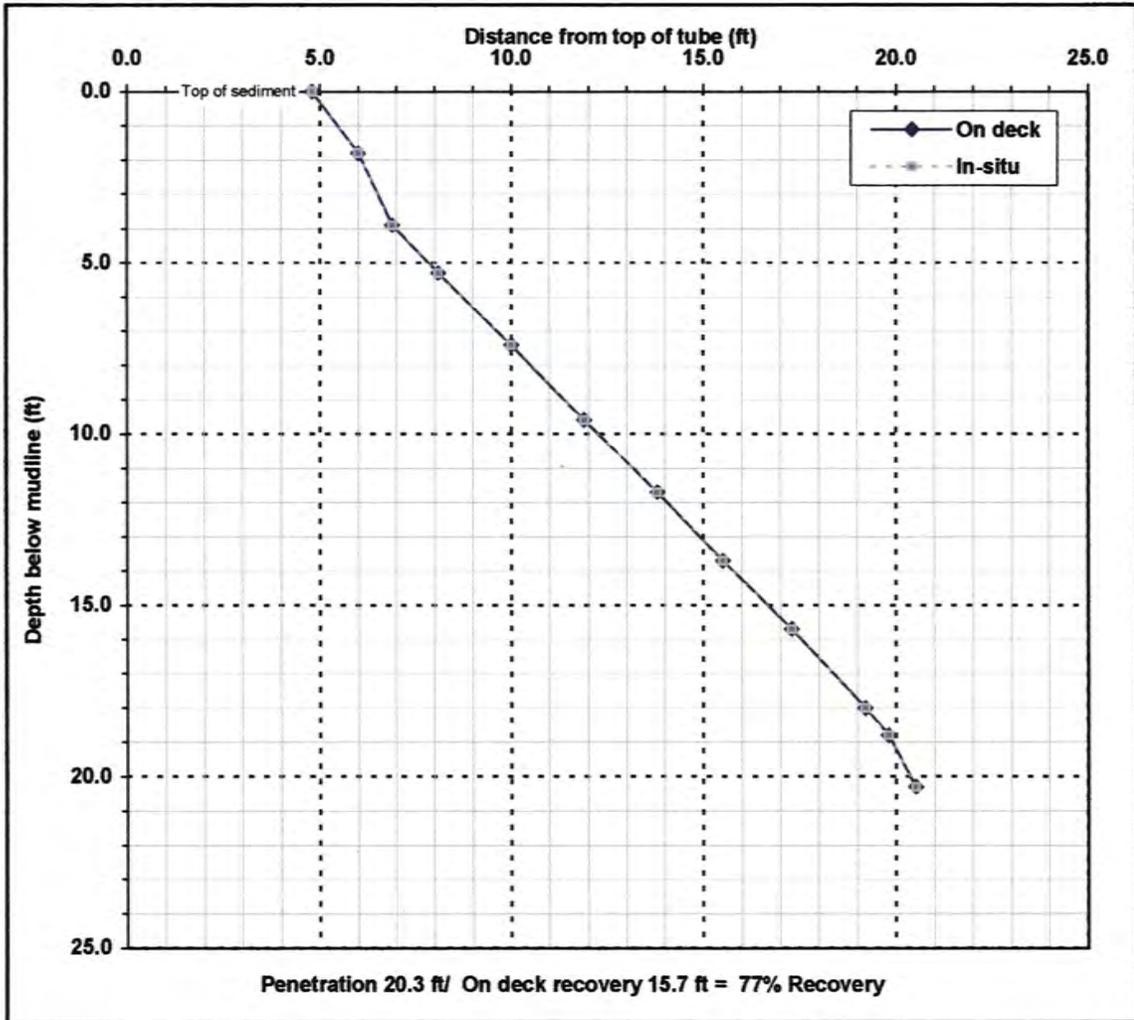
## Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC09DUP  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      238845      Northing  
**Date:** 5/20/2005      **Time:** 10:35      1269353      Easting  
**Water depth:** 41.6 ft      **Mudline:** -19.7 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** N/A

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
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0-1.8	1.2	67%	Mudline	4.8
1.8-3.9	0.9	43%	0.5	5.13
3.9-5.3	1.2	86%	1	5.47
5.3-7.4	1.9	90%	1.5	5.80
7.4-9.6	1.9	86%	2	6.09
9.6-11.7	1.9	90%	2.5	6.30
11.7-13.7	1.7	85%	3	6.51
13.7-15.7	1.8	90%	3.5	6.73
15.7-18	1.9	83%	4	6.99
18-18.8	0.6	75%	4.5	7.41
18.8-20.3	0.7	47%	5	7.84
			5.5	8.28
			6	8.73
			6.5	9.19
			7	9.64
			7.5	10.09
			8	10.52
			8.5	10.95
			9	11.38
			9.5	11.81
			10	12.26
			10.5	12.71
			11	13.17
			11.5	13.62
			12	14.06
			13	14.91
			14	15.77
			15	16.67
			16	17.55
			17	18.37
			18	19.20

# Mudmole™ Bore Log

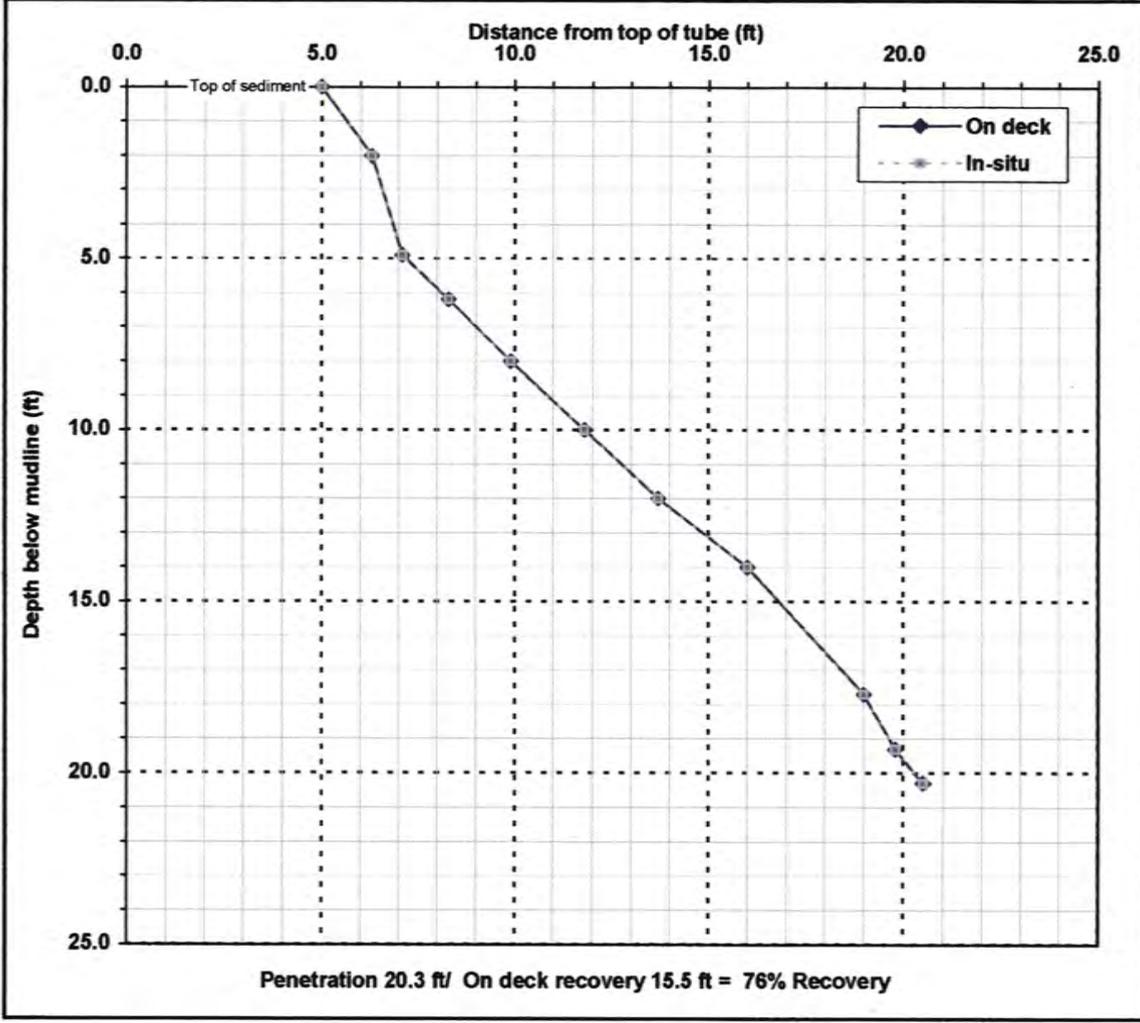
**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC09  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      238842      Northing  
**Date:** 5/19/2005      **Time:** 11:06      1269353      Easting  
**Water depth:** 41.5 ft      **Mudline:** -19.6 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
---------------------------	------------------------	------------------

Depth below mudline (ft)	Distance from top of tube (ft)
--------------------------	--------------------------------



0-2	1.3	65%
2-4.9	0.8	28%
4.9-6.2	1.2	92%
6.2-8	1.6	89%
8-10	1.9	95%
10-12	1.9	95%
12-14	2.3	115%
14-17.7	3	81%
17.7-19.3	0.8	50%
19.3-20.3	0.7	70%

Mudline	5
0.5	5.33
1	5.65
1.5	5.98
2	6.30
2.5	6.44
3	6.58
3.5	6.71
4	6.85
4.5	6.99
5	7.19
5.5	7.65
6	8.12
6.5	8.57
7	9.01
7.5	9.46
8	9.90
8.5	10.38
9	10.85
9.5	11.33
10	11.80
10.5	12.28
11	12.75
11.5	13.23
12	13.70
13	14.85
14	16.00
15	16.81
16	17.62
17	18.43
18	19.15

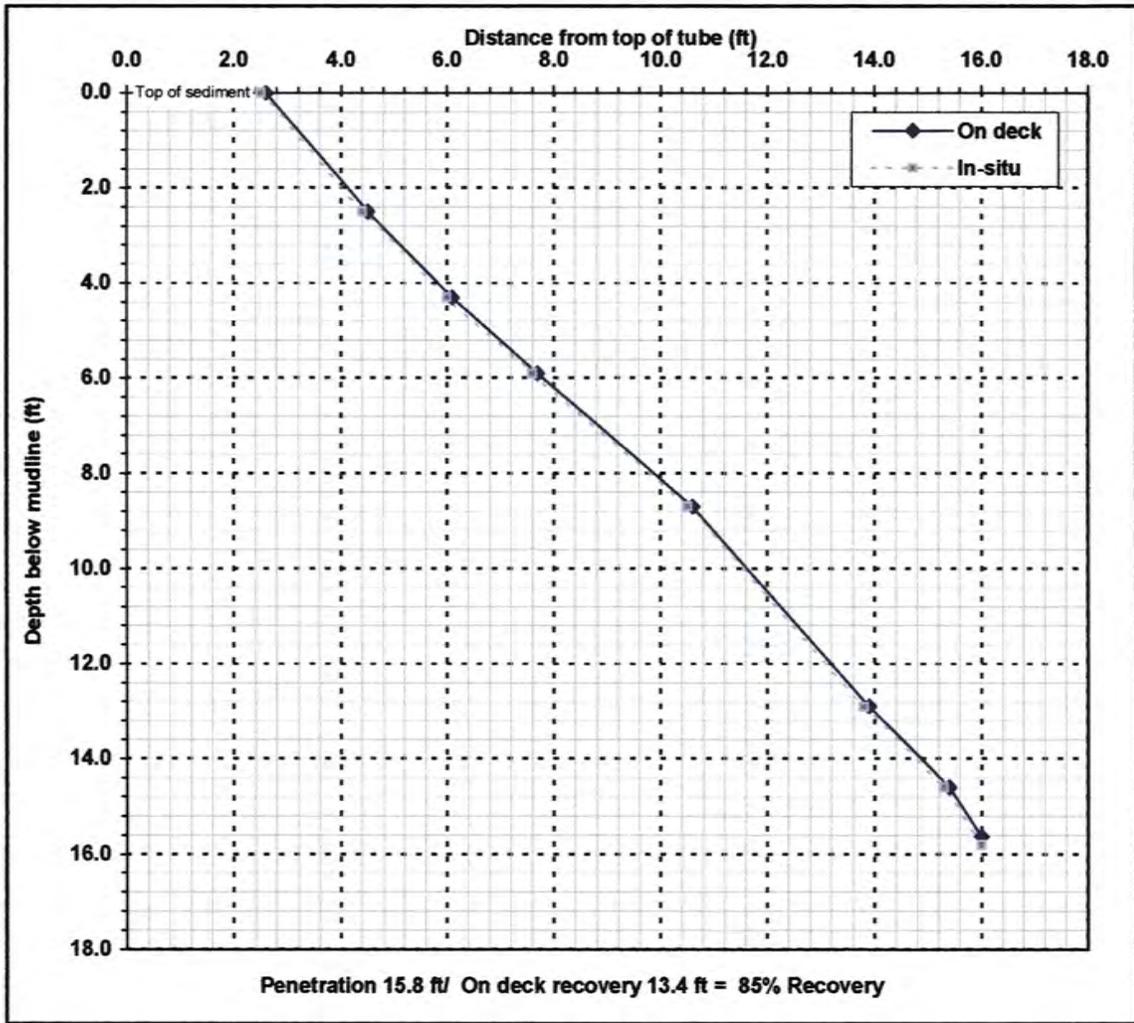
## Mudmole™ Bore Log

<b>Project:</b> Gas Works Sediment-Western Study Area	<b>Station:</b> GWS-EC08	
<b>Project No:</b> 3400542.002	<b>Position:</b> NAD 83	WA N
<b>Collected by:</b> GSM	238894	Northing
<b>Date:</b> 5/16/2005	<b>Time:</b> 13:54	Easting
<b>Water depth:</b> 41.7 ft	<b>Mudline:</b> -19.8 ft (Corps lake datum)	

Place Field ID Label Here

**Weather/Comments:** Cloudy  
Full penetration

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-2.5	1.9	76%	Mudline	2.6
2.5-4.3	1.6	89%	0.5	2.98
4.3-5.9	1.6	100%	1	3.36
5.9-8.7	2.9	104%	1.5	3.74
8.7-12.9	3.3	79%	2	4.12
12.9-14.6	1.5	88%	2.5	4.50
14.6-15.8	0.7	58%	3	4.94
			3.5	5.39
			4	5.83
			4.5	6.30
			5	6.80
			5.5	7.30
			6	7.80
			6.5	8.32
			7	8.84
			7.5	9.36
			8	9.88
			8.5	10.39
			9	10.84
			9.5	11.23
			10	11.62
			10.5	12.01
			11	12.41
			11.5	12.80
			12	13.19
			12.5	13.59
			13	13.99
			13.5	14.43
			14	14.87
			14.5	15.31
			15	15.63



## Mudmole™ Bore Log

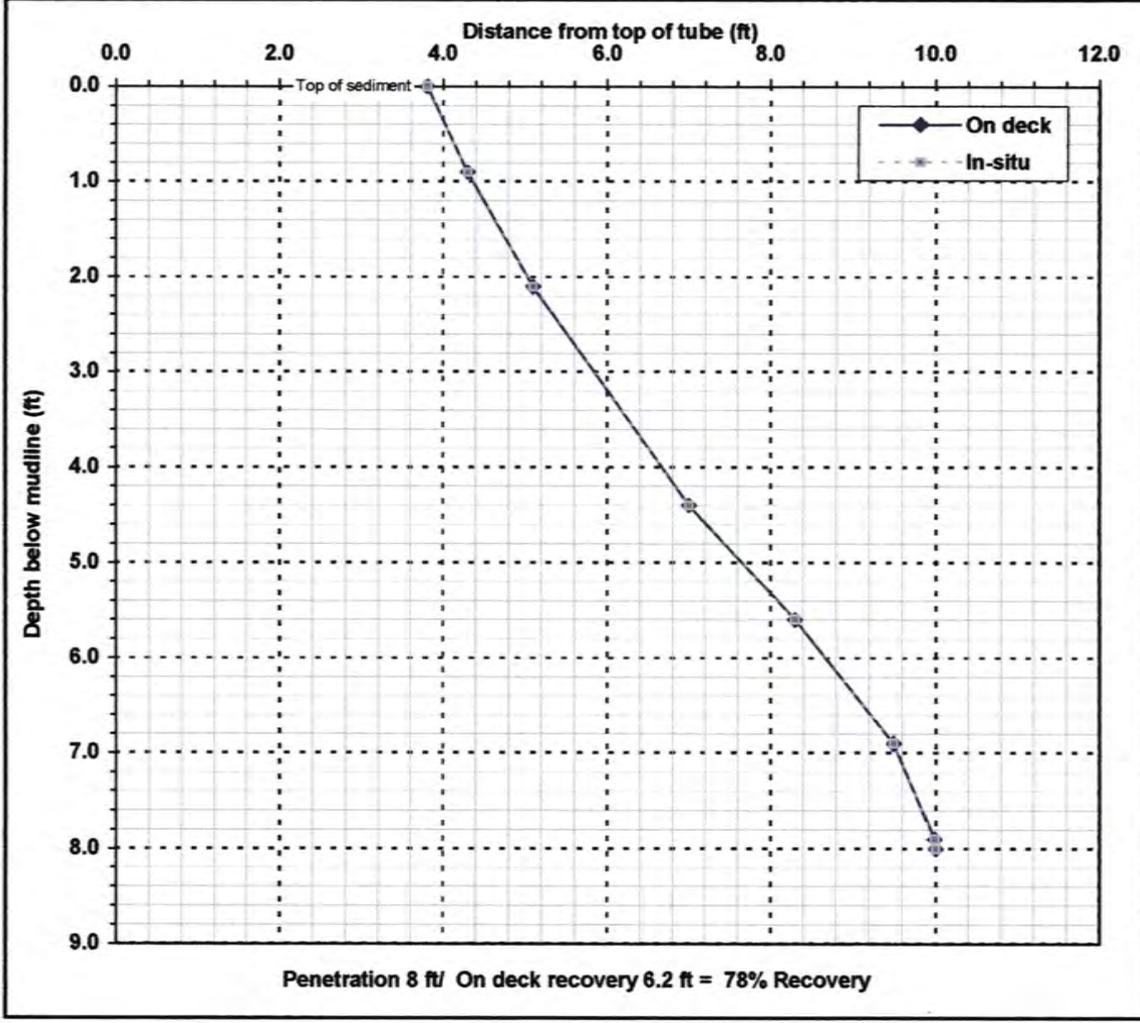
<b>Project:</b> Gas Works Sediment-Western Study Area	<b>Station:</b> GWS-EC07DUP	
<b>Project No:</b> 3400542.002	<b>Position:</b> NAD 83	WA N
<b>Collected by:</b> GSM	239033	Northing
<b>Date:</b> 5/16/2005	<b>Time:</b> 14:36	Easting
<b>Water depth:</b> 23.5 ft	<b>Mudline:</b> -1.6 ft (Corps lake datum)	

Place Field ID Label Here

**Weather/Comments:** Cloudy

Driven to refusal

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-0.9	0.5	56%	Mudline	3.8
0.9-2.1	0.8	67%	0.5	4.08
2.1-4.4	1.9	83%	1	4.37
4.4-5.6	1.3	108%	1.5	4.70
5.6-6.9	1.2	92%	2	5.03
6.9-7.9	0.49	49%	2.5	5.43
7.9-8	0.01	10%	3	5.84
			3.5	6.26
			4	6.67
			4.5	7.11
			5	7.65
			5.5	8.19
			6	8.67
			6.5	9.13
			7	9.55
			7.5	9.79
			8	10.00
			8.5	No sample
			9	No sample
			9.5	No sample
			10	No sample
			10.5	No sample
			11	No sample
			11.5	No sample
			12	No sample
			12.5	No sample
			13	No sample
			13.5	No sample
			14	No sample
			14.5	No sample
			15	No sample



## Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC07  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      239035      Northing  
**Date:** 5/16/2005      **Time:** 10:07      1269642      Easting  
**Water depth:** 23.5 ft      **Mudline:** -1.6 ft (Corps lake datum)

Place Field ID Label Here

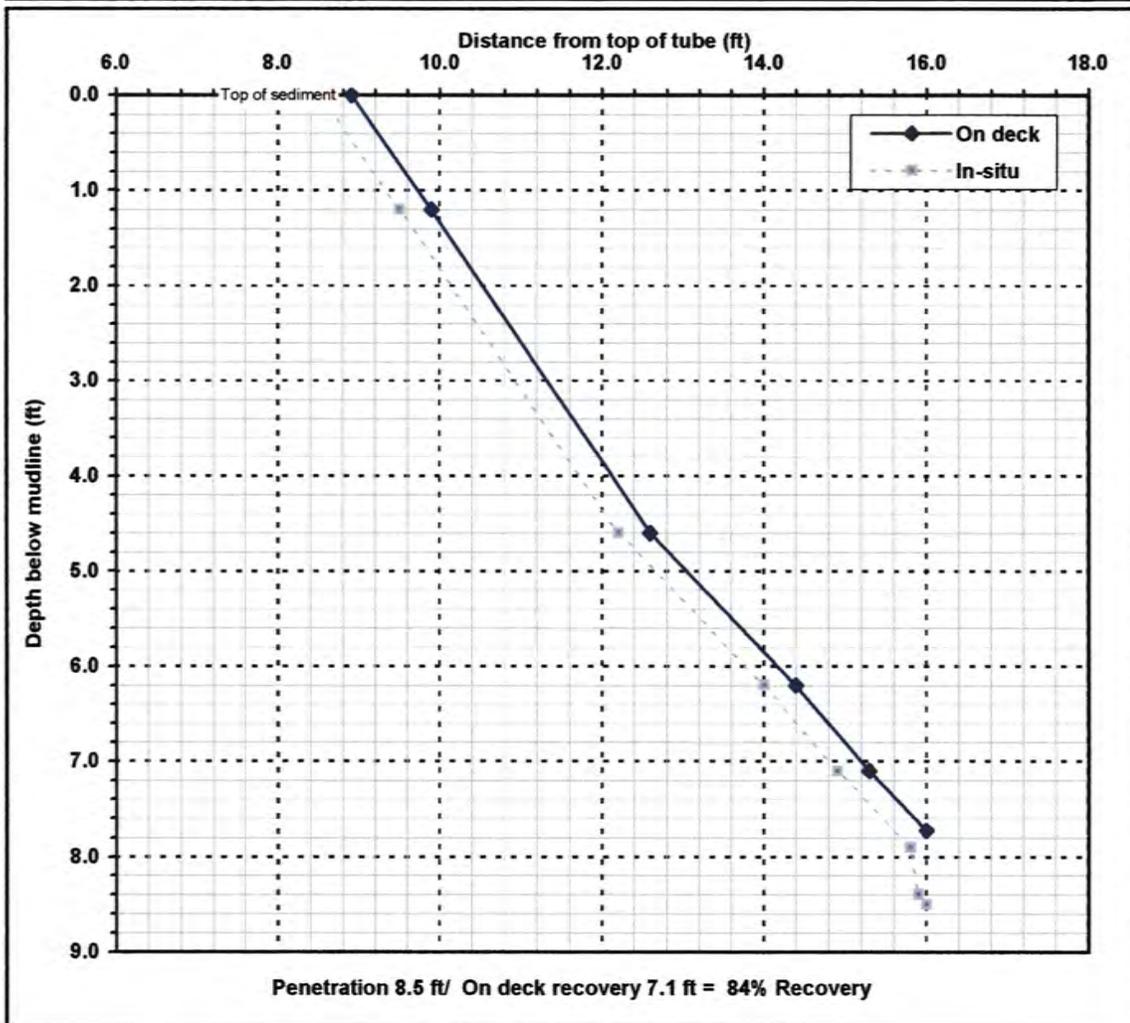
**Weather/Comments:** Cloudy  
Driven to refusal

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
---------------------------	------------------------	------------------

Depth below mudline (ft)	Distance from top of tube (ft)
--------------------------	--------------------------------

0-1.2	1	83%
1.2-4.6	2.7	79%
4.6-6.2	1.8	113%
6.2-7.1	0.9	100%
7.1-7.9	0.9	113%
7.9-8.4	0.1	20%
8.4-8.5	0.1	100%

Mudline	8.9
0.5	9.32
1	9.73
1.5	10.14
2	10.54
2.5	10.93
3	11.33
3.5	11.73
4	12.12
4.5	12.52
5	13.05
5.5	13.61
6	14.18
6.5	14.70
7	15.20
7.5	15.75
8	No sample
8.5	No sample
9	No sample
9.5	No sample
10	No sample
10.5	No sample
11	No sample
11.5	No sample
12	No sample
12.5	No sample
13	No sample
13.5	No sample
14	No sample
14.5	No sample
15	No sample



## Mudmole™ Bore Log

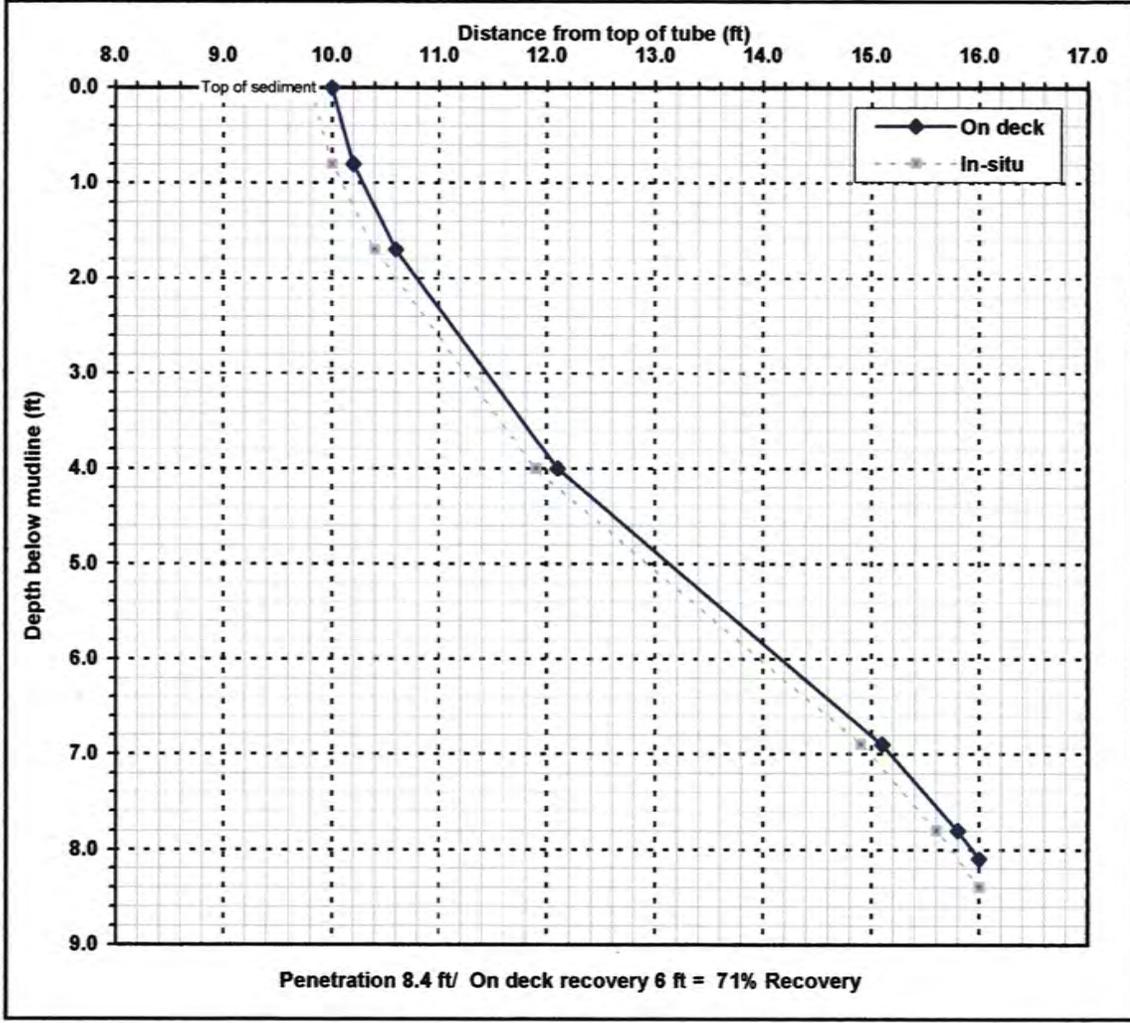
**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC06  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      238765      Northing  
**Date:** 5/16/2005      **Time:** 11:16      1269800      Easting  
**Water depth:** 33.7 ft      **Mudline:** -11.8 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy  
 Driven to refusal, moved offshore 50 ft

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
0-0.80	0.2	25%
0.80-1.7	0.4	44%
1.7-4	1.5	65%
4-6.9	3	103%
6.9-7.8	0.7	78%
7.8-8.4	0.4	67%

Depth below mudline (ft)	Distance from top of tube (ft)
Mudline	10
0.5	10.13
1	10.29
1.5	10.51
2	10.80
2.5	11.12
3	11.45
3.5	11.77
4	12.10
4.5	12.62
5	13.13
5.5	13.65
6	14.17
6.5	14.69
7	15.18
7.5	15.57
8	15.93
8.5	No sample
9	No sample
9.5	No sample
10	No sample
10.5	No sample
11	No sample
11.5	No sample
12	No sample
12.5	No sample
13	No sample
13.5	No sample
14	No sample
14.5	No sample
15	No sample



# Mudmole™ Bore Log

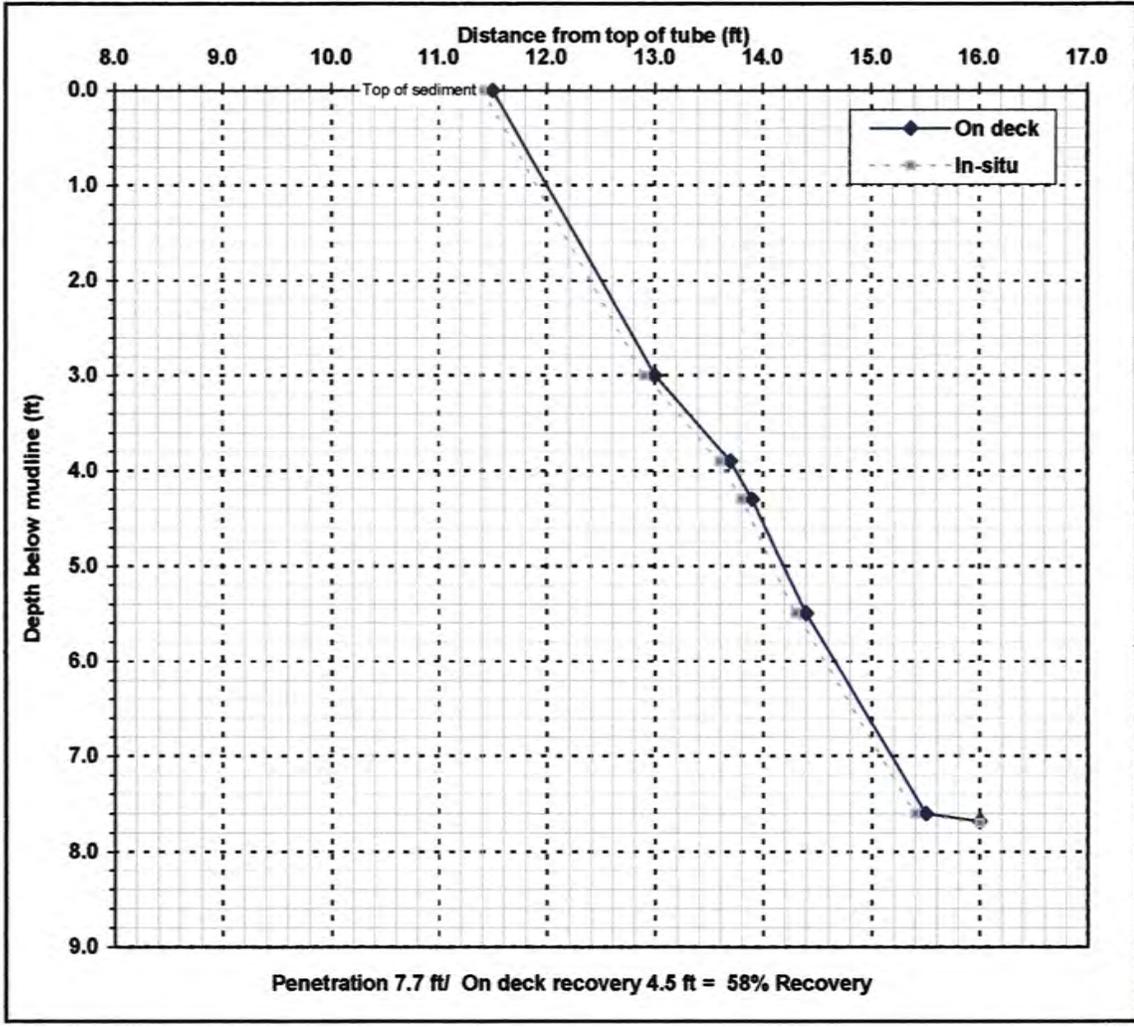
**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC05R4  
**Project No:** 3400542.002      **Position:** NAD 83  
**Collected by:** GSM      238680  
**Date:** 5/20/2005      **Time:** 12:50      1269868  
**Water depth:** 32.1 ft      **Mudline:** -10.2 ft (Corps lake datum)

WA N  
 Northing  
 Easting

Place Field ID Label Here

**Weather/Comments:** N/A

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-3	1.5	50%	Mudline	11.5
3-3.9	0.7	78%	0.5	11.75
3.9-4.3	0.2	50%	1	12.00
4.3-5.5	0.5	42%	1.5	12.25
5.5-7.6	1.1	52%	2	12.50
7.6-7.7	0.6	600%	2.5	12.75
			3	13.00
			3.5	13.39
			4	13.75
			4.5	13.98
			5	14.19
			5.5	14.40
			6	14.66
			6.5	14.92
			7	15.19
			7.5	15.45
			8	No sample
			8.5	No sample
			9	No sample
			9.5	No sample
			10	No sample
			10.5	No sample
			11	No sample
			11.5	No sample
			12	No sample
			13	No sample
			14	No sample
			15	No sample
			16	No sample
			17	No sample
			18	No sample



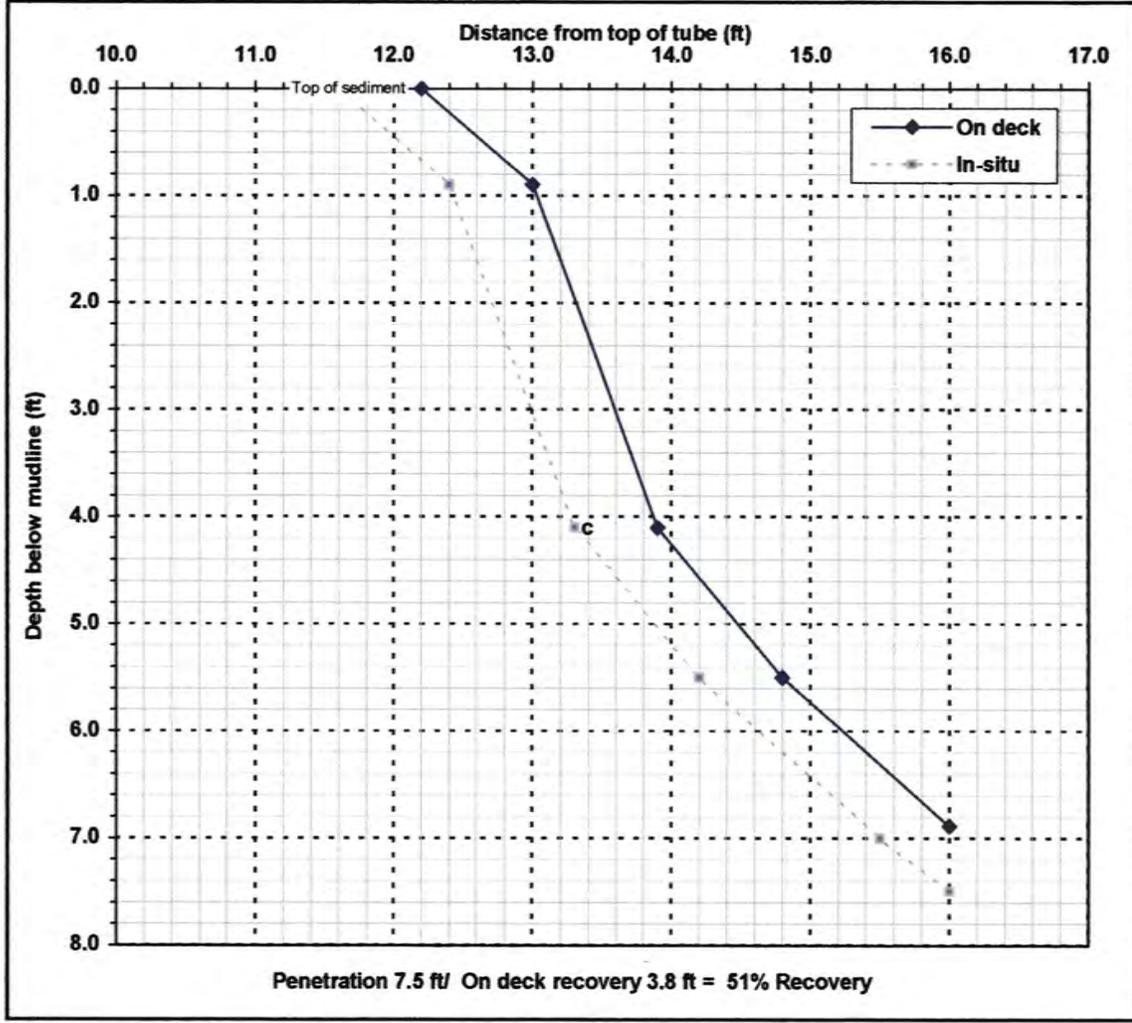
## Mudmole™ Bore Log

<b>Project:</b> Gas Works Sediment-Western Study Area	<b>Station:</b> GWS-EC04	
<b>Project No:</b> 3400542.002	<b>Position:</b> NAD 83	WA N
<b>Collected by:</b> GSM	238646	Northing
<b>Date:</b> 5/17/2005	<b>Time:</b> 10:30	Easting
<b>Water depth:</b> 41.0 ft	<b>Mudline:</b> -19.1 ft (Corps lake datum)	

Place Field ID Label Here

**Weather/Comments:** Cloudy  
 Driven to refusal, end of core dented

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
0-0.9	0.8	89%	Mudline	12.2
0.9-4.1	0.9	28%	0.5	12.64
4.1-5.5	0.9	64%	1	13.03
5.5-7	1.3	87%	1.5	13.17
7-7.5	0.5	100%	2	13.31
			2.5	13.45
			3	13.59
			3.5	13.73
			4	13.87
			4.5	14.16
			5	14.48
			5.5	14.80
			6	15.23
			6.5	15.67
			7	No sample
			7.5	No sample
			8	No sample
			8.5	No sample
			9	No sample
			9.5	No sample
			10	No sample
			10.5	No sample
			11	No sample
			11.5	No sample
			12	No sample
			12.5	No sample
			13	No sample
			13.5	No sample
			14	No sample
			14.5	No sample
			15	No sample



# Mudmole™ Bore Log

**Project:** Gas Works Sediment-Western Study Area

**Station:** GWS-EC03

**Project No:** 3400542.002

**Position:** NAD 83

WA N

**Collected by:** GSM

238690

Northing

**Date:** 5/19/2005

**Time:** 10:28

1269515

Easting

**Water depth:** 41.8 ft      **Mudline:** -19.9 ft (Corps lake datum)

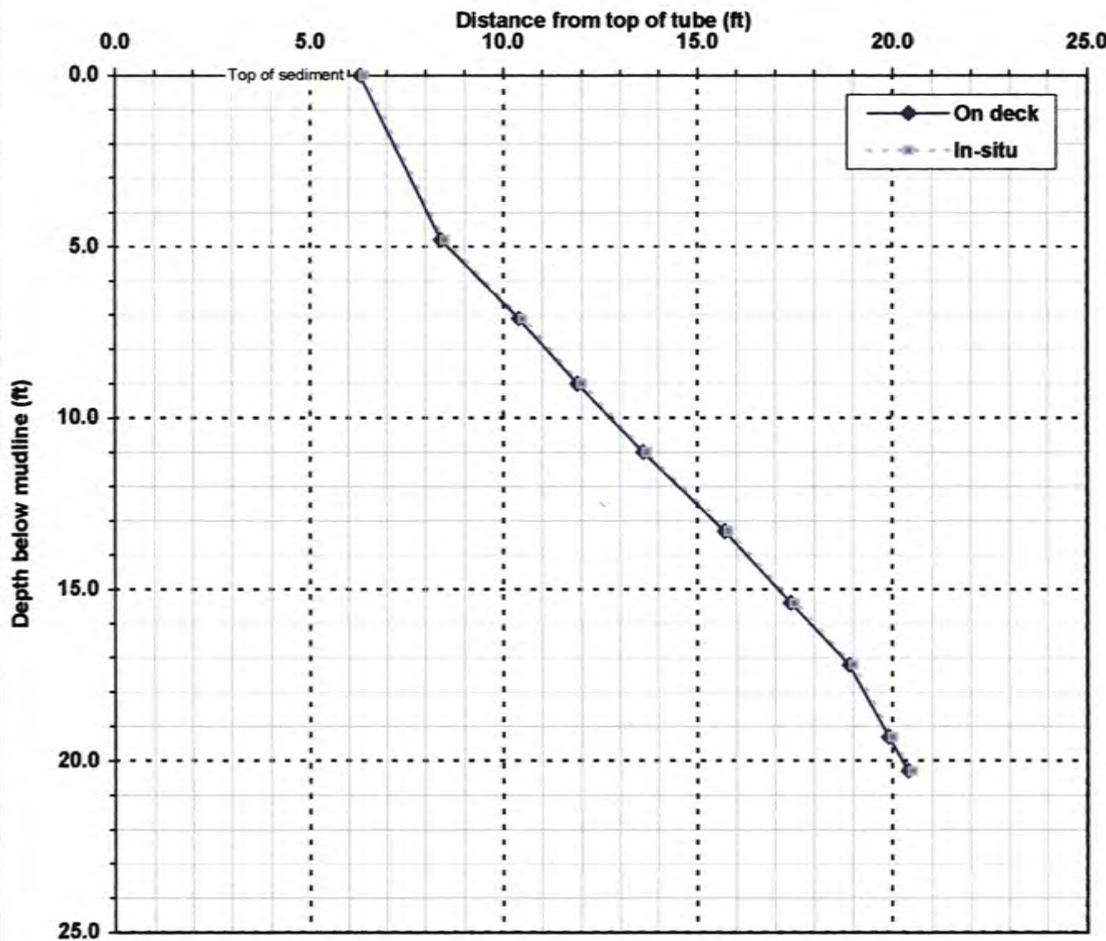
Place Field ID Label Here

**Weather/Comments:** Cloudy, windy

Penetration interval (ft)	Interval recovery (ft)	Percent recovery	Depth below mudline (ft)	Distance from top of tube (ft)
---------------------------	------------------------	------------------	--------------------------	--------------------------------

0-4.8	2.1	44%	Mudline	6.3
4.8-7.1	2	87%	0.5	6.52
7.1-9	1.5	79%	1	6.74
9-11	1.7	85%	1.5	6.96
11-13.3	2.1	91%	2	7.18
13.3-15.4	1.7	81%	2.5	7.39
15.4-17.2	1.5	83%	3	7.61
17.2-19.3	1	48%	3.5	7.83
19.3-20.3	0.5	50%	4	8.05

4.5	8.27
5	8.57
5.5	9.01
6	9.44
6.5	9.88
7	10.31
7.5	10.72
8	11.11
8.5	11.51
9	11.90
9.5	12.33
10	12.75
10.5	13.18
11	13.60
11.5	14.06
12	14.51
13	15.43
14	16.27
15	17.08
16	17.90
17	18.73
18	19.28



Penetration 20.3 ft/ On deck recovery 14.2 ft = 70% Recovery

## Mudmole™ Bore Log

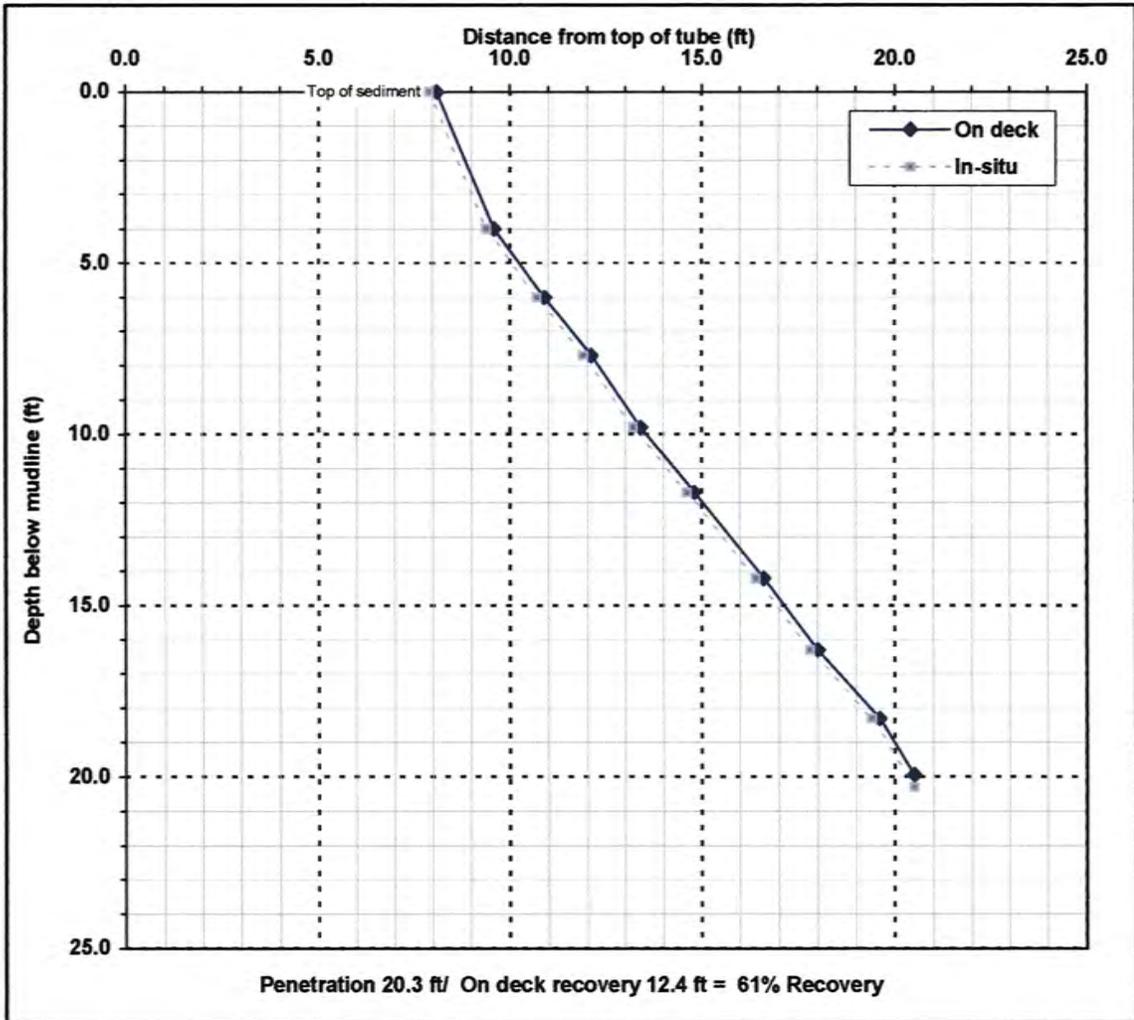
**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC02  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      238520      Northing  
**Date:** 5/19/2005      **Time:** 8:41      1269647      Easting  
**Water depth:** 42.2 ft      **Mudline:** -20.3 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** Cloudy

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
---------------------------	------------------------	------------------

Depth below mudline (ft)	Distance from top of tube (ft)
--------------------------	--------------------------------



0-4	1.5	38%
4-6	1.3	65%
6-7.7	1.2	71%
7.7-9.8	1.3	62%
9.8-11.7	1.4	74%
11.7-14.2	1.8	72%
14.2-16.3	1.4	67%
16.3-18.3	1.6	80%
18.3-20.3	1.1	55%

Mudline	8.1
0.5	8.29
1	8.48
1.5	8.66
2	8.85
2.5	9.04
3	9.23
3.5	9.41
4	9.60
4.5	9.93
5	10.25
5.5	10.58
6	10.90
6.5	11.25
7	11.61
7.5	11.96
8	12.29
8.5	12.60
9	12.90
9.5	13.21
10	13.55
10.5	13.92
11	14.28
11.5	14.65
12	15.02
13	15.74
14	16.46
15	17.13
16	17.80
17	18.56
18	19.36

# Mudmole™ Bore Log

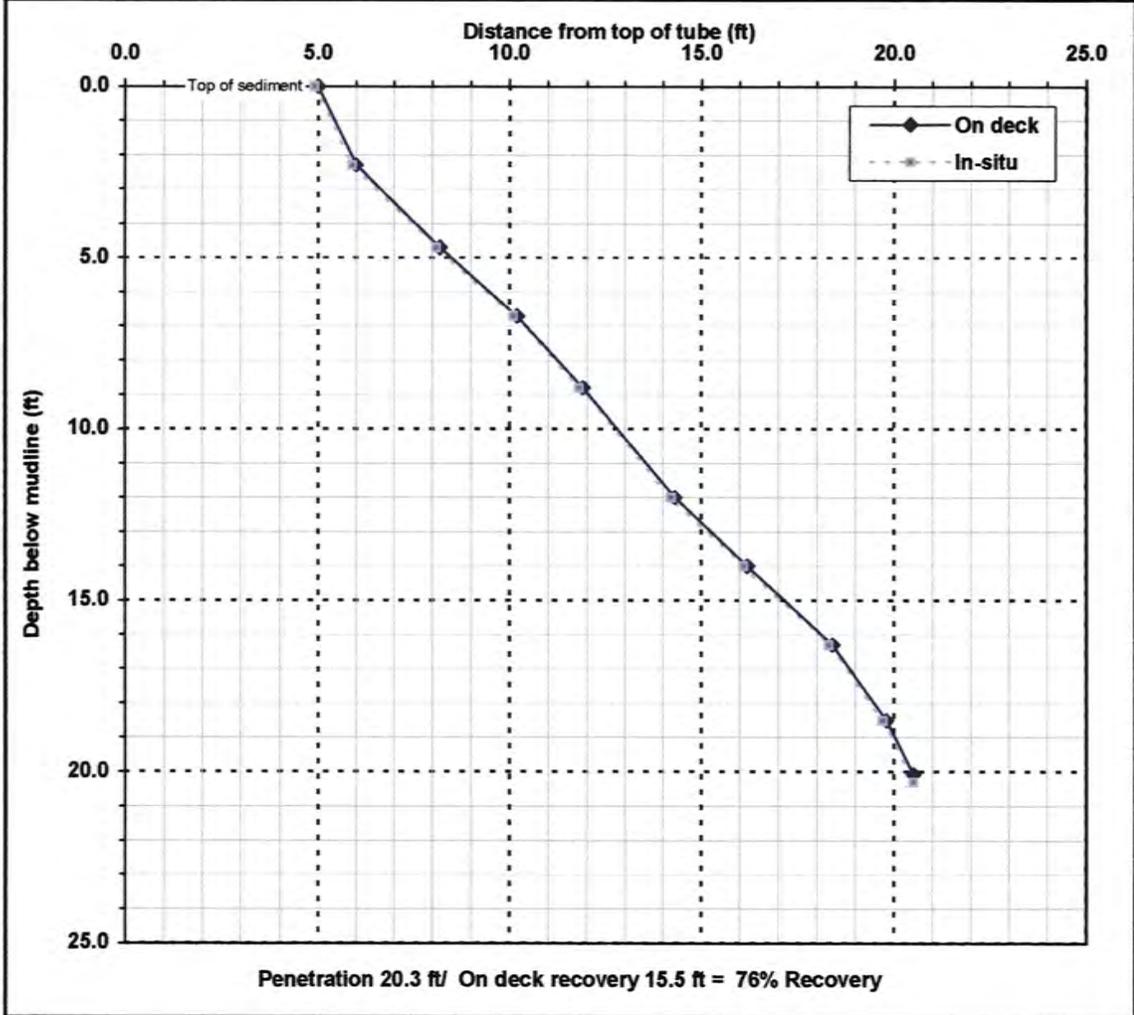
**Project:** Gas Works Sediment-Western Study Area      **Station:** GWS-EC01  
**Project No:** 3400542.002      **Position:** NAD 83      WA N  
**Collected by:** GSM      238271      Northing  
**Date:** 5/18/2005      **Time:** 13:01      1269512      Easting  
**Water depth:** 41.8 ft      **Mudline:** -19.9 ft (Corps lake datum)

Place Field ID Label Here

**Weather/Comments:** N/A

Penetration interval (ft)	Interval recovery (ft)	Percent recovery
---------------------------	------------------------	------------------

Depth below mudline (ft)	Distance from top of tube (ft)
--------------------------	--------------------------------



0-2.3	1	43%
2.3-4.7	2.2	92%
4.7-6.7	2	100%
6.7-8.8	1.7	81%
8.8-12	2.4	75%
12-14	1.9	95%
14-16.3	2.2	96%
16.3-18.5	1.4	64%
18.5-20.3	0.8	44%

Mudline	5
0.5	5.22
1	5.43
1.5	5.65
2	5.87
2.5	6.18
3	6.64
3.5	7.10
4	7.56
4.5	8.02
5	8.50
5.5	9.00
6	9.50
6.5	10.00
7	10.44
7.5	10.85
8	11.25
8.5	11.66
9	12.05
9.5	12.43
10	12.80
10.5	13.18
11	13.55
11.5	13.93
12	14.30
13	15.25
14	16.20
15	17.16
16	18.11
17	18.85
18	19.48

**ATTACHMENT 3C-2**  
**Sediment Logs - Surface Grabs**

**Retec 1999  
Phase 1  
Sediment Investigation  
Surface Grabs**

**Table 5-1 Visual Description of Surface Grab Samples**

Sample ID	Date Collected	Sample Method	Color	Texture	Biological	Odor	Sheen	Debris	Depth of Penetration (in)	Depth of Sample (cm)	Mudline Elevation (ft) <sup>1</sup>	Water Depth (ft)
ST-01	9/14/1999	V V	dark brown	silt	blood worms	HC	abundant	wood chunks/sticks, shirt	6.5	0-10	-18.1	39.0
ST-02	9/15/1999	V V	dark brown with black organic stain	silt	rootlets, worm holes, blood worms	slight HC	abundant	wood chunks/sticks	6.5	0-10	-19.1	40.0
ST-03	9/15/1999	V V	dark brown	silt	worm holes, blood worms	strong HC	abundant	wood chunks	8	0-10	-19.1	40.0
ST-04	9/15/1999	V V	dark brown	silt	none	medium HC	abundant	small wood chunks	7	0-10	-18.1	39.0
ST-05	9/15/1999	V V	dark brown with black organic stain	slightly sandy silt	clam shells	slight HC	abundant	pebbles, wood bits	5.5	0-10	-19.1	40.0
ST-06	9/15/1999	V V	dark brown with black organic stain	silt	rootlets, worm holes, blood worms	none	mild	wood chunks, sticks	8	0-10	-19.1	40.0
ST-07	9/15/1999	V V	dark brown with minor organic stain	silt	rootlets, worm holes	none	slight	none	9	0-10	-18.1	39.0
ST-08	9/15/1999	V V	dark brown with black organic stain	silt with some pebbles	worm holes	mild HC	moderate	woody fibers, pebbles	7.5	0-10	-20.1	41.0
ST-09	9/13/1999	V V	dark brown/black	soupy silt	none	none	none	none	9	0-10	-19.1	40.0
ST-10	9/15/1999	V V	dark brown with black organic stain	silt	worm holes	slight HC	moderate	none	9.5	0-10	-18.1	39.0
ST-11	9/13/1999	V V	dark brown with black organic stain	soupy silt	few roots	none	none	fine organic chunks	8.75	0-10	-21.1	42.0
ST-12	9/13/1999	V V	dark brown with black organic stain	wet silt	worm holes	none	none	wood chunks	8	0-10	-21.1	42.0
ST-13	9/13/1999	V V	dark brown with black organic stain	wet silt	fine rootlets	none	none	none	10	0-10	-19.1	40.0
ST-14	9/13/1999	V V	dark brown with black organic specks	wet silt	worms	none	none	none	9	0-10	-19.1	40.0
ST-15	9/13/1999	V V	dark brown with black organics	wet silt	blood worms	none	none	fine wood debris	10	0-10	-22.1	43.0
ST-16	9/13/1999	V V	dark brown with black organic stain	wet silt	none	none	none	none	8.5	0-10	-22.1	43.0
ST-17	9/13/1999	V V	dark brown with black organic stain	wet silt	none	none	none	none	7.5	0-10	-21.1	42.0
ST-18	9/14/1999	V V	dark brown with trace organic stains	silt with some fine sand	rootlets	none	none	fine wood fibers, sticks	9	0-10	-24.1 <sup>2</sup>	45.0
ST-19	9/15/1999	V V	dark brown with black organic stain	wet silt	few worm holes	none	slight	sticks	9	0-10	-24.1	45.0

**Table 5-1 Visual Description of Surface Grab Samples**

Sample ID	Date Collected	Sample Method	Color	Texture	Biological	Odor	Sheen	Debris	Depth of Penetration (in)	Depth of Sample (cm)	Mudline Elevation (ft) <sup>1</sup>	Water Depth (ft)
ST-20	9/15/1999	V V	dark brown with black organic stain	silt	small worm holes	none	slight	none	9	0-10	-23.1	44.0
ST-21	9/15/1999	V V	dark brown with black organic stain	silt	none	none	slight	small wood chunks	10.5	0-10	-23.1	44.0
ST-22	9/14/1999	V V	dark brown with black organics	silt	none	none	none	none	9	0-10	-19.1 <sup>2</sup>	40.0
ST-23	9/14/1999	V V	dark brown with black organics	silt	none	none	none	none	10	0-10	-25.1 <sup>2</sup>	46.0
ST-24	9/14/1999	V V	dark brown with black organics	wet silt	blood worms	none	none	fine wood debris	9	0-10	-23.1	44.0
ST-25	9/14/1999	V V	dark brown with black organics	silt	none	none	none	none	10.5	0-10	-26.1	47.0
ST-26	9/14/1999	V V	dark brown	silt with some fine sand	fine rootlets	none	none	fine woody debris	7	0-10	-21.1	42.0
ST-27	9/14/1999	V V	dark brown	silt	blood worms	none	none	fine woody debris	8.5	0-10	-22.1	43.0
ST-28	9/15/1999	V V	dark brown	silt	few worm holes	slight HC	slight	none	10.5	0-10	-8.1	29.0
ST-29	9/14/1999	V V	dark brown with black organic stain	silt	few rootlets	none	none	some woody debris	10	0-10	-18.1 <sup>2</sup>	39.0
ST-30	9/14/1999	V V	dark brown with black organic stain	silt	mussel shell, rootlets	none	none	wood chunks, sticks	9	0-10	-18.1	39.0
ST-31	9/14/1999	V V	dark brown with brown organic stain	silt with some fine sand	worm holes (lg. & sm.)	none	none	fine woody debris	9	0-10	-11.1	32.0
ST-32	9/14/1999	V V	dark brown	silt with some fine sand	blood worms, rootlets	none	none	fine woody debris, shells, paint chips	6.5	0-10	-17.1	38.0
ST-34	9/16/1999	V V	dark brown with black organic stain	silt with minute fine sand	none	mild HC	medium	none	11	0-10	-19.6	40.5
ST-35	9/16/1999	V V	dark brown with black organic stain	silt with minute fine sand	worm holes, light brown, algal/organic mats	mild HC	medium	sticks		0-10	-16.6	38.5
ST-37	9/16/1999	V V	dark brown	silt with slight very fine sand	none	none	mild	none	10	0-10	-17.1	38.0
ST-42	9/16/1999	V V	dark brown with black organic stain	silt with medium to coarse sand	shells, worm holes, and milfoil	slight HC	mild	none		0-10	12.3	8.6
ST-43	9/16/1999	V V	dark brown with black organic stain	silt with minute very fine sand	lots of organics	mild HC	mild	sticks, tire	8	0-10	-17.5	38.4

**Notes:**

HC - Hydrocarbon odor.

V V - Sampled using a Van Veen sampler.

<sup>1</sup> USACE Locks/Lakes Datum calculated from lake level at time of sampling.

<sup>2</sup> Depth estimated from NOAA Nautical Chart #18447.

**Retec 2002**  
**Phase 2**  
**Sediment Investigation**  
  
**Surface Grabs**

## North Lake Union Phase 2 - Grab Sample Summary & Description

Location ID	Date	Water Depth (ft)	USACE Elevation (ft)	Sampler Penetration Depth (in)	No. of Grab Attempts	Visual Sample Description	Biota	Debris
NLU01-SS-0010	10/14/02	21.0	-0.6	10	2	OL: Wet, soft, brown gray, CLAYEY ORGANIC SILT w/ trace fine sand, 5-10% wood fragments. Slight to moderate hydrocarbon-like odor.	Light brown algal dusting w/ white larvae (worm) 1cm long.	Composite asphalt shingles fragments just below 10 cm.
NLU02-SS-0010	10/15/02	29.3	-8.9	12	1	OL: Wet, soft, olive gray, ORGANIC SILT w/ trace fine sand. Organic iridescence.	None	Metals strips (2), gas cap, door mat 2'x1.5' stuck in jaws.
NLU04-SS-0010	10/15/02	38.6	-18.2	12	1	OL: Wet, very soft, olive gray, ORGANIC SILT w/ trace fine sand.	None	None
NLU05-SS-0010	10/15/02	5.0	15.4	5.5	3	SW: Wet, med dense, coarse SAND WITH GRAVEL. Gravel is well-rounded and poorly sorted.	Surface covered in algae.	4"x3" piece of brick like material, 1"x2" brown piece of glass.
NLU06-SS-0010	10/14/02	35.4	-15.1	12	1	OL: Wet, soupy, soft, olive brown, ORGANIC SILT w/ trace clay. Slight to moderate H <sub>2</sub> S odor.	None	None
NLU07-SS-0010	10/14/02	37.8	-17.4	12	3	OL: Wet, soupy, soft, olive brown, ORGANIC SILT. Homogenous, very slight organic sheen.	None	Tire stuck in jaws: Ford Dearborn Michigan. Stamped: Military No. Y702387. 4-ply 6.00-16/284
NLU08-SS-0010	10/15/02	41.5	-21.1	12	1	OL: Wet, very soft, olive gray, ORGANIC SILT. Slight H <sub>2</sub> S odor.	Trace leaves	None
NLU10-SS-0010	10/15/02	41.3	-20.9	12	1	ML: Wet, very soft, olive gray, SILT w/ trace sand. Faint organic odor. Minor wood chunks (3/4" - 1").	None	None
NLU12-SS-0010	10/15/02	40.3	-19.9	12	1	OL: Wet, soupy, very soft, olive gray, ORGANIC SILT w/ trace fine sand. Trace to moderate H <sub>2</sub> S odor.	None	None
NLU13-SS-0010	10/14/02	38.4	-18.0	12	1	OL/OH: Wet, soft, olive gray, CLAYEY ORGANIC SILT w/ trace fine sand. Scattered rootlets (3-5%), H <sub>2</sub> S odor.	None	None
NLU14-SS-0010	10/14/02	39.2	-18.8	12	1	OL: Wet, soft, olive gray, ORGANIC SILT w/ minor clay and trace fine sand. Trace roots, slight H <sub>2</sub> S odor.	None	None
NLU15-SS-0010	10/14/02	40.2	-19.8	12	1	OL: Wet, soupy, soft, olive gray, ORGANIC SILT w/ trace fine sand and clay. Slight H <sub>2</sub> S odor and organic sheen. Occasional twig (3").	None	None
NLU16-SS-0010	10/15/02	40.9	-20.5	12	1	OL: Wet, very soft, olive gray, ORGANIC SILT w/ trace sand. Trace sheen, slight H <sub>2</sub> S odor. Black dusting on surface of grab.	None	Wood, pipe, rope
NLU17-SS-0010	10/14/02	40.2	-19.8	11	1	OL: Wet, soft, olive gray, ORGANIC SILT w/ trace fine sand. Trace hydrocarbon sheen and slight hydrocarbon-like odor.	None	Trace wood debris, root 6"
NLU21-SS-0010 (Reference Station) <sup>2</sup>	10/15/02	30.8	-10.4	12	2	OL: Wet, very soft, brownish gray, ORGANIC SILT w/ minor fine sand. Scattered light gray sandy pockets.	Fresh water clams, mussels (2), 2 cm segmented worm.	20% wood (bark, chunks)
NLU22-SS-0010 (Reference Station) <sup>2</sup>	10/15/02	26.8	-6.4	12	1	OL: Wet, soft, reddish brown, ORGANIC SILTY WOOD w/ minor fine sand.	Mussels, clams	50% shredded wood material (bark).
NLU101B-SS-XXXX	11/11/02	1.5	18.8	14	1	0-3 cm: SP: Wet to moist, dense, brown gray, medium to coarse SAND w/ trace gravel. 3-10 cm: SP: Damp, dense, blackish gray, medium to coarse SAND w/ trace gravel. 10-20 cm: SP: Damp, dense, blackish gray, coarse SAND w/ trace gravel. Slight hydrocarbon like odor. 20-30 cm: Same as 10-20 cm w/ scattered paint chips.	Some clam shells	Green & brown glass shards, scattered paint chips.
NLU101-SS-XXXX	11/11/02	12.0	8.3	10	2	0-10 cm: SP: Wet, dense, olive gray, medium to coarse SAND w/ minor gravel, trace rootlets. 10-20 cm: SP: Wet, dense, dark olive gray, SAND WITH GRAVEL.	None	Piece of scrap metal, 2 nails.
NLU102-SS-XXXX	11/14/02	31.4	-11.0	16	1	0-10 cm: OL: Wet, soft, olive brown, ORGANIC SILT w/ fine sand, trace roots. 10-20 cm: OL: Wet, soupy, olive brown ORGANIC SILT. Slight spotty sheen. Roots. 20-30 cm: OL: Same geology as above, no odor or sheen.	Worms (2)	None
NLU103-SS-XXXX	11/14/02	7.5	12.9	13	1	0-10 cm: OL: Wet, soft, black, sandy, ORGANIC SILT. Strong organic odor, slight organic sheen. 10-20 cm: SP: Wet, med dense, black, medium SAND w/ trace silt. No sheen, no odor.	Milfoil on surface, worm	Small glass frags, small lumber and wood debris.
NLU104-SS-XXXX	11/12/02	42.0	-21.7	16.5	3	OL: Wet, soft, olive gray, ORGANIC SILT w/ trace fine sand. Very slight spotty rainbow sheen. Trace roots.	None	None
NLU105-SS-XXXX	11/12/02	41.3	-21.0	16	1	OL: Wet, soupy, soft, olive gray, ORGANIC SILT w/ trace fine sand. Slight H <sub>2</sub> S odor w/ slight spotty sheen.	None	None
NLU106-SS-XXXX	11/12/02	39.9	-19.6	16	1	OL: Wet, soupy, soft, olive gray, ORGANIC SILT. Very slight sheen. Black dusting on surface of grab.	None	None
NLU107-SS-XXXX	11/11/02	38.5	-18.2	16	1	OL: Wet, soupy, soft, olive gray, ORGANIC SILT. Very slight hydrocarbon-like odor. Discontinuous black dusting on top of sample (pasty, silty, no grit, stains gloves when dried).	None	None
NLU112-SS-XXXX	11/14/02	35.3	-15.1	16	1	0-10 cm: OL: Wet, soft, olive gray, ORGANIC SILT. Very slight sheen (2 spots). 10-20 cm: OL: Same geology as above, slight to moderate spotty sheen, hydrocarbon-like odor. 20-30 cm: OL: Same geology as above but with trace fine sand. Slight to moderate sheen.	None	Wire stuck in jaws.
NLU113-SS-XXXX	11/14/02	40.7	-20.3	16	2	0-10 cm: OL: Wet, soupy, soft, olive gray, ORGANIC SILT. Very slight spotty sheen. 10-20 cm: OL: Same geology as above, moderate hydrocarbon-like odor. 20-30 cm: OL: Wet, soft, olive gray, ORGANIC SILT. Strong hydrocarbon-like odor.	None	Bottle
NLU114-SS-XXXX	11/13/02	40.7	-20.4	16	1	0-10 cm: OL: Wet, soupy, soft, olive gray, ORGANIC SILT. Slight H <sub>2</sub> S odor, no roots. 10-20 cm: ML: Wet, loose, olive gray SILT. 20-30 cm: ML/CL: Wet, loose, gray brown, CLAYEY SILT.	None	None

NLU115-SS-XXXX	11/12/02	40.1	-19.8	15	1	0-10 cm: OL, Wet, soupy, soft, olive gray, ORGANIC SILT w/ trace fine sand. Light to moderate hydrocarbon-like odor and moderate spotty rainbow sheen. Dusting of black material on top. 10-30 cm: OL, Same geology as above but now moderate to strong hydrocarbon-like odor and sheen. Small blebs of black, sticky material.	None	None
NLU116-SS-XXXX	11/11/02	40.6	-20.3	16	1	OL: Wet, soupy, soft, olive gray, ORGANIC SILT w/ trace fine sand. Trace wood chunks. Slight to moderate hydrocarbon-like odor, spotty rainbow sheen. Black, slightly gritty dusting on top of sample.	None	Paint can rim, carbon chunk, bottle.
NLU120B-SS-XXXX	11/13/02	16.8	3.5	13	1	0-10 cm: SP, Wet, med dense, olive gray, coarse SAND WITH GRAVEL (multicolored grains). Slight spotty rainbow sheen. 10-30 cm: GP, Wet, dense, blackish gray, GRAVEL WITH SAND trace spotty sheen.	Small clams	Small orange brick pieces.
NLU120-SS-0010	11/13/02	24.2	-3.9	10	2	SP: Wet, med dense, salt and pepper gray, coarse SAND WITH GRAVEL. Very slight hydrocarbon-like odor.	Clam	Brick chunks, corroded pipe, glass bottle, 6" aggregate mass.
NLU121-SS-XXXX	11/13/02	40.7	-20.4	16	1	0-10 cm: OL, Wet, soft, dark olive gray, ORGANIC SILT. Very slight sheen. 10-20 cm: OL, Same geology as above, slight hydrocarbon-like odor and slight spotty sheen. 20-30 cm: OL, Same geology as above, strong hydrocarbon-like odor, blackish blueish metallic sheen.	None	None
NLU122-SS-XXXX	11/13/02	26.9	-6.6	16	4	0-10 cm: ML, Wet, soft, olive gray, SILT WITH SAND w/ strong hydrocarbon-like odor and strong spotty rainbow sheen. PID=0.05. 10-30 cm: ML, Same geology as above, pervasive metallic sheen, trace rootlets, PID=2.5	None	None
NLU123-SS-XXXX	11/13/02	40.7	-20.4	15	1	0-10 cm: OL, Wet, soft, black ORGANIC SILT w/ trace fine sand. Slight spotty sheen. 10-20 cm: OL, Same geology as above, trace roots, trace hydrocarbon-like odor. 20-30 cm: OL, Wet, loose, olive brown ORGANIC SILT. Slight spotty sheen and trace hydrocarbon-like odor.	None	Rusted wire in jaws.
NLU124-SS-XXXX	11/13/02	41.0	-20.7	13	1	0-10 cm: OL, Wet, very soft, blackish brown, ORGANIC SILT w/ very trace fine sand. Trace rootlets. Slight spotty sheen (very distinctive, vibrant colors). 10-30 cm: OL, Wet, soft, blackish olive brown, ORGANIC SILT w/ minor fine sand (more gritty than 0-10). Trace wood debris. Slight spotty sheen (more than in 0-10), slight hydrocarbon-like odor.	None	None
NLU126-SS-XXXX	11/13/02	41.7	-21.4	15	1	0-10 cm: OL, Wet, very soft, black ORGANIC SILT w/ minor fine sand. Slight to moderate spotty sheen. 10-20 cm: OL, Wet, soft, brownish black, ORGANIC SILT w/ minor sand. Slight to moderate spotty sheen. 20-30 cm: OL/OH, Olive gray, CLAYEY ORGANIC SILT.	None	Blue paint chips
NLU127-SS-0010	11/12/02	32.9	-12.6	6	6	0-3 cm: SM, 0.3cm crust of orange oxidized material, then 2.5 cm of dense, damp, blackish green, SILTY SAND. 3-10 cm: SP, blackish green, SAND w/ trace silt.	None	Paint chips, other metal debris.
NLU128-SS-0010	11/13/02	4.9	15.4	7	2	SP: Wet, med dense, blackish gray, medium SAND w/ minor gravel. Trace rootlets. Scattered flecks (micaceous like) of green and blue. Slight H <sub>2</sub> S odor.	None	None
NLU129-SS-XXXX	11/11/02	28.6	-8.3	16	2	0-10 cm: Wet, loose, dark brown, wood debris w/ some sand, twigs, leaves, roots. Trace paint chips, sheen and H <sub>2</sub> S odor. 10-30 cm: SP, Wet, loose, dark brown, organic-rich fine SAND. Shredded wood, strong rainbow sheen, slight hydrocarbon-like odor.	None	Wood debris, trace paint chips.
NLU130-SS-XXXX	11/12/02	7.4	12.9	11	3	0-10 cm: SP, Wet, med dense, black to brown black, medium SAND w/ trace gravel and substantial wood debris (45%). Strong hydrocarbon-like odor and rainbow sheen. 10-30 cm: SP, same geology as above but increasing hydrocarbon-like odor and rainbow sheen.	None	Plexiglass, bottle, globular dense aggregate or irregular mass w/ strong HC like odor.
NLU131-SS-XXXX	11/12/02	7.1	13.2	11	1	0-10 cm: SP, Wet, loose, blackish brown, medium to coarse SAND w/ trace gravel. Moderate hydrocarbon-like odor and moderate spotty rainbow sheen. Well rounded gravel up to 2". 10-20 cm: SP, Same geology as above, uniform rainbow sheen, hard black aggregates.	Milfoil, 2" clam	None
NLU133-SS-XXXX	11/14/02	15.5	4.7	12	3	0-2.5 cm: GP, Layer of pea gravel. 2.5-10 cm: SP, Wet, med dense, blackish gray, medium SAND w/ trace silt. Multicolored grains. Very faint hydrocarbon-like odor. Trace coarse sand. 10-20 cm: GP, Wet, dense, blackish brown, GRAVEL WITH SAND. Very slight hydrocarbon-like odor.	Mussel, crayfish, clams	Yellow brick fragment, glass bottle
NLU134-SS-XXXX	11/14/02	15.5	4.7	14	3	0-10 cm: SP-SM, Wet, loose, blackish brown, medium SAND WITH SILT. Trace to minor wood debris (rootlets, twigs, reeds). Very slight spotty sheen. 10-20 cm: SM, Damp to wet, med dense, blackish brown, SILTY SAND. Slight spotty sheen, slight to moderate odor. Trace twigs.	Milfoil, mussels	Small brick fragments, paint chips (red, white, gold)
NLU135-SS-XXXX	11/14/02	39.8	-19.6	15	1	0-10 cm: OL, Wet, soft, olive brown, ORGANIC SILT. H <sub>2</sub> S odor. 10-30 cm: OL, Same geology but w/ moderate spotty sheen and hydrocarbon-like odor.	None	None
NLU136-SS-XXXX	11/14/02	39.8	-19.6	15	1	0-10 cm: OL, Wet, soupy, soft, olive gray, ORGANIC SILT w/ trace fine sand. Very faint hydrocarbon-like odor. Trace wood debris. Slightly stronger hydrocarbon-like odor with depth. No sheen observed (no more sunlight left).	None	None

Notes:

NLU = North Lake Union

SS = Surface Grab

0010 = 0 to 10 cm surface sample

XXXX = More than 0-10cm sample collected. See Visual Sample Description Column.

**Retec 2004/2005**  
**Phase 3 Eastern Study Area**  
**Sediment Investigation**  
**Surface Grabs**

ESA Table K-1 Sheen and Ultraviolet Test Results from Surface Sediment Samples

Sample ID	Date of Tests	Sheen Test Results			UV Fluorescence Test Results				
		% Sheen	Sheen Color	Comments	% Fluorescence	Flourescence (Intensity)	Specks	NAPL	Class
NLU13-TX-0010	4/22/2005	20	IR	none	80	faint	some	possible	B
NLU40-SS-0010	12/15/2004	0	—	none	80	very faint	trace	none	C
NLU41-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU41-TX-0010	4/22/2005	0	—	none	0	none	none	none	C
NLU42-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU43-SS-0010	12/15/2004	0	—	none	30	very faint	trace	none	C
NLU44-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU45-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU46-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU47-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU48-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU49-SS-0010	12/15/2004	1	IR	1mm diameter	0	none	none	none	C
NLU50-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU51-SS-0010	12/15/2004	20-25	IR	streaky, dissipates quickly	90	moderate	some	possible	B
NLU51-TX-0010	4/22/2005	80	IR	none	95	moderate	some	yes	A
NLU52-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU53-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU54-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU55-SS-0010	12/15/2004	0	—	none	<1	faint	trace	none	C
NLU55-TX-0010	4/22/2005	20	IR	spots	90	faint	abundant	yes	A
NLU56-SS-0010	12/15/2004	5-10	IR	2-4mm diameter, dissipates quickly	0	none	none	none	C
NLU57-SS-0010	12/15/2004	5-10	IR	10mm diameter, dissipates quickly	80	very faint	trace	possible	B
NLU58-SS-0010	12/15/2004	0	—	none	0	none	trace	none	C
NLU59-SS-0010	12/15/2004	20	dark brown	streaky, dissipates quickly	90	moderate	abundant	possible	B
NLU61-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU62-SS-0010	12/15/2004	0	—	none	0	none	some	none	C
NLU63-SS-0010	12/15/2004	5	IR	streaky, dissipates quickly	80	very faint	some	possible	B
NLU64-SS-0010	12/15/2004	0	—	none	90	very faint	none	none	C
NLU64-TX-0010	4/22/2005	0	—	none	0	none	none	none	C
NLU65-SS-0010	12/15/2004	60	IR	5mm diameter, streaky, spotty, does not dissipate quickly	0	none	none	none	C
NLU66-SS-0010	12/15/2004	5	IR	1-2mm diameter, dissipates quickly	0	none	none	none	C
NLU66-TX-0010	4/22/2005	0	—	none	80	very faint	trace	none	C
NLU67-SS-0010	12/15/2004	5-10	IR	streaky, dissipates quickly	90	faint	few	possible	B
NLU68-SS-0010	12/15/2004	5-10	IR	1-3mm diameter, dissipates upon agitation	90	moderate	abundant	possible	A
NLU69-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU69-TX-0010	4/22/2005	0	—	none	0	none	none	none	C
NLU70-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU71-SS-0010	12/15/2004	0	—	none	85	very faint	none	none	C
NLU72-SS-0010	12/15/2004	0	—	none	0	none	trace	none	C
NLU73-SS-0010	12/15/2004	0	—	none	60	very faint	trace	none	C
NLU73-TX-0010	4/22/2005	0	—	none	<1	none	trace	none	C
NLU74-SS-0010	12/15/2004	30-40	IR	3mm diameter, streaky, spotty, dissipates quickly	0	none	none	none	C
NLU75-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU76-TX-0010	4/22/2005	0	—	none	0	none	trace	none	C
NLU77-SS-0010	12/15/2004	0	—	none	0	none	none	none	C
NLU78-SS-0010	12/15/2004	10-15	IR	2mm diameter, dissipates quickly	0	none	none	none	C
NLU81-TX-0010	4/22/2005	0	—	none	<1	none	trace	none	C
NLU82-TX-0010	4/22/2005	< 1	IR	spots	1	faint	trace	possible	B
NLU83-TX-0010	4/22/2005	0	—	none	0	none	none	none	C
NLU84-TX-0010	4/22/2005	0	—	none	0	very faint	none	none	C
NLU85-TX-0010	4/22/2005	0	—	none	<1	none	trace	none	C
NLU86-TX-0010	4/22/2005	<1	IR	small wisps	60	faint	trace	possible	B
NLU87-TX-0010	4/22/2005	<5	IR	spots	80	very faint	trace	possible	B
NLU117-TX-0010	4/22/2005	20	IR	none	60	faint	few	possible	B
NLU EPA19-TX-0010	4/22/2005	<1	IR	tiny spots	0	none	none	none	C
NLU EPA5-TX-0010	4/22/2005	0	—	none	40	faint	trace	possible	B
NLURef1-TX-0010	4/22/2005	0	—	none	0	none	none	none	C
NLURef2-TX-0010	4/22/2005	0	—	none	0	none	none	none	C

Notes:

Sheen Test

% sheen - percentage of surface area of water covered by sheen

Sheen color - dark brown, IR (iridescent)

Comments - summary of observations

UV Test

% flourescence - the percentage of the sample which displays 'matrix glow'

Flourescence - descriptors include none, very faint, faint, moderate, and bright

Specks (intensity) - descriptors include none, trace, few, some, abundant

NAPL is confirmed under regular light and by other criteria; greater than 5% sheen.

Class - A = NAPL is apparent; B = NAPL is suspected; C = no NAPL present

**Table 4-4 Summary Description of Grab Samples**

Sample ID	Date Collected	Field Observations of Sample							Sample Recovery Details			
		Color	USCS Classification	Soil Type	Biological	Odor	Sheen	Comments	Recovery Depth (cm)	Depth of Sample (cm)	Mudline Elevation (USACE ft)	Water Depth (ft)
NLU13-TX-0010	4/13/2005	olive green	OL	organic silt with sand	none	trace HC-like odor	1/8" spots	trace fresh rootlets; 2-4" below surface = lots of bark	28	0-10	-17.9	39.7
NLU40-SS-0010	12/8/2004	dark olive gray silt; gray clay	OL	organic silt; little sand	none	none	1/8" spots	trace to minor wood debris and fibers, clay layer at 20cm	26	0-10	-17.5	37.5
NLU41-SS-0010	12/8/2004	dark olive gray	OL	organic silt; little sand	none	none	1/8" spots	none	24	0-10	-20.8	40.8
NLU41-TX-0010	4/13/2005	olive gray	OL	organic silt; few sand	none	none	none	none	26	0-10	-20.1	41.9
NLU42-SS-0010	12/7/2004	olive brown	OL	organic silt; little sand	1" long worm	none	trace metallic sheen; 1/8" spots	none	26	0-10	-19.3	39.3
NLU43-SS-0010	12/7/2004	dark olive gray	OL	organic silt; little sand	none	none	none	minor decaying rootlets	25	0-10	-19.8	39.9
NLU44-SS-0010	12/7/2004	dark olive brown	OL	organic silt; little sand	none	none	1/8" spots	3x7" bark piece; rootlets below 10cm	27	0-10	-21.1	41.1
NLU45-SS-0010	12/8/2004	dark olive gray	OL	organic silt; little sand	none	none	trace, 1/8" spots	decaying organic material	23	0-10	-21.1	41.1
NLU46-SS-0010	12/9/2004	dark olive gray	OL	organic silt; little sand and few clay	none	none	trace, 1/8" spots	twig at 3", thin gray silt at 25cm	26	0-10	-12.2	32.2
NLU47-SS-0010	12/7/2004	dark olive gray	OL	organic silt; little sand	small midge	slight sulfide-like odor	trace, 1/8" spots	decomposing roots	24	0-10	-23.4	43.4
NLU48-SS-0010	12/8/2004	dark olive gray	OL	organic silt; little sand	none	none	minor sheen; 1/8" spots	trace to minor decomposing root fragments and organic material	27	0-10	-21.0	41.0
NLU49-SS-0010	12/7/2004	dark olive gray	OL	organic silt; little sand	none	none	trace, 1/8" spots	minor decaying rootlets and organic material	27	0-10	-25.1	45.4
NLU50-SS-0010	12/7/2004	dark olive gray	OL	organic silt; little sand	common mussel on surface	none	trace, 1/8" spots	abundant rootlets, organic debris	25	0-10	-26.4	46.4
NLU51-SS-0010	12/10/2004	dark olive gray	OL	organic silt with sand	3/4" clam, 3" clam	slight-moderate HC-like odor	moderate black metallic sheen on wood fibers; moderate 1/4" spots in silt (15% coverage)	25-30% shredded wood fibers	NR	0-10	2.1	17.9
NLU51-TX-0010	4/14/2005	NR	SM	sand; little silt	clams	slight odor	slight	shredded wood, metal nuggets, light weight angular black coal-like pieces	20	0-10	4.7	17.1

**Table 4-4 Summary Description of Grab Samples**

Sample ID	Date Collected	Field Observations of Sample							Sample Recovery Details			
		Color	USCS Classification	Soil Type	Biological	Odor	Sheen	Comments	Recovery Depth (cm)	Depth of Sample (cm)	Mudline Elevation (USACE ft)	Water Depth (ft)
NLU52-SS-0010	12/7/2004	dark olive gray	OL	organic silt; little sand	worm casts	none	trace, 1/8" spots	decomposing plant material	26	0-10	-18.9	38.9
NLU53-SS-0010	12/6/2004	black, orange specs		sand; little silt and few gravel	none	moderate sulfide-like odor	trace, 1/8" spots	1/4" cut wood piece, roots and organics	23	0-10	11.8	8.2
NLU54-SS-0010	12/8/2004	dark olive gray	OL	organic silt; little sand	none	none	trace, 1/8" spots	none	27.5	0-10	-20.8	NR
NLU55-SS-0010	12/9/2004	brown gray, multicolored grains	SM	sand; little silt	milfoil, cironomids, amphipods, clams	none	trace, 1/8" spots	1/4" cut wood piece, coat hanger, piece of duct tape in jaws	20	0-10	7.0	13.0
NLU55-TX-0010	4/15/2005	dark grayish green	SM	sand; little silt	seaweed, 2 clams	moderate mothball-like odor	moderate to strong sheen	trace wood chunks	21	0-10	5.4	16.4
NLU56-SS-0010	12/10/2004	dark olive gray	SP	sand with gravel; trace silt	none	trace HC-like odor	trace to moderate, 1/8' metallic spots	trace wood fibers	20	0-10	4.5	15.5
NLU57-SS-0010	12/8/2004	dark olive gray	SM	sand; little silt	none	none	trace 1/8" spots	none	25	0-10	-14.0	34.0
NLU58-SS-0010	12/6/2004	black	OL	organic silt; few sand	none	none	trace black organic sheen	trace to minor leaf and twigs, organics	NR	0-10	15.1	4.9
NLU59-SS-0010	12/6/2004	black	SM	sand; little organic silt	1/2" and 2 1/2 - 3' freshwater clams, shell fragments	slight to moderate HC-like odor	slight metallic sheen	rootlets, iron-oxide like nodules	21	0-10	8.7	11.4
NLU60-SS-0010	1/26/2005	blue gray	CL	clay with sand and gravel	none	none	none	pine needles, leaves, and wood debris, sample location was above water line	10	0-10	20.6	0.0
NLU61-SS-0010	12/7/2004	olive brown black	OL	organic silt; little sand	none	none	trace, 1/8" spots	decomposing rootlets, 3"x3" plastic piece	25	0-10	-22.8	42.8
NLU62-SS-0010	12/9/2004	dark olive gray	OL	organic silt; little sand	none	minor sulfide-like odor	trace, 1/8" spots	2' of 1" cable in bottom of grab	28.5	0-10	-3.5	23.5
NLU63-SS-0010	12/9/2004	dark olive gray	ML	silt; little sand	none	trace HC-like odor	minor to moderate sheen	3"x4" piece of wood, 3" vesicular, black, agglomerate piece in bottom of grab	30	0-10	-6.7	26.7
NLU64-SS-0010	12/10/2004	dark olive gray	OL	organic silt; little sand	none	moderate sulfide-like odor	trace to moderate, 1/4" spots	sheen and oder increase with depth, 15% wood content below 20cm	27	0-10	-12.0	32.0
NLU64-TX-0010	4/14/2005	dark olive green	OL	organic silt with sand	red worms	none	none	minor root fragments, trace sheen and oder from 12-20cm	25	0-10	-12.8	34.6

**Table 4-4 Summary Description of Grab Samples**

Sample ID	Date Collected	Field Observations of Sample							Sample Recovery Details			
		Color	USCS Classification	Soil Type	Biological	Odor	Sheen	Comments	Recovery Depth (cm)	Depth of Sample (cm)	Mudline Elevation (USACE ft)	Water Depth (ft)
NLU65-SS-0010	12/11/2004	black	GP	gravel with sand	amphipod, algae, ~30 clams (up to 1" long)	trace HC-like odor	none	numerous brittle black aggregates (4" diameter) with HC-like odor, 3" coal-like aggregates	14	0-10	11.3	8.7
NLU66-SS-0010	12/9/2004	dark olive gray	OL	organic silt; little sand	none	trace sulfide-like odor	trace, 1/8" spots	trace wood debris	27	0-10	-16.8	36.8
NLU66-TX-0010	4/14/2005	dark olive green to black	OL	organic silt; little sand	none	none	none	trace florets	23	0-10	-14.9	36.7
NLU67-SS-0010	12/10/2004	dark olive gray	OL	organic silt with sand	none	slight HC-like odor	moderate, 1/4" spots	wood fibers, wood content increases with depth	27	0-10	-4.2	24.2
NLU68-SS-0010	12/5/2004	black	SM	sand with silt	none	HC-like odor	spotty to moderate metallic sheen (5%), 1/4" spots	10% wood fibers, angular viscular aggregate up to 5", intact glass bottle at bottom of grab	30	0-10	-5.2	25.2
NLU69-SS-0010	12/8/2004	dark olive gray	OL	organic silt; little clay	none	moderate sulfide-like odor	none	twigs and roots	26.5	0-10	-16.0	36.0
NLU69-TX-0010	4/14/2005	dark olive green	OL	organic silt; little sand	none	none	none	strong sulfide-like odor below 15cm	24	0-10	-15.0	36.8
NLU70-SS-0010	12/10/2004	dark olive gray	OL	organic silt; little sand	none	none	trace, 1/8" spots	fibrous organics	27	0-10	-18.0	38.0
NLU71-SS-0010	12/10/2004	dark olive gray	OL	organic silt with sand	none	slight HC-like odor	trace, 1/4" spots	trace fibrous organics	23	0-10	-4.7	24.7
NLU72-SS-0010	12/9/2004	dark olive gray	OL	organic silt; little sand	none	none	trace, 1/8" spots	fibrous organics, leaf fragments	26	0-10	-12.4	32.4
NLU73-SS-0010	12/9/2004	dark olive gray	OL	organic silt with sand	none	slight HC-like odor	slight, 1/8" spots	decaying organic matter	27	0-10	1.8	18.2
NLU73-TX-0010	4/14/2005	brown	OL	organic silt with sand	none	none	none	trace wood debris up to 1"	24	0-10	-0.2	22.0
NLU74-SS-0010	12/11/2004	dark olive gray	OL	organic silt; little sand	clam shells	none	moderate (40% coverage), rainbow	woody fragments and chunks (1"x4")	26	0-10	-5.4	25.4
NLU75-SS-0010	12/7/2004	dark olive gray	OL	organic silt; little sand	none	slight sulfide-like odor	trace, 1/8" spots	none	25.5	0-10	-23.2	43.2
NLU76-TX-0010	4/13/2005	olive green	OL	organic silt with sand	1/2" clam, milfoil	none	trace fluorette	trace wood string fiber	28	0-10	-2.6	24.4
NLU77-SS-0010	12/6/2004	dark brown to black	GP	gravel	none	none	none	leaf debris and organics	18	0-10	18.8	1.2
NLU78-SS-0010	12/6/2004	dark brown to black	OL	organic silt; little sand	none	none	none	trace wood, decomposing leaves	21	0-10	15.2	4.9
NLU81-TX-0010	4/13/2005	olive green	OL	organic silt; little sand	none	none	trace fluorette	duct tape in jaws	26	0-10	-15.9	37.7

**Table 4-4 Summary Description of Grab Samples**

Sample ID	Date Collected	Field Observations of Sample							Sample Recovery Details			
		Color	USCS Classification	Soil Type	Biological	Odor	Sheen	Comments	Recovery Depth (cm)	Depth of Sample (cm)	Mudline Elevation (USACE ft)	Water Depth (ft)
NLU82-TX-0010	4/13/2005	olive brown	OL	organic silt with sand	none	slight	trace	trace wood fibers, small wood chunks, strong odor from 5-8"	22	0-10	-5.9	27.7
NLU83-TX-0010	4/13/2005	olive gray	OL	organic silt; little sand	none	slight organic odor	none	fresh rootlet and bark pieces from 10-18cm	27	0-10	-19.9	41.7
NLU84-TX-0010	4/14/2005	dark olive green	OL	organic silt; little sand	none	none	none	rootlets, 10oz. Plastic cup in jaws	23	0-10	-19.5	41.3
NLU85-TX-0010	4/13/2005	olive gray	OL	organic silt; little sand	none	none	none	trace rootlets	25	0-10	-19.8	41.6
NLU86-TX-0010	4/14/2005	dark olive green	ML	silt with sand	red worms	none	minor	paint chips, plastic and wood pieces, brick fragments, pieces of charcoal, bark	19	0-10	-19.5	41.3
NLU87-TX-0010	4/13/2005	dark olive gray	OL	organic silt with sand	none	none	trace, 1/8" spots	trace twigs, wood fragments, and roots	24	0-10	-18.5	40.3
NLU117-TX-0010	4/14/2005	grayish black	OL	organic silt with sand	none	trace HC-like odor, strong sulfide-like odor	slight to moderate flourettes	trace wood shreds	23	0-10	-12.7	34.5
NLUEPA5-TX-0010	4/14/2005	olive brown	OL	organic silt with sand	trace worm castings, 2 clams	none	none	rootlets, wood shred stuck in jaws	27	0-10	-8.4	30.2
NLUEPA19-TX-0010	4/14/2005	olive brown-green	OL	organic silt; little sand	none	none	trace fluorettes	rootlets	24	0-10	-21.1	42.9
NLURef1-TX-0010	4/15/2005	brown	SM	sand with organic silt	clams	none	none	trace rootlets	23	0-10	-15.1	36.9
NLURef2-TX-0010	4/15/2005	grayish green	OL	organic silt with sand	red worms	slight sulfide-like odor	none	trace reed fragments	22	0-10	-13.1	34.9

**Notes:**

All samples collected using hydraulic grab sampler except NLU60-SS-0010 which was collected by stainless steel spoon.

The mudline elevations were calculated using the leadlines and surface water elevation on the collection date

NLU76-SS-0001 - Sample not collected due to location under pier

**Floyd|Snider 2005**  
**Western Study Area**  
**Sediment Investigation**  
**Surface Grabs**

**QUALITATIVE SAMPLE CHARACTERISTICS**

Page \_\_\_\_ of \_\_\_\_

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD83 WAN	5/23/05	N Lake Union	GWS - SG01

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238841	1269536	40	f t		HC	1416

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	c m	RHG	X	X		

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

**Surficial sediment characteristics:**

Biological: \_\_\_\_\_ %    Debris: \_\_\_\_\_ %    Oil Sheen:    None    Trace (<5%) \_\_\_\_\_ %  
*Heavy*

Moisture  
Very Wet    Wet    Moist    Damp    Dry

Color (Circle major & underline modifying)  
 Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_

Major Constituent (Circle major & underline modifying)  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Minor Constituent with trace  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

**Subsurface sediment characteristics:**

Density / Consistency  
Sand / Gravel -    Very Loose    Loose    Medium Dense    Dense    Very Dense  
Silt / Clay -    Very Soft    Soft    Medium Stiff    Stiff    Very Stiff    Hard

Moisture  
Very Wet    Wet    Moist    Damp    Dry

Color (Circle major & underline modifying)  
 Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_

Major Constituent (Circle major & underline modifying)  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Minor Constituent with trace  
Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Biological: \_\_\_\_\_ %    Debris: wood Trace \_\_\_\_\_ %    Oil Sheen:    None    Trace (<5%) \_\_\_\_\_ %

**Comments:**

Small blob of surface oil

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MCS Environmental, Inc.  
 GWS-SG01  
 Description Form  
 Initials: RHG  
 Date: 5/23/05    Time: 1416

QUALITATIVE SAMPLE CHARACTERISTICS

Page \_\_\_\_ of \_\_\_\_

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 WAN	5/23/05	N Lake Union	GWS-SG02

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238841	1269536	40	f t		HC	1239

Penetration		Initials	Sulphide	VOA	Weather	Fines (%)
Depth	Unit					
10	c m	RHG	X	X		

Surficial Wood Estimate:

Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture Very Wet Wet Moist Damp Dry

Color (Circle major & underline modifying)  
Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_

Major Constituent (Circle major & underline modifying)  
Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_

Minor Constituent with trace  
Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense  
Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture Very Wet Wet Moist Damp Dry

Color (Circle major & underline modifying)  
Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_

Major Constituent (Circle major & underline modifying)  
Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_

Minor Constituent with trace  
Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_

Biological: \_\_\_\_\_ % Debris: Trace % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments:

Scattered (few) balls of brownish peat (plant fibers)

MCS Environmental, Inc.  
GWS-SG02  
Description Form

Initials: RHG

Date: 5/23/05 Time: 1239

# QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD83 W A N	5/23/05	N Lake Union	GWS-SG03

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238541	1269733	40	f t		HC	1350

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	cm	RHG	K	X		

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

**Surficial sediment characteristics:**

Biological: \_\_\_\_\_ %    Debris: \_\_\_\_\_ %    Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture: Very Wet    Wet    Moist    Damp    Dry

Color: Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_

(Circle major & underline modifying)

Major Constituent: Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

(Circle major & underline modifying)

Minor Constituent with trace: Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

**Subsurface sediment characteristics:**

Density / Consistency

Sand / Gravel -    Very Loose    Loose    Medium Dense    Dense    Very Dense

Silt / Clay -    Very Soft    Soft    Medium Stiff    Stiff    Very Stiff    Hard

Moisture: Very Wet    Wet    Moist    Damp    Dry

Color: Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_

(Circle major & underline modifying)

Major Constituent: Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

(Circle major & underline modifying)

Minor Constituent with trace: Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Biological: \_\_\_\_\_ %    Debris: wood trace %    Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

MCS Environmental, Inc.  
 GWS-SG03  
 Description Form  
 Initials: GSM  
 Date: 5/23/05    Time: 1350

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 WAN	5/23/05	N Lake Union	GWS-SG04

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238 556	1269545	41	f t		HC	1300

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	cm	RHG	K	X		

Surficial Wood Estimate:

Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture Very Wet Wet Moist Damp Dry

Color Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace Fine Medium Coarse Gravel Sand Silt Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense  
Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture Very Wet Wet Moist Damp Dry

Color Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace Fine Medium Coarse Gravel Sand Silt Clay

Biological: \_\_\_\_\_ % Debris: Plant Trace % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

MCS Environmental, Inc.  
 GWS-SG04  
 Description Form  
 Initials: GSM  
 Date: 5/23/05 Time: 1300

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 W A N	5/23/05	N Lake Union	GWS-SG05

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238765	1269800	39	f t		HC	1435

Penetration	Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
	10	c m	RHG	X	X		

Surficial Wood Estimate:

Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % *Wood* Debris: trace % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture Very Wet Wet Moist Damp Dry

Color Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace Fine Medium Coarse Gravel Sand Silt Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense  
Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture Very Wet Wet Moist Damp Dry

Color Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace Fine Medium Coarse Gravel Sand Silt Clay

Biological: \_\_\_\_\_ % *Wood* Debris: trace % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments:

1cm thick layer of dark gray to black silt over medium gray clay 1/2 to 1cm over brown to dark brown peat  
 station moved offshore - sample taken next to hole from core sampling

MCS Environmental, Inc.  
 GWS-SG05  
 Description Form  
 Initials: GM  
 Date: 5/23/05 Time: 1435

QUALITATIVE SAMPLE CHARACTERISTICS

Page \_\_\_ of \_\_\_

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 WAN	5/23/05	N Lake Union	GWS SG 06

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238 591	126 9269	40	f t		HC	1156

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	c m	RHG	X	X		

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_  
 (Circle major & underline modifying)

Minor Constituent with trace: Silt Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments:

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MCS Environmental, Inc.  
 GWS-SG06  
 Description Form  
 Initials: SSM  
 Date: 5/23/05 Time: 1156

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 WAN	5/23/05	N Lake Union	GWS-SG07

Coordinates		Water Depth			Rep	Gear	Time
North	East	Depth	Unit				
239055	1269632	22	ft			HC	1316

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	cm	RHG	X	X		

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ %    Debris: Shell 10 %    Oil Sheen: None    Trace (<5%) %

Moisture: Very Wet    Wet    Moist    Damp    Dry

Color: Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine    Medium    Coarse    Gravel    Sand    Silt    Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Subsurface sediment characteristics:

Density / Consistency:

Sand / Gravel -    Very Loose    Loose    Medium Dense    Dense    Very Dense

Silt / Clay -    Very Soft    Soft    Medium Stiff    Stiff    Very Stiff    Hard

Moisture: Very Wet    Wet    Moist    Damp    Dry

Color: Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine    Medium    Coarse    Gravel    Sand    Silt    Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Biological: \_\_\_\_\_ %    Debris: wood Trace %    Oil Sheen: None    Trace (<5%) %

Comments: 4x6 in piece of building felt.

Some medium brown sediment along edges

Rusted metal debris 2in x 3in

Pieces of shingle

MCS Environmental, Inc.  
 GWS-SG07  
 Description Form  
 Initials: SGM  
 Date: 5/23/05    Time: 1315

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD83 WAN	5/23/05	N Lake Union	GWS-SG08

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238.414	126 8951	40	f t		HC	1005

Penetration	Depth	Unit	Initials	Sulfide	VOA	Weather	Fines (%)
	10	cm	RHG	X	X		

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: ~~None~~ Trace (<5%) \_\_\_\_\_ %

Comments:  
 Surface diatom film  
 Thin layer of black sediment  
 under dark brown surface then  
 dark gray

MCS Environmental, Inc.  
 GWS-SG08  
 Description Form  
 Initials: GRM  
 Date: 5/23/05 Time: 1005

**QUALITATIVE SAMPLE CHARACTERISTICS**

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
<i>NAD 83 WAN</i>	<i>5/23/05</i>	<i>N Lk Union</i>	<i>GWS SG 09</i>

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
<i>238567</i>	<i>1268783</i>	<i>41</i>	<i>f t</i>		<i>Coning HC</i>	<i>0929</i>

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
<i>0</i>	<i>cm</i>	<i>CSM</i>	<i>X</i>	<i>X</i>	<i>pc</i>	

Surficial Wood Estimate:

Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: 0 %    Debris: 0 %    Oil Sheen: None    Trace (<5%) \_\_\_\_\_ %

Moisture  
Very Wet    Wet    Moist    Damp    Dry

Color  
Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_  
(Circle major & underline modifying)

Major Constituent  
Fine    Medium    Coarse    Gravel    Sand    Silt    Clay  
(Circle major & underline modifying)

Minor Constituent with trace  
Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel -    Very Loose    Loose    Medium Dense    Dense    Very Dense  
Silt / Clay -    Very Soft    Soft    Medium Stiff    Stiff    Very Stiff    Hard

Moisture  
Very Wet    Wet    Moist    Damp    Dry

Color  
Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_  
(Circle major & underline modifying)  
*streaks*

Major Constituent  
Fine    Medium    Coarse    Gravel    Sand    Silt    Clay  
(Circle major & underline modifying)

Minor Constituent with trace  
Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Biological: \_\_\_\_\_ %    Debris: wood trace %    Oil Sheen: None    Trace (<5%) \_\_\_\_\_ %

Comments:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

MCS Environmental, Inc.  
GWS-SG09  
Description Form  
Initials: RW  
Date: 5/23/05    Time: 0929

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 WAN	5/23/05	N Lake Union	GWS SG 10 R1

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238744	1268780	39	f t	1	HC	1033

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	c m	RHG	X	X		

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_

Biological: \_\_\_\_\_ % Debris: Trace % Oil Sheen: None Trace (<5%) %

Comments: Bark piece 1x4in

MCS Environmental, Inc.  
 GWS-SG10  
 Description Form  
 Initials: SSV  
 Date: 5/23/05 Time: 1033

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 WAN	5/23/05	N Lake Union	GWS-SG 10 R2

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238744	1268780	39	f t		HC	1033

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	c m	RHG				

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ %    Debris: \_\_\_\_\_ %    Oil Sheen: None    Trace (<5%) \_\_\_\_\_ %

Moisture  
Very Wet    Wet    Moist    Damp    Dry

Color  
 Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_

Major Constituent  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Minor Constituent with trace  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel -    Very Loose    Loose    Medium Dense    Dense    Very Dense

Silt / Clay -    Very Soft    Soft    Medium Stiff    Stiff    Very Stiff    Hard

Moisture  
Very Wet    Wet    Moist    Damp    Dry

Color  
 Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_

Major Constituent  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Minor Constituent with trace  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay

Biological: \_\_\_\_\_ %    Debris: \_\_\_\_\_ %    Oil Sheen:    None    Trace (<5%) \_\_\_\_\_ %

Comments:  
Composited with GWS-SG 10 R1

MCS Environmental, Inc.  
 GWS-SG10

Initials: GSW  
 Date: 5/23/05 Time: 1033

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD83 WAN	5/23/05	N Lake Union	GWS-SG-11

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238894	1268919	40	f t		HC	1205

Penetration	Initials	Sulfide	VOA	Weather	Fines (%)
Depth Unit					
10 c m	RHT	XK			

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay

Biological: \_\_\_\_\_ % Debris: Plant Trace % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments: Subsurface dark gray with black sediment scattered lens. Brown peaty material near bottom of core

MCS Environmental, Inc.  
 GWS-SG11  
 Description Form  
 Initials: SSR  
 Date: 5/23/05 Time: 12:05

QUALITATIVE SAMPLE CHARACTERISTICS

Page 2 of

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 WAN	5/23/05	N. Lake Union	GWS-SG 12

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
238862	1268657	40	ft		HC	0947

Penetration		Initials	Sulfide	VDA	Weather	Fines (%)
Depth	Unit					
10	c m	RH	X	X		

Surficial Wood Estimate:

Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: 0 % Debris: 0 % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense  
Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay

Biological: \_\_\_\_\_ % Debris: Wood Trace % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments:

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MCS Environmental, Inc.  
 GWS-SG12  
 Description Form  
 Initials: BSM  
 Date: 5/23/05 Time: 947

QUALITATIVE SAMPLE CHARACTERISTICS

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD83 WAN	5/23/05	N Lake Union	GWS-SG13

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
239241	1269518	4	f t		HC	1530

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	c m	RMS	X	X		

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: Algae Trace % Debris: Wood trace % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay

Biological: \_\_\_\_\_ % Debris: Wood trace % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments:

Chironomids

MCS Environmental, Inc.  
 GWS-SG13  
 Description Form  
 Initials: CSN  
 Date: 5/23/05 Time: 1530

QUALITATIVE SAMPLE CHARACTERISTICS

Page \_\_\_ of \_\_\_

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 WAN	5/23/04	N Lake Union	GWS SG 14

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
239 000	126 8598	40	f t		HC	1110

Penetration	Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit				
10	c/m	RHG	X	X	

Surficial Wood Estimate:  
Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture Very Wet Wet Moist Damp Dry

Color Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
(Circle major & underline modifying)

Major Constituent Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_  
(Circle major & underline modifying)

Minor Constituent with trace Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture Very Wet Wet Moist Damp Dry

Color Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
(Circle major & underline modifying)

Major Constituent Fine Medium Coarse Gravel Sand Silt Clay \_\_\_\_\_  
(Circle major & underline modifying)

Minor Constituent with trace Fine Medium Coarse Gravel Sand Silt Clay & brown peat

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments:

Subsurface is mottled black dark gray small area of medium gray and peaty brown

MCS Environmental, Inc.  
GWS-SG14  
Description Form  
Initials: GRM  
Date: 5.23.05 Time: 1110

QUALITATIVE SAMPLE CHARACTERISTICS

Page \_\_\_ of \_\_\_

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD 83 W A N	5/23/05	N Lake Union	GWS SG 15

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
239135	1268677	43	f t		H C	1122

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	c m	RHG	X	X		

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % Debris: \_\_\_\_\_ % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse Gravel Sand Silt Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense

Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture: Very Wet Wet Moist Damp Dry

Color: Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent: Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace: Fine Medium Coarse wood Gravel Sand Silt Clay

Biological: \_\_\_\_\_ % Debris: Trace % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

MCS Environmental, Inc.  
 GWS-SG15  
 Description Form  
 Initials: SSM  
 Date: 5/23/05 Time: 1122

**QUALITATIVE SAMPLE CHARACTERISTICS**

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD83 WAN	5/23/05	N Lake Union	GWS-SG16

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
239 001	1269160	40	f t		HC	1510

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	cm	CHG	X	X		

Surficial Wood Estimate:  
 Contact Points \_\_\_\_\_ X.5 = \_\_\_\_\_ %

**Surficial sediment characteristics:**

Biological: \_\_\_\_\_ %    Debris: \_\_\_\_\_ %    Oil Sheen:    None    Trace (<5%)    10 %

Moisture  
Very Wet    Wet    Moist    Damp    Dry

Color:    Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay \_\_\_\_\_  
 (Circle major & underline modifying)

Minor Constituent with trace  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay \_\_\_\_\_

**Subsurface sediment characteristics:**

Density / Consistency

Sand / Gravel -    Very Loose    Loose    Medium Dense    Dense    Very Dense

Silt / Clay -    Very Soft    Soft    Medium Stiff    Stiff    Very Stiff    Hard

Moisture  
Very Wet    Wet    Moist    Damp    Dry

Color  
 Light    Medium    Dark    Olive    Gray    Brown    Black    Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent  
 Fine    Medium    Coarse    Gravel    Sand    Silt    Clay \_\_\_\_\_  
 (Circle major & underline modifying)

Minor Constituent with trace  
Fine    Medium    Coarse    Gravel    Sand    Silt    Clay \_\_\_\_\_

Biological: \_\_\_\_\_ %    Debris: Wood Trace %    Oil Sheen:    None    Trace (<5%)    10 %

**Comments:**

barge over station  
sample taken near core  
sampling station  
Trace of medium gray clay

MCS Environmental, Inc.  
 GWS-SG16  
 Description Form  
 Initials: SSM  
 Date: 5/23/05    Time: 1510

QUALITATIVE SAMPLE CHARACTERISTICS

Page \_\_\_ of \_\_\_

Coordinate Datum	Date (mm/dd/yy)	Project Location	Sample Identification Number
NAD83 WAN	5/23/05	N Lake Union	GWS-SG17

Coordinates		Water Depth		Rep	Gear	Time
North	East	Depth	Unit			
239055	1269632	22	f t		HC	1332

Penetration		Initials	Sulfide	VOA	Weather	Fines (%)
Depth	Unit					
10	c m	RUG	XX			

Surficial Wood Estimate:

Contact Points \_\_\_\_\_ X 5 = \_\_\_\_\_ %

Surficial sediment characteristics:

Biological: \_\_\_\_\_ % Debris: Wood 25 % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

*shelldebris bivalves*

Moisture Very Wet Wet Moist Damp Dry

Color Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace Fine Medium Coarse Gravel Sand Silt Clay

Subsurface sediment characteristics:

Density / Consistency

Sand / Gravel - Very Loose Loose Medium Dense Dense Very Dense  
Silt / Clay - Very Soft Soft Medium Stiff Stiff Very Stiff Hard

Moisture Very Wet Wet Moist Damp Dry

Color Light Medium Dark Olive Gray Brown Black Other \_\_\_\_\_  
 (Circle major & underline modifying)

Major Constituent Fine Medium Coarse Gravel Sand Silt Clay  
 (Circle major & underline modifying)

Minor Constituent with trace Fine Medium Coarse Gravel Sand Silt Clay

Biological: \_\_\_\_\_ % Debris: Wood 10 % Oil Sheen: None Trace (<5%) \_\_\_\_\_ %

Comments:

Duplicate core taken at Station GWS-SG07  
Metal debris

MCS Environmental, Inc.

GWS-SG17

Description Form

Initials: SSM

Date: 5/23/05 Time: 1332