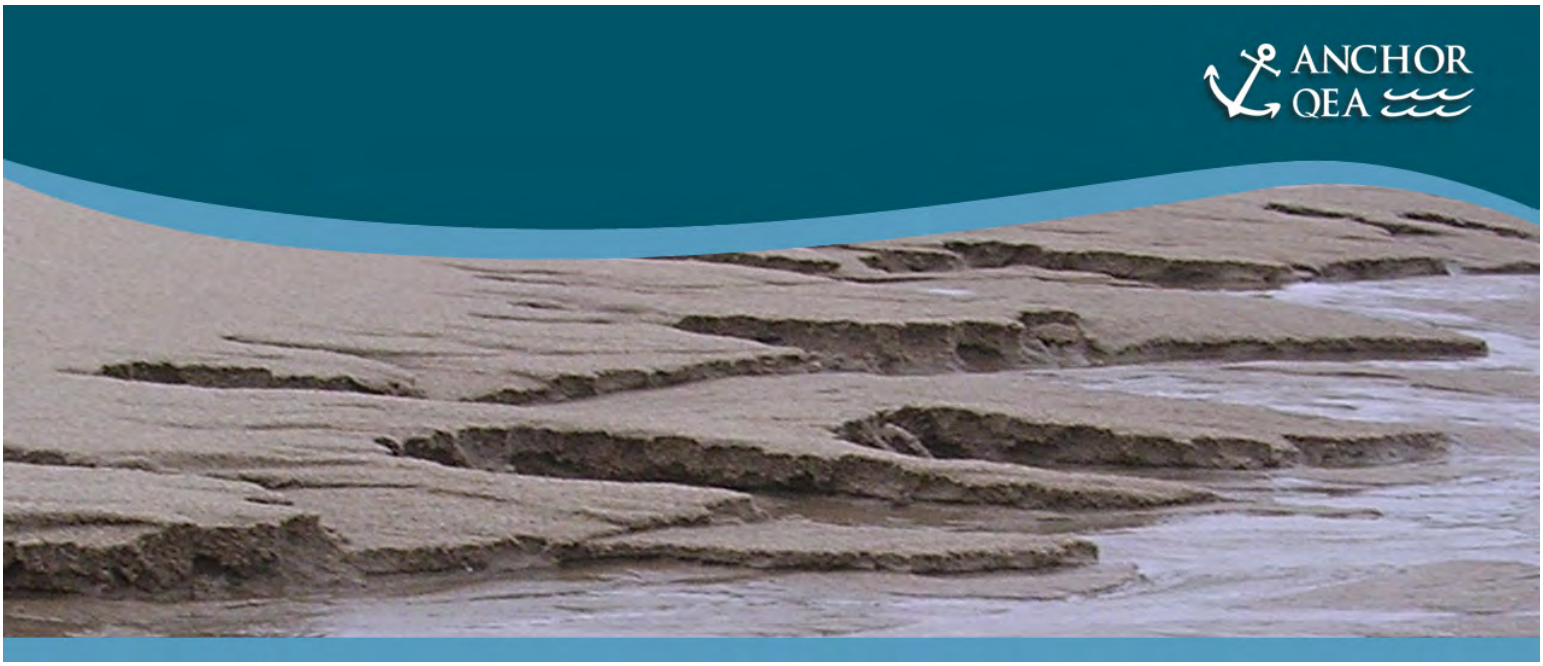

FILL WBZ TRENCH INVESTIGATION WORK PLAN GASCO/SILTRONIC

Prepared for

NW Natural

Prepared by

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LIST OF ACRONYMS AND ABBREVIATIONS

Anchor Environmental	Anchor Environmental, L.L.C.
Anchor QEA	Anchor QEA, LLC
ASTM	ASTM International
bgs	below ground surface
CDR	*Groundwater Source Control Construction Design Report*
COP	City of Portland
CPT	cone penetrometer test
DEQ	Oregon Department of Environmental Quality
EE/CA	Engineering Evaluation/Cost Analysis
FDR	*Draft Groundwater Source Control Final Design Report*
HAI	Hahn and Associates, Inc.
HASP	Health and Safety Plan
MFA	Maul Foster & Alongi, Inc.
MW	monitoring well
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
Siltronic	Siltronic Corporation
Site	Gasco Site
SPT	standard penetration test
TarGOST	Tar-specific Green Optical Screening Tool
TXCU	Tri-axial Consolidated Un-drained Compression Test
USEPA	U.S. Environmental Protection Agency
USEPA Consent Order	2009 Administrative Settlement Agreement and Order in Consent
WBZ	Water Bearing Zone

1 INTRODUCTION

1.1 Background

As directed by the Oregon Department of Environmental Quality (DEQ), NW Natural has completed this work plan describing data needs for the Fill Water Bearing Zone (WBZ) interceptor trench related to source control measures for the Gasco Site (Site) in Portland, Oregon (see Figures 1 and 2). This work plan was revised based on DEQ comments received on August 23, 2013. Also, NW Natural received Siltronic Corporation (Siltronic) comments on October 10, 2013 (MFA 2013b), and discussed them with Siltronic.

This Fill WBZ interceptor trench investigation work is being completed consistent with the requirements of: 1) the Joint Order (DEQ Order No. ECVC-NWR-00-27 to NW Natural and Siltronic, dated October 4, 2000); and 2) the Voluntary Agreement (DEQ No. WMCVM-NWR-94-13, dated August 8, 1994, as amended July 19, 2006). The Site location is shown on Figure 1. On March 21, 2008, DEQ selected source control actions to address potential impacts to the Willamette River from manufactured gas plant and solvent contamination at the Gasco and Siltronic properties via the alluvial groundwater pathway. DEQ approved proceeding with construction of the alluvial hydraulic containment and control portion of the design, which is underway, but not immediate construction of the Fill WBZ trench. However, control of Fill WBZ groundwater to the river using an interceptor trench was identified by DEQ as a needed element to address source control in their comments (September 22, 2011 and August 9, 2012 letters) on the Design Report (Anchor QEA 2011). This work plan provides the recommended geotechnical data needs for further evaluation of the constructability of a Fill WBZ trench to control fill groundwater discharge to the river.

NW Natural submitted the original Fill WBZ interceptor trench design (see Appendix A) in May 2011 and suggested integrating the project with the riverbank remediation work being managed by the U.S. Environmental Protection Agency (USEPA) under a 2009 Administrative Settlement Agreement and Order in Consent (USEPA Consent Order). NW Natural feels that there is a high enough probability that the riverbank remediation work required by the USEPA Consent Order could impact the proposed location of the Fill WBZ interceptor trench that it makes technical and common sense to wait until USEPA selects a final riverbank remedy before construction of a costly interceptor trench in that area of the Site. DEQ did not accept elements of the original Fill WBZ Trench design (including the length, alignment, construction sequence, and construction schedule proposed by NW Natural) and has requested that NW Natural

proceed with an alternatives evaluation of the trench location that might make construction of the interceptor trench prior to riverbank work feasible.

1.2 Investigation Objectives

The overall objective of the investigation program is to gather geotechnical and groundwater information necessary to support an alternatives evaluation for Fill WBZ, which will be presented in a Design Evaluation Report (per Section 4.3). The Design Evaluation Report will include an evaluation of trench construction methods, including the feasibility of the proposed methods adjacent to structures and armored slopes, and an assessment of the feasibility of constructing a Fill WBZ trench in sections (as further described in Section 2.3). To accomplish this, the following broad steps have been identified:

- Assess existing Site geotechnical and groundwater data to look for potential data gaps along alternative trench routes recommended for consideration in DEQ's September 22, 2011 comment letter.
- Conduct geotechnical and groundwater investigations in the identified data gap areas.
- Evaluate the data and prepare a Design Evaluation Report.

This work plan reviews existing Site data and proposes a sampling and analysis scope for DEQ review. Upon DEQ approval of the scope of work, a Sampling and Analysis Plan (SAP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HASP) will be prepared.

2 DISCUSSION OF POTENTIAL CONCEPTUAL DESIGNS AND DEQ RECOMMENDATIONS

2.1 Design Objectives

The purpose of the Fill WBZ interceptor trench is to intercept and collect groundwater in the Fill WBZ, as needed to reduce or prevent contaminant discharge to the Willamette River. To evaluate potential alternative designs, the following investigation objectives, including the feasibility of the approved construction method adjacent to significant surface or buried structures, will be met:

- Collect data required for trench type and location evaluation.
- Evaluate potential construction issues, such as debris or difficult soils.
- Evaluate feasibility of constructing the Fill WBZ trench in sections.
- Evaluate potential shoring and construction requirements in the context of significantly variable groundwater elevations.
- Evaluate potential trench bottom elevations.
- Evaluate potential slope impacts adjacent to the Willamette River.
- Evaluate potential impacts to existing structures and facility operations.
- Evaluate other methods for Fill WBZ control.
- Evaluate potential impacts from future shoreline/sediment remediation work.
- Understand the depth to Fill WBZ groundwater across the Site.

This work plan evaluates existing data with the goal of meeting these objectives and to determine investigation data gaps. This work plan does not evaluate the existing groundwater elevation and analytical dataset for the purpose of confirming whether Fill WBZ source control is required on the Siltronic property because these data are in the process of being collected and evaluated by Maul Foster & Alongi, Inc. (MFA).

2.2 Data Needed for Final Design

Once an interceptor trench concept and location are selected, final design can be completed. Data needs necessary to design the final interceptor trench would include, at a minimum, the following:

- Type and extent of debris likely within the construction area
- Soil type and characteristics
- Thickness of the WBZ

- Depth of groundwater
- Soil index parameters and consistency
- Unit weight of the WBZ
- Hydraulic conductivity of the WBZ
- Short- and long-term strength of the WBZ and possibly soils below

Siltronic (MFA 2013a) also presents a number of suggested data needs for final design of a Fill WBZ interceptor trench on its property.

2.3 Summary of Design History

The original design for the interceptor trench was provided in the May 2011 *Draft Groundwater Source Control Final Design Report* (FDR; Anchor QEA 2011). DEQ refers to that report as the Revised Interim Design Report. Appendix A to the January 2012 *Groundwater Source Control Construction Design Report* (CDR; Anchor QEA 2012a) contains the May 2011 final design submittal. In the FDR the Fill WBZ interceptor trench route is near the top of the riverbank in Segments 1 and 2, as shown on Figure 2. In the FDR, the Fill WBZ interceptor trench extends about 1 foot into the underlying native soil layer, which varies between elevations 5.0 to 0.0 foot City of Portland (COP) datum. A barrier would be constructed on the river side of the trench to minimize capture of river water; however, NW Natural stressed the importance of integrating any riverbank work for DEQ with a final remedial decision from USEPA for the sediment and riverbank project.

DEQ comments on the design in the FDR indicated that the agency did not approve elements of that design (DEQ 2011, 2012), including the length, alignment, construction sequence, and construction schedule and requested that alternative designs be considered. Although the focus of this data gaps evaluation is on the primary alignment and DEQ recommendations described in Section 2.3, it may be found through the data gaps evaluation and resulting investigations that alternative alignments or designs for control of Fill WBZ are more appropriate.
NW Natural may also recommend different or additional methods for fill water control based upon new data (e.g., if alluvial system testing indicates operation of the hydraulic control and containment system adequately dewaters the Fill WBZ in some locations). In addition, as USEPA selection of remedial alternatives for the riverbank advances, this information should be used to further inform alternative alignments or designs for the control of Fill WBZ.

2.4 DEQ Recommendations Following Review of the May 2011 FDR Fill WBZ Interceptor Trench Design

Following submittal of the FDR described in Section 2.2, DEQ provided a compilation of agency comments on the Fill WBZ interceptor trench design to NW Natural on September 22, 2011 (DEQ 2011) and August 9, 2012 (DEQ 2012). These comments did not accept the length, alignment, construction sequence, and construction schedule proposed by NW Natural in the FDR. The majority of DEQ comments focused on sequencing and/or trench location. In the August 9, 2012 letter, DEQ made the following comment related to the geotechnical study: "NW Natural will submit a work plan for a geotechnical investigation, designed to determine the feasibility of relocating the interceptor trench or constructing the trench in sections, as suggested by DEQ." DEQ further states, "Consistent with DEQ's comments regarding the length of the trench, the scope of the geotechnical investigation should extend along the property line between the Gasco and U.S. Moorings sites and beyond the WS-8 monitoring well cluster on the Siltronic property."

Page 12 of DEQ's September 22, 2011 general comments on the Fill WBZ Interceptor Trench Design contained the following comment/requests that seem to apply most to this work plan:

> *Setting the trench back from the top-of-bank will reduce uncertainty regarding slope stability and intercept contaminated groundwater further upgradient of the river. Locating the trench on the upland side of the extraction wells would also allow for performance/effectiveness monitoring using existing and proposed Fill WBZ monitoring wells.*
>
> *Except for the section along the FAMM leasehold, NW Natural should reevaluate the alignment, sequence, and schedule to construct most of the trench in the same timeframe and along a similar alignment as the HC&C system.*

Page 15 of DEQ's September 22, 2011 detailed comments on the Appendix J Fill Interceptor Trench Design and Drawings contained the following requests that seem to apply most to this work plan:

> ***Excavation Limits.*** *The stability of the trench should be evaluated along an alignment set-back from the top-of-bank and near the extraction wells.*
> ***Alignment.*** *The Alignment and sequence trench construction should be evaluated consistent with DEQ's general comments.*

3 DATA GAP ANALYSIS

Appendix A (*Data Gap Investigation Report*) of the May 2012 draft *Engineering Evaluation/Cost Analysis Gasco Sediments Cleanup Action* (EE/CA; Anchor QEA 2012b) is a compilation of available existing data that provides the basis for this data gap analysis. For more information, including analytical data and historical groundwater measurements, please refer to Appendix A of the draft EE/CA.

3.1 Review of Groundwater Data

Figure 2 shows the Fill WBZ interceptor trench alignment, as presented in Appendix A of the CDR and the locations of historical explorations reviewed by Anchor QEA, LLC (Anchor QEA). Historical data reviewed included data collected from monitoring and extraction wells, soil boring explorations, and cone penetrometer tests (CPTs; Tar-specific Green Optical Screening Tool [TarGOST] borings) on the Gasco, Siltronic, and U.S. Moorings properties between the dates of 1995 and 2011. The data reviewed included geotechnical soil borings, environmental soil borings, and monitoring wells completed for groundwater studies by Hahn and Associates, Inc. (HAI). These data were also incorporated in Appendix A of the *Data Gap Investigation Report* (EE/CA; Anchor QEA 2012b). Additional data are currently being collected and evaluated as part of the groundwater source control design and installation of the hydraulic control and containment system.

Figure 2 also presents the locations of the U.S. Moorings Property explorations, which were conducted adjacent to the north property boundary of the Site. The U.S. Moorings explorations were completed as part of a Remedial Investigation (RI) conducted by U.S. Moorings (KTA & TEC 2010). Logs from this study indicate that the observed water level was 8 to 16 feet below ground surface (bgs), sometimes above or below the fill/native soil interface. Permanent monitoring wells were not installed for the U.S. Moorings RI investigation, and the available groundwater level data from that study were from temporary borings, so those data are of limited use for this evaluation.

Figure 3 shows the location of cross section A-A', and Figures 4a, 4b, and 4c are the cross sections presenting the groundwater level (referred to as the potentiometric surface) in the Fill WBZ. For the historical groundwater wells, measured groundwater elevations in the surficial fill unit varied from elevation 32 feet COP in the wet season (MW-9-29) to a low of approximately elevation 7 feet COP (MW-4-35, MW-18-30, and MW-19-22) in the dry season.

The wide variation in observed groundwater elevations is a function of the variation in fill permeability, seasonal recharge to the Fill WBZ, and seasonal river level changes. Seasonal changes in groundwater elevation for the fill unit were typically 5 feet, but in some cases groundwater levels fluctuated as much as 10 feet in a given year. Monitoring wells completed in the fill will respond differently depending on the seasonal river stage at the time of measurement. For example, a Fill WBZ monitoring well may not respond to tidal river changes during a low river stage, but it may respond to tidal river changes at a higher river stage. This was observed during the Segment 2 pump tests conducted in May and November 2010. In May, when river levels were seasonally high, hydrographs from Fill WBZ observation wells OW-7-17, OW-8-15, and OW-9-25 clearly showed tidal fluctuations. During additional testing in November, when river levels were seasonally low, no tidal fluctuations were observed in these wells. NW Natural will further evaluate tidal responses in Fill WBZ wells that are outfitted with pressure transducers during the upcoming Test Plan phases and identify which wells respond to river tidal changes. Note that not all Fill WBZ wells have pressure transducers installed.

Groundwater information in the Fill WBZ appears to be suitable for use in the evaluation of trench alignments along the NW Natural portion of Segment 1 and in Segment 2. However, Fill WBZ groundwater information is very limited along the property line between NW Natural and U.S. Moorings. Site-specific Fill WBZ groundwater occurrence information is needed in this area.

3.2 Review of Geotechnical Data

Geotechnical data reviewed as part of this work plan included soil boring logs for geotechnical and environmental studies, cone penetrometer logs, exploration logs for monitoring wells, and laboratory data reports. Specifically, the following exploration logs were reviewed:

- Northwest Natural Gas Co.—HAI (B, GP, MW Series)
  - Explorations from multiple events completed between September 1995 and January 2007 and presented in the NW Natural Gasco Facility *Remedial Investigation Report* (HAI 2007).
- Gasco Exploratory Borings—GS Series Data

  - Explorations logged by Anchor Environmental, L.L.C. (Anchor Environmental) in the fall of 2006 and presented in Appendix C of the draft EE/CA (Anchor QEA 2012b).

- Gasco Exploratory Borings—B Series Data
  - Explorations logged by Anchor Environmental in the winter of 2008 collected as part of the *Source Control Evaluation Report* and presented in Appendix C of the draft EE/CA (Anchor QEA 2012b). To discern these borings from HAI explorations, these explorations are shown on Figure 3 with an asterisk (*).

- U.S. Moorings Property—RI
  - Explorations logged by TEC, Inc., in March and April of 2008 and presented in the Remedial Investigation Report (KTA & TEC 2010).

- Gasco Data Gaps Riverbank Borings—GST and GSM Series Data
  - Explorations logged by Anchor QEA in the fall of 2010 and presented in Appendix C of the draft EE/CA (Anchor QEA 2012b).
  - Includes CPT soundings (TG-series) performed on NW Natural and Siltronic property. To protect instrumentation, CPT soundings were generally drilled through the Fill Unit and data was not collected in the Fill Unit. Exceptions to this include TG-12 and TG-12S; CPT data was collected in the Fill Unit at these locations.

Figure 3 shows the original design Fill WBZ interceptor trench alignment, the expanded area DEQ requested for possible trench location evaluations, and exploration locations with data relevant to geotechnical engineering and design noted. Appendix B presents the boring logs with relevant geotechnical data used for this analysis. Table 1 notes the depths of explorations shown on Figure 3, and the type of geotechnical data available for the exploration. Table 2 summarizes the geotechnical laboratory analyses performed in the fill unit. These data include the following:

- CPT data—ASTM International (ASTM) D-3441
- Standard Penetration Test (SPT) data—ASTM D-1586
- Boring logs with soils classified for engineering purposes consistent with the Unified Soil Classification System—ASTM D 2488
- Geotechnical laboratory data, including any of the following tests:
  - Specific Gravity of Soils—ASTM D-854

- Moisture Content of Soils—ASTM D-2216
- Total Solids of Soils—ASTM D-2974
- Atterberg Limits—ASTM D-4318
- Strength Test Data Tri-axial Consolidated Un-drained Compression Test (TXCU)—ASTM D-4767
- Particle Size Distribution—ASTM D-442
- One-Dimensional Consolidation—ASTM D-2435

Figure 3 also presents information from the U.S. Moorings Property explorations that are adjacent to the north property boundary of the Site. The U.S. Moorings explorations were collected in 2008 as part of their RI. Because soil samples collected from these explorations were tested only for environmental characteristics, geotechnical data including strength characteristics (SPT, CPT, or TXCU) were not collected. Lithological descriptions provided by these explorations indicate that the fill unit is 6 to 15 feet thick. In general, the explorations shown on Figure 3 were terminated at a depth below the interface between the upper fill unit and the underlying native alluvium unit.

Figures 4a, 4b, and 4c provide interpretations of subsurface geology and estimated fill thickness along the alignment of the original design Fill WBZ interceptor trench. These subsurface profiles have been updated to reflect the new borings completed as part of construction of new source control monitoring wells, piezometers, and extraction wells. At the north end of the Gasco Property, the fill is approximately 20 feet thick. At the south end of the Fill WBZ interceptor trench alignment, the fill is approximately 40 feet thick. This thickness change is due to sharp surface elevation changes along the length of the river bank. The bottom elevation of the fill is essentially flat with a slight dip in the center of the cross sections.

Geotechnical information appears to be suitable for evaluation of alternate alignments in the vicinity of the originally proposed alignment of the trench, including the zone located upland of the original trench alignment, as shown on Figure 3. However, there is little geotechnical information adjacent to the U.S. Moorings property or the waterfront area adjacent to the Siltronic Property; site-specific geotechnical soil information is needed in these areas.

Siltronic is concerned that any excavation of its riverbank, which is composed of unconsolidated fill materials, could de-stabilize the Site and potentially damage infrastructure and adversely impact business operations. Siltronic is specifically concerned that construction of the trench

could impact the stability of the road, utilities, and Fab 1 building—as well as the overall stability of the riverbank—regardless of sequencing with the in-river restoration work. If further evaluation of the existing information and additional information collected as part of this work plan finds that the information is inadequate to determine whether de-stabilization of the Site is possible or likely, then additional studies or data collection may be recommended at a later date.

4 INVESTIGATION SCOPE

4.1 Proposed Groundwater Data Collection

As stated previously, groundwater information is needed for the potential extension of the interceptor trench alignment adjacent to the U.S. Moorings property and along the waterfront of the Siltronic property. To better understand the groundwater conditions in these areas, Anchor QEA recommends the installation of four shallow monitoring wells (MW-39F, MW-40F, MW-41F, and MW-42F; see Figures 2 and 3), with the specific intent of monitoring groundwater conditions in the surficial fill unit.

In a May 2013 work plan, Siltronic proposed the addition of three Fill WBZ monitoring wells on Siltronic property (MFA 2013a). In a June 7 email, DEQ requested revisions to the Siltronic work plan. The overall objective of the May 2013 work plan is to better understand changes in fill groundwater levels as upper and lower alluvium wells are pumped. The locations of these proposed monitoring wells are shown on Figures 2 and 3. Information obtained from these monitoring wells will also be used for the Fill WBZ trench design.

4.2 Proposed Geotechnical Data Collection

As stated in Section 3, geotechnical information is needed for the portion of the potential interceptor trench alignment adjacent to the U.S. Moorings property and along the waterfront of the Siltronic property. To better understand the variation in soil engineering characteristics and thicknesses of the fill unit in these areas, it is recommended that geotechnical data be collected during the installation of the four proposed Fill WBZ monitoring wells (MW-39F, MW-40F, MW-41F, and MW-42F) and the proposed soil boring AQ-B8. The proposed depths for these borings are based upon the anticipated depth to the bottom of the fill unit and include additional depth of confirmatory samples in the underlying unit. Based on a review of nearby explorations, the proposed soil boring depths adjacent to the U.S. Moorings Property are 25 feet bgs, which assumes an anticipated fill thickness of 15 feet. The proposed soil boring depth of MW-42 and AQ-B8 is 40 feet bgs, which assumes an anticipated fill thickness of 30 feet.

Field data will include the collection of soil samples for geotechnical laboratory testing and in situ measurements of strength using the SPT (ASTM D-1586).

Additional details regarding sampling procedures, data quality objectives, and health and safety considerations will be provided in the SAP, QAPP, and HASP once this approach is approved by DEQ.

4.3 Data Use

Upon completion of soil borings and laboratory analysis, a data report will be produced summarizing the field activities and results. Boring logs, well installation logs, and laboratory results will be included in the data report, which will be provided as an appendix to the Design Evaluation Report. The data report will be combined with the following information to support evaluations in the Design Evaluation Report:

- The existing data reviewed along the expanded area DEQ identified for evaluating trench alignment
- Potential data from other areas of the Site if alternative alignments are indicated at that time
- Data collected by Siltronic on new Fill WBZ wells, as described in their recent sampling plan
- Data available on source control extraction well testing or operation that is relevant to potential effects of the Alluvial WBZ extraction system on the Fill WBZ control

The combined data will be used in the Design Evaluation Report, and it will be evaluated in the context of any pertinent developments in riverbank remedy selection by USEPA.

5 REFERENCES

Anchor QEA (Anchor QEA, LLC), 2011. *Draft Groundwater Source Control Final Design Report*. NW Natural Gasco Site. Prepared by Anchor QEA, LLC. May 2011.

Anchor QEA, 2012a. *Groundwater Source Control Construction Design Report.* NW Natural Gasco Site. January 2012.

Anchor QEA, 2012b. *Engineering Evaluation/Cost Analysis Gasco Sediments Cleanup Action*. Prepared on behalf of NW Natural. Prepared for U.S. Environmental Protection Agency, Region 10. May 2012.

DEQ (Oregon Department of Environmental Quality), 2011. Email from Dana Bayuk to Bob Wyatt. September 22.

DEQ, 2012. Email from Dana Bayuk to Bob Wyatt. August 9.

HAI (Hahn and Associates, Inc.), 2007. *Remedial Investigation Report*. NW Natural Gasco Facility, Portland, Oregon. April 30, 2007.

KTA & TEC (KTA & TEC, Inc.), 2010. *Final Remedial Investigation Report*. Prepared on behalf of the Portland District of the Army Corps of Engineers, U.S. Government Moorings Site. Portland, Oregon. May 2010.

MFA (Maul Foster & Alongi, Inc.), 2013a. *Fill Zone Well Installation Work Plan*. Prepared for Siltronic Corporation, Portland, Oregon. ECSI No. 183. May 10, 2013.

MFA, 2013b. Letter from Maul Foster & Alongi to Mr. Dana Bayuk of ODEQ titled Fill WBZ Investigation Work Plan and DEQ Comments—Siltronic Corporation Property. October 10, 2013.

TABLES

Table 1
Summary of Explorations with Geotechnical Data

Location ID	Document Source	Exploration Date (Month-Year)	Laboratory Data	Maximum Exploration Depth (feet)	Standard Penetration Test Data?
B-1	A	September-95	NA	25	Yes
B-3	A	September-95	NA	29	Yes
B-6	A	September-95	NA	30	Yes
B-7	A	September-95	NA	30	Yes
B-8	A	September-95	NA	27	Yes
B-9A	A	September-95	NA	35	Yes
B-9	A	September-95	NA	35	Yes
B-11	A	September-95	NA	32	Yes
B-14	A	September-95	NA	19	Yes
B-17	A	September-95	NA	24	Yes
B-18	A	September-95	NA	28	Yes
B-20	A	September-95	NA	24	Yes
B-27	A	September-95	NA	37	Yes
B-29	A	September-95	NA	48	Yes
B-32	A	October-95	NA	59	Yes
B-33	A	October-95	NA	70	Yes
B-35	A	October-95	NA	30	Yes
GT-1	A	November-97	NA	37	Yes
GT-2	A	November-97	NA	37	Yes
GT-3	A	November-97	NA	37	Yes
GT-4	A	November-97	NA	52	Yes
MW-2-32	A	November-95	NA	33	Yes
MW-2-61	A	October-98	NA	62	Yes
MW-3-56	A	November-05	NA	57	Yes
MW-4-57	A	October-95	NA	58	Yes
MW-4-101	A	October-98	NA	120	Yes
MW-5-32	A	October-95	NA	32	Yes
MW-5-175	A	October-98	NA	150	Yes
MW-8-56	A	October-95	NA	56	Yes
MW-9-29	A	October-95	NA	29	Yes
MW-14-110	A	October-98	NA	110	Yes
MW-15-66	A	June-99	NA	66	Yes
B-1*	B	February-08	AL, WC, GS, SG	122	Yes
B-2*	B	February-08	AL, WC, GS, SG	122	Yes
B-3*	B	February-08	AL, WC, GS, SG	122	Yes
B-4*	B	February-08	AL, WC, GS, SG	122	Yes
B-5*	B	February-08	AL, WC, GS, SG	41	Yes
B-6*	B	February-08	AL, WC, GS, SG	41	Yes
B-7*	B	February-08	AL, WC, GS, SG	41	Yes
GS-00	B	November-06	GS	85	No
GS-01	B	November-06	AL, GS, SG, TS	80	No

Table 1
Summary of Explorations with Geotechnical Data

Location ID	Document Source	Exploration Date (Month-Year)	Laboratory Data	Maximum Exploration Depth (feet)	Standard Penetration Test Data?
GS-02	B	November-06	TS, GS	90	No
GS-03	B	December-06	AL, TS, GS, SG	123	No
GS-04	B	December-06	AL, TS, GS, SG	148	No
GS-05	B	October-06	AL, TS, GS, SG	200	No
GS-06	B	January-07	AL, TS, GS, SG	148	No
GS-07	B	October-06	AL, TS, GS, SG	193	No
GS-08	B	October-06	AL, TS, GS, SG	148	No
GS-09	B	October-06	AL, TS, GS, SG	187	No
GS-10	B	January-07	AL, TS, GS, SG	148	No
GS-11	B	January-07	AL, TS, GS, SG	175	No
GS-12	B	January-07	GS	148	No
GSM-07	B	September-10	AL, TS, WC, GS, SG	20	Yes
GSM-08	B	September-10	AL, TS, WC, GS	15	Yes
GSM-14	B	October-10	AL, WC, ST, DD, CS	18	Yes
GST-01	B	October-10	TS, WC, GS	30	Yes
GST-02	B	October-10	TS, WC, GS	30	Yes
GST-03	B	October-10	TS, WC,	30	Yes
GST-04	B	October-10	AL, TS, WC	30	Yes
GST-05	B	October-10	AL, TS, WC, GS	20	Yes
GST-06	B	October-10	AL, TS, WC, GS	30	Yes
GST-09	B	October-10	TS, WC, GS, ST, DD, CS	30	Yes
GST-11	B	October-10	TS, WC, GS, ST, DD, CS	45	Yes
GST-13	B	October-10	AL, WC, GS, ST, DD, CS	45	Yes
TG-1	B	August-07	NA	150	CPT
TG-2	B	August-07	NA	150	CPT
TG-3	B	August-07	NA	150	CPT
TG-4	B	August-07	NA	150	CPT
TG-5	B	August-07	NA	99	CPT
TG-5A	B	September-07	NA	150	CPT
TG-6	B	August-07	NA	126	CPT
TG-7	B	August-07	NA	150	CPT
TG-8	B	August-07	NA	150	CPT
TG-9	B	March-08	NA	148	CPT
TG-10	B	March-08	NA	151	CPT
TG-11	B	March-08	NA	150	CPT
TG-12	B	March-08	NA	150	CPT
TG-13	B	March-08	NA	102	CPT
TG-14	B	March-08	NA	101	CPT
TG-15	B	March-08	NA	149	CPT
TG-16	B	March-08	NA	149	CPT
TG-1S	B	September-07	NA	151	CPT

Table 1
Summary of Explorations with Geotechnical Data

Location ID	Document Source	Exploration Date (Month-Year)	Laboratory Data	Maximum Exploration Depth (feet)	Standard Penetration Test Data?
TG-2S	B	September-07	NA	151	CPT
TG-3S	B	September-07	NA	150	CPT
TG-4S	B	September-07	NA	150	CPT
TG-5S	B	September-07	NA	151	CPT
TG-6S	B	September-07	NA	152	CPT
TG-7S	B	March-08	NA	150	CPT
TG-8S	B	August-07	NA	147	CPT
TG-9S	B	March-08	NA	101	CPT
TG-10S	B	March-08	NA	91	CPT
TG-11S	B	March-08	NA	79	CPT
TG-12S	B	March-08	NA	156	CPT
SB-1	C	March-08	NA	20	No
SB-7	C	March-08	NA	28	No
SB-11	C	March-08	NA	20	No
SB-12	C	March-08	NA	20	No
SB-16	C	March-08	NA	20	No
WS-44-29	D	August-13	GS	35	No
WS-45-23	D	August-13	GS	40	No
WS-46-23	D	August-13	GS	35	No

Notes:

* = Asterisk inserted to avoid confusion with similarly named explorations by Hahn and Associates, Inc., and indicates that these explorations were completed by Anchor QEA.

AL = Atterberg limits

CPT = Cone penetration test data; indicates that SPT data and soil characteristics can be interpreted from the CPT log.

CS = consolidation

DD = density test

GS = grain size

NA = Indicates that no laboratory data were found in the project file for the given exploration.

O = other

SG = specific gravity

SPT = standard penetration test

ST = laboratory strength test (Tri-Axial)

TS = total solids

WC = water content

Document Source:

A = Hahn and Associates, Inc., 2007. *Remedial Investigation Report*. NW Natural Gasco Facility, Portland, Oregon. April 30, 2007.

B = Anchor QEA, LLC, 2012. *Engineering Evaluation/Cost Analysis Gasco Sediments Cleanup Action.* Draft. Appendix A of the Data Gaps Investigation Report. Prepared on behalf of NW Natural. Prepared for the U.S. Environmental Protection Agency, Region 10. May 2012.

C = KTA & TEC, Inc., 2010. *Final Remedial Investigation Report*. Prepared on behalf of the Portland District of the Army Corps of Engineers, U.S. Government Moorings Site. Portland, Oregon. May 2010.

D = Maul Foster & Alongi, Inc., 2013. *Fill Zone Well Installation Work Plan*. Prepared for Siltronic Corporation, Portland, Oregon. ECSI No. 183. October 2013.

Table 2
Summary of Geotechnical Data in Fill Unit

Boring Log ID	Parameter								
	Standard Penetration Test ASTM D1586	Atterberg Limits ASTM D4318	Total Solids ASTM D2974	Water Content ASTM D2216	Grain Size Distribution ASTM D422	Triaxial ASTM D4767	Density ASTM D2937	Consolidation ASTM D4318	Specific Gravity ASTM D854
B-1*	☑	☑		☑	☑				☑
B-2*	☑	☑		☑	☑				☑
B-3*	☑	☑		☑	☑				☑
B-4*	☑	☑		☑	☑				☑
B-5*	☑	☑		☑	☑				☑
B-6*	☑	☑		☑	☑				☑
B-7*	☑	☑		☑	☑				☑
GS-00			☑		☑				
GS-01		NP	☑		☑				☑
GS-02		NP	☑		☑				
GS-03		NP	☑		☑				☑
GS-04		NP	☑		☑				☑
GS-05		NP	☑		☑				☑
GS-06		☑	☑		☑				☑
GS-07		NP	☑		☑				☑
GS-08		NP	☑		☑				☑
GS-09		NP	☑		☑				☑
GS-10		☑	☑		☑				☑
GS-11		☑	☑		☑				☑
GS-12					☑				
GSM-07	☑	☑	☑	☑	☑				☑
GSM-08	☑	☑	☑	☑	☑				
GSM-14	☑	☑	☑	☑		☑	☑	☑	
GST-01	☑		☑	☑	☑				
GST-02	☑		☑	☑	☑				
GST-03	☑		☑	☑					

Table 2
Summary of Geotechnical Data in Fill Unit

Boring Log ID	Parameter								
	Standard Penetration Test ASTM D1586	Atterberg Limits ASTM D4318	Total Solids ASTM D2974	Water Content ASTM D2216	Grain Size Distribution ASTM D422	Triaxial ASTM D4767	Density ASTM D2937	Consolidation ASTM D4318	Specific Gravity ASTM D854
GST-04	☑	☑	☑	☑					
GST-05	☑	☑	☑	☑	☑				
GST-06	☑	☑	☑	☑	☑				
GST-09	☑		☑	☑	☑	☑[1]	☑[1]	☑[1]	
GST-11	☑		☑	☑	☑	☑[1]	☑[1]	☑[1]	
GST-13	☑[1]	☑		☑	☑	☑[1]	☑[1]	☑[1]	
WS-44-29					☑				
WS-45-23					☑				
WS-46-23					☑				

Notes:

* = Asterisk inserted to avoid confusion with similarly named explorations by Hahn and Associates, Inc., and indicates that these explorations were completed by Anchor QEA.

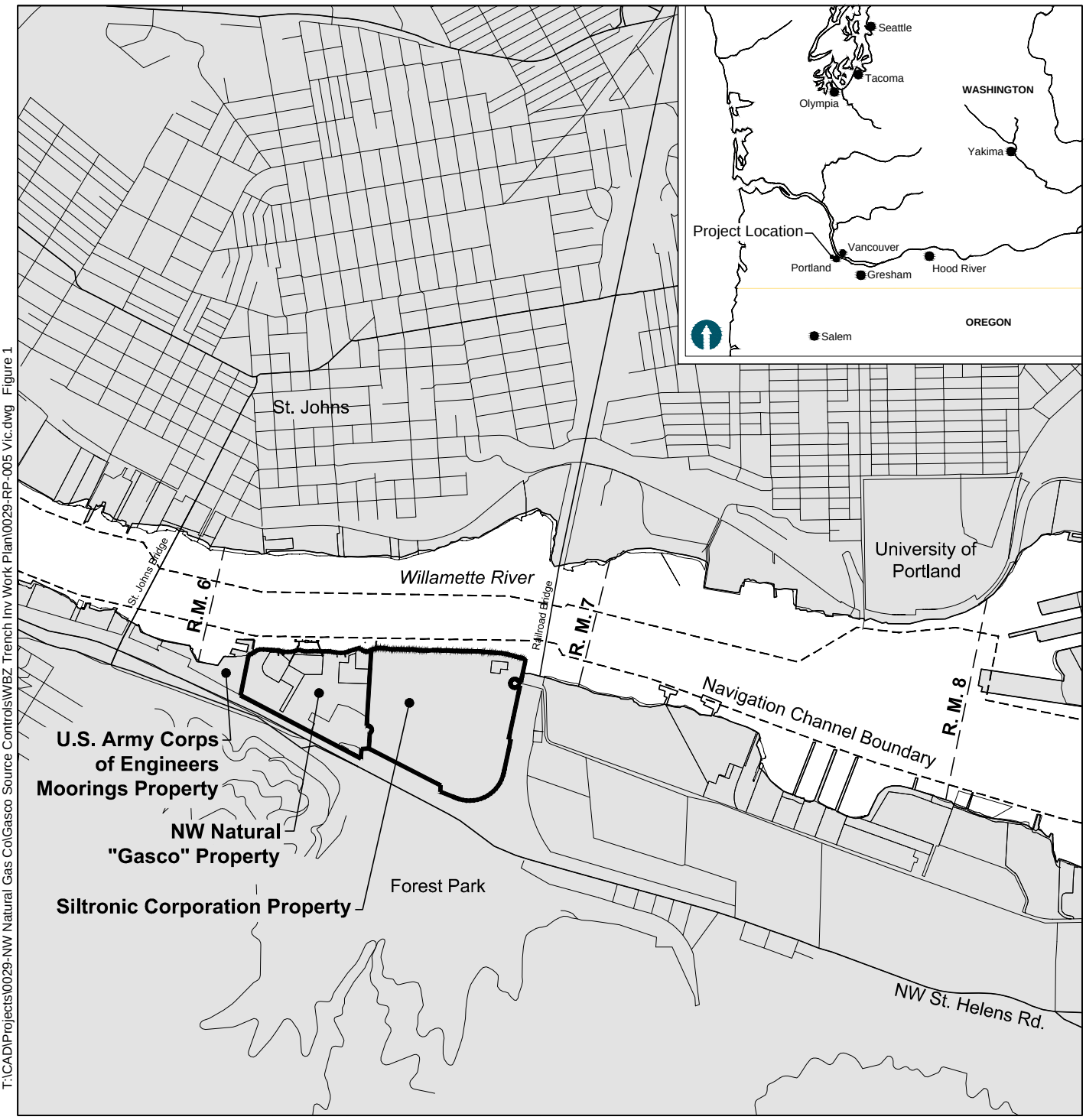
☑ = Data available in fill unit.

1 = Data available only for soil unit underlying the fill unit.

ASTM = ASTM International

NP = Atterberg limits test indicate non-plastic behavior.

FIGURES



0 2000
Scale in Feet

NOTE: All locations are approximate.

T:\CAD\Projects\0029-NW Natural Gas Co\Gasco Source Controls\WBZ Trench Inv Work Plan\0029-RP-005 Vic.dwg Figure 1

Oct 22, 2013 10:18am heriksen

ANCHOR QEA

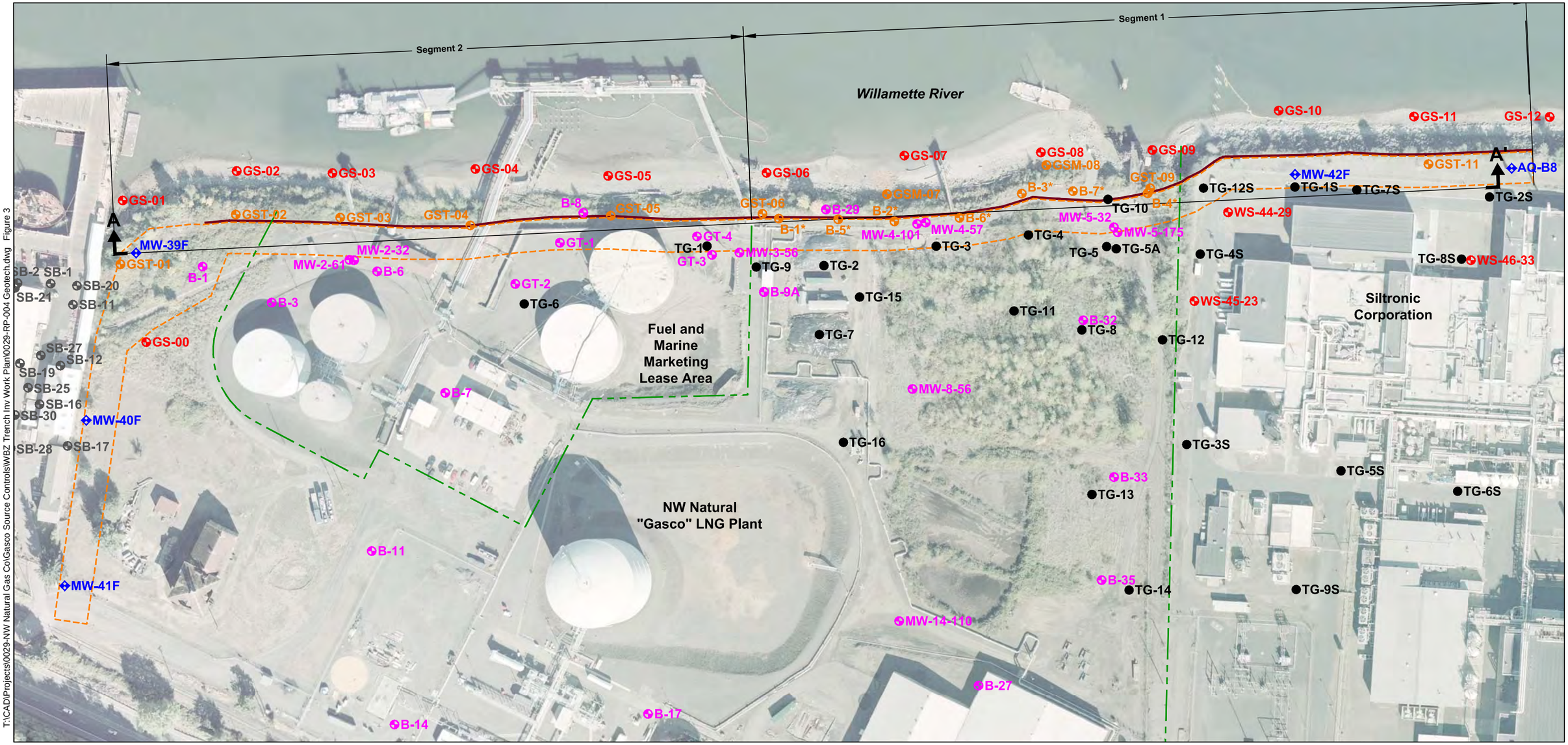
Figure 1
Vicinity Map
Fill WBZ Trench Investigation Work Plan
Gasco/Siltronic

T:\CAD\Projects\0029-NW Natural Gas Co\Gasco Source Controls\WBZ Trench Inv Work Plan\0029-RP-006 All Samp.dwg Figure 2

Nov 11, 2013 12:39pm heriksen

ANCHOR QEA

Figure 2
All Sample Locations
Fill WBZ Trench Investigation Work Plan
Gasco/Siltronic



HORIZONTAL DATUM: Oregon State Plane North NAD 83 (International Feet).

VERTICAL DATUM: City of Portland

NOTE: Drawing prepared from CAD file provided by Advanced Remediation Technologies Co, dated January 5, 2012.

LEGEND:

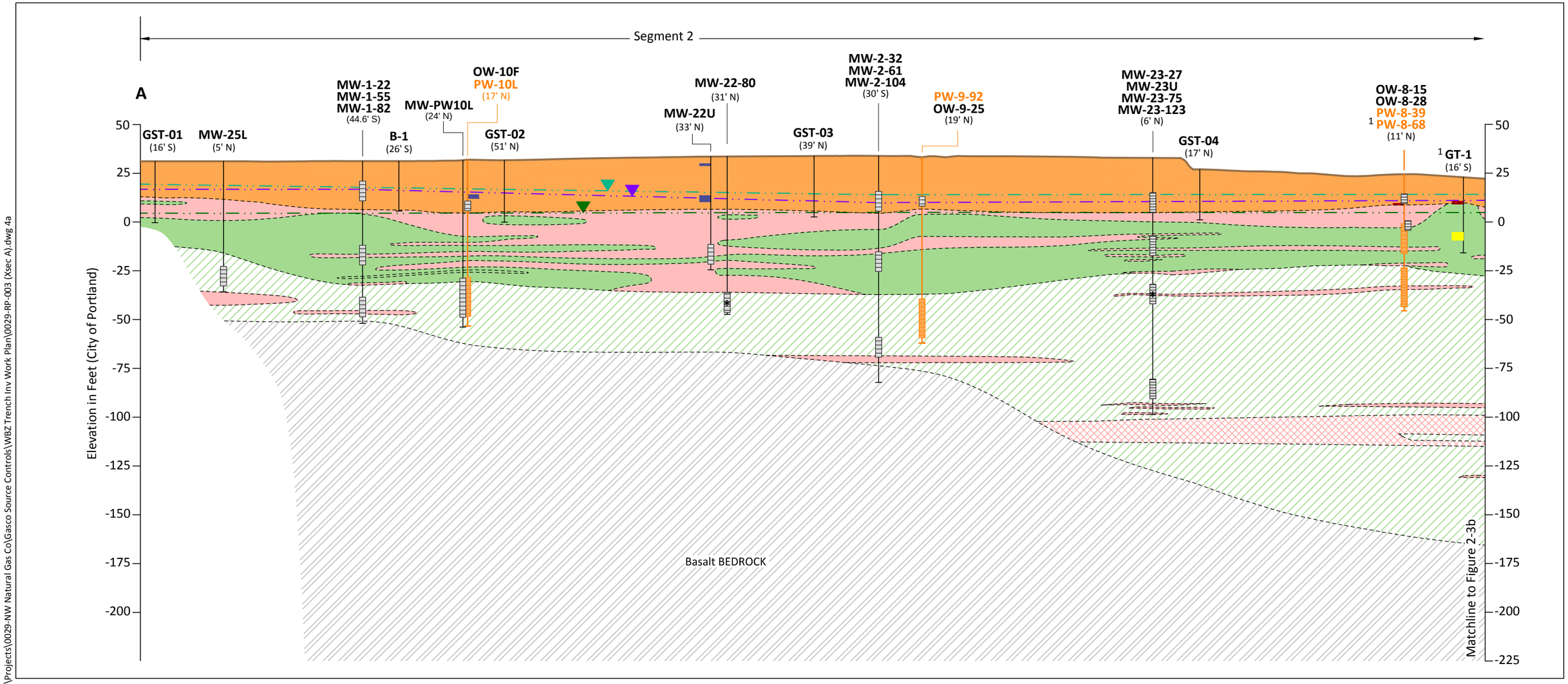
- B-7 — Soil Boring with SPT Data (No Lab Data)
- GST-04 — Geoprobe, Soil Boring, or Sonic Boring with Index Lab Data, (No SPT Data)
- GST-09 — Soil Boring, Sonic Boring, or Geoprobe with Lab Data and SPT Data
- TG-16 — CPT
- SB-1 — U.S. Moorings Remedial Investigation Soil Borings (No SPT or Lab Data)
- MW-40F — Proposed Soil Boring and Monitoring Well
- NW Natural Fill WBZ Trench Alignment
- Area Identified by DEQ as Alternative Trench Alignment
- Property Boundary

0 150
Scale in Feet

T:\CAD\Projects\0029-NW Natural Gas Co\Gasco Source Controls\WBZ Trench Inv Work Plan\0029-RP-004 Geotech.dwg Figure 3
Nov 11, 2013 12:37pm heriksen

ANCHOR QEA

Figure 3
Geotechnical Explorations
Fill WBZ Trench Investigation Work Plan
Gasco/Siltronic



LEGEND:

- **Fill WBZ** - Fill composed of gravel, silt, sand, metal, brick, and concrete debris
- **Upper Alluvium WBZ** - Primarily fine to medium grained SAND and SILTY-SAND interbedded with thin silt and sandy-silt layers
- **Lower Alluvium WBZ** - Primarily medium grained SAND with generally less than 5% fines.
- **Aquitard** - Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Alluvial GRAVEL, sandy gravel, gravelly sand, and gravelly silt
- Basalt BEDROCK
- Potentiometric Surface of Surficial Fill (measured June 3, 2009)
- Potentiometric Surface of Surficial Fill (measured August 5, 2009)
- Potentiometric Surface of Alluvium (measured August 5, 2009)
- Existing Ground Surface

MW-21-16 — Boring ID
(57' E) — Offset Distance in Feet

Existing Extraction Well
Existing Well or Piezometer

- Tar Interval
- Oil or Mixed Oil and Tar Interval
- Sheen Interval
- Well Screen
- * — Control Well

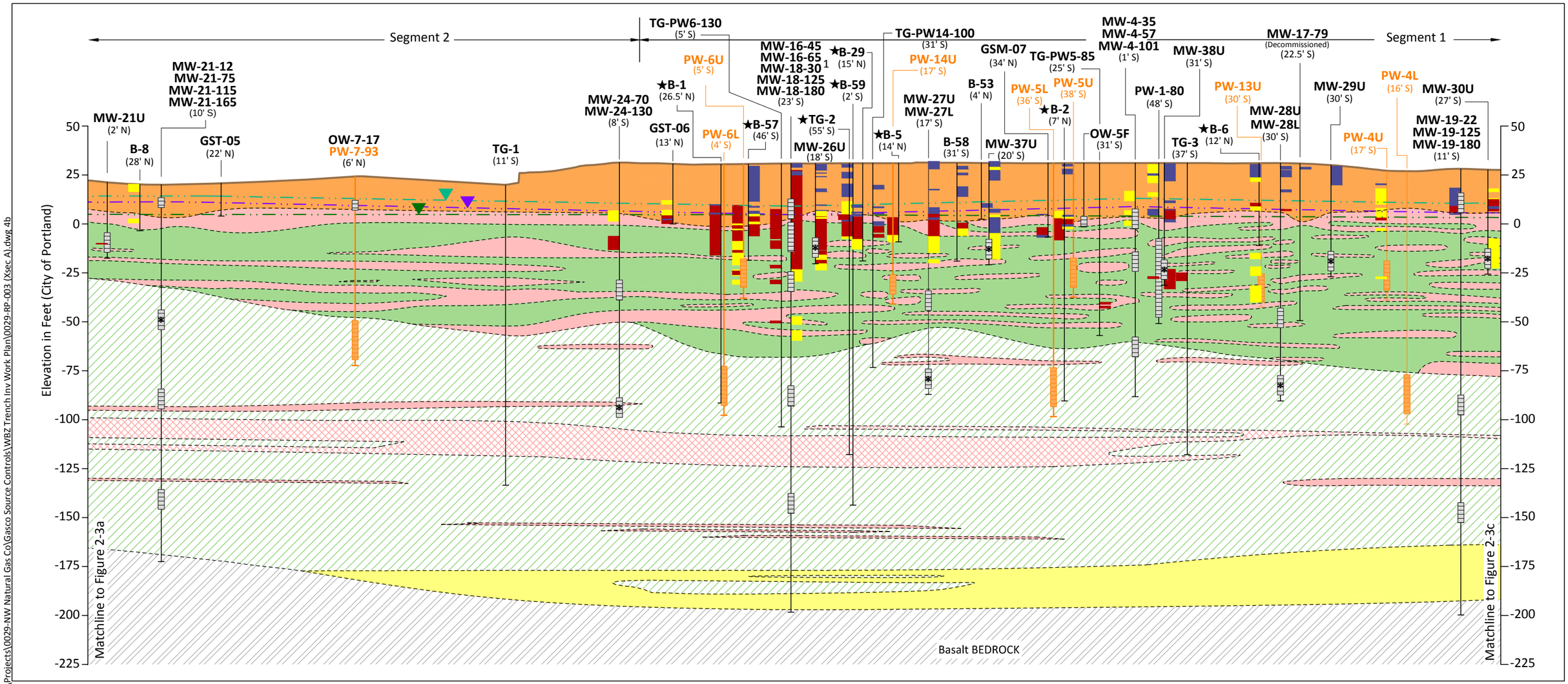
0 50
Scale in Feet

NOTE: Geologic contacts are inferred between borings.
[1] Based on visual observations and analytical testing conducted by Hahn and Associates (Remedial Investigation Report, Hahn and Associates, April 2007), the oil and sheen detected in the fill unit does not appear to be MGP-related, but appears to be associated with petroleum products stored in the FAMM storage tanks.

T:\CAD\Projects\0029-NW Natural Gas Co\Gasco Source Controls\WBZ Trench Inv Work Plan\0029-RP-003 (Xsec A).dwg 4a
Nov 15, 2013 8:40am heriksen

ANCHOR QEA

Figure 4a
Cross Section A-A' (North Segment)
Fill WBZ Trench Investigation Work Plan
Gasco/Siltronic



LEGEND:

- **Fill WBZ** - Fill composed of gravel, silt, sand, metal, brick, and concrete debris
- **Upper Alluvium WBZ** - Primarily fine to medium grained SAND and SILTY-SAND interbedded with thin silt and sandy-silt layers
- **Lower Alluvium WBZ** - Primarily medium grained SAND with generally less than 5% fines.
- **Aquitard** - Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Alluvial GRAVEL, sandy gravel, gravelly sand, and gravelly silt
- Basalt BEDROCK
- Potentiometric Surface of Surficial Fill (measured June 3, 2009)
- Potentiometric Surface of Surficial Fill (measured August 5, 2009)
- Potentiometric Surface of Alluvium (measured August 5, 2009)
- Existing Ground Surface

MW-21-16 — Boring ID
(57' E) — Offset Distance in Feet

Existing Extraction Well
Existing Well or Piezometer

- Tar Interval
- Oil or Mixed Oil and Tar Interval
- Sheen Interval
- Well Screen
- * — Control Well

0 50
Scale in Feet

NOTE: Geologic contacts are inferred between borings.

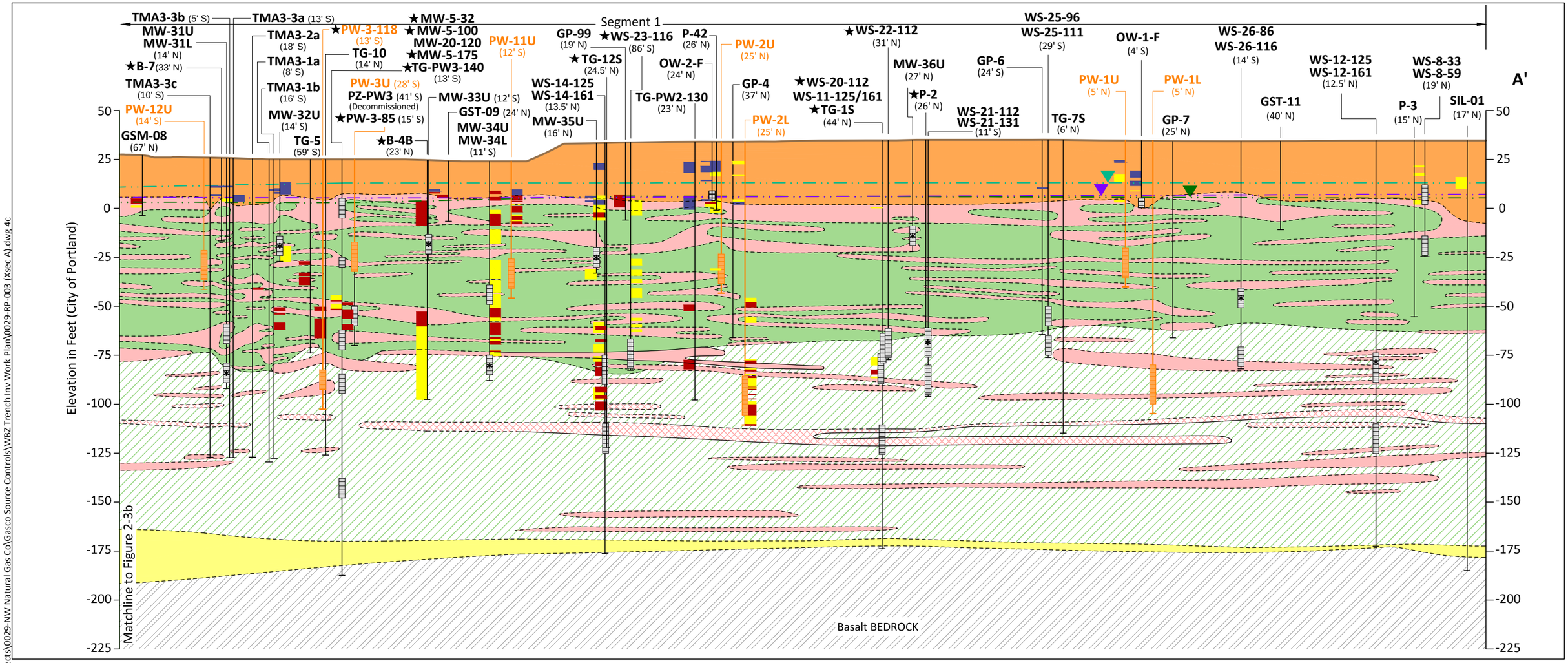
★ Not used for geologic interpretation.

1 Data from MW-18-125 used for geologic interpretation from ground surface to -94 feet elevation. Data from MW-18-180 used for geologic interpretation from -94 to -198 feet elevation.

T:\CAD\Projects\0029-NW Natural Gas Co\Gasco Source Controls\WBZ Trench Inv Work Plan\0029-RP-003 (Xsec A).dwg 4b
Nov 15, 2013 8:40am heriksen

ANCHOR QEA

Figure 4b
Cross Section A-A' (Central Segment)
Fill WBZ Trench Investigation Work Plan
Gasco/Siltronic



LEGEND:

- **Fill WBZ** - Fill composed of gravel, silt, sand, metal, brick, and concrete debris
- **Upper Alluvium WBZ** - Primarily fine to medium grained SAND and SILTY-SAND interbedded with thin silt and sandy-silt layers
- **Lower Alluvium WBZ** - Primarily medium grained SAND with generally less than 5% fines.
- **Aquitard** - Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Alluvial GRAVEL, sandy gravel, gravelly sand, and gravelly silt
- Basalt BEDROCK
- Potentiometric Surface of Surficial Fill (measured June 3, 2009)
- Potentiometric Surface of Surficial Fill (measured August 5, 2009)
- Potentiometric Surface of Alluvium (measured August 5, 2009)
- Existing Ground Surface

MW-21-16 — Boring ID
(57' E) — Offset Distance in Feet

Existing Extraction Well
Existing Well or Piezometer

- Tar Interval
- Oil or Mixed Oil and Tar Interval
- Sheen Interval
- Well Screen
- * — Control Well

0 50
Scale in Feet

NOTE: Geologic contacts are inferred between borings.

★ Not used for geologic interpretation.

T:\CAD\Projects\0029-NW Natural Gas Co\Gasco Source Controls\WBZ Trench Inv Work Plan\0029-RP-003 (Xsec A).dwg 4c
Nov 15, 2013 8:40am heriksen

ANCHOR QEA

Figure 4c
Cross Section A-A' (South Segment)
Fill WBZ Trench Investigation Work Plan
Gasco/Siltronic

APPENDIX A
INTERCEPTOR TRENCH DESIGN REPORT AND DRAWINGS

NW Natural Gas Company

NW Natural and Siltronic
Interceptor Trench Design Report

April 2011

Prepared by

Glynn Geotechnical Engineering

for

Sevenson Environmental Services, Inc.

NW NATURAL GASCO SITE – PORTLAND OREGON April 6, 2011
INTERCEPTOR TRENCH DESIGN REPORT

INTRODUCTION This section of the overall project design report provides the technical and logistical information that pertains to the design of the 1855 feet of interceptor trench that is to be constructed along the eastern boundary of the NW Natural Gasco / Siltronic site in Portland Oregon.

PROJECT DESCRIPTION

Objective The primary objective of the interceptor trench is to collect the groundwater in the upper soil fill layer and prevent the migration of DNAPL from the site to the Willamette River.

PERFORMANCE STANDARDS

System Permeability On an overall basis the in place hydraulic conductivity, or permeability, of the barrier wall is in the range of 1.0 E+0 to +2 cm/sec. or approximately 2 orders of magnitude greater than the soil in which the sewer is to be installed.

Interceptor Depths In general the interceptor will be at a site elevation of 5.0 COP down to 0.0 COP. The invert of the interceptor pipe has been established at a level of about 8 inches into the native soil layer. The trench detail indicates there will be 4 inches of bedding stone below the pipe invert. As a result the invert of the trench will be about 12 inches into the first layer of native soil.

Excavation Limits GGE has performed a fundamental review of the stability of the excavation. Pending the proper use of a trench support scheme, the existing slope to the Willamette River will be stable under the current design. However, the stability of the completed interceptor trench must be reevaluated once the nature and scope of the river cleanup is decided. This is because the river cleanup will likely include dredging of sediments near the toe of the riverbank. Dredging of sediment near the toe of the riverbank would alter the factors considered in a stability analysis of the riverbank.

EXISTING CONDITIONS

Topography The site contours shown on sheets S1 through S3 of the GGE design drawings provide an indication of the variability of grades along the alignment of the proposed interceptor trench. In general the top of the bank along the length of the interceptor varies from approximate elevation +32 COP datum to elevation +22 COP datum. In general, the slope of the river bank in the area of station 0+00 to 15+00 is on the order of 2.25H to 1.0V. From station 15+00 to the end at station 18+55, specifically the Siltronic portion of the alignment of the interceptor trench, the slope of the river bank is approximately 1.75H to 1.0V.

Geotechnical Multiple soil borings were advanced along the top of slope in the region where the interceptor will be installed. These test borings were conducted in accordance with ASTM procedures and included the measuring of resistance to a standard penetration-sampling tool hence providing an indication of the relative density

in terms of the blow counts. Below a thick layer of manmade fill the native soils consist of alternating layers of silt - saturated, loose to medium dense, sand and silty sand. The profile for the interceptor trench was selected on the basis of the interpreted contact between the manmade fill and the initial layer of native SILT and SANDY SILT.

Groundwater The free groundwater surface measured in the test borings along the alignment of the interceptor was found to vary from 5 feet below grade near station 5+50 to 17 feet below grade in the region of station 1+50. This equates to approximately elevation +13 COP datum, which indicates the water level in the fill zone is slightly above the level of the Willamette River.

Chemistry The interceptor will be installed into soils and groundwater that contain hydrocarbon based contaminants, plus cyanide. The nature and composition of the contamination has been studied by others and the information provided to GGE for consideration in the evaluation of the interceptor design. The site DNAPL consists of medium to light hydrocarbons. This information was considered in the selection of the materials presented in the interceptor design.

WALL DESIGN

Excavation The soil and manmade fill along the proposed alignment of the interceptor trench consists of a percentage of debris; wood, concrete, boulders, rip rap and brick. The debris, which extends to an average depth of 30 feet below existing grade, could preclude, or at best seriously hinder, the driving of steel sheet piling. Because of the nature of the material to be excavated, in addition to the consideration of all the existing structures and utilities, the excavation support method considered for the interceptor is a combination of partial open cut, to a limited depth, and a specialized highly viscous fluid, a Bio-Polymer. The specialized fluid product is equivalent to drilling mud and will serve to support the trench walls during excavation and interceptor installation. Upon completion of the pipe and pump well installation the Bio-Polymer will be chemically reduced to water and simple sugars, subsequently activating the interceptor trench. Unlike drilling mud the bio-polymer will not degrade the horizontal permeability of the finished excavation walls. The activities associated with the use and maintenance of the Bio-Polymer requires the service of a full time site inspector that can monitor and direct the process.

Sheet Sections Based on the need to limit the potential for river water to flow into the interceptor trench, a line of non-structural PVC sheeting will be installed along the outboard face of the trench. This light weight sheeting wall will be tapped – lightly pressed - into the underlying native soil layer to create a barrier to the intrusion of river water into the system.

Piping and Pump Risers All piping; including the 8 inch diameter perforated interceptor, clean outs, force mains and pump risers; is specified as high density polyethylene – HDPE. These components of the design have been selected on the basis of the depth of installation, backfill materials and the fluids to be collected.

Backfill Once the pipe, manholes and other facilities are installed the trench will be filled to within 12 inches of the existing grade with poorly graded small diameter gravel or crushed stone product. This material has a demonstrated permeability of approximately 1.0E+0 cm/sec, approximately 2 orders of magnitude greater than the fill materials into which the interceptor will be installed. The “pea stone” sized material will be protected from intrusion of fill material with a geotextile having the properties suited to the installation.

Clay Barriers In order to separate the ground waters of the Siltronics site from the remainder of the interceptor sewer a clay barrier has been positioned in the interceptor trench just north of the Siltronics property line. The barrier is to be constructed of soil having properties that will provide an impermeable shield along the excavation alignment. The specialized soil must have a demonstrated installed permeability of not greater than 1.0E-007 cm/sec.

In addition to the clay barrier to be installed in the interceptor trench, a pair of clay barriers shall be installed around the Siltronic stormwater outfall sewer to preclude the entrance of excess water from upstream and downstream of the interceptor. In all cases the barrier is to be socketed into the surrounding soils a distance of not less than 4 feet.

Alignment In general the interceptor trench will be located along the top of the riverbank, set back from the top of slope a distance adequate to permit safe and efficient installation. The exact location of the barrier wall will accommodate existing site conditions, location of existing wells and the known underground facilities; however certain existing facilities will require temporary interruption and/or maintenance during construction. Detailed work around and maintenance plans must be prepared in anticipation of the actual construction. It will be the contractor’s responsibility to investigate, locate and protect all existing facilities whether above or below ground.

INSTALLATION AND SCHEDULE

Equipment A CAT 325 excavator (or similar) will be used to excavate the overburden material. A pump and mixer will be used to install and control the excavation support fluid. Triaxle trucks will haul the soil off site for disposal. Similarly, trucks will be used to transport the fill materials to the site and a loader will be used to place the materials as shown on the design drawings. A team of medium sized cranes will be used to install the piping, pump risers and PVC sheeting.

Sequencing Installation of the interceptor will begin at the lowest points of the excavation, at the location of the pump risers and proceed to move upslope, installing the materials as the excavation proceeds. In as much as there are three (3) pump risers, there will be 3 points of beginning and ending.

Production Rates and Schedules The planned workweek will be Monday through Saturday at 12 hours per day. The complete works will take on the order of 40 to 60 days depending on the difficulties encountered with the excavation and utility work around practices required.

REFERENCES

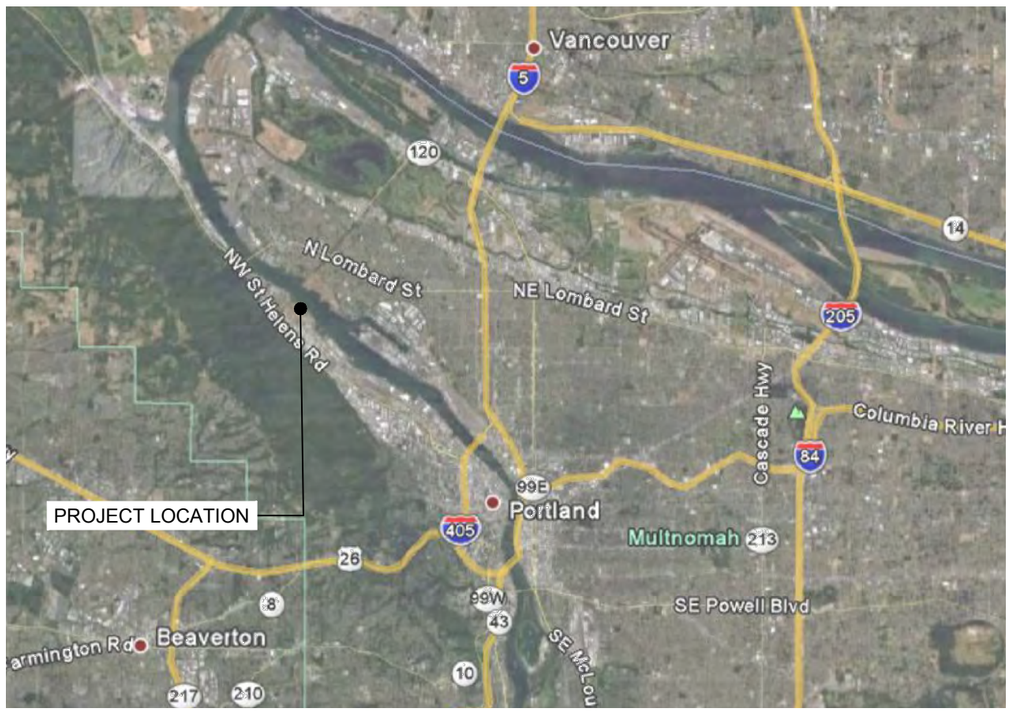
a. GGE design drawings S1 through S10, dated 4-6-11, rev 0.
b. Soil Profile developed from Geologic Cross Section A-A', figures 2-3a through 2-3c by Anchor QEA
c. Contour mapping from Figure 1 Site Plan NW Natural – Gasco Site, by Anchor Environmental, LLC

NW NATURAL, GASCO FACILITY
INTERCEPTOR TRENCH DRAWINGS

at 7900 NW ST. HELENS ROAD
PORTLAND, OREGON
APRIL 6, 2011
ISSUED FOR REVIEW - NOT FOR CONSTRUCTION

DRAWING LIST

S0 - COVER SHEET
S1 - SITE PLAN - STA. 0+00 to 5+50
S2 - SITE PLAN - STA. 5+50 to 12+50
S3 - SITE PLAN - STA. 12+50 to 19+00
S4 - MAIN TREATMENT & PRE-TREATMENT FACILITY
S5 - DETAIL SHEET
S6 - DETAIL SHEET
S7 - DETAIL SHEET
S8 - EXISTING 24" STORM SEWER OUTFALL TO RIVER
S9 - SPECIFICATIONS
S10 - SPECIFICATIONS



VICINITY MAP
NOT TO SCALE:

LOCATION MAP
NOT TO SCALE:

CLIENT

Sevenson Environmental Services, Inc.
2749 LOCKPORT ROAD
NIAGARA FALLS, NEW YORK
14305

ENGINEER

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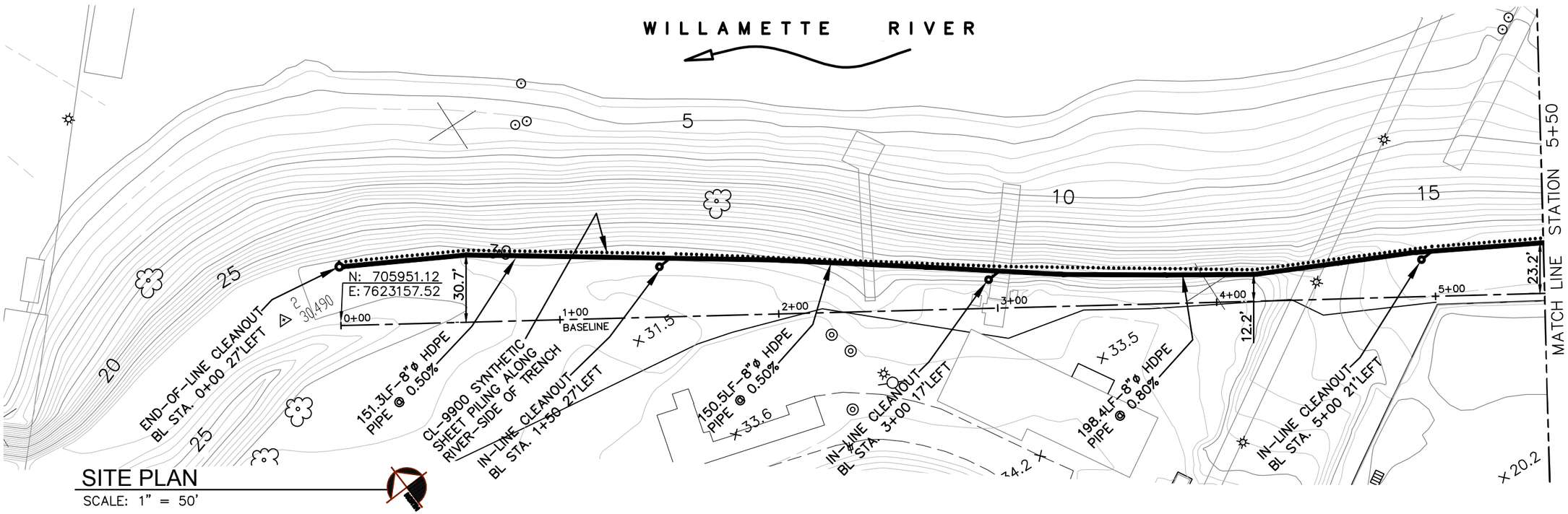
TS JONES CONSULTING

TS JONES CONSULTING
250 DICKSON POINT ROAD
PLATTSBURGH, NEW YORK 12901

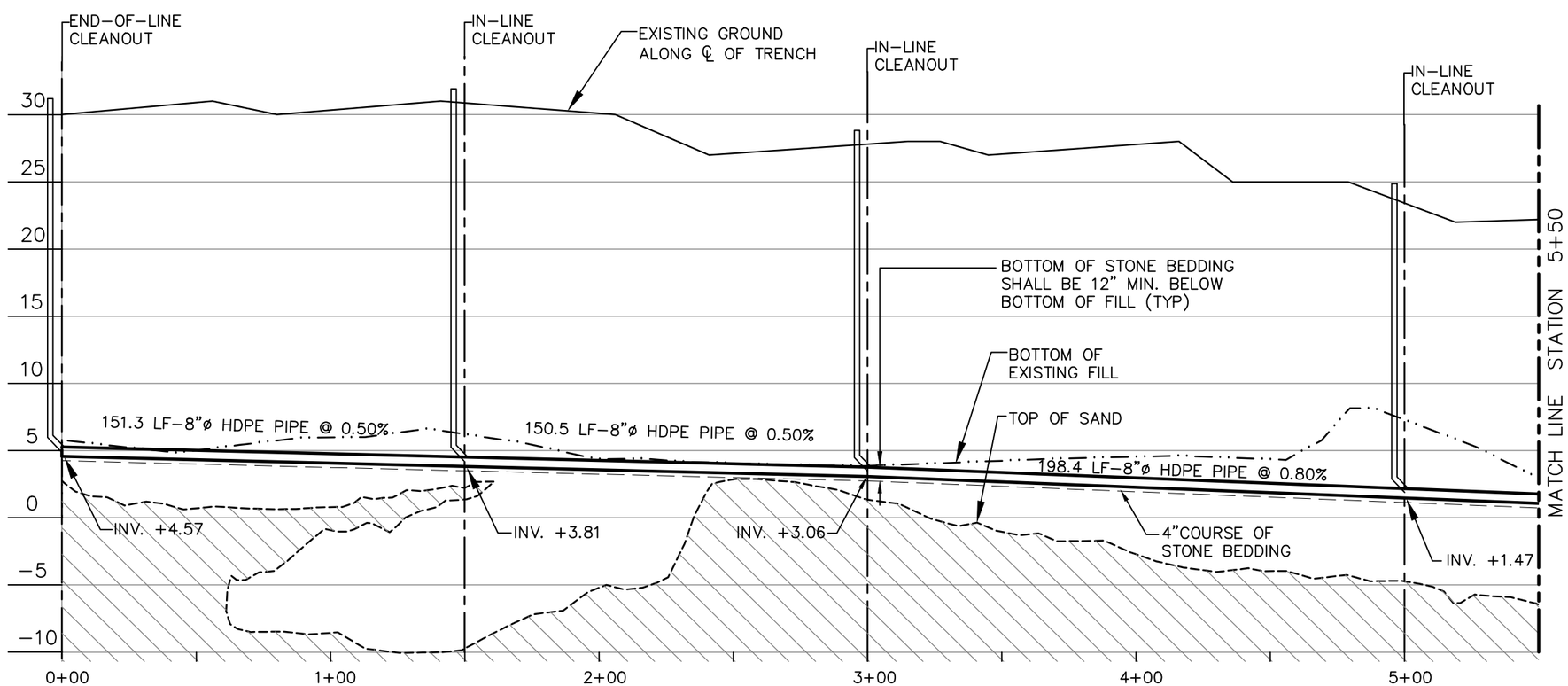
MARK W. GLYNN, PE.

ITEM:	DATE:	REVISION:
1	4.6.11	ISSUED FOR REVIEW - NOT FOR CONSTRUCTION



SITE PLAN

SCALE: 1" = 50'



NOTE:
IMPORTANT TO MAINTAIN SLOPE OF 8" PIPING (TYP)

PROFILE ALONG ALIGNMENT

SCALE: 1" = 50' (HORIZ.)
1"= 10' (VERTICAL)

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ISSUED FOR REVIEW

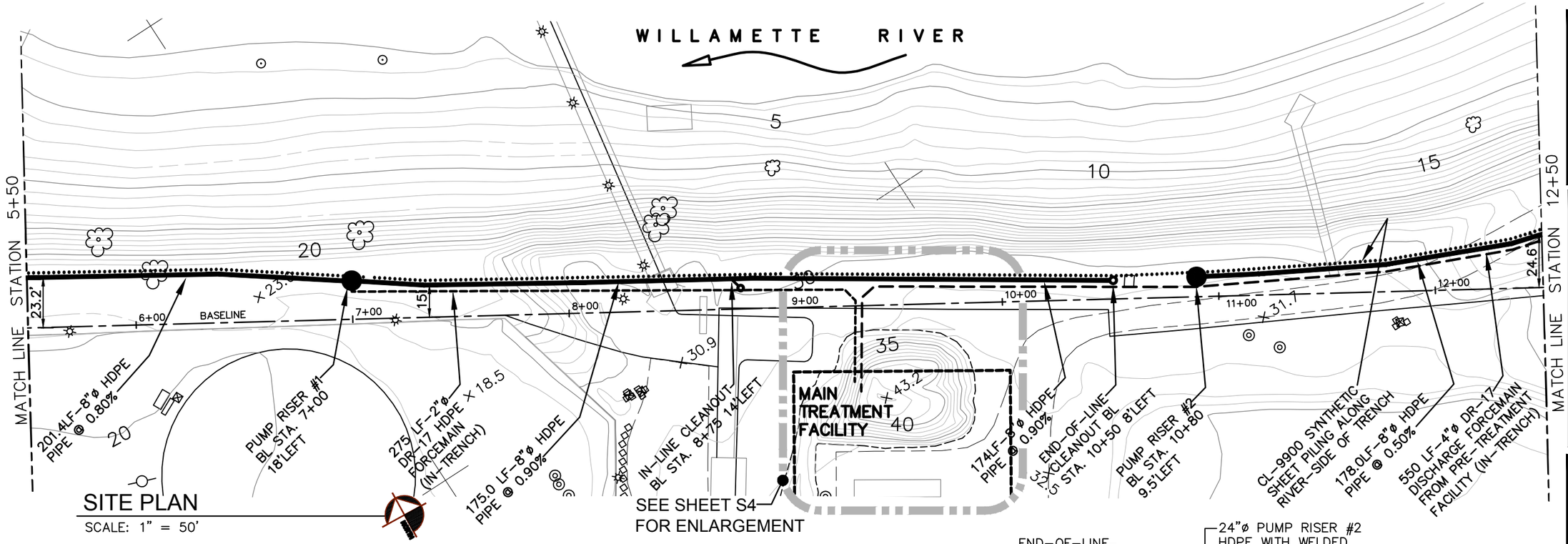
NOT FOR CONSTRUCTION

GGE PROJ. # 05-1043D
FILE NAME: SITE PLAN
DATE: REV.0 4.6.11
DRAWN BY: EMP
CHECKED BY: MWG

CLIENT: SEVENSON ENVIR. SERVICES
PROJECT: GASCO SITE - INTERCEPTOR TRENCH

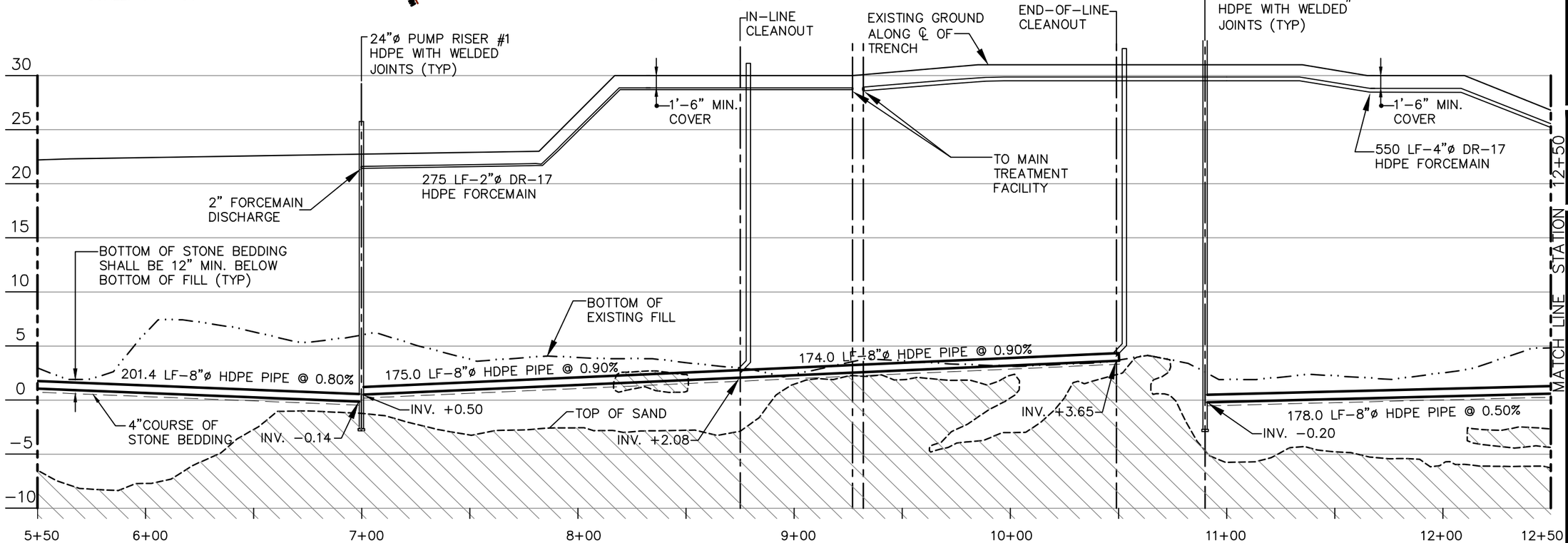
TITLE: SITE PLAN STA. 0+00 to 5+50

DWG : S1



SITE PLAN

SCALE: 1" = 50'



PROFILE ALONG ALIGNMENT

SCALE: 1" = 50' (HORIZ.)
1"= 10' (VERTICAL)

NOTE:
IMPORTANT TO MAINTAIN SLOPE OF 8" PIPING (TYP)

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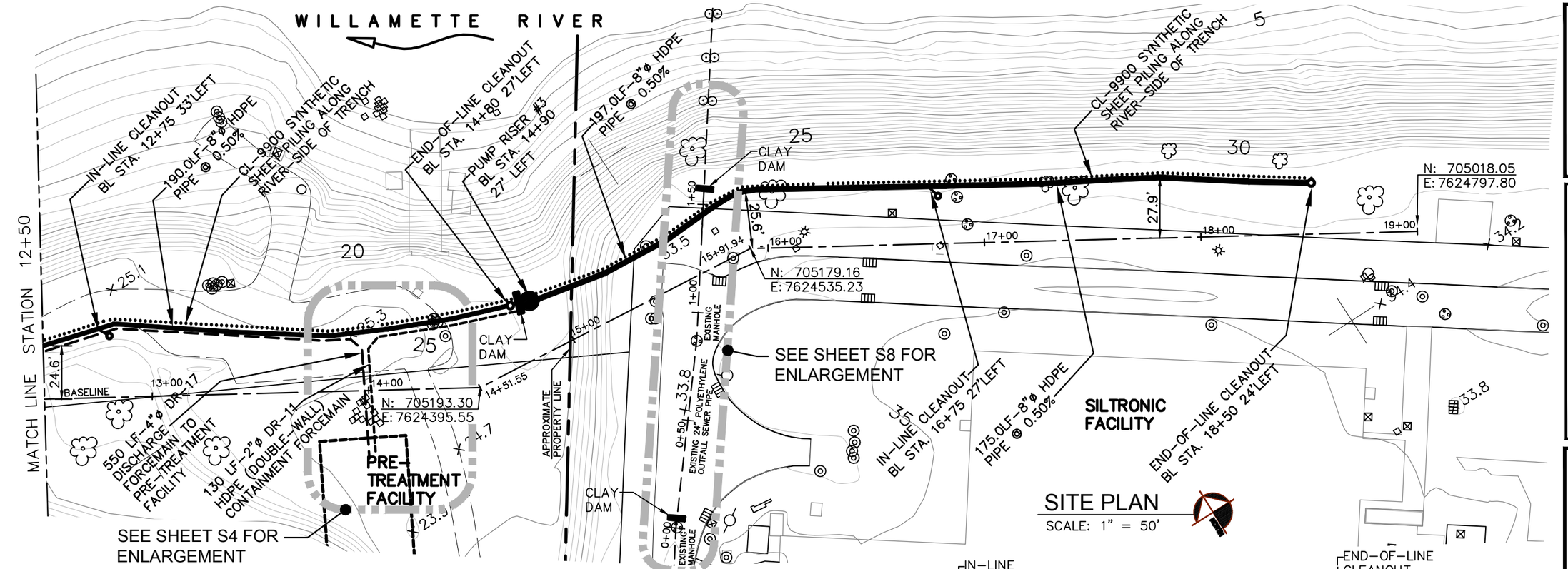
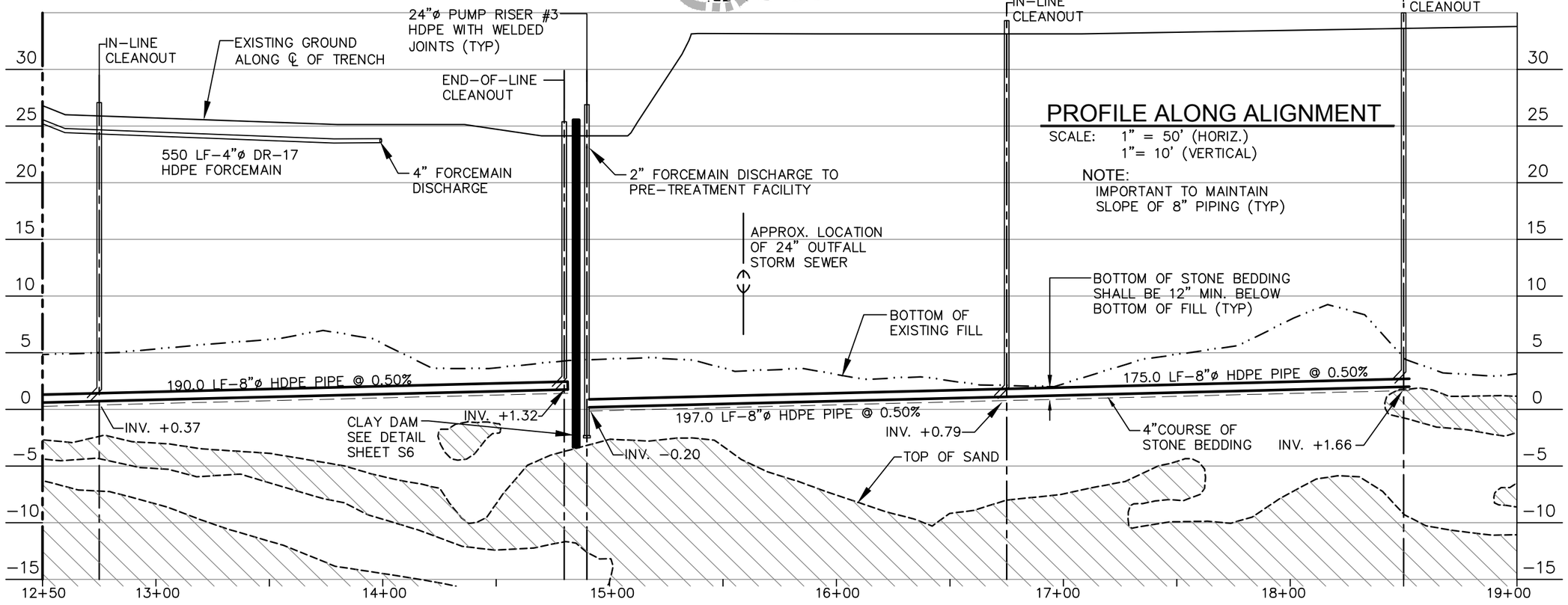
GGE PROJ. # 05-1043D
FILE NAME: SITE PLAN
DATE: REV.0 4.6.11
DRAWN BY: EMP
CHECKED BY: MWG

CLIENT: SEVENSON ENVIR. SERVICES
PROJECT: GASCO SITE - INTERCEPTOR TRENCH

TITLE: SITE PLAN STA. 5+50 to 12+50

DWG : S2





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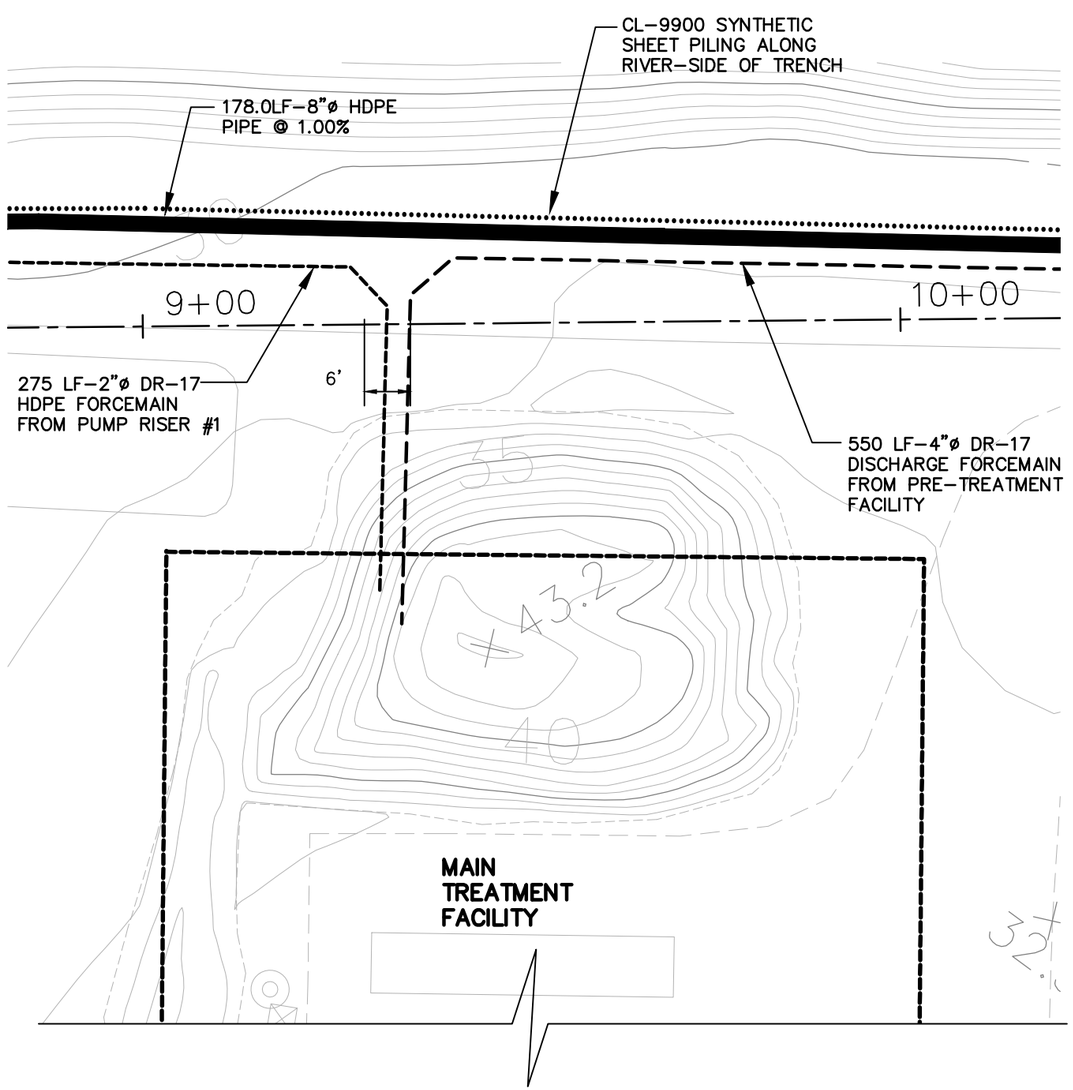
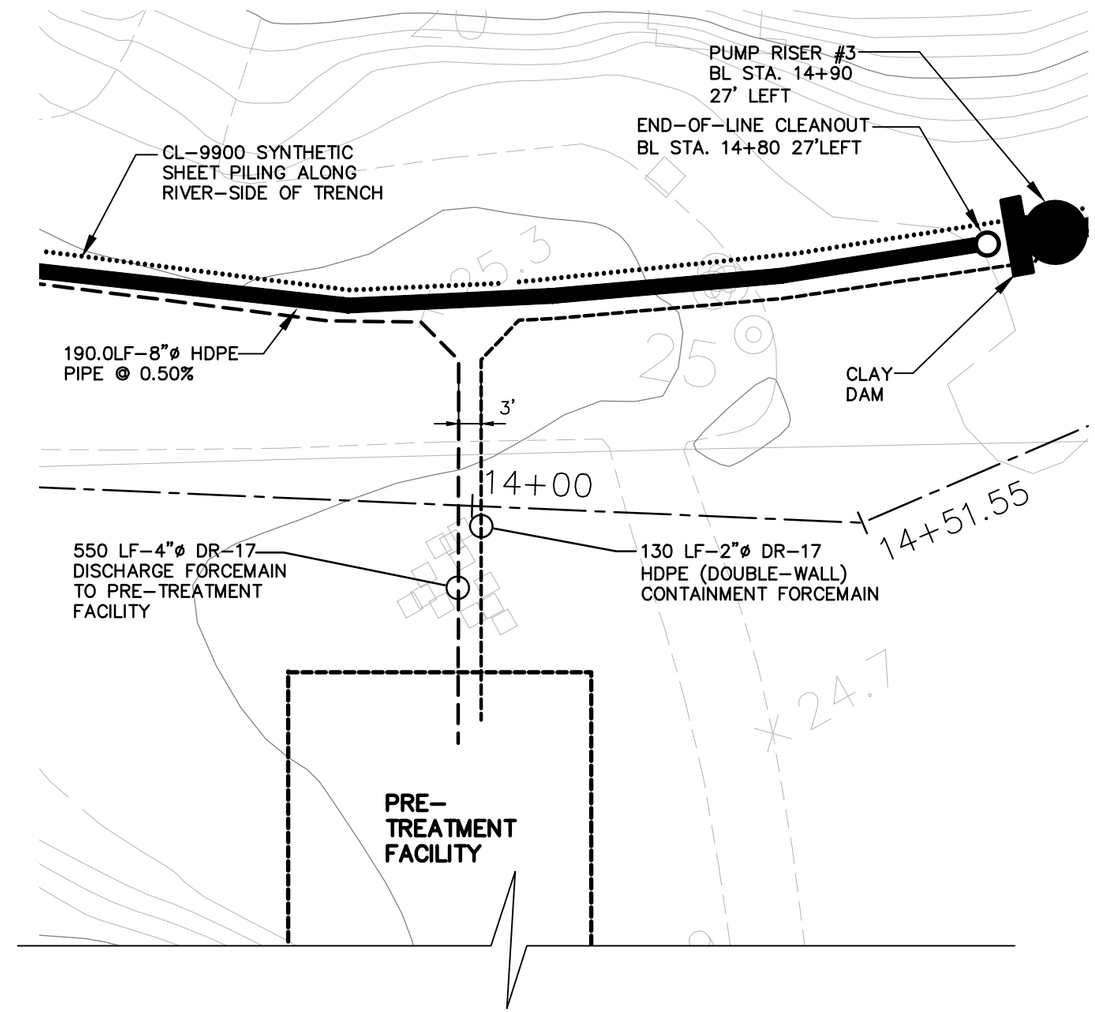
PROJECT: GASCO SITE - INTERCEPTOR TRENCH

TITLE: SITE PLAN STA. 12+50 to 19+00

DWG : S3





SCHEMATIC SITE PLANS

SCALE: 1" = 20'

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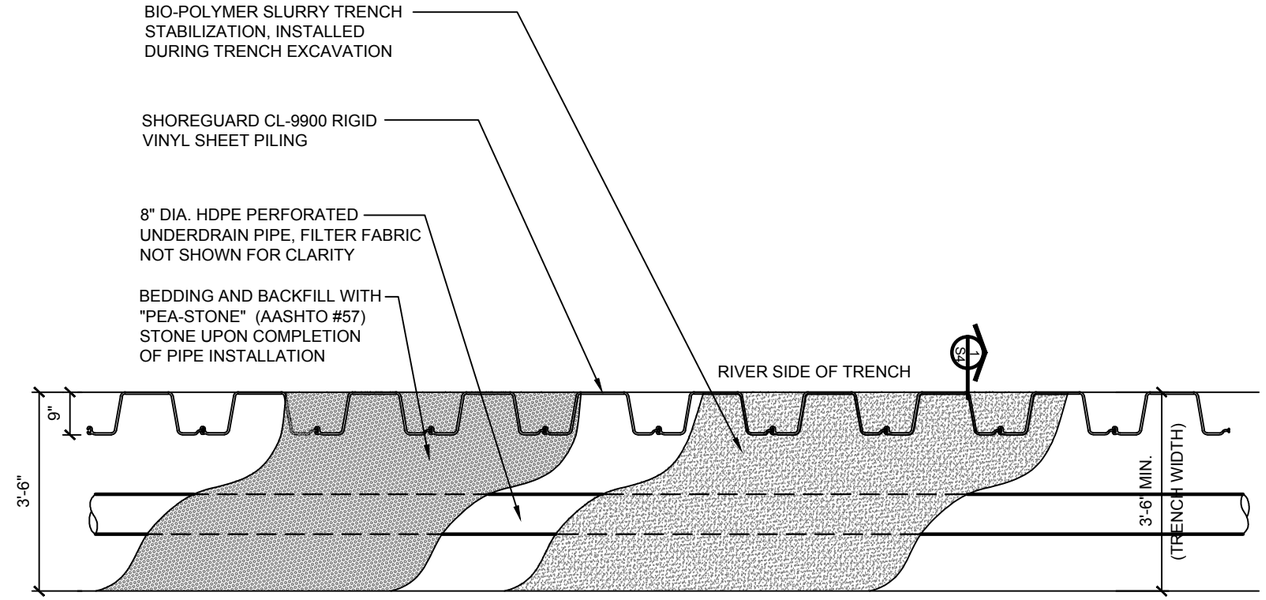
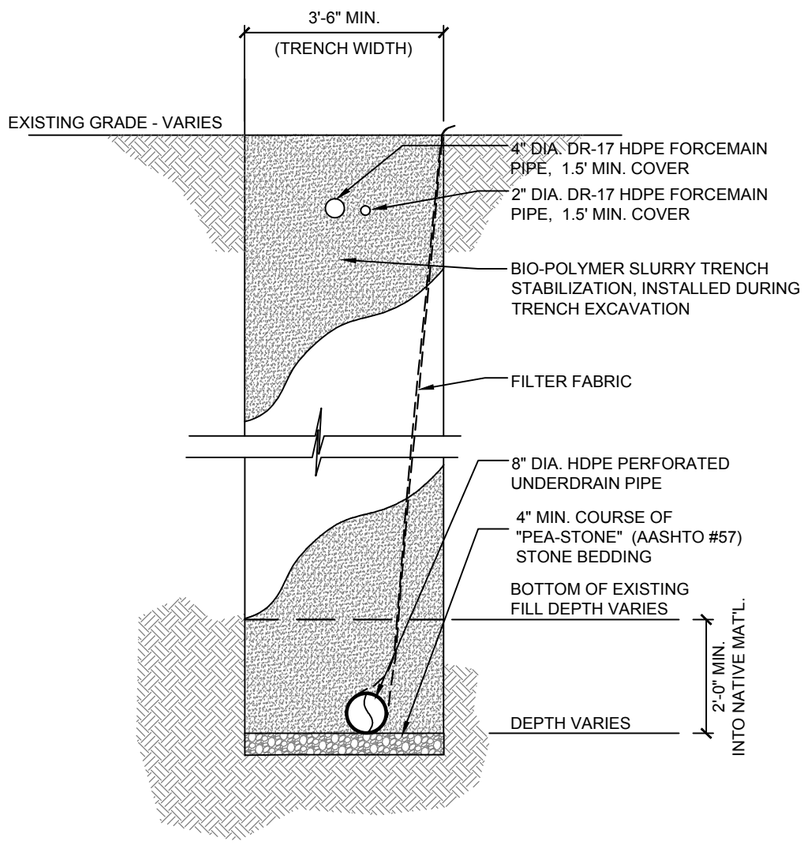
PROJECT: GASCO SITE - INTERCEPTOR TRENCH

TITLE: MAIN TREATMENT FACILITY & PRE-TREATMENT FACILITY

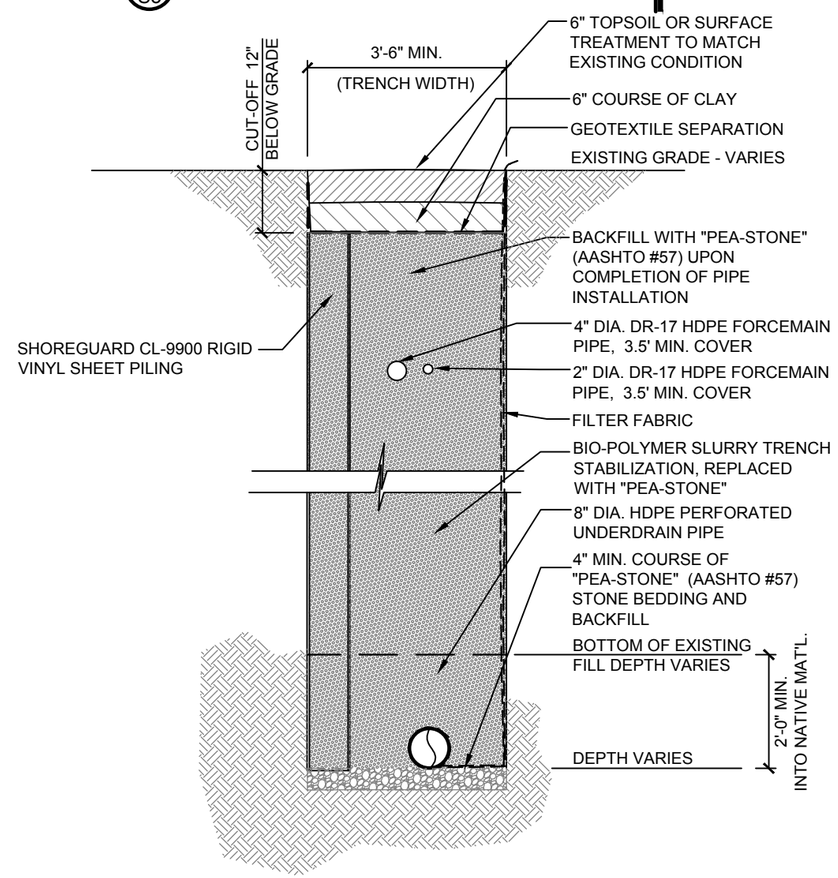
DWG : S4



A S5 PLAN VIEW: TYP. TRENCH
SCALE: 3/8" = 1'-0"



1 S5 EXCAVATION TRENCH DETAIL
SCALE: 3/8" = 1'-0"



2 S5 BACKFILLED TRENCH DETAIL
SCALE: 3/8" = 1'-0"

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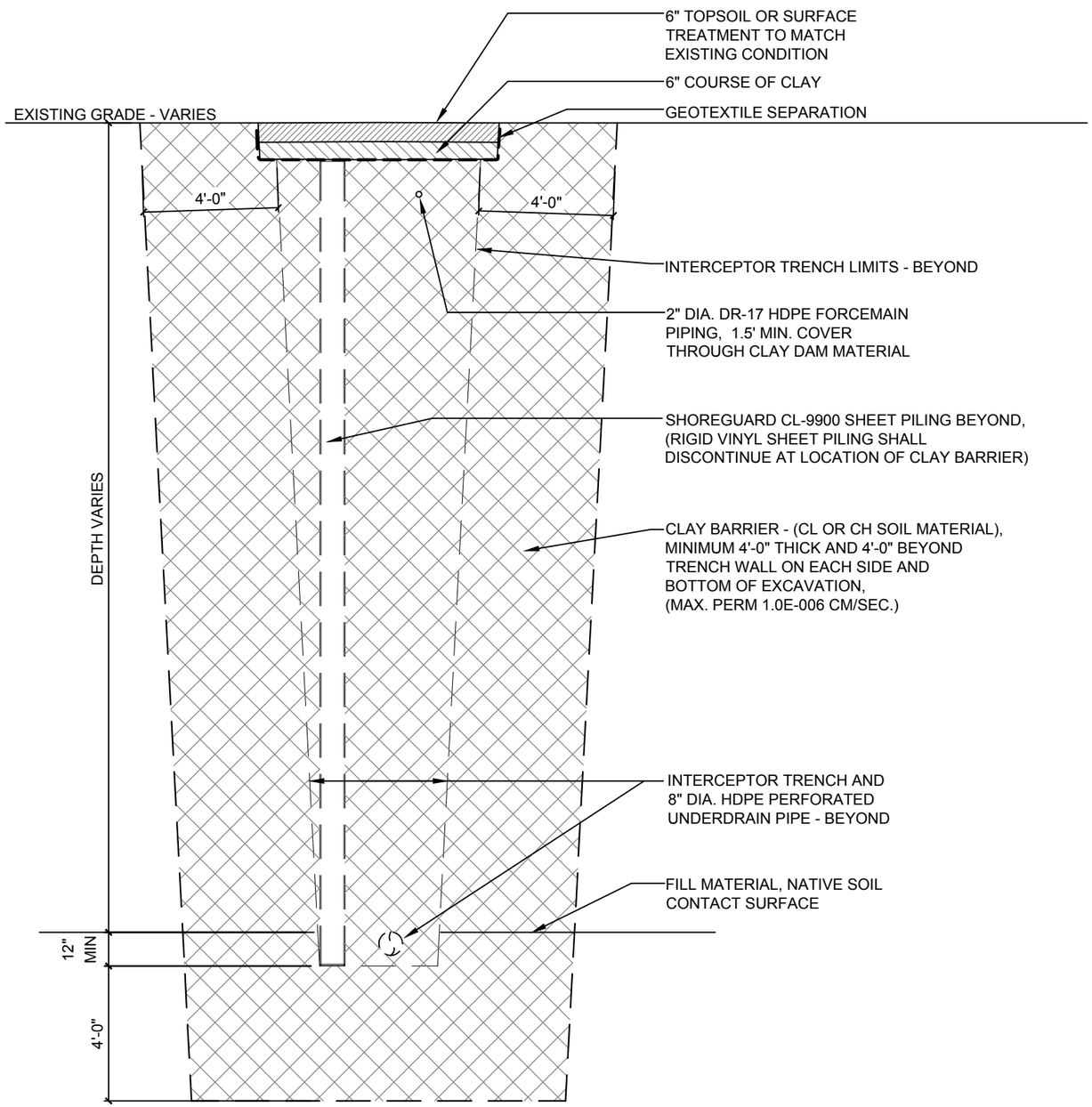
PROJECT: GASCO SITE - INTERCEPTOR TRENCH

TITLE: DETAIL SHEET

DWG : S5



S6 CLAY CUT-OFF WALL DETAIL (SEE SHEET S3)
SCALE: 1/4" = 1'-0"

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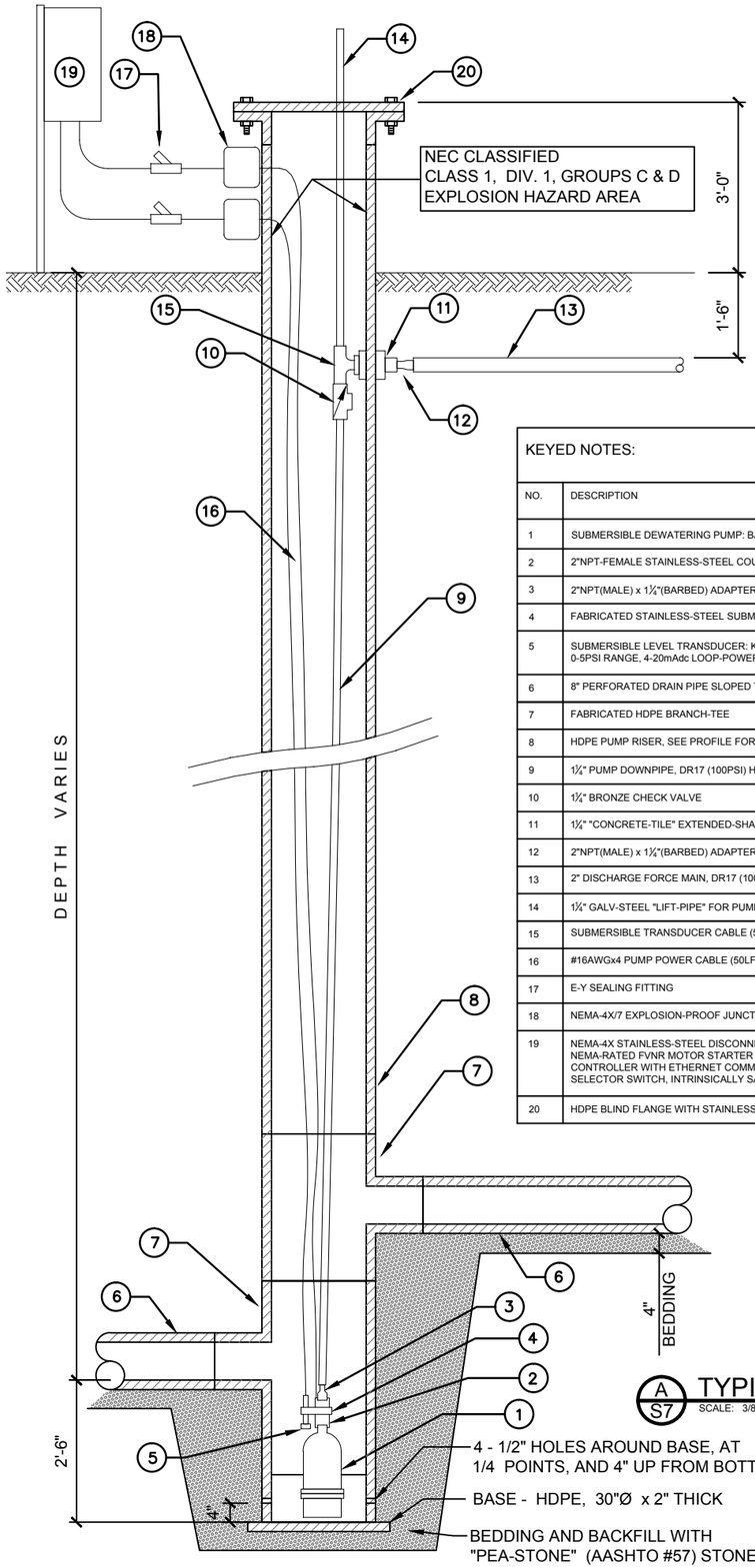
TITLE: DETAIL SHEET

DWG : S6

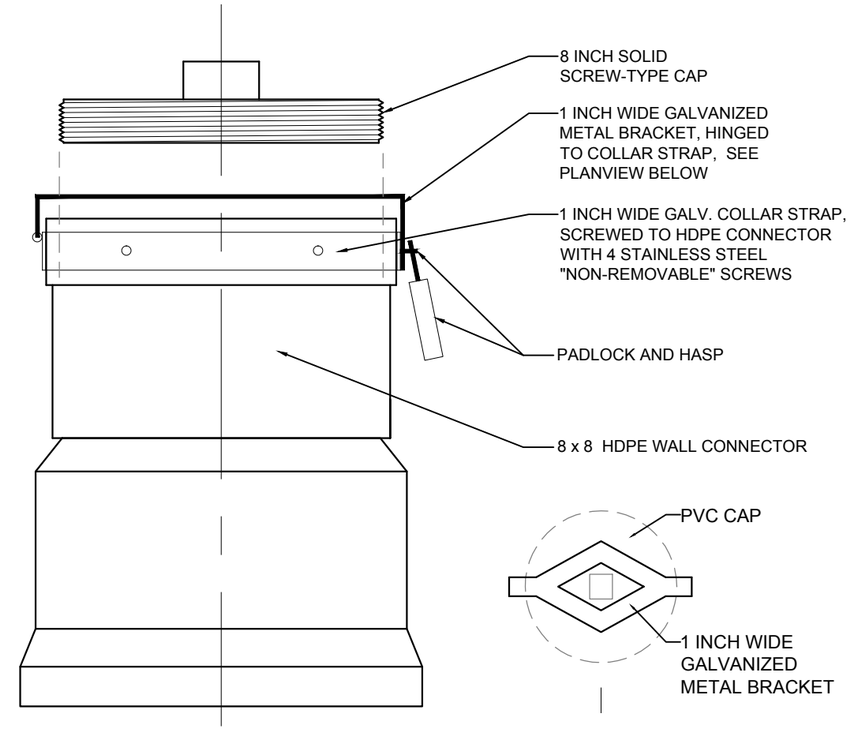


A S7 TYPICAL PUMP RISER - 24" DIAMETER
SCALE: 3/8" = 1'-0"

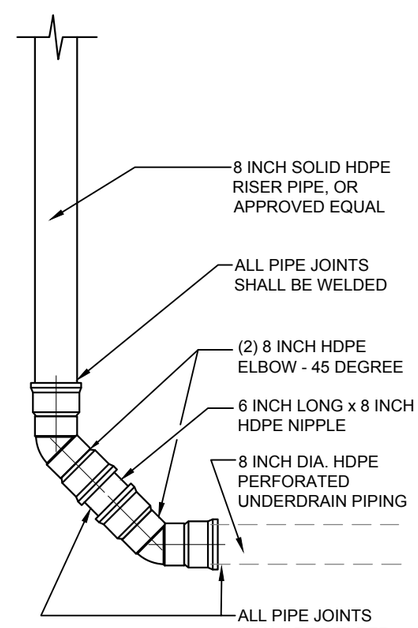
KEYED NOTES:

NO.	DESCRIPTION
1	SUBMERSIBLE DEWATERING PUMP: BJM MODEL RX15SS, 316 STAINLESS-STEEL, 25GPM@60'TDH, 2HP, 480V, 3PH, 3.0 FLA, 23 LRA
2	2"NPT-FEMALE STAINLESS-STEEL COUPLING
3	2"NPT(MALE) x 1¼"(BARBED) ADAPTER WITH DOUBLE STAINLESS-STEEL HEAVY-DUTY HOSE CLAMPS
4	FABRICATED STAINLESS-STEEL SUBMERSIBLE TRANSDUCER BRACKET
5	SUBMERSIBLE LEVEL TRANSDUCER: KPSI SERIES 700 316 STAINLESS-STEEL WITH INTEGRAL SURGE/LIGHTNING PROTECTION, 0-5PSI RANGE, 4-20mAdc LOOP-POWERED, 50' FACTORY INSTALLED CABLE AND INTRINSICALLY SAFE ISOLATION BARRIER
6	8" PERFORATED DRAIN PIPE SLOPED TO SUMP (SEE PROFILE)
7	FABRICATED HDPE BRANCH-TEE
8	HDPE PUMP RISER, SEE PROFILE FOR DIAMETER (12" MIN) AND DR CLASS
9	1¼" PUMP DOWNPIPE, DR17 (100PSI) HDPE
10	1¼" BRONZE CHECK VALVE
11	1¼" "CONCRETE-TILE" EXTENDED-SHAFT PITLESS ADAPTER
12	2"NPT(MALE) x 1¼"(BARBED) ADAPTER WITH DOUBLE STAINLESS-STEEL HEAVY-DUTY HOSE CLAMPS
13	2" DISCHARGE FORCE MAIN, DR17 (100PSI) HDPE (DOUBLE-WALL CONTAINMENT STYLE FOR SILTRONIC)
14	1¼" GALV-STEEL "LIFT-PIPE" FOR PUMP AND DOWNPIPE REMOVAL
15	SUBMERSIBLE TRANSDUCER CABLE (50LF)
16	#16AWGx4 PUMP POWER CABLE (50LF)
17	E-Y SEALING FITTING
18	NEMA-4X/7 EXPLOSION-PROOF JUNCTION BOX WITH TERMINAL BLOCK
19	NEMA-4X STAINLESS-STEEL DISCONNECT-STYLE PUMP CONTROL PANEL, MAIN CIRCUIT-BREAKER WITH NEMA-4X FLANGE OPERATOR, NEMA-RATED FVNR MOTOR STARTER WITH MANUAL RESET OVERLOADS, ALLEN-BRADLEY MICROLOGIX PROGRAMMABLE LOGIC CONTROLLER WITH ETHERNET COMMUNICATION, FIBER/ETHERNET CONVERTER, PRECISION DIGITAL LEVEL INDICATOR, H/O/A SELECTOR SWITCH, INTRINSICALLY SAFE BARRIERS, CONTROL RELAYS, TERMINAL BLOCKS, ETC. AS REQUIRED
20	HDPE BLIND FLANGE WITH STAINLESS-STEEL NUTS & BOLTS

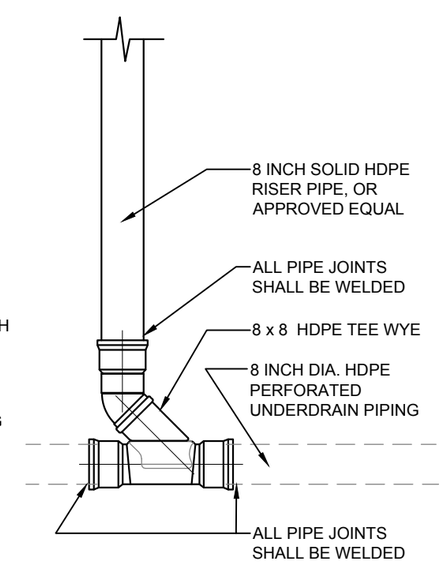
METAL BRACKET



D S7 LOCK-ABLE CAP FOR CLEANOUTS
SCALE: 3" = 1'-0"



B S7 END-OF-LINE CLEANOUT
SCALE: 3/8" = 1'-0"



C S7 IN-LINE CLEANOUT
SCALE: 3/8" = 1'-0"

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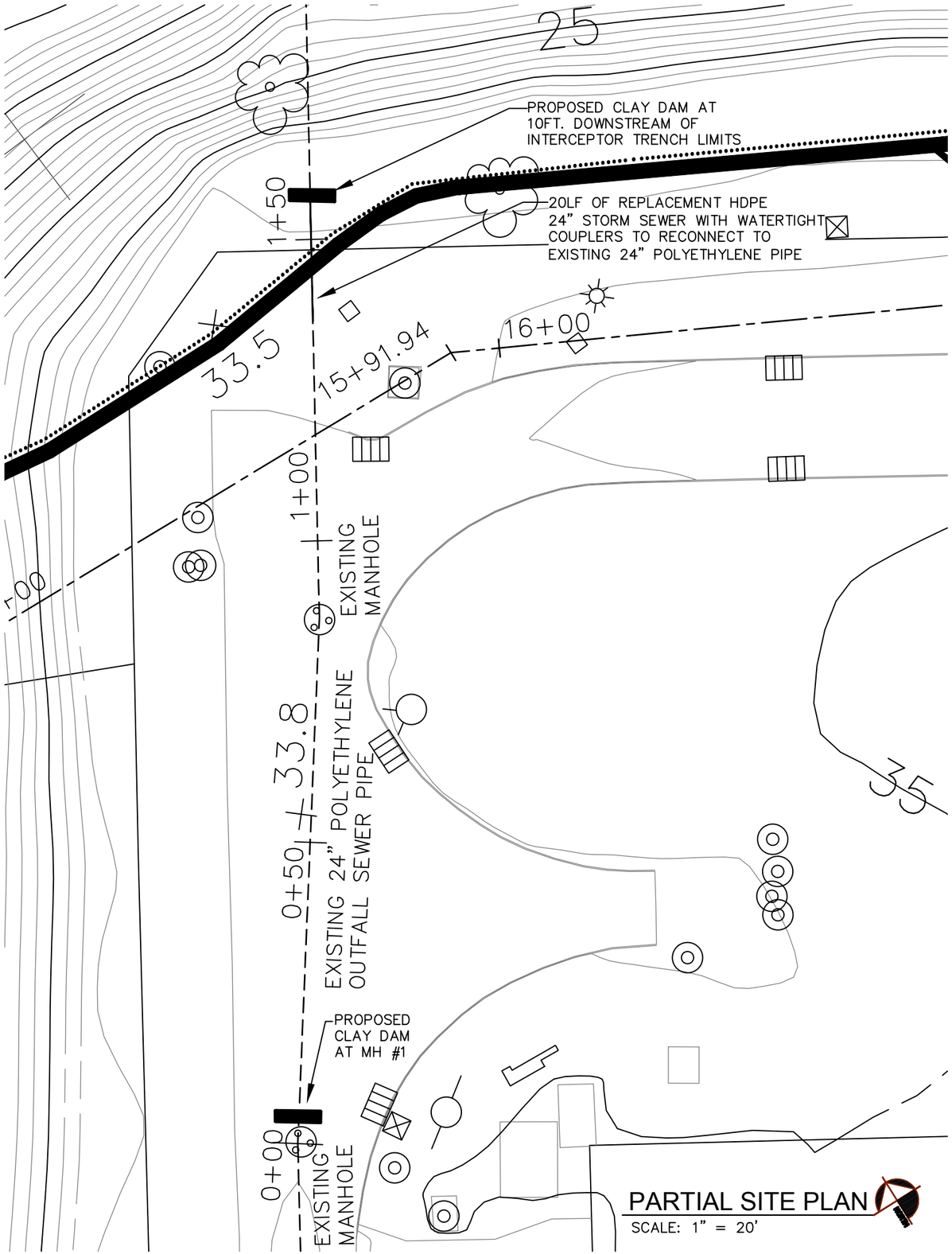
PROJECT: GASCO SITE - INTERCEPTOR TRENCH

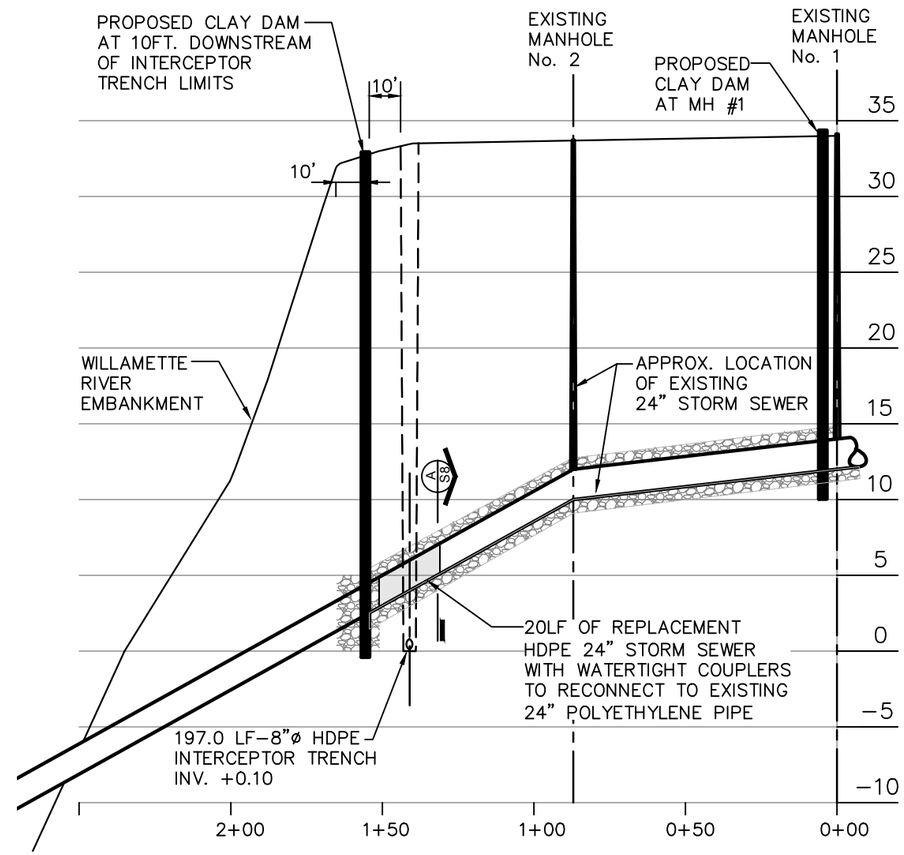
TITLE: DETAIL SHEET

DWG : S7



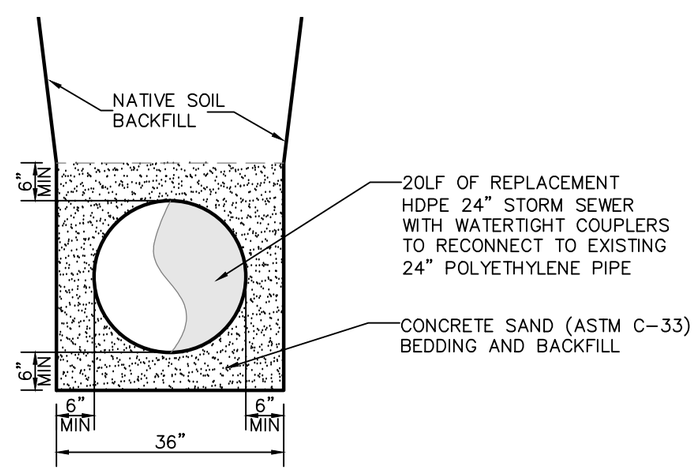
PARTIAL SITE PLAN

SCALE: 1" = 20'



PROFILE ALONG 24" STORM SEWER ALIGNMENT

SCALE: 1" = 50' (HORIZ.)
1"= 10' (VERTICAL)



REPLACEMENT OUTFALL 24" STORM SEWER DETAIL

A S8 SCALE: 1/2" = 1'-0"

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PROJECT: GASCO SITE - INTERCEPTOR TRENCH

TITLE: EXISTING 24" STORM SEWER OUTFALL TO RIVER

DWG : S8

DIVISION 1 GENERAL REQUIREMENTS

SECTION 01010 - SUMMARY OF THE WORK

PART I - GENERAL

A. Furnish all labor, materials, equipment and incidentals necessary to construct the interceptor sewer, as shown on these drawings(S1 thru S10). Specifically, the work includes, but is not limited to following:

1. Establishing and maintaining line and grade control.
2. Preconstruction survey of all existing above and below grade facilities.
3. Protection and/or removal - replacement of existing works along interceptor alignment.
4. Temporary excavation support with Bio-Polymer or an approved equivalent fliud.
5. Furnish and install all materials and equipment.
6. Commissioning and testing of interceptor and equipment.
7. Disposal of excess excavated material, as mandated by regulatory authority.
8. Preparation of record drawings.

B. The interceptor trench and appurtenances are designed to be fully operational and functional when installed. It is solely the contractors responsibility to determine the construction procedures, equipment and sequences; and ensure the completed functionality of the system resulting from construction.

SECTION 01040 - COORDINATION

PART I - GENERAL

A. Drawing Revisions: It shall be the Contractor's responsibility to verify that construction proceeds in accordance with the latest revision of design drawings.

B. Coordination Drawings: Prepare field coordination drawings where work by separate entities requires off-site fabrication of products and materials which must accurately interface. Coordination drawings shall indicate how work shown by separate shop drawings will interface, and shall indicate sequence for installation.

SECTION 01060 - REGULATORY REQUIREMENTS

PART 1 - GENERAL

A. Working from lines and levels established by the contract documents, establish and maintain bench marks and other dependable markers. Establish bench marks and markers to set lines and levels for work at each level of construction and elsewhere as needed to properly locate each element of the project. Calculate and measure required dimensions as shown within recognized tolerances. Drawings shall not be scaled to determine dimensions.

B. Record and maintain a set of construction drawings on site to document details of construction that differ from the design. Also, contractor shall perform detailed survey to document the location of existing structures and new and existing utilities.

C. Construction shall conform to the latest edition of the Oregon State Building Code requirements.

D. Intentionally left Blank.

E. Where specifically indicated, the Geotechnical Engineer, the Owners Testing Agency or the special inspector, shall verify adequacy of all subgrades, fills and backfills before placement of fills, footings, piers, slabs, or other construction dependent upon them.

F. Coordinate all work with the contract drawings, site development drawings, electrical drawings, architectural drawings, and the latest manufacturer's drawings. Notify Glynn Geotechnical Engineering (referred to as the Engineer) in writing of conflicts prior to construction. Resolution by Engineer will be given in writing.

G. Contractor is responsible for means, methods, procedures and safety associated with performance of the work.

H. Contractor shall verify all dimensions on the job. Verification of existing dimensions and conditions shall be done prior to preparation of shop drawings.

I. Intentionally left Blank.

J. Typical details apply to all drawings and shall be used except where otherwise shown or noted.

K. All work shall be performed in accordance with local practice in a workman like manner.

L. Provide attachment and connection devices and methods for securing the work. Secure work true to line and level, and within recognized industry tolerances.

SECTION 01400 - QUALITY CONTROL

PART 1 - SUMMARY OF WORK

A. Testing and inspection shall conform to the latest edition of the Oregon State Building Code.

B. Special inspection if required shall be identified by the local building officials or code enforcment office.

C. Intentionally left Blank.

D. Manufacturer's Instructions: Where installations include manufactured products, comply with the manufacturers applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the contract documents.

E. Conflicting Requirements: Where compliance with two or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the contract documents specifically indicate otherwise. Refer to Engineer for a written decision regarding requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent, before proceeding.

F. All building materials shall be new products. All building materials shall be installed per manufacturer's specifications, for the intended use. Any questions regarding installation, strength, factor of safety, maintenance, or similar concern shall be brought to the engineers attention in writing. Resolution will be documented by engineer in writing.

G. Inspection and Tests: Required inspection and testing services are intended to assist in the determination of probable compliance of the work with requirements specified or indicated. These required services do not relieve the Contractor of responsibility for compliance with these requirements or for compliance with requirements of the contract documents. Inspections, tests and related actions specified in this section are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the contract documents.

H. Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related work with the requirements of the contract documents, retests are the responsibility of the Contractor, regardless of whether or not the original test was the Contractor's responsibility. Retesting the work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original work.

I. Responsibility for Associated Services: The Contractor is required to cooperate with the independent agencies performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:

1. Providing access to the work.
2. Taking samples or assistance with taking samples.
3. Delivery of samples to test laboratories.
4. Security and protection of samples and test equipment at the project site.

J. Coordination: The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the work. In addition, Contractor and each independent testing agency shall coordinate their work so as to avoid the necessity of removing or replacing work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

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PROJECT: GASCO SITE - INTERCEPTOR TRENCH

TITLE: SPECIFICATIONS AND NOTES

DWG : S9

DIVISION 2 SITEWORK

SECTION 02200 - EARTHWORK

PART I - GENERAL

1.01 SUMMARY OF WORK

A. Extent of earthwork is indicated on drawings and includes, but is not limited to the following:

1. Site clearing.
2. Excavation and trench stability using specialized fluid (Bio-Polymer).
3. Disposal of excess soil.
4. Maintenance of existing buildings, utilities and other structures.
5. Gravel backfill.
6. Interceptor underdrain pipe, clean out piping and pump riser.
7. PVC sheeting.
8. Clay barriers.
9. Removal, replacement as shown, and full time bypass pumping of all existing outfall sewers, including but not limited to the "Siltronic" storm sewer outfall.
10. Locate, establish and monitor settlement markers on all structures within 50 feet of the interceptor trench alignment.

B. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

1.02 SUBMITTALS

A. Submit the following to Engineer:

1. Procedure for full time bypass pumping of outfall sewers.
2. Plan of settlement markers and details of monitoring program.
3. Product information for excavation support fluid, including detailed procedures for installation, maintenance and monitoring of qualities.
4. Experience records and qualifications of inspectors for excavation support plan.
5. Grain size report on granular backfill and concrete sand.
6. Shop drawings for all piping, cleanouts, and pump risers.
7. Material specification sheet for filter fabric, HDPE, and PVC sheeting.
8. Laboratory test data for clay barrier soil.

PART 2 - PRODUCTS

2.01 PRODUCT INFORMATION

A. Definitions:

1. Concrete Sand - ASTM C-33.
2. Barrier Clay - Unified classification CL, CH or other soil material with maximum permeability of 1.0E-007 cm/sec.
3. Piping - High density polyethlene (HDPE).
4. Sheet piling - "Shoreline" CL-9900 PVC.
5. Filter Fabric - non woven polypropelene identified as separation / filtration fabric by the Geosynthetics Fabric Assoc.
6. Stone bedding and backfill - Clean "pea-stone" size stone, natural or crushed, meeting gradations of AASHTO No. 57.
7. Topsoil - natural organic soil having a minimum 4% organic content.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavation is Unclassified, and includes excavation to line and grade, regardless of character of materials.

B. Locate all existing below grade utilities. Provide utilities with positive protection against damage due to all construction activities and potential future settlement.

C. Excavation shall proceed through soil fill to native soil barrier layer. If encountered soil conditions are not as shown on the design drawings, contact Engineer for further action.

D. Shore, brace or otherwise support excavation to permit installation of interceptor system. Provide additional or specialized support system where required due to existing structures or overhead facilities.

E. Provide sediment and erosion control practices as mandated by the regulatory agencies.

F. Establish requirements for excavation safety to comply with OSHA, local codes and authorities having jurisdiction and neighboring infrastructure.

G. Install facilities as shown on design drawings. Connections shall be capable of resisting stress / force of installation handling. Locate components in general arrangement as on design drawings.

I. Place bedding and backfill stone in a loose condition and consolidate by means of flooding with water. Discontinue flooding when consolidation has been established based on visual clues.

J. Overlap filter fabric a minimum of 24" and join by sewing or tying.

3.02 QUALITY CONTROL

A. Provide manufacturers data sheets for all materials incorporated into the project.

B. Provide daily QA / QC reports of construction activities.

C. Provide final record drawings of installation.

D. Flush all cleanouts and televise all collection piping to demonstrate integity of completed system.

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PROJECT: GASCO SITE - INTERCEPTOR TRENCH

TITLE: SPECIFICATIONS AND NOTES

DWG : S10

APPENDIX B
EXISTING GEOTECHNICAL BORING LOGS

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

SOIL BORING NUMBER B-1

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	3" OD Split Spoon/4" OD Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	13:55	15:35
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	9/21/95	9/21/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	30.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips	B1-01	13:45	5.6	13					SM	Silty SAND with some Gravel - brown, dry (surface sample)
	-02 Dup	13:50	Dup	56			1			
					50/5"	90	2		GP	Sandy GRAVEL - brown, dry, very dense
							3			
							4			
	B1-03	14:05	8.2	-	21	100				
					10	10	**5**		ML	Sandy SILT - brown to yellow, moist, very stiff, slightly plastic, no hydrocarbon odor, no sheen
					14	0				
							6			
					9	100	7			Sandy SILT - brown to yellow, moist, stiff, slightly plastic, slight hydrocarbon odor, no sheen
	B1-04	14:10		-	6	100				
			4.7		5	60	8			
							9			Concrete encountered at 8.5 to 10 feet bgs.
								9/21/95		
							10			
					2	100			SM	Silty SAND with Gravel - wet, medium dense, very strong hydrocarbon odor, sheen, hard black material (lampblack?) from 11 to 11.5 feet bgs
	B1-05	14:30		1,280	27	100	11			
			44.6		38	50				
					2	100	12			
	B1-06	14:35		-	6	100				Silty GRAVEL - olive gray, wet, dense, strong hydrocarbon odor, no sheen
			26.5		28	100	13			
							14		GM	
					16	0				
					22	0	**15**			
					25	0				
							16			
					4	100	17			
	B1-07	14:50	16.8	-	40	60				SAND - black, wet, medium dense, poorly graded, strong hydrocarbon odor, no sheen, appears to be saturated with oily substance
					4	0	18		SP	
							19			
					6	100				
	B1-08	14:57	22.3	-	6	100	20			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-1

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	3" OD Split Spoon/4" OD Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	13:55	15:35
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	9/21/95	9/21/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	30.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips					6	40				
							21		SP	SAND - black, wet, dense, strong hydrocarbon odor, wood fragments present at sand-silt boundary
	B1-09	15:20		21						
			24.6				22			Continuous core barrel sampling device used to collect soil samples from 20.5 to 24.5 feet bgs
							23		ML	
	B1-10	15:30	20.6	-			24			SILT with some Sand - olive gray, wet, slightly plastic, mild petroleum hydrocarbon odor, no sheen
							25			
							26			Installed a 2-inch diameter 0.010-inch slotted stainless steel well screen at 20 to 23 feet bgs. Purged twelve gallons of water using a peristaltic pump prior to groundwater sampling. GROUNDWATER SAMPLE (2708-950921-BW1-01) collected at 17:30 hrs, 9/21/95. Well point was removed prior to abandonment.
							27			
							28			
							29			Drilled to 25 feet bgs Sampled to 24.5 feet bgs
							30			
							31			* Sample Number Prefix is 2708-950921-
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-3

HAI LOGGER:	Rob Ede	DRILL START Time: 10:30 Date: 9/21/95	DRILL FINISH Time: 12:30 Date: 9/21/95
SAMPLING METHOD:	Split Spoon		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger		
EQUIPMENT TYPE	B-59 Mobile Drill		
DRILLER:	Brad James		
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	34.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips	B3-01	10:30		-					GP	Sandy GRAVEL - dry, road fill (surface sample)
			2.4				1			
							2		SP	
					10	100				
	B3-02	10:35		-	12	100	3			SAND with some Gravel - brown, moist, medium dense, poorly graded, fine to medium grained, no hydrocarbon odor, no sheen
			7.0		17	100				
							4			
					9	100	**5**			
	B3-03	10:40	7.4	-	10	70				SAND with some Gravel - brown, moist, medium dense, poorly graded, slight hydrocarbon odor, no sheen
					17	0	6			
							7		SP	
					10	100				
	B3-04	10:45		-	18	100	8			SAND - brown with gray mottling, moist, medium dense, slight hydrocarbon odor, no sheen
					18	0				
							9			
					12	100	10			
					21	100				SAND - brown, moist, medium dense, fine grained black sand at lower 4 inches of sample, black material has hydrocarbon odor and is hydrophobic (lampblack)
	B3-05	11:00	8.3	49	34	60	11			
							12		SP	
	B3-06	11:10	4.0	-	44	60				SAND - brown, moist, dense, large piece of wood stained black stuck in end of spoon - sands directly surrounding wood are coated black, slight hydrocarbon odor, no sheen
					27	0	13			
					34	0				
							14			
					13	100	**15**			
	B3-07	11:20		ND	16	100				SAND - brown, dry, medium dense, poorly graded, no hydrocarbon odor, no sheen
			8.0		13	100	16			
							17		SP	
					4	100				
	B3-08	11:30		-	9	100	18	9/21/95		SAND - green to gray, moist to wet, stiff, poorly graded, moderate hydrocarbon odor, no sheen
			5.3		9	100				
							19			
					14	100	20			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-3

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Split Spoon		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	10:30	12:30
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/21/95	9/21/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	34.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips	B3-09	11:40		-	17	100			SP	SAND - green to gray, wet, medium dense, poorly graded, strong hydrocarbon odor, no sheen
			2.0		17	50	21			
							22			
					3	100				SAND - green to gray, wet, medium dense, poorly graded, strong hydrocarbon odor, no sheen, Clayey SILT in bottom 6 inches of core
	B3-10	12:00		-	12	100	23			
			22.0		14	100				
							24			
					4	100	**25**		ML	Clayey SILT, green to gray, wet, loose, plastic, strong hydrocarbon odor, no sheen
	B3-11	12:05		-	6	100				
			29.1		10	100	26			
							27			
					4	100			SP	SAND - green to gray, wet, stiff, poorly graded, fine grained, slight hydrocarbon odor, no sheen
	B3-12	12:24		-	5	100	28			
			4.5		5	100				
							29			
							30			
										Drilled to 28.5 feet bgs Sampled to 28.5 feet bgs
							31			
							32			* Sample Number Prefix is 2708-950921-
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-6

HAI LOGGER:	Rob Ede	DRILL START Time: 11:15	DRILL FINISH Time: 12:35
SAMPLING METHOD:	3"OD Split Spoon/4" OD Core Barrel		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger		
EQUIPMENT TYPE	B-59 Mobile Drill		
DRILLER:	Brad James	Date: 9/27/95	Date: 9/27/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	34.7 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	Recovery (%) or Sample Interval	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Concrete							1		GP	GRAVEL - old pavement at surface
3/4" Bentonite Chips							2		SP	SAND - brown, slightly moist, medium dense, poorly graded, fine to medium grained, no hydrocarbon odor, no sheen, (2.5-3 feet bgs)
					15	100	3			
	B6-01	11:20		-	30	100				Sandy GRAVEL - black, dense, pieces of lampblack (hydrophobic in water), no hydrocarbon odor, no sheen, (3-4 feet bgs)
			4.8		24	50	4			
							5		GP	
					9	10				
					4	0	6			Sandy GRAVEL - gray, moist, loose, no hydrocarbon odor, no sheen
					2	0				
							7			
					13	100	8		SP	SAND with Gravel and Brick - black, moist, medium dense, grains stuck together by tarry substance, strong hydrocarbon odor, strong sheen
	B6-02	11:30	38.5	12,487	12	50				
					10	0	9			
							10			
					7	10				Large Rock in end of sampler - blue matrix, concoidal fracture, specimen retained
					11	0	11			
					13	0				
							12		SP	
					5	50	13			Weathered Brick in end of tube - moist, stiff, no hydrocarbon odor, no sheen
					5	0				
					5	0	14			
							15			
					6	100				SAND - brown, slightly moist, loose, fine to medium grained, gravels from 16-16.5 feet bgs, no hydrocarbon odor, no sheen
	B6-03	12:00		87	16	100	16			
			8.0		9	80				
							17		SP	
							18			
	B6-04	12:10		-				9/27/95		SAND - as above, no gravel
			7.2				19			
							20			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
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(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-6

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	3"OD Split Spoon/4" OD Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	11:15	12:35
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	9/27/95	9/27/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	34.7 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	Recovery (%) or Sample Interval	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							21		SP	
	B6-05	12:20		-			22			SAND - green to gray, wet, poorly graded, fine to medium graded, no hydrocarbon odor, no sheen
			9.4							
							23		ML	Sandy SILT - green to gray, stiff, slightly plastic, slight organic odor (anaerobic degradation), no sheen, sand content decreasing with depth
	B6-06	12:25		-						
			8.3				24			
							25			
							26			
	B6-07	12:30		-						
			9.2				27			Sandy SILT - green to gray, wet, slightly plastic, no hydrocarbon odor, no sheen
							28		ML	
	B6-08	12:35		-			29			
			9.8				30			
							31			Drilled to 30 feet bgs Sampled to 29.5 feet bgs
							32			* Sample Number Prefix is 2708-950927-
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

HAHN & ASSOCIATES, INC.	SOIL BORING NUMBER	B-7		
434 NW Sixth Avenue				
Portland, Oregon				
(503) 796-0717	HAI LOGGER:	Rob Ede	DRILL	DRILL
PROJECT:	SAMPLING METHOD:	3" OD Split Spoon/4"OD Core Barrel	START	FINISH
Northwest Natural Gas Co.	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Gasco Facility	EQUIPMENT TYPE	B-59 Mobile Drill	13:30	14:30
Portland, Oregon	DRILLER:	Brad James	Date:	Date:
PROJECT #: 2708	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/27/95	9/27/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT(blows/6 in) or Core Interval	RECOVERY (%) or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Concrete									Concrete	
							1			
							2		SP	
					4	100	3			
	B7-01	13:35		-	6	100				SAND - brown, slightly moist, loose, poorly graded, fine to medium grained, no hydrocarbon odor, no sheen
			3.9		5	100	4			
							5			
					5	100				
	B7-02	13:45		-	5	100	6			SAND - as above
			5.0		5	100				
							7			
							8		SP	
	B7-03	13:50								SAND - as above, some pebbles, moist, no hydrocarbon odor, slight sheen
			4.6				9			
							10			
							11			
							12			
	B7-04	13:55		-						SAND - as above, moist, no hydrocarbon odor, slight sheen
			6.0				13			
							14			
							15			
							16			
							17		SP	
	B7-05	14:02		ND						SAND - as above, moist, no hydrocarbon odor, no sheen
			7.7				18			
							19			
							20			

3/4" Bentonite Chips

HAHN & ASSOCIATES, INC.	SOIL BORING NUMBER	B-7		
434 NW Sixth Avenue				
Portland, Oregon				
(503) 796-0717	HAI LOGGER:	Rob Ede	DRILL	DRILL
PROJECT:	SAMPLING METHOD:	3" OD Split Spoon/4"OD Core Barrel	START	FINISH
Northwest Natural Gas Co.	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Gasco Facility	EQUIPMENT TYPE	B-59 Mobile Drill	13:30	14:30
Portland, Oregon	DRILLER:	Brad James	Date:	Date:
PROJECT #: 2708	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/27/95	9/27/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT(blows/6 in) or Core Interval	RECOVERY (%) or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips								9/27/95		
	B7-06	14:10		-			21		SP	SAND - brown, wet, poorly graded, medium grained, slight hydrocarbon odor, no sheen, (20-21 feet bgs)
			8.4							
							22			
	B7-07	14:12		-			23			SAND - green to gray, wet, poorly graded, medium grained, no hydrocarbon odor, no sheen, (21-25 feet bgs)
			6.6							
							24			
							25			
							26		SP	
							27			
	B7-08	14:20		-			28			SAND - as above
			5.2							
							29		ML	
	B7-09	14:30	6.4	-						SILT - green to gray, moist, stiff, plastic, no hydrocarbon odor, no sheen, some brown organic matter
							30			
							31			
							32			Drilled to 30 feet bgs Sampled to 29.5 feet bgs
							33			
							34			* Sample Number Prefix is 2708-950927-
							35			
							36			
							37			
							38			
							39			
							40			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**	**B-8**		
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural Gas Co.	SAMPLING METHOD:	1.5" / 3" OD Split Spoon	START	FINISH
Gasco Facility	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	9:30	12:10
PROJECT #: 2708	DRILLER:	Brad James	Date:	Date:
	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/18/95	9/18/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	23.0
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							1			
							2			
									GM	
					5	100	3			Silty GRAVEL - brown, moist, loose, non-plastic, slightly graded, no hydrocarbon odor or discoloration, spotty sheen
	B8-01	9:35	9.3	-	6	50				
					8	0	4			
							5			
	B8-02	9:42		-	4	100				
			-		7	0	6			Silty GRAVEL - brown, dry, loose, non-plastic, slightly graded, no hydrocarbon odor or discoloration, spotty sheen
					9	0			GM	
							7			
	B8-03	9:44	-	-	9	70	8			Silty GRAVEL - as above, wet, medium dense
					18	0				
					23	0	9			
							10			
	B8-04	9:50		338	17	100			GM	Sandy GRAVEL - brown, moist, medium dense, non-plastic, poorly graded, no hydrocarbon odor, no sheen, large pieces of slag in sampling tube
			7.5		23	20	11			
					17	0		9/18/95		
							12			
	B8-05	10:00	8.0	-	11	100	13			
	B8-06 Dup	10:02			10	20				SAND - gray, wet, medium dense, non-plastic, poorly graded, fine grained, mild hydrocarbon odor, no sheen
					8	0	14			
							15			Note: Change to 1.5" Split Spoon sampling device
					3	100			SP	
	B8-07	10:05		-	4	100	16			SAND - gray, wet, loose, non-plastic, poorly graded, medium grained, mild hydrocarbon odor, no sheen
			7.3		6	50				
							17			
					3	100	18			Sandy SILT - gray, wet, soft, slightly plastic, no hydrocarbon odor, no sheen
	B8-08	10:15		0.24	3	100				
			6.5		3	100	19		ML	
							20			

HAHN & ASSOCIATES, INC.
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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-8

HAI LOGGER:	Rob Ede	DRILL START Time: 9:30 Date: 9/18/95	DRILL FINISH Time: 12:10 Date: 9/18/95
SAMPLING METHOD:	1.5" / 3" OD Split Spoon		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger		
EQUIPMENT TYPE	B-59 Mobile Drill		
DRILLER:	Brad James		
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	23.0
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips					1	100				
	B8-09	10:20		-	1	100	21		SP	SAND - gray, wet, very loose, non-plastic, poorly graded, moderate petroleum hydrocarbon odor, slight sheen
			6.1		2	100				
							22			
					2	100	23			
					2	100			SM	Silty SAND - dark gray, wet, very loose, non-plastic, poorly graded, fine grained, mild petroleum hydrocarbon odor
	B8-10	11:45	5.1	-	4	100	24			
							25			
					1	100				
					2	100	26			Silty SAND - as above
	B8-11	12:00	4.1	-	3	100				
							27			
							28			
							29			
							30			
							31			
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

Installed a 2-inch diameter 0.010-inch slotted stainless steel well screen at 20.5 to 23.5 feet bgs. Purged two gallons of water using a peristaltic pump prior to groundwater sampling. GROUNDWATER SAMPLE (2708-950918-BW8-01) collected at 11:30 hrs, 9/18/95. Well point was removed prior to abandonment.

Drilled to 26.5 feet bgs
Sampled to 26.5 feet bgs

* Sample Number Prefix is 2708-950918-

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**	**B-9**		
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural Gas Co.	SAMPLING METHOD:	1.5" OD Split Spoon/4" OD Core Barrel	START	FINISH
Gasco Facility	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	14:50	16:40
PROJECT #: 2708	DRILLER:	Brad James	Date:	Date:
	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/18/95	9/18/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	31.6 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY (%) or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							1			
							2		SP	
							3			See boring log B-9A for 0 to 5 foot soil description.
							4			
							5			
	B9-01	14:50		-	8	100				SAND with some Gravel - black, dry, medium dense, very strong petroleum hydrocarbon odor, all pores filled with tar-like substance throughout
			8:10		10	20	6			
					11	0				
							7			
							8			
					18	10				SAND with some Gravel - as above, dense, large piece of gravel in end of sampler
					33	0				
					21	0	9		SP	
							10			
	B9-02	15:00	897	19,438	18	100				SAND with some Gravel - as above, moist, dense
					13	0	11			
					23	0				
							12			
	B9-03	15:10	278.0	-	16	100	13			Silty SAND with some Gravel - brown, moist, medium dense, poorly graded, strong petroleum hydrocarbon odor, some tar-like blebs
					6	0				
					17	0	14			
							15		SM	
	B9-04	15:20	118	-	4	100				Silty SAND with Gravel - brown with black mottles, dry, medium dense, tar-like substance mottled throughout, strong petroleum hydrocarbon odor
					7	0	16			
					11	0				
							17			
	B9-05	15:30	211	-	13	100	18			SAND with some Gravel - black, very dense, possible lampblack
					50?3"	5		9/18/95	SP	
							19			
	B9-06	15:40	363	-	3	100	20	▼		

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-9

HAI LOGGER:	Rob Ede	DRILL START Time: 14:50 Date: 9/18/95	DRILL FINISH Time: 16:40 Date: 9/18/95
SAMPLING METHOD:	1.5" OD Split Spoon/4" OD Core Barrel		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger		
EQUIPMENT TYPE	B-59 Mobile Drill		
DRILLER:	Brad James		
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	31.6 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY (%) or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips					4	0			SP	SAND - black, wet, very loose, poorly graded, fine to medium grained, slight petroleum hydrocarbon odor
					4	0	21			
							22			
					2	100				SAND with some Gravel - black, wet, very loose, slightly graded, medium grained, strong petroleum hydrocarbon odor, strong sheen
	B9-07	1	100	-	3	100	23			
					6	100				
							24			
							25			
							26			
							27			
							28		SM	
	B9-08	16:10	504	-						Silty SAND - gray to black, wet, mild petroleum hydrocarbon odor, sheen
							29			
							30			
	B9-09	16:20	33.1	43.5			31			Silty SAND - dark gray, wet, poorly sorted, petroleum hydrocarbon odor, slight sheen
							32			
							33		SP	
							34			
	B9-10	16:21	9.1	0.46						SAND - green to gray, wet, poorly graded, fine grained, no petroleum hydrocarbon odor, no sheen
							35			
							36			
							37			Drilled to 35 feet bgs Sampled to 35 feet bgs
							38			
							39			* Sample Number Prefix is 2708-950918-
							40			

HAHN & ASSOCIATES, INC.
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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-9A

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	4" OD Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	14:00	14:20
EQUIPMENT TYPE	B-59 Mobile Drill		
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/18/95	9/18/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	31.6 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	CORE INTERVAL	RECOVERY INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Chips							1		SP	Gravelly SAND - black, dry, strong petroleum hydrocarbon odor, saturated with tar-like substance throughout
	B9A-01	14:00		-						
	B9A-02	14:02	614	-			2			
	B9A-03	14:05	274	-			3			
							4			Note: Stopped drilling at 14:20 due to lack of soil recovery from 5 to 15 feet bgs. Relocate to boring B-9.
							5			
							6			
							7			Drilled to 15 feet bgs Sampled to 3 feet bgs *Sample prefix is 2708-950918-
							8			
							9			
							10			
							11			
							12			
							13			
							14			
							15			
							16			
							17			
							18			
							19			
							20			

HAHN & ASSOCIATES, INC.
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SOIL BORING NUMBER B-11

HAI LOGGER:	Rob Ede	DRILL START Time: 10:30	DRILL FINISH Time: 11:40
SAMPLING METHOD:	3" OD Split Spoon/4" OD Core Barrel		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger		
EQUIPMENT TYPE	B-59 Mobile Drill		
DRILLER:	Brad James	Date: 9/28/95	Date: 9/28/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.5 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
	B11-01	10:30		-						Silty SAND with Gravel - brown, moist, no hydrocarbon odor, no sheen
			9.2				1			
							2		SP	
					8	100	3			
	B11-01	10:40		-	15	100				SAND - brown, slightly moist, medium dense, poorly graded, medium grained, no hydrocarbon odor, no sheen
			7.2		18	70	4			
							5			
					8	100				
	B11-03	10:42		-	13	100	6			SAND - dark gray, moist, medium dense, poorly graded, medium grained, hydrocarbon odor, sheen
			20		13	95				
							7		SP	
	B11-04	10:45		-			8			SAND - dark gray, moist, loose, poorly graded, medium grained, hydrocarbon odor, sheen
			21.6							
							9			
3/4" Bentonite Chips	B11-05	10:48		-						SAND - as above, gray to black, strong hydrocarbon odor, strong sheen
			119				10			
							11			
							12		SP	
	B11-06	10:55		973			13			SAND - as above, strong hydrocarbon odor, strong sheen
			260							
							14			
							15			
							16			
							17		SP	
							18			
	B11-07	11:00		-				9/28/95		SAND - as above, moist to wet, strong hydrocarbon odor, strong sheen, brown product and froth formed when water was added to sample
			97				19			
							20			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**	**B-11**		
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural Gas Co.	SAMPLING METHOD:	3" OD Split Spoon/4" OD Core Barrel	START	FINISH
Gasco Facility	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	10:30	11:40
PROJECT #: 2708	DRILLER:	Brad James	Date:	Date:
	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/28/95	9/28/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.5 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							21		SP	
	B11-08	11:10		-						SAND - as above, wet, (froth no longer present)
			17.1				22			
							23			
	B11-09	11:15		1.1						SAND - as above, no hydrocarbon odor, no sheen
			2.1				24			
							25			
							26		SP	
	B11-10	11:20		-						SAND - as above, hydrocarbon odor and sheen from 25' to 27' bgs
			0.4				27			
							28			
	B11-11	11:25		-			29			SAND - as above, no hydrocarbon odor, no sheen
			0.7							
	B11-12	11:30		-			30			SILT - green to gray, moist, stiff, no hydrocarbon odor, no sheen
			0.5						ML	
							31			
	B11-13	11:40		-						SILT - as above
			0				32			
							33			
							34			Drilled to 32 feet bgs Sampled to 32 feet bgs
							35			
							36			* Sample Number Prefix is 2708-950921-
							37			
							38			
							39			
							40			

HAHN & ASSOCIATES, INC.
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Portland, Oregon
(503) 796-0717

SOIL BORING NUMBER B-14

HAI LOGGER:	Rob Ede	DRILL START Time: 8:25	DRILL FINISH Time: 9:30
SAMPLING METHOD:	3" OD Split Spoon/4" OD Core Barrel		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger		
EQUIPMENT TYPE	B-59 Mobile Drill		
DRILLER:	Brad James	Date: 9/28/95	Date: 9/28/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips	B14-01	8:20	4.6	-			1		SM	Silty SAND with Gravel - brown, moist (surface sample)
							2			
					11	100				
	B14-02	8:30		-	23	100	3		SP	Silty SAND with Gravel - olive gray, moist, dense, hydrocarbon odor, sheen
			8.4		35	90	4			
					5	100	**5**		ML	Sandy SILT - brown, moist, stiff, slightly plastic, no hydrocarbon odor, no sheen
	B14-03	8:35		ND	8	100				
			3.0		13	95	6			
					6	100	7		SP	SAND - olive gray, moist, loose, poorly graded, fine grained, no hydrocarbon odor, no sheen
	B14-04	8:40		-	6	100	8			
			3.4		7	90	9			
							10			
	B14-05	9:00		-			11			SAND - as above, (10-11 feet bgs)
			4.1				12		ML	SILT - brown, moist, stiff, slightly plastic, no hydrocarbon odor, no sheen, (11-12 feet bgs)
							13		SP	SAND - olive gray, moist, medium dense, poorly graded, fine grained, no hydrocarbon odor, no sheen, (12-13 feet bgs)
	B14-06	9:05		-			14		ML	SILT - brown, moist, very stiff, slightly plastic, no hydrocarbon odor, no sheen
			4.6				**15**	9/28/95		
	B14-07	9:20		-			16			Sandy SILT - brown and tan mottled, moist, no hydrocarbon odor, no sheen, (piece of bark present)
			3.7				17		SP	SAND with some Silt - brown, wet, medium dense, poorly graded, fine grained, no hydrocarbon odor, no sheen (16.5-17.5 feet bgs)
	B14-08	9:25		-			18		ML	SILT - brown, moist, stiff, no hydrocarbon odor, no sheen, (17.5-18 feet bgs)
	B14-09	9:30		-			19		SP	SAND - brown, wet, poorly graded, fine grained, no hydrocarbon odor, no sheen, (18-19 feet bgs)
			4.9				20			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**	**B-14**		
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural Gas Co.	SAMPLING METHOD:	3" OD Split Spoon/4" OD Core Barrel	START	FINISH
Gasco Facility	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	8:25	9:30
PROJECT #: 2708	DRILLER:	Brad James	Date:	Date:
	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/28/95	9/28/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							21			Drilled to 20 feet bgs Sampled to 19 feet bgs * Sample Number Prefix is 2708-950928-
							22			
							23			
							24			
							25			
							26			
							27			
							28			
							29			
							30			
							31			
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**	**B-17**		
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural Gas Co.	SAMPLING METHOD:	1.5" OD Split Spoon/4" OD Core Barrel	START	FINISH
Gasco Facility	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	9:55	10:40
PROJECT #: 2708	DRILLER:	Brad James	Date:	Date:
	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/29/95	9/29/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.9 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							1			Surface - GRAVEL fill (surface)
							2		SM	
					2	100	3			Silty SAND - brown, moist, no sheen
	B17-01	10:00		59	2	100				
			421		2	90	4			
							5		ML	
							6			Sandy SILT - olive gray, moist, firm, no sheen
	B17-02	10:10		-						
			603				7			
							8			
							9			SAND - olive gray, moist, poorly graded, medium grained, no sheen
	B17-03	10:12		-						
			213				10			
							11		SP	SAND - olive gray, poorly graded, strong sheen, brown product and froth when water added to sample, some wood fragments
	B17-04	10:20		-						
			1409				12			
							13			
							14			
							15			
							16		SP	
	B17-05	10:30		1,814			17			SAND - as above, wet, saturated with brown, oily product
			1478				18			
							19	9/29/95		
							20			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**	**B-17**		
	HAI LOGGER:	Rob Ede	DRILL	DRILL
PROJECT:	SAMPLING METHOD:	1.5" OD Split Spoon/4" OD Core Barrel	START	FINISH
Northwest Natural Gas Co.	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Gasco Facility	EQUIPMENT TYPE	B-59 Mobile Drill	9:55	10:40
Portland, Oregon	DRILLER:	Brad James	Date:	Date:
PROJECT #: 2708	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/29/95	9/29/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.9 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							21		SP	SAND - as above, wet, contains brown product, strong sheen, many roots at sand/silt interface
	B17-06	10:35		-			22			
			145				23		ML	SILT - olive gray, moist, very stiff, no hydrocarbon odor, no sheen, some brown root casts
	B17-07	10:40		0.89			24			
			65.8				**25**			
							26			Drilled to 25 feet bgs Sampled to 24 feet bgs
							27			
							28			* Sample Number Prefix is 2708-950929-
							29			
							30			
							31			
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**	**B-18**		
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural Gas Co.	SAMPLING METHOD:	Split Spoon	START	FINISH
Gasco Facility	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	10:05	11:45
PROJECT #: 2708	DRILLER:	Brad James	Date:	Date:
	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/19/95	9/19/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.4 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							1			Sandy GRAVEL - dry, road fill (surface)
							2			
	B18-01	10:15	74	-	50/5"	80	3		ML	Sandy SILT - brown and olive gray, moist, hard, slightly plastic, slight sheen
							4			
	B18-02	10:20	1772	-	8 11	100 100	**5**			SILT - brown, gray mottling, moist, stiff, plastic, no sheen
					14	100	6			
	B18-03	10:30	2500	-	4 7	100 100	7 8		SM	Silty SAND with Clay - brown, moist, loose, plastic, slight sheen
							9			
	B18-04	10:35		-	4 4	100 100	10			Sandy SILT with some Clay - brown, moist, medium stiff, poorly graded, slightly plastic, slight sheen
	B18-05	10:40	2500+ 2500+	59.3	6 2 5 6	100 100 100 100	11 12 13		ML	Sandy SILT - as above
							14	9/19/95		
	B18-06	10:50		-	2 2	100 100	**15**			SAND - brown, wet, very loose, poorly graded, fine grained, sheen observed on surface of core
	B18-07	11:00	2500+ 2500+	-	4 4 5 5	100 100 100 100	16 17 18		SP	SAND - as above
	B18-08	11:05		-	4 6	100 100	19 20			SAND - olive gray, wet, loose, poorly graded, slight sheen on core

HAHN & ASSOCIATES, INC.
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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-18

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Split Spoon		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	10:05	11:45
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/19/95	9/19/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.4 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips			224		7	100				
							21			
									SP	
					3	100	22			SAND - as above, no sheen
	B18-09	11:10		-	8	100				
			2500+		12	100	23			
							24			
					7	100				SAND - as above
	B18-10	11:30		ND	17	100	**25**			
			14.4		14	100				
							26		SP	
					12	100	27			SAND - as above
	B18-11	11:40			21	100				
			24.0		16	100	28			
							29			
							30			Drilled to 28 feet bgs Sampled to 28 feet bgs
							31			* Sample Number Prefix is 2708-950919-
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

HAHN & ASSOCIATES, INC.
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SOIL BORING NUMBER B-20

HAI LOGGER:	Rob Ede	DRILL START Time: 14:00	DRILL FINISH Time: 15:00
SAMPLING METHOD:	1.5" OD Split Spoon/4" OD Core Barrel		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger		
EQUIPMENT TYPE	B-59 Mobile Drill		
DRILLER:	Brad James	Date: 9/29/95	Date: 9/29/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	35.4 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Asphalt									Asphalt	Asphalt (surface)
							1			
							2			
									SP	
					5	100	3			
	B20-01	14:05		-	5	100				SAND - brown, moist, loose, poorly graded, no sheen
			355		5	50	4			
							5			
							6			
							7			SAND - as above, large rock in sand at depth of 7.5 feet bgs
	B20-02	14:10		-			8		SP	
			1166				9			SAND - olive gray, moist, poorly graded, medium grained, no sheen
3/4" Bentonite Chips							10			
	B20-03	14:15		1,093			11			SAND - gray, wet, poorly graded, saturated with hydrocarbon product, metallic sheen, (10-11 feet bgs)
			2500+				12			SAND - brown, moist, poorly graded, fine grained, no product saturation, sheen is present, (11-13 feet bgs)
	B20-04	14:20		-						
			2500+				13			
							14			
							15			
							16			
									SP	
							17	9/29/95		SAND - olive gray, moist to wet, sheen
	B20-05	14:25		-			18			
			1270				19			
							20			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-20

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5" OD Split Spoon/4" OD Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	14:00	15:00
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	9/29/95	9/29/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	35.4 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/6 in) or Core Interval	RECOVERY or INTERVAL	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							21		SP	SAND - brown to metallic gray, wet, strong sheen
							22			
	B20-06	14:30		-			23			
			2500+						ML	SILT - brown, very stiff, brown pockets of organic material
	B20-07	14:35		13			24			
			1010				**25**			
							26			Drilled to 25 feet bgs Sampled to 24 feet bgs
							27			
							28			* Sample Number Prefix is 2708-950929-
							29			
							30			
							31			
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-27

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Split Spoon		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	12:40	13:30
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/20/95	9/20/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	37.0 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips	B27-01	12:15		-			1		GP	Sandy GRAVEL - brown, dry, fill (surface)
							2			
	B27-02	12:50		-	13	100	3		SM	Silty SAND - brown, dry, dense, pieces of coal? present, no petroleum odor, no sheen
			7.6		17	0				
					18	0	4			
							5			
					16	100			SP	SAND - brown, dry, medium dense, poorly graded, fine grained, some coal in upper 6 inches, no sheen, black colored hydrophobic particulates float via sheen test (lampblack?)
	B27-03	12:55		-	16	100	6			
			6.5		20	50				
							7			
					10	100	8			SAND - black, moist, medium dense, poorly graded, fine grained, strong petroleum hydrocarbon odor, sheen via sheen test
	B27-04	13:00		-	10	100				
			21.5		12	50	9			
							10			
					4	100				SAND - as above, loose, strong petroleum hydrocarbon odor, sheen via sheen test
	B27-05	13:03		-	8	70	11			
					8	0			SP	
							12			
					6	100	13			SAND - as above, strong petroleum hydrocarbon odor, sheen via sheen test
	B27-06	13:05		-	10	100		9/20/95		
			36.4		13	50	14			
							15			
					4	100				SAND - olive gray to black, wet, loose, petroleum hydrocarbon odor, slight sheen via sheen test
	B27-07	13:10		-	6	100	16			
			13.2		8	60			SP	
							17			
					2	100	18			SAND - as above, slight petroleum hydrocarbon odor, no sheen via sheen test
	B27-08	13:15		-	4	100				
			35.2		7	100	19			
							20			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-27

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Split Spoon		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	12:40	13:30
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/20/95	9/20/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	37.0 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips					11	100			SP	SAND - black, wet, dense, sheen on core, sheen via sheen test
	B27-09	13:30		-	24	100	21			
			2031		16	100				
							22			
					2	100	23			SAND - black, wet, loose, saturated with oily substance, (22.5-23.5 feet bgs)
	B27-10	13:40		1,243	3	100				
			2500+		3	100	24		ML	SILT - brown, wet, medium stiff, plastic, sheen via sheen test, (23.5-24 feet bgs)
							25			
					2	100			SP	SAND with some Silt - black, wet, loose, sheen on sampler, (25-25.5 feet bgs)
	B27-11	13:45		-	2	100	26			
			392		2	50				SILT with some Clay - brown, wet, soft, plastic, sheen via sheen test, (25.5-26.5 feet bgs)
							27			
					4	100	28		ML	Clayey SILT - brown, moist, medium stiff, plastic, no sheen via sheen test
	B27-12	13:55		125	5	100				
			120		5	70	29			
							30			
					3	100				
	B27-13	14:05		-	3	100	31			Clayey SILT - as above, slight sheen via sheen test, (outside of core smeared with petroleum product from shallower depths)
			861		5	100				
							32			
					3	100	33		ML	
	B27-14	14:15		-	4	100				Clayey SILT - olive gray, moist, soft, sheen via sheen test, (outside of core smeared with petroleum product from shallower depths)
			714		5	10	34			
							35			
					3	100				
	B27-15	14:40		12.2	3	80	36			SILT - olive gray, moist, soft, no petroleum hydrocarbon odor, no sheen via sheen test
			254		3	0				
							37			
							38			
										Drilled to 36.5 feet bgs
							39			Sampled to 36.5 feet bgs
										* Sample Number Prefix is 2708-950920-
							40			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-29

HAI LOGGER:	Roger Brown	DRILL START	DRILL FINISH
SAMPLING METHOD:	Split Spoon		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	14:15	9:30
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/22/95	9/25/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	31.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips	B29-01	14:08	-	230	-	-	1		GM	Silty GRAVEL - brown, dry, fill, no sheen via sheen test (surface)
							2			
					27	100	3			Sandy Silty GRAVEL - gray/brown, damp, dense, non-plastic, well graded, no hydrocarbon odor, no sheen via sheen test
	B29-02	14:18			27	100				
					32	0	4			
							5			
	B29-03				6	100				Sandy Silty GRAVEL - as above, no hydrocarbon odor, no sheen via sheen test
		14:22			9	0	6			
					5	0				
							7			
					11	100	8		GW	Sandy GRAVEL with Silt - dark gray, moist to wet, medium dense, non-plastic, well graded, possible petroleum hydrocarbon odor, no sheen via sheen test
	B29-04	14:26			5	60				
					11	0	9			
							10			
	B29-05				3	100			GM	Silty Sandy GRAVEL - brown, wet, dense, slightly plastic, well graded, no petroleum hydrocarbon odor, no sheen via sheen test
		14:30			13	20	11			
					20	0				
							12			
	B29-06	14:35			11	100	13			Silty Sandy GRAVEL - as above, slight naphthalene odor, turning to dark gray at 13.2 feet, no sheen via sheen test
					14	20				
					30	0	14			
							15			
					5	100			ML	SILT with some Sand and Gravel - brown, moist, stiff, slightly plastic, possible petroleum hydrocarbon odor, no sheen via sheen test
	B29-07	15:05			8	100	16			
					12	100				
							17			
					6	100	18			SILT with some Sand and Gravel - as above, more Gravel, brown with slight odor to 18.25 feet bgs, dark gray with distinct odor to 19 feet bgs with wood fragments and occasional tar globs, no sheen via sheen test
	B29-08	15:11			12	100				
					15	100	19			
							20			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-29

HAI LOGGER:	Roger Brown	DRILL START	DRILL FINISH
SAMPLING METHOD:	Split Spoon		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	14:15	9:30
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/22/95	9/25/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	31.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips					12	100			ML	Gravelly SILT - gray/brown with gray mottling, moist, very stiff, slightly plastic, slight petroleum hydrocarbon odor, no sheen via sheen test, tip of core is black
	B29-09	15:17			13	100	21			
					15	100				
							22		ML + tar	Gravelly SILT - black, moist, strong hydrocarbon odor, sheen via sheen test, tarry globs (22.5-22.75 feet bgs)
										SILT - gray with red-brown mottling, non-plastic, slight hydrocarbon odor (22.75-23 feet bgs)
	B29-10A				-	100	23			
		15:23			-	100			SP	SAND - dark gray, moist to wet, poorly graded (23-24 feet bgs)
	B29-10				-	100	24			
							25			
					3	100			tar	SILT and SAND - as above , tarry (25-25.25 feet bgs)
	B29-11	15:30			9	100	26		ML	SILT - gray, as above (25.25-26.25 feet bgs)
					12	100			tar	SILT and SAND - black, tarry, hydrocarbon odor, sheen via sheen test (26.25-27 feet bgs)
							27			
									ML	SILT - olive-gray with red-brown mottling, medium stiff, organic matter or root zones with brown product in them, petroleum hydrocarbon odor, sheen via sheen test, brown product present (27.5-29 feet bgs)
					3	100	28			
	B29-12	15:40			5	100		9/22/95		
					6	100	29			
							30			
					3	100			SM	Silty SAND with occasional Silt zones - olive-gray, loose, non-plastic, rootlets present, strong hydrocarbon odor, brown product via sheen test (30-31.5 feet bgs)
	B29-13	15:50			2	100	31			
					5	100				
							32			
					9	100	33		SP	SAND - black, wet, medium dense, poorly graded, entire core covered with brown product (32.5-34 feet bgs)
	B29-14	16:00			7	100				
					9	100	34			
							35			
					4	100				SAND - as above, product saturated throughout core (35-36.5 feet bgs)
	B29-15	16:08		58,822	9	100	36			
					12	100				
							37			Drilling resumes at 8:40, 9/25/95
							38			
	B29-16	9:00								SAND - black, wet, saturated with product to 39 feet bgs, less staining from 39-40 feet bgs, some brown bedding or zones of oxidation, sheen throughout (36.5-40 feet bgs)
							39			
							40			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-29

HAI LOGGER:	Roger Brown	DRILL START	DRILL FINISH
SAMPLING METHOD:	Split Spoon		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	14:15	9:30
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	9/22/95	9/25/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	31.1 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							41			
							42			SAND - olive-gray, wet, sheen via sheen test, strong sheen on drill stem (40-44 feet bgs)
							43		SP	
							44			
	B29-17	9:10		16.5						SAND with some Silt - gray, moist, no sheen via sheen test, no sheen on drill stem (44-45 feet bgs)
			69.0				**45**			
							46			
							47		SP	SAND with some Silt - moist to wet, poorly graded, fine to medium grained, no sheen via sheen test, no sheen on core (45-50 feet bgs)
	B29-18	9:25		0.18						
			28.1				48			
							49			
							50			
							51			Drilled to 50 feet bgs Sampled to 48 feet bgs
							52			* Sample Number Prefix is 2708-950922-
							53			
							54			
							55			
							56			
							57			
							58			
							59			
							60			

HAHN & ASSOCIATES, INC.
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SOIL BORING NUMBER B-32

HAI LOGGER:	Rob Ede	DRILL START Time: 11:50	DRILL FINISH Time: 15:40
SAMPLING METHOD:	Core Barrel		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger		
EQUIPMENT TYPE	B-59 Mobile Drill		
DRILLER:	Brad James	Date: 10/4/95	Date: 10/4/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.9 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips	B32-01	11:45	1067	61			1		GM	Silty SAND with Gravel - brown, moist, no hydrocarbon odor, no sheen via sheen test (surface)
							2			
					17	0	3			
					18	0				
					15	0	4			
							5			
					7	0			ML	Sandy SILT and GRAVEL - black, moist, slightly plastic, hydrocarbon odor, sheen via shen test (5-6.5 feet bgs)
					8	0	6			
					4	10				
							7		SM	Silty SAND with Gravel - olive-gray to black, moist, hydrocarbon odor (6.5-10 feet bgs)
	B32-02	12:08		-						
			296				8			
							9	10/4/95		
							10			
							11		GP	Sandy GRAVEL - brown, wet, no sheen via sheen test (10-11.5 feet bgs)
	B32-03	12:15	785	28,772			12			
	B32-04	12:18	-				13			SAND and GRAVEL with some Silt - black, matrix is tar material, highly viscous, strong sheen via sheen test (11.5-15 feet bgs)
							14			
							15			
							16			SAND and GRAVEL with some Silt - black, wet, matrix is tar material, highly viscous, strong sheen on sampling core (15-17 feet bgs)
	B32-05	12:25		-			17			Gravelly SILT - brown, wet, little tar (17-17.5 feet bgs)
			809				18		GP	
							19			
							20			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**		**B-32**	
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural Gas Co.	SAMPLING METHOD:	Core Barrel	START	FINISH
Gasco Facility	DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	11:50	15:40
PROJECT #: 2708	DRILLER:	Brad James	Date:	Date:
	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	10/4/95	10/4/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.9 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							21		ML + tar	
	B32-06	12:32	1072	-			22			SILT and TAR - black, moist, plastic, smooth texture, highly viscous (20-25 feet bgs)
	B32-07	12:34	-	-			23			
							24		ML + tar	
							25			
							26			Sandy SILT - black, wet, poorly graded, matrix is tar material, highly viscous, roots present (25-26 feet bgs)
							27			
							28		ML	Sandy SILT - olive-gray, moist, tar seams present - preferential in areas of roots, cracks (26-30 feet bgs)
3/4" Bentonite Chips	B32-08	12:46		-						
			1321				29			
							30			
							31			
	B32-09	13:15		-						Sandy SILT - olive-gray to green, moist, firm, slightly plastic, pockets of brown product - lighter in color and less viscous than above, brown froth via sheen test (30-35 feet bgs)
			1219				32			
							33			
	B32-10	13:20		-						
			1355				34			
									ML	
							35			
							36			Sandy SILT - brown with orange pockets, saturated with oily, black product (35-37.5 feet bgs)
	B32-11	13:29		-						
			499				37			
	B32-12	13:33		-			38		SP	SAND - black, wet, poorly graded, fine grained, saturated with product, sheen via sheen test (35-37.5 feet bgs)
			745.0							
							39		ML	Sandy SILT - brown with orange pockets, saturated with oily, black product, sheen via sheen test (38-40 feet bgs)
	B32-13	13:36	1041	-			40			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-32

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Core Barrel		
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	11:50	15:40
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	10/4/95	10/4/95

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	36.9 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							41		SM	Silty SAND - olive-gray, wet, firm, fine grained, strong sheen via sheen test (40-42.5 feet bgs)
							42			
							43		SP	SAND - olive-gray, wet, poorly graded, fine grained, saturated with oily product (42.5-43 feet bgs)
	B32-14	13:45	287	-			44		ML	Sandy SILT - olive-gray, wet, wood fragments present, saturated with oily product (43-44.5 feet bgs)
							45			
							46		SP	
	B32-15	14:26	1230	21,961			47			
							48			SAND - olive-gray, wet, poorly graded, fine grained, saturated with oily product (44.5-50.5 feet bgs)
							49			
							50			
							51			SAND with lenses of Silt - as above, saturated with oily product (50.5-52.5 feet bgs)
	B32-16	14:47	562	-			52		SP	
							53			SAND - olive-gray, wet, poorly graded, fine grained, saturated with oily product (52.5-54 feet bgs)
							54			
							55		SM	Silty SAND - olive-gray, moist, sheen via sheen test (54-55 feet bgs)
							56		SP	SAND - olive-gray, wet, saturated with product (55-56 feet bgs)
	B32-17	15:04	461	-			57		SM	Silty SAND - olive-gray, moist, no sheen via sheen test (56-57.5 feet bgs)
							58		SP	SAND - olive-gray, wet, loose, poorly graded, fine grained, slight sheen on core (57.5-59 feet bgs)
	B32-18	15:29	954	1.2			59			
							60			

* Sample Number Prefix is 2708-951004-

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-33

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	13:50	9:10
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	10/5/95	10/6/96
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	34.8 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS Total PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips	B33-01	13:15	-	955			1		GM	Silty SAND with Gravel - brown, moist, no hydrocarbon odor, no sheen, no hydrocarbon odor (surface)
							2			
	B33-02	14:00		38	3	100	3			Sandy SILT and GRAVEL - olive grey, moist, loose, no sheen
			97		5	50				
					18	0	4			
							5			
					15	100			SM + tar	Tarry Silty SAND with Gravel - black, wet, medium dense, viscous tar seeps from cracks
	B33-03	14:03		8,238	15	100	6			
			219		16	50				
							7			
					50/5"	5	8			Rock in end of sampler - no recovery
							9			
							10			
							11			
	B33-04	14:28		-	12	100				
			318		11	50	12			Tarry Silty SAND with Gravel - black, moist, medium dense
					9	0			SM +tar	
							13			
					2	100	14			Tarry Silty SAND with Gravel - as above, loose
	B33-05	14:30	624	-	5	50				
					7	0	**15**			
							16			Tarry Gravels with Sand and Silt - black, moist, viscous tar zone at 16.5 feet bgs
	B33-06	14:42		-			17			
			646						GM + tar	
							18			
							19			
							20			

HAHN & ASSOCIATES, INC.
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(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-33

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	13:50	9:10
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	10/5/95	10/6/96
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	34.8 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS Total PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips							21			
							22		tar	TAR - some gravel and wood fragments at 21.5 feet bgs
	B33-07	14:50		-						
			701				23			
							24			
							25			
							26		SM	Silty SAND -black, moist,many rootlets and wood fragments, tar im matrix, strong sheen (25-27 feet bgs)
	B33-08	15:00		-						
			2500+				27			
							28		ML	Sandy SILT - brown with green mottling, moist, stiff, rootlets and cracks contain wet, viscous tar (27-30 feet bgs)
	B33-09	15:03		-			29			
			1475				30			
							31			Sandy SILT - brown with orange oxidation spots, moist, tar seams present - preferential in areas of rootlets and cracks
							32			
							33			
	B33-10	15:34		-						
			1383				34			
							35			
							36		ML	Sandy SILT - green, moist, stiff, black tarry patches throughout core, tarry sand seam at 38.5 feet bgs
							37			
							38			
	B33-11	15:45		-			39			
			2500+				40			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-33

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	13:50	9:10
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	10/5/95	10/6/96
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	34.8 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS Total PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							41		ML	Sandy SILT - as above, moist, fingers of tar throughout core (40 - 43 feet bgs)
							42			
							43			
							44		SP	SAND - olive gray and green mottled, moist, medium dense, fine grained, strong sheen (43 - 45 feet bgs)
	B33-12	15:55		-						
			819.0				**45**			
3/4" Bentonite Chips							46			SAND with some Silt- olive gray, moist, medium dense, fingers of tar throughout core, sheen
							47			
							48			
							49			
	B33-13	16:05		-						
			692				50			
							51		SM	Silty SAND - olive gray, moist, medium dense, fine grained, fingers of tar throughout core, sheen
							52			
							53			
							54			
	B33-14	16:25		65						
			793				**55**			
							56		ML	Sandy SILT - olive gray, moist, thin fine grained sand lenses, roots at 57 feet bgs, less product than above
							57			
	B33-15	8:27		-			58			
			2500+				59			
							60			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
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PROJECT #: 2708

SOIL BORING NUMBER B-33

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	13:50	9:10
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	10/5/95	10/6/96
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	34.8 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS Total PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							61		ML	Sandy SILT - as above, black oily product within rootlet zones (60-62 feet bgs)
							62			
	B33-16	8:40		-					SP	SAND - olive gray to black, wet, saturated with black, oily product (62 - 63 feet bgs)
			2500+				63			
							64		ML	Sandy SILT - green, moist, stiff, many rootlets present, product within rootlet zones (63 - 65 feet bgs)
							65			
							66		SM	Silty SAND - olive gray and green mottled, wet, fine grained, saturated with brown/black product, sand lens at 67 feet bgs is saturated with product (65 - 67 feet bgs)
	B33-17	8:55		-						
			407				67			
							68		ML	SILT - olive gray, moist, stiff, bark and rootlets present, no product, no sheen (67 - 70 feet bgs)
							69			
	B33-18	9:00		5.7						
			133				70			
							71			Drilled to 70 feet bgs Sampled to 70 feet bgs
							72			
							73			* Sample Number Prefix is 2708-951005-
							74			
							75			
							76			
							77			
							78			
							79			
							80			

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SOIL BORING NUMBER B-35

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	4" OD Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	10:20	12:05
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	10/5/95	10/5/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
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PROJECT #: 2708

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	33.8 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	CORE INTERVAL	SAMPLE RECOVERY	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips	B35-01	10:20	38	39			1		GM	Sandy GRAVEL with Silt - brown, moist, no hydrocarbon odor (surface)
							2			
	B35-02	10:35	235	-	5	90	3			Sandy GRAVEL with Silt, brown, wet, hardened tar in end of sampler, no sheen
					5	0				
					7	0	4			
							5			
					31	5				No Recovery - Rock blocking end of sampler
					34	0	6			
							7			
	B35-03	10:44		-	7	100	8			
			520		5	10			SP + tar	Tarry SAND with Gravel and Silt, moist, black, tar throughout matrix, sheen
					8	0	9			
							10			
	B35-04	10:50		-			11			Tarry SAND with Gravel and Silt, as above
			715				12			
							13			
							14			
							15			
							16			No Recovery - rock blocking end of sampler
							17			
							18		SP + tar	
							19	9/26/95		
							20			

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PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER B-35

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	4" OD Core Barrel	Time:	Time:
DRILLING METHOD:	4 1/4-inch ID Hollow Stem Auger	10:20	12:05
EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
DRILLER:	Brad James	10/5/95	10/5/95
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	33.8 feet msl
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	CORE INTERVAL	SAMPLE RECOVERY	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4" Bentonite Chips					4	100			GP+ oil	Gravelly SILT with Sand, black, moist, many roots and wood fragments, saturated with black oily product
					6	100	21			
	B35-05	11:10	936	-	7	80				
							22		SP + oil	SAND - black, wet, medium grained, saturated with black oily product (21.5 - 22.5 feet bgs)
	B35-06	11:16		41,602					SP	
			2,255				23			
										SILT - olive gray to green, upper 6-inches is tarry, no tar below (22.5-24 feet bgs)
	B35-07	11:20	499	-			24			
							25		ML	
										SILT - olive gray with orange oxidation spots, moist, medium stiff, some root zones present, no product, no sheen
	B35-08	11:32	98	-			26			
	B35-09	11:56		-			27			
			335							
							28			
							29			
	B35-10	12:02		9.3						
			299				30			
							31			
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

Drilled to 30 feet bgs
Sampled to 30 feet bgs

* Sample Number Prefix is 2708-951005-

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PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER GT-1

HAI LOGGER:	Rob Ede	DRILL START Time: 9:30 Date: 11/17/97	DRILL FINISH Time: 12:30 Date: 11/17/97
SAMPLING METHOD:	2" OD Split Spoon		
DRILLING METHOD:	4 1/4-inch OD Mud Rotary		
EQUIPMENT TYPE	B-61 Mobile Drill		
DRILLER:	Jim Clark		
DRILLING CONTRACTOR:	Subterranean, Inc.		

BORING DIAMETER:	4 1/4-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	Not Measured
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite / Cement Grout							1		GM	Silty GRAVEL - as indicated from drill cuttings and drilling conditions
							2			
					4	100	3		SM	Sandy SILT- brown, moist, soft, no hydrocarbon odor or discoloration, no sheen
	001	10:20	2.3	?	7	50			SP	
					10	0	4			SAND - brown, slightly moist, loose, no hydrocarbon odor or discoloration, no sheen
							5			
					7	100				SAND - as above, no hydrocarbon odor or discoloration, no sheen
	002	10:30	3.7		7	100	6			
					7	0				
							7			
					5	100	8			SAND - as above, hydrocarbon odor, sheen, moist non-viscous black oily product from 8'4" to 8'6"
	003	10:39	16.2		5	100				
					5	0	9			
							10			
					5	100				SAND - wet, loose, saturated with oil-like product, hydrocarbon (oil) odor, brown product obseved via sheen test
	004	10:45	7.0	?	4	75	11			
					1	0				
							12			
					1	100	13			Silty SAND - olive gray, moist, very loose, non-plastic, no product, no sheen, hydrocarbon odor exists
	005	10:54	5.0		1	75				
					0	0	14			
							15			
					1	100			SM	Sandy SILT - as above, no sheen, hydrocarbon odor exists
					1	100	16			
	006	11:00	7.4	?	3	50				
							17			
					1	100	18			Sandy SILT - grey to olive grey, loose, wood fragment at 18' 6", no sheen, hydrocarbon odor exists
	007	11:05			1	100				
			6.6		3	50	19			
							20			

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PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER GT-1

HAI LOGGER:	Rob Ede	DRILL START Time: 9:30 Date: 11/17/97	DRILL FINISH Time: 12:30 Date: 11/17/97
SAMPLING METHOD:	2" OD Split Spoon		
DRILLING METHOD:	4 1/4-inch OD Mud Rotary		
EQUIPMENT TYPE	B-61 Mobile Drill		
DRILLER:	Jim Clark		
DRILLING CONTRACTOR:	Subterranean, Inc.		

BORING DIAMETER:	4 1/4-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	Not Measured
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite / Cement Grout					3	100			SP	SAND - gray with some brown to orange oxidation zones, wet, loose, fine grained, no sheen, no hydrocarbon odor
	008	11:12	2.6	?	7	100	21			
					7	0				
							22			
							23			
							24			
							25			
					3	100				
					8	100	26			SAND - brown to 26', gray below 26', muscovite present in gray sand, slight sheen and hydrocarbon odor below 26'
	009	11:20	1.5		12	50				
							27			
							28			
							29			
							30			
					3	100				
	010	11:28	1.6		4	100	31			SAND - as above, gray, fine grained, no sheen, slight reducing odor
					4	0				
							32		SP	
							33			
							34			
							35			
					6	100				
	011	11:35	1.4	?	6	100	36			SAND -as above, no sheen, no hydrocarbon odor
					11	0				
							37			
							38			Drilled to 36.5 feet bgs Sampled to 36.5 feet bgs
							39			
							40			* Sample Number Prefix is 2708-971117-

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**		**GT-2**	
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural - Gasco Facility	SAMPLING METHOD:	2" OD Split Spoon	START	FINISH
7900 NW St. Helens Road	DRILLING METHOD:	4 1/4-inch OD Mud Rotary	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-61 Mobile Drill	14:30	16:00
	DRILLER:	Jim Clark	Date:	Date:
PROJECT #: 2708	DRILLING CONTRACTOR:	Subterranean, Inc.	11/17/97	11/17/97

BORING DIAMETER:	4 1/4-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	20.68 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite / Cement Grout							1		GM	Silty GRAVEL - as indicated from drill cuttings and drilling conditions.
							2			
					3	100	3		SP	SAND - brown, moist, loose, fine grained, poorly graded, no hydrocarbon odor or discoloration, no sheen.
					4	100				
	012	1439	1.9	0.08	5	50	4			
							5			
					2	100				SAND - as above, no hydrocarbon odor or discoloration, no sheen.
					3	100	6			
	013	1442	2.7	-	4	50				
							7			
	014	1453	2.1	-	5	75	8			SAND - as above, grey, no sheen, slight organic odor.
					5	0				
					2	0	9			
							10	▼		
					1	100			ML	Sandy SILT - olive grey, moist to wet, very soft, slightly plastic, no hydrocarbon odor, no sheen.
					0	100	11			
	015	1500	2.5	-	1	100				
							12			
					1	100	13			
	016	1505		-	0	100				Sandy SILT - as above, wet, no hydrocarbon odor, no sheen, some mica.
			2.4		0	25	14			
							15			
					1	100			SP	SAND - grey, wet, very loose, fine grained, no hydrocarbon odor, no sheen, slight organic decay odor.
	017	1510		ND	1	100	16			
			2.9		2	25				
							17			
							18			
							19			
							20			

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PROJECT:
Northwest Natural - Gasco Facility
7900 NW St. Helens Road
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER GT-2

HAI LOGGER:	Rob Ede	DRILL START Time: 14:30	DRILL FINISH Time: 16:00
SAMPLING METHOD:	2" OD Split Spoon		
DRILLING METHOD:	4 1/4-inch OD Mud Rotary		
EQUIPMENT TYPE	B-61 Mobile Drill		
DRILLER:	Jim Clark	Date: 11/17/97	Date: 11/17/97
DRILLING CONTRACTOR:	Subterranean, Inc.		

BORING DIAMETER:	4 1/4-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	20.68 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite / Cement Grout					4	100			SP	
					5	100	21			SAND - as above, medium dense, no hydrocarbon odor, no sheen, slight organic decay odor.
	018	1515	3.6	-	6	50				
							22			
							23			
							24			
							25			
					4	100				
					4	100	26			SAND - as above, grey, few thin grey silt lenses, no sheen, slight organic decay odor.
	019	1521	3.6	-	7	50				
							27			
							28			
							29			
							30			
					2	100				
	020	1529		-	1	100	31			SAND - as above, many thin grey silt lenses, no hydrocarbon odor, no sheen.
			2.2		7	25				
							32			
					7	100	33		SP	SAND - as above, no hydrocarbon odor, no sheen.
	021	1534		ND	8	100				
			2.6		9	25	34			
							35			
					5	100				SAND - as above, no hydrocarbon odor, no sheen.
					10	100	36			
	022	1540	2.7	-	6	50				
							37			
							38			Drilled to 35.0 feet bgs Sampled to 36.5 feet bgs
							39			
							40			* Sample Number Prefix is 2708-971117-

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PROJECT:
Northwest Natural - Gasco Facility
7900 NW St. Helens Road
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER GT-3

HAI LOGGER:	Rob Ede	DRILL START Time: 8:20 Date: 11/18/97	DRILL FINISH Time: 12:00 Date: 11/18/97
SAMPLING METHOD:	2" OD Split Spoon		
DRILLING METHOD:	4 1/4-inch OD Mud Rotary		
EQUIPMENT TYPE	B-61 Mobile Drill		
DRILLER:	Jim Clark		
DRILLING CONTRACTOR:	Subterranean, Inc.		

BORING DIAMETER:	4 1/4-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	19.44 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite / Cement Grout							1		GM	Silty GRAVEL - as indicated from drill cuttings and drilling conditions.
							2			
					2	100	3		ML	SILT with fine Sand and Gravel - olive grey with some brown, moist, stiff, non-plastic, no hydrocarbon odor, no sheen, some wood fragments.
	023	847		43.1	3	100				
			0		7	25	4			
							5			
	024	850	0	-	4	50				
					5	0	6			SILT with fine Sand and Gravel - as above, brown, no hydrocarbon, no sheen.
					16	0				
							7			
					3	100	8			
					8	100				SILT with fine Sand and Gravel - as above, no hydrocarbon odor, no sheen, some wood fragments.
	025	859	0	-	11	50	9			
							10			
					3	20				SILT with fine sand and gravel - as above, no hydrocarbon odor, no sheen, some wood fragments.
					2	0	11			
					1	0				
					1	100	12		SM	Silty SAND - grey with brown oxidation spots, moist, fine grained, very loose, no hydrocarbon odor, no sheen.
					1	100				
	026	911	0	0.05	1	100	13			
					1	10			ML	Sandy SILT - grey, moist, very soft, non-plastic, no hydrocarbon odor, no sheen.
					1	0	14			
					1	0				
							15			
							16			
					3	100	17		SP	
					6	100				SAND - grey, moist, very loose, fine grained, non-plastic, no hydrocarbon odor, no sheen.
	027	922	0	-	6	75	18			
							19			
							20			

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434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural - Gasco Facility
7900 NW St. Helens Road
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER GT-3

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	2" OD Split Spoon	Time:	Time:
DRILLING METHOD:	4 1/4-inch OD Mud Rotary	8:20	12:00
EQUIPMENT TYPE	B-61 Mobile Drill	Date:	Date:
DRILLER:	Jim Clark	11/18/97	11/18/97
DRILLING CONTRACTOR:	Subterranean, Inc.		

BORING DIAMETER:	4 1/4-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	19.44 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite / Cement Grout					6	100				
					7	100	21			SAND - as above, no hydrocarbon odor, slight organic decay odor, no sheen.
	028	928	0	-	8	75			SP	
							22			
					1	100	23			SAND - as above, moist to wet, no hydrocarbon odor, no sheen.
					6	100				
	029	935	0	-	7	50	24			
							25			
					2	100				
					2	100	26			SAND - as above, grey, moist to wet, no hydrocarbon odor, no sheen, fine grained, some grey silt lenses with rootlets.
	030	943	0	-	2	75				
							27			
							28			
							29			
							30			
					2	100				
	031	953		-	1	100	31			SAND - as above, many silt lenses, no hydrocarbon odor, no sheen, fine grained.
			0		3	75				
							32		SP	
							33			
							34			
							35			
					8	100				
					10	100	36			SAND -as above, wet, no sheen, no hydrocarbon odor.
	032	1000	0	ND	10	100				
							37			
							38			Drilled to 35.0 feet bgs Sampled to 36.5 feet bgs
							39			
										* Sample Number Prefix is 2708-971118-
							40			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**	**GT-4**		
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural - Gasco Facility	SAMPLING METHOD:	2" OD Split Spoon	START	FINISH
7900 NW St. Helens Road	DRILLING METHOD:	4 1/4-inch OD Mud Rotary	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-61 Mobile Drill	12:45	16:00
PROJECT #: 2708	DRILLER:	Jim Clark	Date:	Date:
	DRILLING CONTRACTOR:	Subterranean, Inc.	11/18/97	11/18/97

BORING DIAMETER:	4 1/4-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	19.64 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite / Cement Grout							1		GM	
							2			
	-				8	10	3			Silty GRAVEL with brick fragments - no sheen, driller lost mud at 4.0 feet (voids in fill).
					5	0				
					7	0	4			
							5			
	-				8	10				Silty GRAVEL with brick fragments - no hydrocarbon odor, no sheen.
					12	0	6			
					9	0				
							7			
	-				7	20	8			Silty GRAVEL with brick fragments - grey and green silt, no hydrocarbon odor, no sheen.
					14	0				
					16	0	9			
							10		GM	
					15	100				Sandy GRAVEL with brick - grey, fine grained sand, organic decay odor, no sheen.
					30	100	11			
	033	1341	0	-	18	50				Driller indicates smoother drilling below 11.5 feet
							12			
					1	100	13			SAND with silt lenses - grey, fine grained, no hydrocarbon odor, organic decay odor, no sheen, fine grained.
					1	100				
	034	1350	0	ND	1	50	14			
							15			
							16		SP	
	-				2	0	17			No Recovery.
					1	0				
					1	0	18			
							19			
							20			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER**	**GT-4**		
PROJECT:	HAI LOGGER:	Rob Ede	DRILL	DRILL
Northwest Natural - Gasco Facility	SAMPLING METHOD:	2" OD Split Spoon	START	FINISH
7900 NW St. Helens Road	DRILLING METHOD:	4 1/4-inch OD Mud Rotary	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-61 Mobile Drill	12:45	16:00
PROJECT #: 2708	DRILLER:	Jim Clark	Date:	Date:
	DRILLING CONTRACTOR:	Subterranean, Inc.	11/18/97	11/18/97

BORING DIAMETER:	4 1/4-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	19.64 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite / Cement Grout	-		0		4	20			SP	SAND - brown, fine grained, medium dense, no hydrocarbon odor, no sheen, appears to be oxidized.
					5	0	21			
					7	0				
							22			
							23			
					6	0				No Recovery.
					12	0	24			
					12	0				
							25			
	035	1417		-	5	100				SAND - as above, grey, no hydrocarbon odor, no sheen, fine grained, appears to be oxidized.
			0		8	25	26			
					7	0				
							27			
							28			
							29			
							30			
					4	100				SAND - grey, organic decay odor, no hydrocarbon odor, no sheen, fine grained, appears to be oxidized.
	036	1427		-	5	100	31			
			0		7	25				
							32		SP	
							33			
							34			
							35			
					5	100				SAND - as above, no hydrocarbon odor, no sheen.
	037	1439		-	5	100	36			
			0		7	25				
							37			
							38			
							39			
							40			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
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PROJECT:
Northwest Natural - Gasco Facility
7900 NW St. Helens Road
Portland, Oregon
PROJECT #: 2708

SOIL BORING NUMBER GT-4

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	2" OD Split Spoon	Time:	Time:
DRILLING METHOD:	4 1/4-inch OD Mud Rotary	12:45	16:00
EQUIPMENT TYPE	B-61 Mobile Drill	Date:	Date:
DRILLER:	Jim Clark	11/18/97	11/18/97
DRILLING CONTRACTOR:	Subterranean, Inc.		

BORING DIAMETER:	4 1/4-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	19.64 feet MSL
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHS (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite / Cement Grout					8	100			SP	
	038	1517		ND	15	100	41			SAND - as above, dense, no hydrocarbon odor, no sheen.
			0		17	25				
							42			
							43			
							44			
							45			
	039	1525		-	7	100				SAND - grey, fine grained, medium dense, some shell fragments, no hydrocarbon odor, no sheen.
			0		7	100	46			
					11	25				
							47			
							48			
							49		SP	
							50			
					8	100				SAND - as above, no hydrocarbon odor, no sheen.
					8	100	51			
					8	0				
							52			
							53			Drilled to 50.0 feet bgs Sampled to 51.5 feet bgs
							54			
							55			* Sample Number Prefix is 2708 971118
							56			
							57			
							58			
							59			
							60			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER**		**MW-2-32**	
	OWRD # 84235			
	HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
PROJECT:	SAMPLING METHOD:	3-inch Split Spoon/4-inch Core Barrel		
Northwest Natural Gas Co.	DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
Gasco Facility	EQUIPMENT TYPE	B-59 Mobile Drill	11:20	13:00
Portland, Oregon	DRILLER:	Brad James	Date:	Date:
PROJECT: 2708	DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	6-Nov-95	6-Nov-95

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch
SURFACE ELEVATION:	35.8 feet MSL
TOP OF CASING ELEVATION:	34.46 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS Total PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Flush Monument										Ground surface
Concrete	M2-01	1115	9.3	10.3			1		GM	Surface: Sandy, Silty, GRAVEL - moist, brown, well graded, stone for parking lot.
							2			
							3			SAND (1.5-4.0 feet bgs) - brown, slightly moist, loose, poorly graded, fine/medium grained, no hydrocarbon odor, slight sheen?.
	M2-02	1125		-						
			40.4				4			
							5		SP	
					9	60				SAND with gravel (5.0-6.5 feet bgs) - brown, slightly moist, loose, poorly graded, fine/medium grained, no hydrocarbon odor, slight sheen, lampblack in end of sampler.
					7	0	6			
					7	0				
	M2-03	1135		-			7			Sandy, Silty, GRAVEL (6.5-7.5 feet bgs) - lampblack, pieces of brick, concrete.
			43.7							
							8			Driller notes large concrete pieces at 8.5 feet bgs.
							9			
Bentonite Chips									GM	
							10			
2-inch ID Blank PVC Casing					7	50				Sandy, Silty, GRAVEL (10.0-11.5 feet bgs) - as above, some lampblack, hydrocarbon odor, slight sheen.
					9	0	11			
					9	0				
							12			
					5	50	13			Sandy GRAVEL (12.5-14.0 feet bgs) - olive grey, moist, loose, hydrocarbon odor, sheen, brick in end of sampler.
					9	0				
					6	0	14			
							15		GP	
					6					Sandy GRAVEL (15.0-16.5 feet bgs) - large pieces of brick material, loose, hydrocarbon odor, sheen.
					9		16			
					50/5"					
							17			
	M2-04	1200	25.9	-	7	70	18			Gravelly Sand (17.5-19.0 feet bgs) - yellow/brown, moist, poorly graded, fine grained, no hycdrocarbon odor, no sheen, minor olive grey silt lenses.
					11	0				
					15	0	19		SP	
							20			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-2-32

OWRD # 84235

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	3-inch Split Spoon/4-inch Core Barrel		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	11:20	13:00
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	6-Nov-95	6-Nov-95

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch
SURFACE ELEVATION:	35.8 feet MSL
TOP OF CASING ELEVATION:	34.46 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS Total PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
PVC					10	100				
	M2-05	1210	24.7	-	8	100	21	11/6/95		SAND (20.0-21.5 feet bgs) - orange/brown, moist, loose, poorly graded, medium grained, no hycdrocarbon odor, no sheen.
					9	0				
							22		SP	
					7	100	23			SAND (22.5-23.0 feet bgs) - as above, wet, no hydrocarbon odor, no sheen.
					8	100				
					6	90	24			SAND (23.0-24.0 feet bgs) - olive grey, wet, loose, fine grained, no hydrocarbon odor, no sheen.
2-inch ID 0.020-inch PVC Slotted Screen	M2-06	1223	25.4	0.43			**25**			Silty SAND (24.0-25.0 feet bgs) - wet, slightly dense, hydrocarbon odor?, no sheen, olive grey silt lenses.
							26		SM	Silty SAND (25.0-27.5 feet bgs) - wet, slightly dense, fine grained, slight hydrocarbon odor?, no sheen.
	M2-07	1240		-			27			
			17.8				28		SP	Silty SAND (27.5-28.5 feet bgs) - olive grey, wet, loose, fine grained, no hydrocarbon odor, no sheen.
	M2-08	1250		-			29			
			23.1				**30**		SM	Sandy SILT (31.5-32.5 feet bgs) - olive grey, orange oxidation spots, no hydrocarbon odor, no sheen, thin lenses of fine grained sand.
							31			
Cap	M2-09	1255		-			32		ML	Boring terminated at 32.5 feet bgs Boring sampled to 32.5 feet Monitoring well installed to 31.5feet bgs Well depth is 31.5 feet below top of casing
			25.7				33			
							34			
							35			Materials: 10 feet 2-inch diameter, 0.020-inch PVC slotted screen 21.5 feet 2-inch diameter PVC blank casing 12 50# bags 10/20 sand 13 50# bags bentonite chips 1 end cap 1 locking cap Flush steel monument
							36			
							37			
							38			
							39			* Sample Prefix Number is 2708-951106-
							40			

Colorado 10/20 Sand Pack

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-2-61

OWRD # 100684

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	2-inch OD Split Spoon and 4-inch OD Core Barrel		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobil Drill	10:00	10:00
DRILLER:	Armando Pablo	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations	7-Oct-98	8-Oct-98

BORING DIAMETER: 10-inch
CASING DIAMETER: 2-inch ID
SURFACE ELEVATION: 34.7 feet msl
TOP OF CASING ELEVATION: 34.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Flush Monument										Ground surface
Concrete										Surface: gravel
							1			
					10	100	2			SAND (1.5-3.0 feet bgs) - brown, dry, medium dense, fine grained, poorly graded, no hydrocarbon odor, no sheen (fill).
	M2-01	10:15		110	11	100				
			1.7		9	25	3			
							4			
							5		SP	
	M2-02	10:20		5,425	4	35	6			SAND (5.5-7.0 feet bgs) - black, dry, loose, fine grained, poorly graded, hydrocarbon odor, hydrophobic via sheen test, material appears to be lampblack, no sheen (fill).
			1.4		7	0				
					7	0	7			
							8			
							9			SAND (7.0-9.5 feet bgs) - very moist lampblack noted on auger flights
			0.3	-	3	10	**10**			Sandy Silty GRAVEL (9.5-11.0 feet bgs) - loose, pieces of concrete in sample, poor recovery due to presence of large rock ahead of sampler (fill).
					9	0				
					12	0	11			
									GM	
							12			
							13			
							14			
							15		GP	Note: See Boring Log for well MW-2-32 for soil description from 11 feet bgs to a depth of 31.5 feet bgs.
							16			
							17			
							18			
							19		SP	
							20			

2-inch ID Blank PVC Casing

Bentonite Grout

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER**		**MW-2-61**	
	OWRD # 100684			
	HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
PROJECT:	SAMPLING METHOD:	2-inch OD Split Spoon and 4-inch OD Core Barrel		
Northwest Natural	DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
Gasco Facility	EQUIPMENT TYPE	B-59 Mobil Drill	10:00	10:00
Portland, Oregon	DRILLER:	Armando Pablo	Date:	Date:
PROJECT: 2708	DRILLING CONTRACTOR:	Geo-Tech Explorations	7-Oct-98	8-Oct-98

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	34.7 feet msl
TOP OF CASING ELEVATION:	34.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Grout; 2-inch ID Blank PVC Casing							21			
							22		SP	
							23			Note: See Boring Log for well MW-2-32 for soil description from 11 feet bgs to a depth of 31.5 feet bgs.
							24			
							25			
							26		SM	
							27			
							28		SP	
							29			
							30		SM	Note: Switch to 4-inch OD 4-foot core barrel sampler.
							31			
							32		ML	Sandy SILT (31.5-33 feet bgs) - olive grey to dark grey with some brown mottling, moist, slightly plastic, no hydrocarbon odor, no sheen.
	M2-03	11:45		0.42						
			1.5				33			
							34		SM	Silty SAND (33-36.5 feet bgs) - dark grey, wet, fine grained, some mica, thin fine grained sand bedding, no hydrocarbon odor, no sheen.
							35			
	M2-04	11:51		-			36			
			1.4							
							37		SP	SAND (36.5-39.0 feet bgs) - dark grey, wet, fine grained, no hydrocarbon odor, no sheen.
							38			
	M2-05	12:10		-						
			0.8				39			Silty SAND (39.0-42.5 feet bgs) - dark grey, wet, some thin sand beds, shell fragments, no hydrocarbon odor, no sheen.
							40		SM	

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER**		**MW-2-61**	
	OWRD # 100684			
PROJECT: Northwest Natural Gasco Facility Portland, Oregon	HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
	SAMPLING METHOD:	2-inch OD Split Spoon and 4-inch OD Core Barrel		
	DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
	EQUIPMENT TYPE	B-59 Mobil Drill	10:00	10:00
	DRILLER:	Armando Pablo	Date:	Date:
PROJECT: 2708	DRILLING CONTRACTOR:	Geo-Tech Explorations	7-Oct-98	8-Oct-98

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	34.7 feet msl
TOP OF CASING ELEVATION:	34.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Grout							41			Note: Switch to split spoon at 41.5 feet bgs because core barrel is not penetrating through a kink in the augers.
	M2-06	12:15	1.5	-						
					3	100	42		SM	Silty SAND (41.5-43.5 feet bgs) - dark grey, wet, loose, medium grained, numerous thin fine grained sand beds, shell fragments, no hydrocarbon odor, no sheen.
					8	100				
					4	100	43			
					12	50				Silty SAND (43.5-45.5 feet bgs) - as above, loose to medium dense, becoming a fine grained sand at 45 feet bgs, no hydrocarbon odor, no sheen.
	M2-07	12:58		-	6	100	44			
			0.6		12	100				
Bentonite Chip Plug					14	100	**45**			
2-inch ID Blank PVC Casing	M2-08	13:15	1.4	-	18	100				
							46			
									SP	
					8	100	47			SAND (46.5-48.5 feet bgs) - dark grey, wet, medium dense, fine grained, minor mica, few silt lenses, no hydrocarbon odor, no sheen.
					16	100				
	M2-09	13:22		-	23	75	48			
			1.9		24	0				
							49			
					9	100	**50**		SM	Silty SAND (49.5-50.0 feet bgs) - grey, wet, medium dense, few silt lenses, no hydrocarbon odor, no sheen.
					10	100			SP	SAND (50.0-51.0 feet bgs) - dark grey, wet, medium dense, medium grained, no hydrocarbon odor, no sheen.
	M2-10	13:22		-	12	100	51			
			1.9		14	75			SM	Silty SAND (51.0-51.5 feet bgs) - dark grey, wet, medium dense, few silt lenses, no hydrocarbon odor, no sheen.
					5	100	52		SP	SAND (51.5-52.5 feet bgs) - dark grey, wet, loose, medium grained, no hydrocarbon odor, no sheen.
	M2-11	13:42		-	8	100				
			1.3		12	100	53			
					23	75			ML	Sandy SILT (52.5-54.5 feet bgs) - dark grey, moist, stiff to very stiff, shell fragments, no hydrocarbon odor, no sheen.
							54			
					6	100	**55**			
2-inch ID 0.020-inch PVC Slotted Screen	M2-12	13:59		-	8	100				SAND (54.5-56.5 feet bgs) - grey, wet, loose to medium dense, fine to medium grained, few grey sandy silt lenses, no hydrocarbon odor, no sheen.
			2.2		12	75	56			
					18	0				
							57		SP	
					6	100	58			SAND (57.5-59.5 feet bgs) - grey, wet, loose to medium dense, medium grained, few rounded gravels, no hydrocarbon odor, no sheen.
	M2-13	14:05		-	10	100				
			1.08		11	100	59			
					15	25				
Colorado 10-20 Sand Pack					6	100	**60**			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
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PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-2-61

OWRD # 100684

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	2-inch OD Split Spoon and 4-inch OD Core Barrel		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobil Drill	10:00	10:00
DRILLER:	Armando Pablo	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations	7-Oct-98	8-Oct-98

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	34.7 feet msl
TOP OF CASING ELEVATION:	34.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)
Sand / Sum					6	100			SP
	M2-14	14:25		-	12	100	61		
			1.6		18	100			
							62		
							63		
							64		
							65		
							66		
							67		
							68		
							69		
							70		
							71		
							72		
							73		
							74		
							75		
							76		
							77		
							78		
							79		
							80		

SOIL DESCRIPTION

SAND (59.5-61.5 feet bgs) - dark grey, wet, loose to medium dense, medium grained, no hydrocarbon odor, no sheen.

Boring terminated at 61.5 feet bgs
Boring sampled to 61.5 feet
Monitoring well installed to 61.5 feet bgs

Materials:
1.5 foot PVC sump/end cap
10 feet 2-inch diameter, 0.020-inch PVC slotted screen
50 feet 2-inch diameter PVC blank casing
14 50# bags 10/20 Colorado sand
5 50# bags bentonite chips
6 bags bentonite grout
3 centralizers
1 locking cap
Flush steel monument

* Sample Prefix Number is 2708-981007-

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-3-56

OWRD # 84231

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Core Barrel		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	8:00	11:00
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations	1-Nov-95	1-Nov-95

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.20 feet MSL
TOP OF CASING ELEVATION:	34.07 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Steel Monument							-3			
							-2			
							-1			Ground surface
Concrete	M3-01	758	1.7							Surface - Sandy Silty Gravel - brown, moist, no hydrocarbon odor, no sheen, grassy area.
							1			
							2		GM	
Bentonite Chips; 2-inch ID Blank PVC Casing					11	0	3			No Recovery (2.5-4.0 feet bgs).
					12	0				
					15	0	4			
							5			
	M3-02	810	251		16	100				Sandy Silty GRAVEL (5.0-6.5 feet bgs) - brown with black tarry staining, moist, hydrocarbon odor, sheen, pockets of moist tar.
	M3-03	812	282		17	70	6			
					14	0				
							7			
	M3-04	817			9	100	8			Sandy Silty GRAVEL (7.5-9.0 feet bgs) - black and tarry, moist, hydrocarbon odor, sheen.
			247		11	100				
					17	50	9			
							10			
							11			
					50/3"	0				Large Gravels.
							12			
					50/3"	0	13			
							14			
							15			
Bentonite Grout; 2-inch ID Blank Stainless Steel Casing	M3-05	840			16	100				Sandy GRAVEL with silt (15.0-16.5 feet bgs) - black, slightly moist, loose, hydrocarbon odor, sheen, brick and wood fragments.
			59.7		38	100	16			
					50/3"	0		11/1/95	GM	
							17			
										Sandy GRAVEL (17.5-19.0 feet bgs) - olive grey,wet, loose, slight hydrocarbon odor, slight sheen, brick and wood fragments.
	M3-06	850			12	100	18			
			15.9		7	30				
					4	0	19		GP	Sandy Gravel (19.0-20.5 feet bgs) - as above, hydrocarbon odor, sheen.
					17	100				
	M3-07	9:00			18	100	**20**			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **MW-3-56** **OWRD # 84231**			
PROJECT:	HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
Northwest Natural Gas Co.	SAMPLING METHOD:	Core Barrel	Time:	Time:
Gasco Facility	DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	8:00	11:00
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
PROJECT: 2708	DRILLER:	Brad James	1-Nov-95	1-Nov-95
	DRILLING CONTRACTOR:	Geo-Tech Explorations		

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.20 feet MSL
TOP OF CASING ELEVATION:	34.07 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Grout; 2-inch ID Blank Stainless Steel Casing			7.9		20	100				
					8	20	21			SILT with some gravel (20.5-21.0 feet bgs) - brown, moist, stiff, slight hydrocarbon odor, sheen.
									ML	SILT with gravel (21.0-25.0 feet bgs) - black tarry substance, moist to wet, hydrocarbon odor, sheen, 22.5-23.0 feet bgs is wet and tarry.
							22			
	M3-08	910								
			45.7				23		GP	
							24			
							25			
							26		ML	Sandy SILT (25.0-29.9 feet bgs) - olive grey with orange oxidized zones, moist, no hydrocarbon odor, no sheen, sand lens at 25.5 feet bgs.
							27			
	M3-09	915					28			
			5.8				29			
							30			
							31			SAND (29.9-34.0 feet bgs) - olive grey, wet, loose, medium grained, slight hydrocarbon odor, slight sheen, sand lens at 25.5 feet bgs.
	M3-10	925								
			9.8				32			
							33			
							34		SP	
	M3-11	930								SAND (34.0-35.0 feet bgs) - brown, wet, loose, fine grained, no hydrocarbon odor, no sheen, thin silt lenses present.
			2.8				**35**			
							36			SAND (35.0-37.5 feet bgs) - olive grey, wet, loose, poorly graded, fine grained, no hydrocarbon odor, no sheen.
	M3-12	955								
			9.8				37			
							38			SAND (37.5-39.0 feet bgs) - brown, wet, medium dense, fine grained, no hydrocarbon odor, no sheen, silt layers
	M3-13	1000								
Bent.			5.9				39			
							40		SM	Silty SAND (39.0-40.0 feet bgs) - brown, moist to wet, dense, fine grained, no hydrocarbon odor, no sheen.

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

MONITORING WELL NUMBER MW-3-56

OWRD # 84231

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Core Barrel		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	8:00	11:00
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations	1-Nov-95	1-Nov-95

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT: 2708

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.20 feet MSL
TOP OF CASING ELEVATION:	34.07 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bent. Chips							41			SAND (40.0-41.5 feet bgs) - olive grey, wet, loose, medium grained, no hydrocarbon odor, no sheen.
2-inch Blank Stainless Steel Casing	M3-14	1010								
			19.0				42			SAND (41.5-45.0 feet bgs) - olive grey, wet, fine grained, silt layers.
							43			
	M3-15	1015					44			
			3.1				**45**		SP	
							46			SAND (45.0-49.0 feet bgs) - olive grey, wet, loose, poorly graded, medium grained, no hydrocarbon odor, no sheen.
							47			
Colorado 10-20Sand Pack							48			
2-inch ID 0.020-inch Stainless Steel Slotted Screen	M3-16	1025					49			
			6.7				**50**			SAND (49.0-50.0 feet bgs) - as above, silt layers, no hydrocarbon odor, no sheen.
							51			SAND (50.0-55.0 feet bgs) - olive grey, wet, loose, poorly graded, medium grained, no hydrocarbon odor, no sheen, olive grey silt layers. Heaving sands reported by driller.
							52			
							53			Boring terminated at 56.5 feet bgs Boring sampled to 56.5 feet Monitoring well installed to 55 feet bgs
	M3-17	1048	-				54		SP	Materials: 10 feet 2-inch diameter, 0.010-inch PVC slotted screen 6.5 feet 2-inch diameter PVC blank casing 39.5 feet 2-inch diameter stainless steel blank casing 12 50# bags 10/20 sand 3 50# bags bentonite chips 4 bags bentonite grout 1 end cap 1 locking cap above-grade steel monument 3 guard posts
	M3-18	1050	-							
							55			
Cap					3	100				
					5	100	56			
					16	100				
							57			
							58			
							59			* Sample Prefix Number is 2708-951101-
							60			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **MW-4-57** **OWRD # 84229**			
PROJECT:	HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
Northwest Natural Gas Co.	SAMPLING METHOD:	3-inch Split Spoon/Core Barrel	Time:	Time:
Gasco Facility	DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	10:15	13:15
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	Date:	Date:
PROJECT: 2708	DRILLER:	Brad James	30-Oct-95	30-Oct-95
	DRILLING CONTRACTOR:	Geo-Tech Explorations		

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.7 feet MSL
TOP OF CASING ELEVATION:	34.53 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Slurry; 2-inch ID Blank Stainless Steel Casing	M4-05	1115	7.0	-			21, 22, 23, 24, **25**		ML	SILT with sand and gravel (20.0-25.0 feet bgs) - brown, moist, slightly plastic, no hydrocarbon odor, no sheen.
	M4-06	1135	10.2	3,261			26, 27		SM	Silty SAND (25.0-27.0 feet bgs) - olive grey, moist to wet, wood fragments, hydrocarbon odor, sheen.
							28		ML	Sandy SILT (27.0-28.0 feet bgs) - olive grey with brown and orange oxidation spots, root zones, no hydrocarbon odor, no sheen.
	M4-07	1140	2.1	-			29, **30**	10/30/95	SM	Silty SAND (28.0-30.0 feet bgs) - olive grey with brown mottling, moist to wet, fine grained, root zones, no hydrocarbon odor, no sheen.
	M4-08	1150	2.4	-			31, 32		SP	SAND (30.0-32.5 feet bgs) - olive grey, wet, loose, poorly graded, fine grained, root zones, hydrocarbon odor, sheen.
							33		ML	SILT (32.5-33.0 feet bgs) - brown with orange oxidized zones, moist, slightly plastic, no hydrocarbon odor, no sheen.
	M4-09	1155	2.6	-			34		SM	Silty SAND (33.0-33.5 feet bgs) - brown with bright orange oxidized zones, moist to wet, dense, fine grained.
							35		ML	SILT (33.5-35.0 feet bgs) - olive grey, moist, stiff, no hydrocarbon odor, no sheen.
							36, 37, 38, 39		ML	SILT with fine sand (35.0-39.0 feet bgs) - olive grey, moist, stiff, root zones, no hydrocarbon odor, no sheen.
	M4-10	1210	-	-			**40**		SP	SAND (39.0-40.0 feet bgs) - olive grey, wet, loose, medium grained, no hydrocarbon odor, no sheen.

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	MONITORING WELL NUMBER OWRD # 84229	MW-4-57	
PROJECT: Northwest Natural Gas Co. Gasco Facility Portland, Oregon	HAI LOGGER: Rob Ede SAMPLING METHOD: 3-inch Split Spoon/Core Barrel DRILLING METHOD: 6 1/4-inch ID Hollow Stem Auger EQUIPMENT TYPE B-59 Mobile Drill DRILLER: Brad James	DRILL START Time: 10:15 Date: 30-Oct-95	DRILL FINISH Time: 13:15 Date: 30-Oct-95
PROJECT: 2708	DRILLING CONTRACTOR: Geo-Tech Explorations		

BORING DIAMETER: 10-inch
CASING DIAMETER: 2-inch ID
SURFACE ELEVATION: 31.7 feet MSL
TOP OF CASING ELEVATION: 34.53 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Chip Seal							41			SAND (40.0-44.0feet bgs) - as above, no hydrocarbon odor, no sheen.
2-inch ID Blank Stainless Steel Casing							42		SP	
							43			
20/40	M4-11	1220		-						
			8.7				44			
	M4-12	1225	-	-			**45**		ML	Sandy SILT (44.0-45.0 feet bgs) - olive grey, moist, stiff, slightly plastic, no hydrocarbon odor, no sheen.
							46			SAND (45.0-49.0 feet bgs) - olive grey, wet, loose, medium grained, no hydrocarbon odor, no sheen, thin silt layers from 49.0-50.0 feet bgs.
							47		SP	
	M4-13	1238		-			48			
			31.9				49			
2-inch ID 0.020-inch Stainless Steel Slotted Screen							**50**			
Colorado 10-20 Sand Pack							51			SAND (50.0-55.0 feet bgs) - as above, no hydrocarbon odor, no sheen.
							52			
							53			
							54			
	M4-14	1245		-						
			178				**55**			
							56			SAND (55.0-58.0 feet bgs) - as above, no hydrocarbon odor, no sheen.
Ca							57		SP	
	M4-15	1312		0.26						
			17.5				58			
							59			
							60			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **MW-4-57** **OWRD # 84229**			
PROJECT:	HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
Northwest Natural Gas Co.	SAMPLING METHOD:	3-inch Split Spoon/Core Barrel		
Gasco Facility	DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobile Drill	10:15	13:15
PROJECT: 2708	DRILLER:	Brad James	Date:	Date:
	DRILLING CONTRACTOR:	Geo-Tech Explorations	30-Oct-95	30-Oct-95

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.7 feet MSL
TOP OF CASING ELEVATION:	34.53 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)
							61		
							62		
							63		
							64		
							65		
							66		
							67		
							68		
							69		
							70		
							71		
							72		
							73		
							74		
							75		
							76		
							77		
							78		
							79		
							80		

SOIL DESCRIPTION

Boring terminated at 58.0 feet bgs
Boring sampled to 58.0 feet
Monitoring well installed to 58.0 feet bgs

Materials:
10 feet 2-inch diameter, 0.010-inch stainless steel slotted screen
40.5 feet 2-inch diameter stainless steel blank casing
5.5 feet 2-inch diameter PVC blank casing
13 50# bags 10/20 sand
5 50# bags bentonite chips
1 end cap
1 locking cap
above-grade steel monument
3 guard posts

* Sample Prefix Number is 2708-951030-

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

MONITORING WELL NUMBER MW-4-101

OWRD # 88125

PROJECT:	HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START
Northwest Natural	SAMPLING METHOD:	1.5-inch OD Split Spoon	Time: 10:55
Gasco Facility	DRILLING METHOD:	Dual Wall Reverse Circulation Air	DRILL FINISH
Portland, Oregon	EQUIPMENT TYPE	AP-1,000 Drill Systems	Time: 11:40
PROJECT: 2708	DRILLER:	P.D. Lodder	Date: 14-Oct-98
	DRILLING CONTRACTOR:	Layne Christenson Company	Date: 16-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.8 feet msl
TOP OF CASING ELEVATION:	34.36 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Steel Monument							-3			
							-2			
							-1			Ground surface
Concrete							1		SM	Surface: Silty SAND with gravel - brown, moist, pieces of brick, grass covered area, no hydrocarbon odor, no sheen (fill).
							2			
	M4-01	11:02		976.4	15	100				
			219		29	100	3		GM	Silty Sandy GRAVEL (2.0-3.5 feet bgs) - brown, moist, medium dense, lampblack present at 2 and 3 feet bgs, no hydrocarbon odor, no sheen (fill).
					14	90				
							4			
							5			
					7	50	6		GP	Sandy GRAVEL (5.5-7.0 feet bgs) - brown, moist, loose, some brick fragments, no hydrocarbon odor, no sheen (fill).
	M4-02	12:11		0.367	14	100				
			53.1		8	80	7			
							8			
							9		Concrete	Concrete or rock (9-10.5 feet bgs), based on drilling conditions, no recovery from 9-10.5 feet bgs (fill).
					2	0				
					2	0	**10**			
					4	0				
3/8-inch Bentonite Chips	M4-03	12:21	349	1.44	4	50	11		GM	Sandy GRAVEL with some silt (10.5-12.0 feet bgs) - brown, moist, very loose to loose, some wood fragments, no hydrocarbon odor, no sheen (fill).
					4	0				
					8	0	12			
							13			
							14			
							15			
							16			
							17			
							18			
							19			Cyclone grab sample at 20 feet bgs indicates Sandy Silty GRAVEL - brown, dry, a lot of wood debris, no hydrocarbon odor, no sheen (fill).
							20			

2-inch ID Blank PVC Casing

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **MW-4-101** **OWRD # 88125**			
PROJECT:	HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
Northwest Natural	SAMPLING METHOD:	1.5-inch OD Split Spoon		
Gasco Facility	DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	AP-1,000 Drill Systems	10:55	11:40
PROJECT: 2708	DRILLER:	P.D. Lodder	Date:	Date:
	DRILLING CONTRACTOR:	Layne Christenson Company	14-Oct-98	16-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.8 feet msl
TOP OF CASING ELEVATION:	34.36 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Grout; 2-inch ID Blank PVC Casing							21		ML	Note: See boring log for well MW-4-57 for soil description from 12 feet bgs to a depth of 57 feet bgs.
							22			
							23			
							24			
							25			Wood debris plugging end of drill casing - no cyclone grab sample.
							26		SM	
							27			
							28		ML	
							29		SM	
							30			Wood debris plugging end of drill casing - no cyclone grab sample.
							31		SP	
							32			
							33		ML	
							34		SM	
							35			Cyclone grab sample at 35feet bgs indicates fine grained grey SAND and SILT, wet, slight sheen, slight odor
							36		ML	
							37			
							38			
							39			
							40		SP	

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	MONITORING WELL NUMBER OWRD # 88125	MW-4-101		
PROJECT:	HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
Northwest Natural	SAMPLING METHOD:	1.5-inch OD Split Spoon		
Gasco Facility	DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	AP-1,000 Drill Systems	10:55	11:40
PROJECT: 2708	DRILLER:	P.D. Lodder	Date:	Date:
	DRILLING CONTRACTOR:	Layne Christenson Company	14-Oct-98	16-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.8 feet msl
TOP OF CASING ELEVATION:	34.36 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
2-inch ID Blank PVC Casing							41			
							42		SP	
							43			
							44			
							45		ML	Cyclone grab sample at 45 feet bgs indicates fine grained grey SAND, wet, slight sheen, moderate odor
							46		SP	
							47			
							48			
							49			
							50			
							51			
							52			
Bentonite Grout							53			
							54			
							55			No Recovery from 55-56.5 feet bgs due to apparent presence of wood stuck to end of drill casing.
					2	0				
					2	0	56			
					35	0				
							57		SP	
							58			
							59			
					8	10				SAND (59.0-60.5) - grey, wet, fine grained, loose to medium dense, no sheen, no odor, poor recovery.
					19	0	**60**			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-4-101

OWRD # 88125

HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch OD Split Spoon		
DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
EQUIPMENT TYPE	AP-1,000 Drill Systems	10:55	11:40
DRILLER:	P.D. Lodder	Date:	Date:
DRILLING CONTRACTOR:	Layne Christenson Company	14-Oct-98	16-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.8 feet msl
TOP OF CASING ELEVATION:	34.36 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
					7	0				
							61			
							62			
							63			
							64			
							65		SP	
	M4-04	14:15	-	-	2	100				SAND (65.0-66.5) - grey, wet, fine grained, loose to medium dense, some rootlets and mica present, no sheen, no odor.
					7	0	66			
					12	0				
							67			
							68			
							69			
							70			
					20	100				SAND (70-70.5) - grey, wet, fine grained, medium dense, no sheen, no odor.
	M4-05	14:30	-	-	14	25	71		ML	SILT (70.5-71.0) - grey, wet, medium stiff to stiff, rootlets, shell fragments, organic odor, no sheen, sand in end of sampler.
					8	0				
							72			
							73			Driller indicates minor heaving conditions beginning at approximately 75 feet bgs.
							74			
							75			
	M4-06	14:50	-	-	1	100				SAND (75.0-76.5) - grey, wet, fine grained, very loose, some mica present, no sheen, slight odor.
					1	100	76			
					1	0				
							77			
									SP	
							78			
							79			
							80			

Bentonite Grout

2-inch ID Blank PVC Casing

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-4-101

OWRD # 88125

HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch OD Split Spoon		
DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
EQUIPMENT TYPE	AP-1,000 Drill Systems	10:55	11:40
DRILLER:	P.D. Lodder	Date:	Date:
DRILLING CONTRACTOR:	Layne Christenson Company	14-Oct-98	16-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.8 feet msl
TOP OF CASING ELEVATION:	34.36 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Grout; 2-inch ID Blank PVC Casing					1	5				
					0	0	81			SAND (80-81.5) - as above, no sheen, no odor
					0	0				
							82			
							83		SP	
							84			**GROUNDWATER SAMPLE** Drove a 2-inch OD stainless steel Hydropunch Sampler with a 6-inch long stainless steel screen 4 feet below drill casing. Pulled back drive rods to expose screen at depth of 86.0 to 86.5 feet bgs. The sampler was pulled to the surface and sample (#2708-981014-BW4-01) was collected by pouring directly from the sampler at 16:20 on 10/14/98.
							85			
					1	0				
					0	0	86			
20/40					0	0				
							87			
							88			Terminate drilling for day at 16:30 10/14/98, boring depth is 86.5 feet bgs. Resume drilling at 9:30 10/15/98.
10/20							89			Persistent heaving sands into drill casing, unable advance split spoon to undisturbed formation, terminate split spoon sample collection.
							90			
20/40 Sand Pre-Pack; 2-inch OD 0.010-inch PVC Screen							91			Cyclone grab sample at 90 feet bgs indicates fine grained grey SAND, wet, organic odor, no sheen.
							92			
							93			
							94			
							95			Cyclone grab sample at 95 feet bgs indicates fine grained grey SAND with some grey silts, wet, organic odor, no sheen.
							96			
							97		SP	
							98			
							99			Cyclone grab sample at 100 feet bgs indicates fine grained grey sand with some grey silts, wet, organic odor, no sheen.
							100			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	MONITORING WELL NUMBER OWRD # 88125	MW-4-101		
PROJECT:	HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
Northwest Natural	SAMPLING METHOD:	1.5-inch OD Split Spoon		
Gasco Facility	DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	AP-1,000 Drill Systems	10:55	11:40
PROJECT: 2708	DRILLER:	P.D. Lodder	Date:	Date:
	DRILLING CONTRACTOR:	Layne Christenson Company	14-Oct-98	16-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.8 feet msl
TOP OF CASING ELEVATION:	34.36 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Cap							101			
							102			
							103			
							104			
							105			Cyclone grab sample at 105 feet bgs indicates fine grained grey SAND with some grey silts, wet, organic odor, no sheen.
							106		SP	
							107			
							108			
							109			
							110			Cyclone grab sample at 110 feet bgs indicates fine grained grey SAND with some grey silts, wet, organic odor, no sheen.
Heaved Formation Sand							111			**GROUNDWATER SAMPLE** Drove a 2-inch OD stainless steel Hydropunch Sampler with a 6-inch long stainless steel screen 2 feet below drill casing. Pulled back drive rods to expose screen at depth of 110.5 to 111.0 feet bgs. The sampler was pulled to the surface and sample (#2708-981015-BW4-02) was collected by pouring directly from the sampler at 11:17 on 10/15/98.
							112			
							113			
							114			
							115		SP	Cyclone grab sample at 115' indicates fine grained grey sand with some grey silts, wet, organic odor, no sheen.
							116			Boring terminated at 120 feet bgs, heaved sand to 80 feet bgs. Add potable water to hole and lift drill casing in effort to remove sand from boring such that target well depth (112' bgs) may be achieved. Top of heaved sand drops to a maximum depth of 89.5 feet bgs. Maximum achievable well installation depth is 101 feet bgs by pushing a pre-pack screen into the heaved formation sand.
							117			
							118			
							119			
							120			* Sample Prefix Number is 2708-981014-

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **MW-4-101** **OWRD # 88125**			
PROJECT:	HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
Northwest Natural	SAMPLING METHOD:	1.5-inch OD Split Spoon		
Gasco Facility	DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	AP-1,000 Drill Systems	10:55	11:40
PROJECT: 2708	DRILLER:	P.D. Lodder	Date:	Date:
	DRILLING CONTRACTOR:	Layne Christenson Company	14-Oct-98	16-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	31.8 feet msl
TOP OF CASING ELEVATION:	34.36 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							121			Boring terminated at 120 feet bgs Monitoring well installed to 101 feet bgs Materials: 10 feet 2-inch ID 0.010-inch slotted PVC screen, with 3.25-inch OD 20/40 sand pre-pack 95 feet 2-inch diameter Schedule 40 PVC blank casing 2 50# bags 20/40 sand 3 50# bag 10/20 sand 4 100# bags bentonite grout 1 stainless steel end cap 1 locking cap above-grade steel monument 3 guard posts
							122			
							123			
							124			
							125			
							126			
							127			
							128			
							129			
							130			
							131			
							132			
							133			
							134			
							135			
							136			
							137			
							138			
							139			
							140			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-5-32

OWRD # 84228

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Split Spoon/Core Barrel		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	13:03	15:00
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations	27-Oct-95	27-Oct-95

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.1 feet MSL
TOP OF CASING ELEVATION:	28.05 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Steel Monument							-3			
							-2			
							-1			Ground surface
Concrete	M5-01	1306		1.4						Surface: Silty GRAVEL - brown, moist, well graded, no hydrocarbon odor, no sheen.
			1107				1			
							2			
									GP	
					50/5"	50	3			GRAVEL (2.5-3.0 feet bgs) - grey, damp, loose, poorly graded, no hydrocarbon odor, no sheen.
							4			
							5			
	M5-02	1320		-	10	100				
			874		6	0	6			Silty GRAVEL (5.0-6.0 feet bgs) - brown, moist, well graded, no hydrocarbon odor, no sheen.
					26	0		10/27/95	GM	
							7			
3/8-inchBentonite Chips							8			GRAVEL (7.5-9.0 feet bgs) - brown, wet, loose, well graded, no hydrocarbon odor, no sheen.
					10	30				
					15	0	9			
					19	0				
							10			
2-inch ID Blank PVC Casing	M5-03	1330		-	8	100			GP	
			279		5	0	11			GRAVEL with coarse sand and silt (10.0-13.0 feet bgs) - brown, wet, no hydrocarbon odor, no sheen.
					5	0				Switch to core barrel sampler.
							12			
	M5-04	1340		-			13			
			383							SAND with lampblack (13.0-15.0 feet bgs) - black, dry, hard, fine grained, hydrophobic, hydrocarbon odor.
							14			
							15		SP	
	M5-05	1350		1,942			16			SAND (15.0-20.0 feet bgs) - dark grey, moist, medium dense, poorly graded, fine grained, pieces of bark, hydrocarbon odor?, olive grey sandy silt on core bottom.
			81.1							
							17			
							18		ML	
							19			
							20			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

MONITORING WELL NUMBER MW-5-32

OWRD # 84228

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	Split Spoon/Core Barrel		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	13:03	15:00
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations	27-Oct-95	27-Oct-95

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT: 2708

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.1 feet MSL
TOP OF CASING ELEVATION:	28.05 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Colorado 10-20 Sand Pack	M5-06	1357		-						Sandy SILT (20.0-22.0 feet bgs) - brown with orange mottling, moist, non-plastic, no hydrocarbon odor, no sheen, some root zones.
			117				21		ML	
	M5-07	1400	18.1	0.91			22			SAND (22.5-22.5 feet bgs) - brown, wet, fine grained, no hydrocarbon odor, no sheen.
							23			SAND (22.5-23.5 feet bgs) - as above, no hydrocarbon odor, no sheen.
2-inch ID 0.020-inch PVC Slotted Screen							24			Silty SAND (23.5-25.0 feet bgs) - brown with orange oxidation spots, wet, loose, no hydrocarbon odor, no sheen.
	M5-08	1406		-						
			62.1				**25**		SP	SAND (25.0-26.5 feet bgs) - brown with orange oxidation spots, wet, loose, fine grained, some thin silt layers no hydrocarbon odor, no sheen.
							26			
							27			SAND (26.5-27.5 feet bgs) - olive grey, wet, loose, poorly graded, some thin silt layers, no hydrocarbon odor, no sheen.
							28			SAND with thin silt layers (27.5-30.0 feet bgs) - olive grey, wet, loose, no hydrocarbon odor, no sheen.
	M5-09	1425		-			29			
			177							
							30			
					1	100				SAND with thin silt (30.0-32.0 feet bgs) - olive grey, wet, loose, poorly graded, fine grained, no hydrocarbon odor, no sheen.
					3	100	31			
Cap					4	100				
	M5-10	1448		ND	4	70	32			
			29.4							Boring terminated at 32.0 feet bgs Boring sampled to 32.0 feet Monitoring well installed to 32.0 feet bgs
							33			
							34			Materials: 10 feet 2-inch diameter, 0.020-inch PVC slotted screen 21 feet 2-inch diameter PVC blank casing 12.5 50# bags 10/20 sand 10 50# bags 3/8-inch bentonite chips 1 end cap 1 locking cap above-grade steel monument 3 guard posts
							35			
							36			
							37			
							38			* Sample Prefix Number is 2708-951027-
							39			
							40			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

MONITORING WELL NUMBER MW-5-175

OWRD # 88126

PROJECT:	HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START
Northwest Natural	SAMPLING METHOD:	1.5-inch Split Spoon	Time: 15:40
Gasco Facility	DRILLING METHOD:	Dual Wall Reverse Circulation Air	DRILL FINISH
Portland, Oregon	EQUIPMENT TYPE	AP-1,000 Drill Systems	Time: 18:32
PROJECT: 2708	DRILLER:	P.D. Lodder	Date: 19-Oct-98
	DRILLING CONTRACTOR:	Layne Christenson Company	Date: 22-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.2 feet msl
TOP OF CASING ELEVATION:	27.19 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Steel Monument							-3			
							-2			
							-1			Ground surface
Concrete										Surface: Silty SAND with Gravel - brown, moist, pieces of brick, grass covered area, no hydrocarbon odor, no sheen (fill).
							1			
									SM	
							2			
							3			
					9	0				Rock in end of split spoon sampler, no recovery
					11	0	4		GM	
					11	0				
					10	100	**5**			Sandy GRAVEL (4.5-6.0 feet bgs) - brown, moist, loose, lampblack, wood and plastic debris present, no hydrocarbon odor, no sheen (fill).
2-inch ID Blank PVC Casing	M5-01	16:01		122.31	10	100				
	M5-02 (dup)		3.6	67.21	8	50	6			
							7		GP	
							8			
							9			
					25	100				Sandy GRAVEL (9.0-10.5 feet bgs) - brown, moist, medium dense, some small cobbles, no visual lampblack, no hydrocarbon odor, no sheen (fill).
	M5-03	16:10	15.2	ND	22	50	**10**			
					17	0			GP	
3/8-inch Bentonite Chips							11			
							12			Note: See boring log for well MW-5-32 for soil description from 10 feet bgs to 30 feet bgs.
							13			
							14			
							15			
							16			
									SP	
							17			
							18			
							19			Cyclone grab sample at 20 feet bgs indicates moist brown SAND with some gravel, slight odor
							20			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-5-175

OWRD # 88126

HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch Split Spoon		
DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
EQUIPMENT TYPE	AP-1,000 Drill Systems	15:40	18:32
DRILLER:	P.D. Lodder	Date:	Date:
DRILLING CONTRACTOR:	Layne Christenson Company	19-Oct-98	22-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.2 feet msl
TOP OF CASING ELEVATION:	27.19 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Grout; 2-inch ID Blank PVC Casing							21		ML	
							22			
							23		SP	
							24			
							25			
							26			
							27			
							28			
							29			
							30			
					1	100				SAND (30-31.5 feet bgs), grey, wet, very loose, fine grained, with some oxidation zones, slight odor.
	M5-04	16:35		-	2	100	31			
			6.9		4	100			SP	
							32			
							33			
							34			
							35			
	M5-05	16:47	4.1	-	2	100				SAND (35-36.5 feet bgs), grey, wet, very loose, fine grained, with some oxidation zones, slight odor.
					4	50	36			
					4	0				
							37			
							38			
							39		SP	
							40			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-5-175

OWRD # 88126

HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch Split Spoon		
DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
EQUIPMENT TYPE	AP-1,000 Drill Systems	15:40	18:32
DRILLER:	P.D. Lodder	Date:	Date:
DRILLING CONTRACTOR:	Layne Christenson Company	19-Oct-98	22-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.2 feet msl
TOP OF CASING ELEVATION:	27.19 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
2-inch ID Blank PVC Casing					1	100				SAND (40-41.5 feet bgs), grey, wet, very loose, fine grained, with some oxidation zones, slight odor.
	M5-06	16:57		-	1	100	41			
			5.3		3	100				
							42		SP	
							43			
							44			
							45		ML	
					4	100				SAND (45-46.5 feet bgs), grey, wet, loose, fine grained, with some oxidation zones, slight odor.
	M5-07	17:15		-	5	100	46			
			9.6		9	100			SP	
							47			Note: Stop drilling for the day at 46.5 feet bgs at 18:30, 10/19/98, resume drilling at 8:00, 10/20/98.
							48			
							49			
							50			
							51			**GROUNDWATER SAMPLE** Drove a 2-inch OD stainless steel Hydropunch Sampler with a 6-inch stainless steel screen 4.0 feet below drill casing. Pulled back drive rods to expose screen at depth of 52.5 to 53.0 feet bgs. The sampler was pulled to the surface and samples #2708-981020-BW5-03 and -4 (a duplicate) were collected by pouring directly from the sampler at 8:26 and 8:28 on 10/20/98.
							52			
Bentonite Grout							53			
							54			
							55			Note; No sample at 55 feet bgs, sand heave preventing use of split spoon.
							56			
							57		SP	
							58			
							59			
							60			Cyclone grab sample at 60 feet bgs indicates wet, grey SAND, fine grained, slight odor, no sheen

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **OWRD # 88126**	**MW-5-175**	
PROJECT:	HAI LOGGER: Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
Northwest Natural	SAMPLING METHOD: 1.5-inch Split Spoon		
Gasco Facility	DRILLING METHOD: Dual Wall Reverse Circulation Air	Time: 15:40	Time: 18:32
Portland, Oregon	EQUIPMENT TYPE AP-1,000 Drill Systems		
PROJECT: 2708	DRILLER: P.D. Lodder	Date: 19-Oct-98	Date: 22-Oct-98
	DRILLING CONTRACTOR: Layne Christenson Company		

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.2 feet msl
TOP OF CASING ELEVATION:	27.19 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
	M5-08	9:16		-	1	100	61			SAND (60.5-61.5) - grey, wet, fine grained, very loose, no sheen, no odor.
			252		0	100				
					0	100	62			
							63			
							64			
							65		SP	
							66			Cyclone grab sample at 65 feet bgs indicates wet, grey SAND, fine grained, slight odor, no sheen
							67			
							68			
							69			
							70			
					3	100				SAND (70-70.5) - grey, wet, fine grained, very loose to loose, some minor silt layers, slight odor, no sheen
					4	100	71			
	M5-09	9:33	209	ND	6	75				
							72			**GROUNDWATER SAMPLE** Drove a 2-inch OD stainless steel Hydropunch Sampler with a 6-inch stainless steel screen 1.5 feet below the drill casing. Pulled back drive rods to expose screen at depth of 72.5 to 73.0 feet bgs. The sampler was pulled to the surface and sample #2708-981020-BW5-05 was collected by pouring directly from the sampler at 10:18 on 10/20/98.
							73			
							74			
							75			
							76			
							77			
							78		SP	
							79			Cyclone grab sample at 80 feet bgs indicates wet, brown SAND, fine grained, slight odor, no sheen
							80			

Bentonite Grout

2-inch ID Blank PVC Casing

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	MONITORING WELL NUMBER OWRD # 88126	MW-5-175	
PROJECT:	HAI LOGGER: Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
Northwest Natural	SAMPLING METHOD: 1.5-inch Split Spoon		
Gasco Facility	DRILLING METHOD: Dual Wall Reverse Circulation Air	Time: 15:40	Time: 18:32
Portland, Oregon	EQUIPMENT TYPE AP-1,000 Drill Systems		
PROJECT: 2708	DRILLER: P.D. Lodder	Date: 19-Oct-98	Date: 22-Oct-98
	DRILLING CONTRACTOR: Layne Christenson Company		

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.2 feet msl
TOP OF CASING ELEVATION:	27.19 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
2-inch ID Blank PVC Casing							81			
							82			Note: Persistent heaving sands into drill casing (6 to 10 feet into casing on average). Unable to advance split spoon to undisturbed formation, terminate split spoon sample collection.
							83		SP	
							84			
							85			Cyclone grab sample at 85 feet bgs indicates wet, brown SAND, fine grained, increased odor, no sheen
							86			
							87			
							88			
							89			
Bentonite Grout							**90**			Cyclone grab sample at 90 feet bgs indicates fine grained grey SAND with some silts, wet, strong odor, no sheen.
							91			
							92			
							93			**GROUNDWATER SAMPLE** Drove a 2-inch OD stainless steel Hydropunch Sampler with a 6-inch stainless steel screen 2.5 feet below the drill casing. Pulled back drive rods to expose screen at depth of 94.5 to 95.0 feet bgs. The sampler was pulled to the surface and sample #2708-981020-BW5-06 was collected by pouring directly from the sampler at 16:06 on 10/20/98.
							94			
							95			
							96			Stop drilling for the day at 95.0 feet bgs at 1720 10/20/98, resume drilling at 8:00 10/21/98
							97		SP	Cyclone grab sample at 95 feet bgs indicates fine grained grey SAND with some grey silts, wet, organic odor, no sheen.
							98			
							99			Cyclone grab sample at 100 feet bgs indicates fine grained grey sand with some grey silts, wet, odor, no sheen, grey to brown foam observed on groundwater exiting cyclone, no sheen observed, foam has no odor
							100			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **OWRD # 88126**		**MW-5-175**	
PROJECT:	HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
Northwest Natural	SAMPLING METHOD:	1.5-inch Split Spoon		
Gasco Facility	DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	AP-1,000 Drill Systems	15:40	18:32
PROJECT: 2708	DRILLER:	P.D. Lodder	Date:	Date:
	DRILLING CONTRACTOR:	Layne Christenson Company	19-Oct-98	22-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.2 feet msl
TOP OF CASING ELEVATION:	27.19 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							101			Note: Drill casing dropped with little force from a depth of 100 to 110 feet bgs.
							102			
							103			
							104			
							105			
							106		SP	
							107			
							108			
							109			
Bentonite Grout							**110**			Cyclone grab sample at 110 feet bgs indicates fine grained grey SAND, odor, no sheen, minimum of 10 feet of heave within drill casing
2-inch ID Blank PVC Casing							111			
							112			
							113			
							114			
							115		SP	Cyclone grab sample at 115 feet bgs indicates fine grained grey SAND, odor, no sheen
							116			
							117			
							118			
							119			Cyclone grab sample at 120 feet bgs indicates fine grained grey SAND, odor, no sheen
							120			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **OWRD # 88126**	**MW-5-175**	
PROJECT:	HAI LOGGER: Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
Northwest Natural	SAMPLING METHOD: 1.5-inch Split Spoon		
Gasco Facility	DRILLING METHOD: Dual Wall Reverse Circulation Air	Time: 15:40	Time: 18:32
Portland, Oregon	EQUIPMENT TYPE AP-1,000 Drill Systems		
PROJECT: 2708	DRILLER: P.D. Lodder	Date: 19-Oct-98	Date: 22-Oct-98
	DRILLING CONTRACTOR: Layne Christenson Company		

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.2 feet msl
TOP OF CASING ELEVATION:	27.19 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							121			
							122			**GROUNDWATER SAMPLE** Drove a 2-inch OD stainless steel Hydropunch Sampler with a 6-inch stainless steel screen 2.5 feet below the drill casing. Pulled back drive rods to expose screen at depth of 122.0 to122.5 feet bgs. The sampler was pulled to the surface and sample #2708-981021-BW5-07 was collected by pouring directly from the sampler at 9:18 on 10/21/98.
							123			
							124			
							125			Cyclone grab sample at 125 feet bgs indicates fine grained grey SAND, wet, increased odor, no sheen.
							126		SP	
							127			
							128			
							129			
Bentonite Grout							**130**			Cyclone grab sample at 130 feet bgs indicates fine grained grey SAND, wet, odor, no sheen.
							131			
							132			
							133			
							134			
							135		SP	Cyclone grab sample at 135 feet bgs indicates fine grained grey SAND, wet, odor, no sheen.
							136			
							137			
							138			
							139			
							140			Cyclone grab sample at 140 feet bgs indicates fine grained grey SAND, wet, odor, no sheen.

2-inch ID Blank PVC Casing

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	MONITORING WELL NUMBER OWRD # 88126	MW-5-175	
PROJECT: Northwest Natural Gasco Facility Portland, Oregon	HAI LOGGER: Rob Ede/Jay Greifer SAMPLING METHOD: 1.5-inch Split Spoon DRILLING METHOD: Dual Wall Reverse Circulation Air EQUIPMENT TYPE AP-1,000 Drill Systems DRILLER: P.D. Lodder	DRILL START Time: 15:40 Date: 19-Oct-98	DRILL FINISH Time: 18:32 Date: 22-Oct-98
PROJECT: 2708	DRILLING CONTRACTOR: Layne Christenson Company		

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.2 feet msl
TOP OF CASING ELEVATION:	27.19 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Grout; 2-inch ID Blank PVC Casing							141			
							142			
							143			
							144			
							145			Cyclone grab sample at 145 feet bgs indicates fine grained grey SAND, wet, slight odor, no sheen.
							146		SP	
							147			
							148			
							149			
							150			Cyclone grab sample at 150 feet bgs indicates fine to medium grained grey SAND, wet, no odor, no sheen.
							151			**GROUNDWATER SAMPLE** Drove a 2-inch OD stainless steel Hydropunch Sampler with a 6-inch stainless steel screen 4 feet below the drill casing. Pulled back drive rods to expose screen at depth of 152.0 to 152.5 feet bgs. The sampler was pulled to the surface and sample (#2708-981021-BW5-08) was collected by pouring directly from the sampler at 11:13 on 10/21/98 .
							152			
							153			
							154			
							155		SP	
							156			
							157			Note: Sand heaved to 100 feet bgs within drill casing (50 feet of heave) prior to resuming drilling after water sample -08 collection - sand is locked within casing. To continue drilling, potable water is added to hole and sand drilled out of casing with tri-cone bit. Plan to remove sand, drive to 175 feet with casings filled with water, and immediately set well before heave overcomes borehole.
Bentonite Chip							158			
							159			
20/40							**160**			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **MW-5-175** **OWRD # 88126**			
PROJECT:	HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
Northwest Natural	SAMPLING METHOD:	1.5-inch Split Spoon		
Gasco Facility	DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	AP-1,000 Drill Systems	15:40	18:32
PROJECT: 2708	DRILLER:	P.D. Lodder	Date:	Date:
	DRILLING CONTRACTOR:	Layne Christenson Company	19-Oct-98	22-Oct-98

BORING DIAMETER:	6-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	25.2 feet msl
TOP OF CASING ELEVATION:	27.19 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
20/40							161			
							162			
							163			
							164			
							165			
							166		SP	
							167			
							168			
							169			
							170			
							171			
							172			
							173			
							174			
							175			
							176			
							177			
							178			
							179			
							180			

Colorado 10/20 Sand Pack

3.25-inch OD 0.010-inch PVC Pre-Packed Screen with 20/40 Sand

Sump

Boring terminated at 175 feet bgs on 10/22/98
Monitoring well installed to 101 feet bgs

Materials:
10 feet 2-inch ID, 0.010-inch slotted PVC screen, with 3.25-inch OD sand pre-pack
165 feet 2-inch diameter Schedule 40 PVC blank casing
2 50# bags 20/40 sand
6 50# bag 10/20 sand
1 50# bag of bentonite pellets
25 50# bags grout
1 2 foot stainless steel sump
1 locking cap
above-grade steel monument
3 guard posts

* Sample Prefix Number is 2708-981019- or 2708-981020-

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

MONITORING WELL NUMBER MW-8-56

OWRD # 84226

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	3-inch Split Spoon/Core Barrel		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobil Drill	905	1410
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations	25-Oct-95	25-Oct-95

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregon
PROJECT: 2708

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	36.5 feet MSL
TOP OF CASING ELEVATION:	39.13 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Steel Monument							-3			
							-2			
							-1			Ground surface
Concrete	M8-01	900	5.9	281						
							1		SM	Surface: Silty SAND with gravel - brown, moist, no hydrocarbon odor, no sheen.
							2			
2-inch ID Blank PVC Casing										
					6	100	3			Tarry GRAVEL - black, moist, strong hydrocarbon odor, liquied-viscous tar from 5-6.5 feet bgs, sand and silt mix from 8.5-10.5 feet bgs.
					15	0				
					29	0	4			
							5			
2-inch ID Blank Stainless Steel Casing	M8-02	915		-	6	100				
			84.8		7	20	6			
					12	0			GP	
							7			
							8			
	M8-03	945	-	-	5	100	9			
					9	10				
					10	0	**10**			
					8	100				
					15	100	11			
					13	0				Silty GRAVEL (10.5-11.5 feet bgs) - brown and tan mottled, some black staining, moist, hydrocarbon odor.
							12			
							13			Silty GRAVEL (12.5-13.0 feet bgs) - olive grey, moist, slight hydrocarbon odor, no sheen.
	M8-04	1002	-	-	10	100				Silty GRAVEL (13.0-14.0 feet bgs) - loose, pieces of brick, moist, slight hydrocarbon odor, no sheen.
					11	100	14			
					13	50				
							15		GM	
						0				No Recovery (15.0-16.0 feet bgs).
						0	16	10/25/95		
					11					Silty GRAVEL (16.0-17.0 feet bgs) - black, hydrophobic, lampblack?, poor recovery.
					50/1"		17			
							18			Silty GRAVEL (17.5-20.0 feet bgs) - brown, wet, no hydrocarbon odor, no sheen, brick and wood fragments.
	M8-05	1025	-	-			19			
3/4-inch Bentonite Chips							**20**			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **MW-8-56** **OWRD # 84226**			
PROJECT:	HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
Northwest Natural Gas Co.	SAMPLING METHOD:	3-inch Split Spoon/Core Barrel	Time:	Time:
Gasco Facility	DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	905	1410
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobil Drill	Date:	Date:
PROJECT: 2708	DRILLER:	Brad James	25-Oct-95	25-Oct-95
	DRILLING CONTRACTOR:	Geo-Tech Explorations		

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	36.5 feet MSL
TOP OF CASING ELEVATION:	39.13 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4-inch Bentonite Chips; 2-inch ID Blank Stainless Steel Casing							21		GM	Silty GRAVEL (20.0-22.0 feet bgs) - brown, wet, brick and wood fragments, no hydrocarbon odor, no sheen.
	M8-06	1034		-			22			
			5.0							
	M8-07	1044		-	9	100	23		SP (lampblack)	SAND (22.0-25.0 feet bgs) - black, wet, loose, coarse grained, lampblack throughout, hydrocarbon odor, sheen, becoming solid and brittle with a slight sheen from 23.0-23.3 feet bgs.
			13.3		50/3"	100				
							24			
							25			
							26		ML	Tarry SILT (25.0-27.5 feet bgs) - black, wet, stiff, mostly tar, strong sheen, vegetation throughout sample.
	M8-08	1115		-						
			225				27			
							28			SILT (27.5-30.0 feet bgs) - olive grey, moist, stiff, vegetation, tar within root zones, sheen.
							29			
							30			
							31			SILT (30.0-35.0 feet bgs) - olive grey, moist, stiff, semi-viscous tar within root zones.
							32			
							33			
							34			
	M8-09	1134		-						
			81.5				**35**			
3/4-inch Bentonite Chips; 2-inch ID Blank Stainless Steel Casing							36			Sandy SILT (35.0-40.0 feet bgs) - brown, orange-mottled, moist, stiff, tar within root zones.
							37			
							38		ML	
	M8-10	1152	-	-			39			
							40			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **MW-8-56** **OWRD # 84226**			
PROJECT:	HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
Northwest Natural Gas Co.	SAMPLING METHOD:	3-inch Split Spoon/Core Barrel		
Gasco Facility	DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobil Drill	905	1410
PROJECT: 2708	DRILLER:	Brad James	Date:	Date:
	DRILLING CONTRACTOR:	Geo-Tech Explorations	25-Oct-95	25-Oct-95

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	36.5 feet MSL
TOP OF CASING ELEVATION:	39.13 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
3/4-inch Bentonite Chips							41		ML	Sandy SILT (40.0-42.0 feet bgs) - as above.
2-inch ID Blank Stainless Steel Casing							42		SP	SAND (42-42.3 feet bgs) - olive grey, medium grained, black product saturated, less viscous than tar.
							43		ML	SILT (42.3-42.8 feet bgs) - olive grey, medium grained, black product saturated.
							44		SP	SAND (42.8-45 feet bgs) - olive grey, wet, loose, poorly graded, medium grained, no product, slight sheen.
	M8-11	1202	112	8.1			45			
Colorado 10-20 Sand Pack							46			SAND (45.0-47.5 feet bgs) - olive grey, wet, loose, poorly graded, medium grained, no sheen.
	M8-12	1245		-			47			
2-inch ID 0.020-inch Stainless Steel Slotted Screen			43.7				48			SAND (47.5-50.0 feet bgs) - olive grey, wet, loose, poorly graded, medium grained, some thin silt layers, no sheen.
							49			
	M8-13	1314	-	-			50			
							51			SAND (50.0-54.0 feet bgs) - as above, no hydrocarbon odor, no sheen.
	M8-14	1320	-	-			52			
							53			
							54			
							55		SP	SAND (54.0-56.0 feet bgs) - as above, no hydrocarbon odor, no sheen.
Cap	M8-15	1400	-	0.64			56			
							57			
							58			
							59			
							60			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**MONITORING WELL NUMBER** **MW-8-56** **OWRD # 84226**			
PROJECT:	HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
Northwest Natural Gas Co.	SAMPLING METHOD:	3-inch Split Spoon/Core Barrel	Time:	Time:
Gasco Facility	DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	905	1410
Portland, Oregon	EQUIPMENT TYPE	B-59 Mobil Drill	Date:	Date:
PROJECT: 2708	DRILLER:	Brad James	25-Oct-95	25-Oct-95
	DRILLING CONTRACTOR:	Geo-Tech Explorations		

BORING DIAMETER:	10-inch
CASING DIAMETER:	2-inch ID
SURFACE ELEVATION:	36.5 feet MSL
TOP OF CASING ELEVATION:	39.13 feet MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)
							61		
							62		
							63		
							64		
							65		
							66		
							67		
							68		
							69		
							70		
							71		
							72		
							73		
							74		
							75		
							76		
							77		
							78		
							79		
							80		

SOIL DESCRIPTION

Boring terminated at 56.0 feet bgs
Boring sampled to 56.0 feet
Monitoring well installed to 56.0 feet bgs

Materials:
10 feet 2-inch diameter, 0.020-inch stainless steel slotted screen
40.5 feet 2-inch diameter stainless steel blank casing
4.5 feet 2-inch diameter PVC blank casing
11 50# bags 10/20 sand
26 50# bags bentonite chips
1 end cap
1 locking cap
above-grade steel monument
3 guard posts

* Sample Prefix Number is 2708-951025-

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregons
PROJECT: 2708

MONITORING WELL NUMBER MW-9-29

OWRD # 84223

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	3-inch Split Spoon		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	9:30	12:30
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations	23-Oct-95	23-Oct-95

BORING DIAMETER:	10-inch OD
CASING DIAMETER:	2-inch
SURFACE ELEVATION:	37.9 feet MSL
TOP OF CASING ELEVATION:	37.65 MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Flush Monument										Ground surface
Concrete	M9-01	855	0.4	21.5						Surface: Sandy GRAVEL - grey gravel, olive grey sand, moist, non-plastic, well graded, no hydrocarbon odor, no sheen.
							1		GW	
							2			
					9	100			GM	Sandy, Silty GRAVEL (2.0-3.0 feet bgs) - brown, moist, loose, non-plastic, well graded, slight hydrocarbon odor, slight sheen.
	M9-02	935	5.5	-	15	100	3			
					14	50			SP	SAND (3.0-3.5 feet bgs) - brown, moist, loose, poorly graded, fine grained.
					2	100	4		ML	Gravelly SILT (3.5-4.5 feet bgs) - brown, moist, stiff, poorly graded, wire present, no hydrocarbon odor, no sheen.
	M9-03	940	0.7	-	5	100				SAND (4.5-5.0 feet bgs) - brown, moist, loose, poorly graded, fine grained, no hydrocarbon odor, no sheen.
					7	70	**5**		SP	
	M9-04	950	1.3	163	2	100				Sandy SILT (5.0-6.5 feet bgs) - orange/brown with black and blue/grey staining, moist, slight hydrocarbon odor?, sheen is blue/green in color.
					5	0	6		ML	
					50/2"	0				
							7			
							8			CONCRETE
Bentonite Chips							9			
							10			
2-inch ID Blank PVC Casing							11			Sandy SILT (11.5-13.0 feet bgs) - brown, moist to wet, slightly plastic, very fine sand, no hydrocarbon odor, no sheen.
	M9-05	1045		0.52	13	100	12			
			6.7		8	30				
					5	0	13			SILT (13.0-15.0 feet bgs) - brown, moist to wet, stiff, slightly plastic, no hydrocarbon odor, no sheen.
					3	100			ML	
	M9-06	1055		-	3	100	14			
			8.8		4	100				SILT (15.0-15.5 feet bgs) - as above, no hydrocarbon odor, no sheen.
					8	50	**15**	10/23/95		Sandy SILT (15.5-16.0 feet bgs) - brown, moist to wet, slightly stiff, no hydrocarbon odor, no sheen.
20-40					2	0				
					2	100	16			
	M9-07	1120		-	3	100				SAND with muscovite (16.0-17.0 feet bgs) - brown, wet, no hydrocarbon odor, no sheen.
			20.9		6	100	17			
					2	100			SP	SAND (17.0-18.5 feet bgs) - as above, no hydrocarbon odor, no sheen.
					3	100	18			
Colorado 10-20 Sand Pack					5	100				
					2	100	19			SILT (18.5-20.0 feet bgs) - brown, moist to wet, stiff, no hydrocarbon odor, no sheen.
					4	100			ML	
					8	100	**20**			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural Gas Co.
Gasco Facility
Portland, Oregons
PROJECT: 2708

MONITORING WELL NUMBER MW-9-29

OWRD # 84223

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	3-inch Split Spoon		
DRILLING METHOD:	6 1/4-inch ID Hollow Stem Auger	Time:	Time:
EQUIPMENT TYPE	B-59 Mobile Drill	9:30	12:30
DRILLER:	Brad James	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations	23-Oct-95	23-Oct-95

BORING DIAMETER:	10-inch OD
CASING DIAMETER:	2-inch
SURFACE ELEVATION:	37.9 feet MSL
TOP OF CASING ELEVATION:	37.65 MSL

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Colorado 10-20 Sand Pack; 2-inch ID 0.010-inch PVC Slotted Screen					2	100				
					3	100	21			SAND (20.0-24.0 feet bgs) - brown, wet, stiff, fine grained, muscovite present 20.0-21.5 feet bgs, no hydrocarbon odor, no sheen.
	M9-08	1140		-	3	100				
			9.5		2	100	22		SP	
					2	100				
					9	90	23			
					3	100				
					6	100	24			
	M9-09	1200	-	-	16	100			ML	Sandy SILT (24.0-25.0 feet bgs) - brown, moist to wet, stiff, no hydrocarbon odor, no sheen.
					25	90	**25**			
					5	100			SP	SAND (25.0-26.0 feet bgs) - olive grey, wet, loose, fine grained, no hydrocarbon odor, no sheen.
					8	100	26			
					12	70			ML	Sandy SILT (26.0-26.5 feet bgs) - brown, wet, stiff, slighlty plastic, no hydrocarbon odor, no sheen.
					3	100	27		SP	SAND (26.7-27.5 feet bgs) - brown, wet, loose, poorly graded, medium grained, no hydrocarbon odor, no sheen.
	M9-10	1210		-	5	100				
			2.0		12	80	28		ML	SILT (27.5-28.0 feet bgs) - brown, moist to wet, stiff, no hydrocarbon odor, no sheen.
Cap										
							29			
							30			
							31			Boring terminated at 29.0 feet bgs Boring sampled to 28.0 feet Monitoring well installed to 29.0 feet bgs
							32			
							33			Materials: 10 feet 2-inch diameter, 0.010-inch PVC slotted screen 18 feet 2-inch diameter PVC blank casing 1 50# bags 20/40 sand 12 50# bags 10/20 sand 10 50# bags bentonite chips 1 end cap 1 locking cap
							34			
							35			
							36			* Sample Prefix Number is 2708-961023-
							37			
							38			
							39			
							40			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-14-110

OWRD # 88127

HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch Split Spoon		
DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
EQUIPMENT TYPE	AP-1,000 Drill Systems	12:30	14:30
DRILLER:	P.D. Lodder	Date:	Date:
DRILLING CONTRACTOR:	Layne Christenson Company	13-Oct-98	19-Oct-98

BORING DIAMETER:	14-inch / 6-inch
CASING DIAMETER:	10-inch steel / 2-inch PVC
SURFACE ELEVATION:	35.3 feet msl
TOP OF CASING ELEVATION:	37.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Steel Monument							-3			
							-2			
							-1			Ground surface
Concrete							1			
							2			
							3		GP	
					48	100				Sandy GRAVEL (3.0-4.5 feet bgs) - brown and black, pieces of concrete, lampblack, dry, dense to very dense, hydrocarbon odor, no sheen (fill).
	M14-01	13:00	5.6	5876.7	64	50	4			
					5 for 2"	0	**5**			
Cement Grout										
					15	100	6			Sandy GRAVEL (5.5-7.0 feet bgs) - as above, moist, medium dense, concrete, brick fragments and sandy lampblack, petroleum odor, no sheen (fill).
	M14-02	13:10	46.3	1697.2	20	75				
					12	0	7			
2-inch ID Blank PVC Casing							8			
							9			
3/8-inch Bentonite Chips					22	100	**10**			Gravely SAND (9.5-11.0 feet bgs) - black, moist to wet, medium dense, saturated with black oily product in gravel zones, strong sheen elsewhere, strong hydrocarbon odor (fill).
	M14-03	13:22		1410.1	17	100				
			12.5		11	50	11		SP	
							12			Note: See boring log for boring B-26 for soil description from 11 feet to 29.5 feet bgs.
							13			
							14			
10-inch Steel Casing							**15**			Cyclone grab sample at 15 feet bgs indicates gravely SAND, brown, dry (not much soil being ejected by cyclone).
							16		SP	
							17			
Bentonite Grout							18			
							19			
							20			Cyclone grab sample at 20 feet bgs indicates gravely SAND, black, dry (not much material being ejected by cyclone).

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon	MONITORING WELL NUMBER OWRD # 88127	MW-14-110	
(503) 796-0717	HAI LOGGER: Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
PROJECT:	SAMPLING METHOD: 1.5-inch Split Spoon		
Northwest Natural	DRILLING METHOD: Dual Wall Reverse Circulation Air	Time:	Time:
Gasco Facility	EQUIPMENT TYPE AP-1,000 Drill Systems	12:30	14:30
Portland, Oregon	DRILLER: P.D. Lodder	Date:	Date:
PROJECT: 2708	DRILLING CONTRACTOR: Layne Christenson Company	13-Oct-98	19-Oct-98

BORING DIAMETER:	14-inch / 6-inch
CASING DIAMETER:	10-inch steel / 2-inch PVC
SURFACE ELEVATION:	35.3 feet msl
TOP OF CASING ELEVATION:	37.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Cement Grout							21		SP	
							22			
							23			
							24			
							25			
							26			
							27			
							28			
Bentonite Grout; 2-inch ID Blank PVC Casing							29			
					8	100	**30**			Gravely SAND (29.5-31.0 feet bgs) - black, wet, loose, some woody debris, saturated with black oily product, strong sheen, strong hydrocarbon odor (fill).
	M14-04	13:54		-	17	60				
			112		9	20	31			
							32			
							33			Cyclone grab sample at 32 feet bgs indicates SILT, stained with oily product.
							34			
							35		ML	
					13	100				Sandy SILT (35-36.5 feet bgs) - olive grey, wet, medium stiff to stiff, some gravel lenses, strong sheen and odor, some product within gravel lenses.
	M14-05	14:20	139	-	7	75	36			
					5	0				
10-inch Steel Casing							37			
							38			
							39			Sandy SILT (39-40.5 feet bgs) - olive grey, moist to wet, very strong sheen, some product within sand lenses, strong sheen on core.
					6	100				
	M14-06	14:30	139	-	6	75	**40**			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon	MONITORING WELL NUMBER OWRD # 88127	MW-14-110	
(503) 796-0717	HAI LOGGER: Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
PROJECT:	SAMPLING METHOD: 1.5-inch Split Spoon		
Northwest Natural	DRILLING METHOD: Dual Wall Reverse Circulation Air	Time:	Time:
Gasco Facility	EQUIPMENT TYPE AP-1,000 Drill Systems	12:30	14:30
Portland, Oregon	DRILLER: P.D. Lodder	Date:	Date:
PROJECT: 2708	DRILLING CONTRACTOR: Layne Christenson Company	13-Oct-98	19-Oct-98

BORING DIAMETER:	14-inch / 6-inch
CASING DIAMETER:	10-inch steel / 2-inch PVC
SURFACE ELEVATION:	35.3 feet msl
TOP OF CASING ELEVATION:	37.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
10-inch Steel Casing					5	0				
							41			
							42			
							43			
Cement Grout					7	100				SILT (43-44.5 feet bgs) - olive grey, moist, medium stiff, no sheen, no hydrocarbon odor.
	M14-07	15:15		10.83	8	100	44			
			23.5		4	100			ML	
							45			Note: Stop drilling at 14:30 on 10/13/98 and set 8-inch steel surface casing into borehole from ground surface to 44.5 feet bgs. Materials used are 16 bags of cement to mix 120 gallons of grout. Discontinue drilling until 10/16/98 in order to allow concrete to set.
							46			
2-inch ID Blank PVC Casing										
							47			
							48			
							49			
	M14-08	14:57	0	-	31	80				SILT (49-50.5 feet bgs) - as above, some concrete from surface casing plug, moist, no sheen, hard, no hydrocarbon odor.
					26	0	**50**			
					24	0				
							51			
							52			
Bentonite Grout										
							53			
							54			
							55			SILT (55-56.5 feet bgs) - as above, some hardened concrete from surface casing plug, moist, medium stiff, no sheen, no hydrocarbon odor.
	M14-09	15:14	42.1	-	8	60				
					4	0	56			
					0	0			ML	
							57			
							58			
							59			
					2	100	**60**			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon	MONITORING WELL NUMBER OWRD # 88127	MW-14-110	
(503) 796-0717	HAI LOGGER: Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
PROJECT:	SAMPLING METHOD: 1.5-inch Split Spoon		
Northwest Natural	DRILLING METHOD: Dual Wall Reverse Circulation Air	Time:	Time:
Gasco Facility	EQUIPMENT TYPE AP-1,000 Drill Systems	12:30	14:30
Portland, Oregon	DRILLER: P.D. Lodder	Date:	Date:
PROJECT: 2708	DRILLING CONTRACTOR: Layne Christenson Company	13-Oct-98	19-Oct-98

BORING DIAMETER:	14-inch / 6-inch
CASING DIAMETER:	10-inch steel / 2-inch PVC
SURFACE ELEVATION:	35.3 feet msl
TOP OF CASING ELEVATION:	37.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
	M14-10	15:27	2.2	-	3	100				SILT (59.5-61 feet bgs) - as above, moist, very soft, minor sand, no sheen, no hydrocarbon odor.
					0	100	61			
							62			
							63			
							64			
							65		ML	
					2	100				SILT (65-66.5 feet bgs) - as above, moist, soft, brown and olive grey mottled, minor sand, moist, no sheen, no hydrocarbon odor
	M14-11	15:42	3.9	-	3	100	66			
	M14-12 (du	15:43	4.1	-	12	100				
							67			
							68			
2-inch ID Blank PVC Casing							69			
					2	100				SILT (69-70.5 feet bgs) - as above, moist, medium stiff, brown and olive grey mottled, minor sand, moist, no sheen, slight odor.
	M14-13	14:57	952	ND	6	100	**70**			
					11	100				
							71			
Bentonite Grout							72			Note: Stop drilling for the day (10/16/98) at depth = 70.5 feet bgs. Resume drilling AM on 10/19/98.
							73			
							74			
							75			
	M14-14	8:42	746	-	1	100				SAND (75-76.5 feet bgs) - Grey, wet, fine grained, very loose, no sheen, no odor, no discoloration.
					1	10	76			
					2	0				
							77			
							78		SP	
							79			
					1	100				SAND (79-80.5 feet bgs) - grey with some apparent iron staining (orange coloration), wet, very loose, organic odor?, no sheen.
	M14-15	8:59	75.2	-	2	100	**80**			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	MONITORING WELL NUMBER OWRD # 88127	MW-14-110	
	HAI LOGGER: Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
PROJECT:	SAMPLING METHOD: 1.5-inch Split Spoon		
Northwest Natural	DRILLING METHOD: Dual Wall Reverse Circulation Air	Time:	Time:
Gasco Facility	EQUIPMENT TYPE AP-1,000 Drill Systems	12:30	14:30
Portland, Oregon	DRILLER: P.D. Lodder	Date:	Date:
PROJECT: 2708	DRILLING CONTRACTOR: Layne Christenson Company	13-Oct-98	19-Oct-98

BORING DIAMETER:	14-inch / 6-inch
CASING DIAMETER:	10-inch steel / 2-inch PVC
SURFACE ELEVATION:	35.3 feet msl
TOP OF CASING ELEVATION:	37.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
2-inch ID Blank PVC Casing					6	80				
							81			
							82			
							83		SP	
							84			
							85			
					4	100				
	M14-16	9:23	55.2	-	7	100	86			SAND (85-86.5 feet bgs) - grey, wet, loose to medium dense, some thin interbedded silts, no sheen, no hydrocarbon odor.
Bentonite Grout					16	100				
							87			
							88			
							89			
							90			
					4	100				SAND (90-91.5 feet bgs) -as above, no sheen, no hydrocarbon odor.
	M14-17	9:37	0	-	6	100	91			
					16	0				
							92			
							93			
Bentonite Chip							94			
							95			
					4	100				SAND (95-96.5 feet bgs) -as above, no sheen, no hydrocarbon odor.
	M14-18	9:58	0	-	8	100	96			
20/40 Sand					15	0			SP	
							97			
							98			
10/20 Sand							99			
							100			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon	**MONITORING WELL NUMBER** **OWRD # 88127**		**MW-14-110**	
(503) 796-0717	HAI LOGGER:	Rob Ede/Jay Greifer	DRILL START	DRILL FINISH
PROJECT:	SAMPLING METHOD:	1.5-inch Split Spoon		
Northwest Natural	DRILLING METHOD:	Dual Wall Reverse Circulation Air	Time:	Time:
Gasco Facility	EQUIPMENT TYPE	AP-1,000 Drill Systems	12:30	14:30
Portland, Oregon	DRILLER:	P.D. Lodder	Date:	Date:
PROJECT: 2708	DRILLING CONTRACTOR:	Layne Christenson Company	13-Oct-98	19-Oct-98

BORING DIAMETER:	14-inch / 6-inch
CASING DIAMETER:	10-inch steel / 2-inch PVC
SURFACE ELEVATION:	35.3 feet msl
TOP OF CASING ELEVATION:	37.41 feet msl

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
10/20 silica sand pack; 3.25-inch 0D 0.010-inch stainless steel Pre-Packed Screen with 20/40 Sand; Cap					3	100			SP	SAND (100-101.5 feet bgs) -as above, very loose to loose, no sheen, slight odor.
	M14-19	10:14	0	-	3	100	101			
					6	90				
							102			
							103			
							104			
							105			
					10	100				SAND (105-106.5 feet bgs)- as above, but with some brown/orange coloration, appears to be iron staining, medium dense, potential sheen?
	M14-20	10:42	0	ND	13	100	106			
					21	70				
							107			
							108		GP	GRAVEL (107.5-108 feet bgs) - grey gravel (basaltic) immediately above bedrock, some very rounded, mixed in with broken rock no sheen, discoloration, or odor (sampled from cyclone).
							109		Bedrock	
							110			Bedrock encountered at depth = 108 feet bgs. Large and small angular chips of basalt coming from cyclone.
							111			
							112			Boring terminated at 110 feet bgs on 10/19/98 Monitoring well installed to 110 feet bgs
							113			Materials: 10 feet 2-inch ID, 0.010-inch stainless steel screen, with 3.25-inch OD 20/40 sand pre-pack 100 feet 2-inch diameter Schedule 40 PVC blank casing 40 feet 10-inch diameter steel conductor casing 2 50# bags 20/40 sand 5 50# bag 10/20 sand 13 50# bag of bentonite pellets 36 50# bags grout 15 100# bags cement 1 stainless steel sump 1 locking cap above-grade steel monument 3 d t
							114			
							115			
							116			
							117			
							118			
							119			* Sample Prefix Number is 2708-981013- , 2708-981019-, or 2708-981020-
							120			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-15-66

OWRD # 122742

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch Split Spoon	Time:	Time:
DRILLING METHOD:	Air Rotary	3:20	10:00
EQUIPMENT TYPE	AP-1,000 Drill Systems	Date:	Date:
DRILLER:	Gordon Burton	28-Jun-99	30-Jun-99
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	12-inch / 6-inch
CASING DIAMETER:	8-inch steel / 2-inch PVC
SURFACE ELEVATION:	36.27
TOP OF CASING ELEVATION:	36.06

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							-3			
							-2			
Flush Monument							-1			Ground surface
Concrete							1			See boring log for boring M-15 for soil description to a depth of 48 feet bgs.
							2		SP	
							3			
3/8-inch Bentonite Chips							4			
							5			
Cement							6			
							7			
							8			
2-inch ID Blank PVC Casing							9			
							10			
							11		SP	
							12			
							13		Tar	
							14			
							15			
8-inch Steel Casing							16		SP	
							17			
							18			
Bentonite Grout							19			
							20		ML	

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
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(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-15-66

OWRD # 122742

HAI LOGGER:	Rob Ede	DRILL	DRILL
SAMPLING METHOD:	1.5-inch Split Spoon	START	FINISH
DRILLING METHOD:	Air Rotary	Time:	Time:
EQUIPMENT TYPE	AP-1,000 Drill Systems	3:20	10:00
DRILLER:	Gordon Burton	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	28-Jun-99	30-Jun-99

BORING DIAMETER:	12-inch / 6-inch
CASING DIAMETER:	8-inch steel / 2-inch PVC
SURFACE ELEVATION:	36.27
TOP OF CASING ELEVATION:	36.06

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							21			
							22		ML	
							23			
							24			
							25			
							26			
							27			
Cement							28			
							29			
Bentonite Grout							**30**			
2-inch ID Blank PVC Casing							31			
							32			
							33			
8-inch Steel Casing							34		ML	
							35			
							36			
							37			
							38		SP	
							39			
							40			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-15-66

OWRD # 122742

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch Split Spoon	Time:	Time:
DRILLING METHOD:	Air Rotary	3:20	10:00
EQUIPMENT TYPE	AP-1,000 Drill Systems	Date:	Date:
DRILLER:	Gordon Burton	28-Jun-99	30-Jun-99
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	12-inch / 6-inch
CASING DIAMETER:	8-inch steel / 2-inch PVC
SURFACE ELEVATION:	36.27
TOP OF CASING ELEVATION:	36.06

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Grout; 2-inch ID Blank PVC Casing							41		ML	
							42		SP	
							43		ML	
							44			
							45		SP	
							46			
							47			
							48			
							49			
							50			
					2	100				SAND - brown, wet, very fine grained, loose, some thin orange-brown mottled silt layers, no odor, no sheen.
					4	100	51			
	-12	12:15	0.1	ND	2	100				
							52			
							53			
							54			
							55			
Bentonite Chip Seal					2	100				Silty SAND - brown, wet, very fine grained, loose, some thin brown mottled silt layers, no odor, no sheen.
					3	100	56			
	-13	13:15	0.1	-	4	100				
							57		SM	
10/20 Sand Pack							58			
							59			
							60			

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-15-66

OWRD # 122742

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch Split Spoon		
DRILLING METHOD:	Air Rotary	Time:	Time:
EQUIPMENT TYPE	AP-1,000 Drill Systems	3:20	10:00
DRILLER:	Gordon Burton	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	28-Jun-99	30-Jun-99

BORING DIAMETER:	12-inch / 6-inch
CASING DIAMETER:	8-inch steel / 2-inch PVC
SURFACE ELEVATION:	36.27
TOP OF CASING ELEVATION:	36.06

WELL CONSTRUCTION DETAILS: 10/20 Silica Sand Pack; 2-inch ID 0.010-inch slot stainless steel screen

SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
				15	100				
				20	100	61		ML	SILT - brown, moist, non-plastic, some very fine grained muscovite, a few thin beds of very fine grained sand, no odor, no sheen.
-14	14:20	0	-	25	100				
				20	100	62			
				22	100				SAND with interbedded Silts - brown, wet Sand, moist Silt, no odor, no sheen.
-15	14:30	0	-	15	100	63		SP	
				-	100			SM	Silty SAND - brown, wet, very fine grained, loose, no odor, no sheen.
				-	100	64			
-16	14:50	0	ND	-	100			SP	SAND - brown, wet, fine grained no odor, no sheen.
						65		Bedrock	Bedrock - vesicular basalt fragments in end of sampler at depth of sampler refusal at depth of 64.5 feet bgs.
						66			
						67			
						68			
						69			
						70			
						71			
						72			
						73			
						74			
						75			
						76			
						77			
						78			
						79			
						80			

Boring terminated at 66 feet bgs on 6/29/99
Monitoring well installed to 66 feet bgs

Materials:
5 feet 2-inch ID, 0.010-inch slot stainless steel screen
65 feet 2-inch diameter Schedule 40 PVC blank casing
40 feet 8-inch diameter steel conductor casing
5 50# bag 10/20 sand
13 50# bag of bentonite pellets
10 50# bags bentonite grout
15 100# bags cement
1 6-inch PVC sump
1 locking cap
flush well monument

* Sample Prefix Number is 2708-990629 -

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-15-66

OWRD # 122742

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch Split Spoon	Time:	Time:
DRILLING METHOD:	Air Rotary	3:20	10:00
EQUIPMENT TYPE	AP-1,000 Drill Systems	Date:	Date:
DRILLER:	Gordon Burton	28-Jun-99	30-Jun-99
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	12-inch / 6-inch
CASING DIAMETER:	8-inch steel / 2-inch PVC
SURFACE ELEVATION:	36.27
TOP OF CASING ELEVATION:	36.06

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							-3			
							-2			
Flush Monument							-1			Ground surface
Concrete							1			See boring log for boring M-15 for soil description to a depth of 48 feet bgs.
							2		SP	
							3			
3/8-inch Bentonite Chips							4			
							5			
Cement							6			
							7			
							8			
2-inch ID Blank PVC Casing							9			
							10			
							11		SP	
							12			
							13		Tar	
							14			
							15			
8-inch Steel Casing							16		SP	
							17			
							18			
Bentonite Grout							19			
							20		ML	

HAHN & ASSOCIATES, INC.
434 NW Sixth Avenue
Portland, Oregon
(503) 796-0717

PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-15-66

OWRD # 122742

HAI LOGGER:	Rob Ede	DRILL	DRILL
SAMPLING METHOD:	1.5-inch Split Spoon	START	FINISH
DRILLING METHOD:	Air Rotary	Time:	Time:
EQUIPMENT TYPE	AP-1,000 Drill Systems	3:20	10:00
DRILLER:	Gordon Burton	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	28-Jun-99	30-Jun-99

BORING DIAMETER:	12-inch / 6-inch
CASING DIAMETER:	8-inch steel / 2-inch PVC
SURFACE ELEVATION:	36.27
TOP OF CASING ELEVATION:	36.06

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
							21			
							22		ML	
							23			
							24			
							25			
							26			
							27			
Cement							28			
							29			
Bentonite Grout							**30**			
2-inch ID Blank PVC Casing							31			
							32			
							33			
8-inch Steel Casing							34		ML	
							35			
							36			
							37			
							38		SP	
							39			
							40			

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PROJECT:
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Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-15-66

OWRD # 122742

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch Split Spoon	Time:	Time:
DRILLING METHOD:	Air Rotary	3:20	10:00
EQUIPMENT TYPE	AP-1,000 Drill Systems	Date:	Date:
DRILLER:	Gordon Burton	28-Jun-99	30-Jun-99
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.		

BORING DIAMETER:	12-inch / 6-inch
CASING DIAMETER:	8-inch steel / 2-inch PVC
SURFACE ELEVATION:	36.27
TOP OF CASING ELEVATION:	36.06

WELL CONSTRUCTION DETAILS	SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Grout; 2-inch ID Blank PVC Casing							41		ML	
							42		SP	
							43		ML	
							44			
							45		SP	
							46			
							47			
							48			
							49			
							50			
					2	100				SAND - brown, wet, very fine grained, loose, some thin orange-brown mottled silt layers, no odor, no sheen.
					4	100	51			
	-12	12:15	0.1	ND	2	100				
							52			
							53			
							54			
							55			
Bentonite Chip Seal					2	100				Silty SAND - brown, wet, very fine grained, loose, some thin brown mottled silt layers, no odor, no sheen.
					3	100	56			
	-13	13:15	0.1	-	4	100				
							57		SM	
10/20 Sand Pack							58			
							59			
							60			

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PROJECT:
Northwest Natural
Gasco Facility
Portland, Oregon
PROJECT: 2708

MONITORING WELL NUMBER MW-15-66

OWRD # 122742

HAI LOGGER:	Rob Ede	DRILL START	DRILL FINISH
SAMPLING METHOD:	1.5-inch Split Spoon		
DRILLING METHOD:	Air Rotary	Time:	Time:
EQUIPMENT TYPE	AP-1,000 Drill Systems	3:20	10:00
DRILLER:	Gordon Burton	Date:	Date:
DRILLING CONTRACTOR:	Geo-Tech Explorations, Inc.	28-Jun-99	30-Jun-99

BORING DIAMETER:	12-inch / 6-inch
CASING DIAMETER:	8-inch steel / 2-inch PVC
SURFACE ELEVATION:	36.27
TOP OF CASING ELEVATION:	36.06

WELL CONSTRUCTION DETAILS: 10/20 Silica Sand Pack; 2-inch ID 0.010-inch slot stainless steel screen

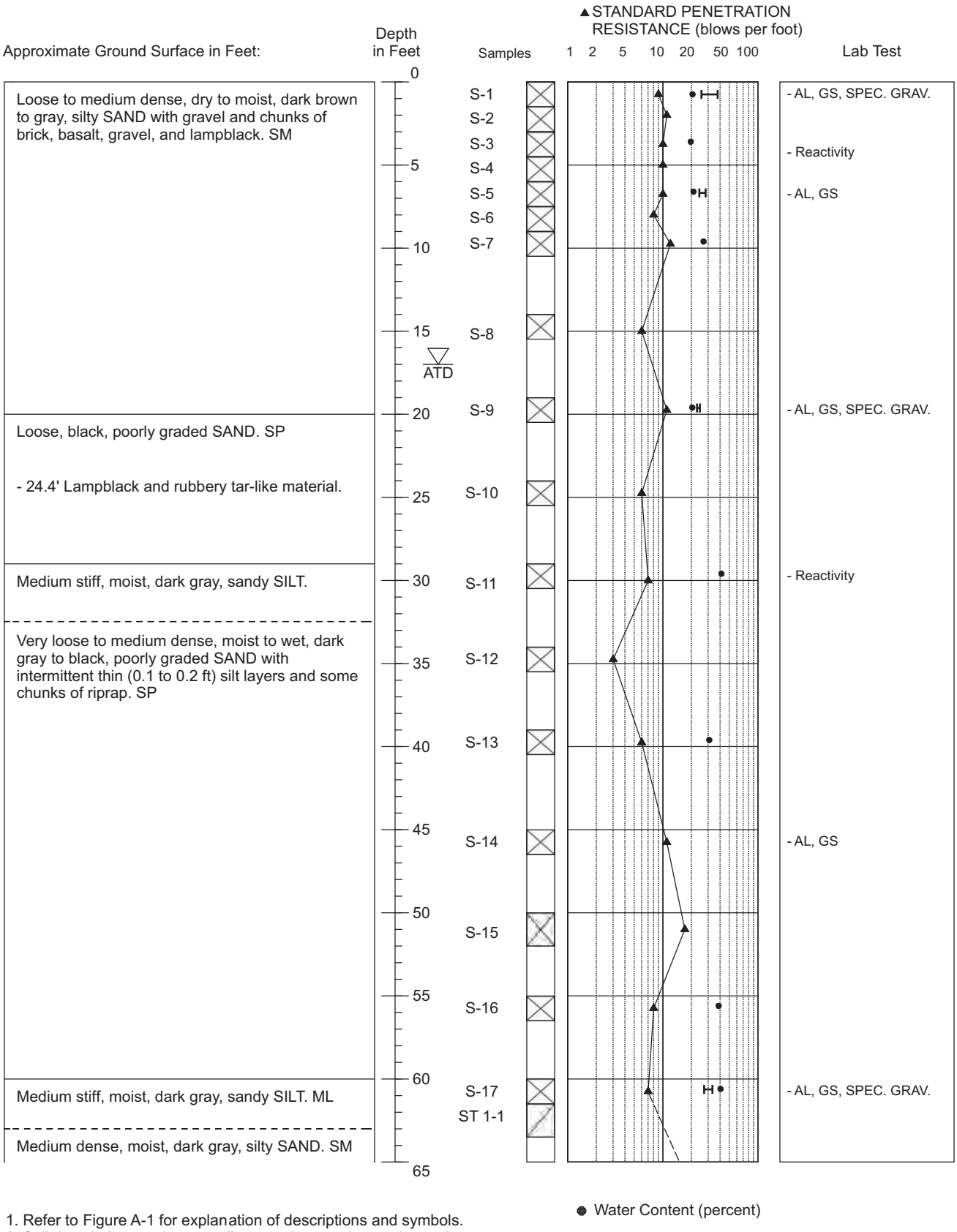
SAMPLE NUMBER*	TIME	HEADSPACE (ppm)	LAB RESULTS TOTAL PAHs (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
				15	100				
				20	100	61		ML	SILT - brown, moist, non-plastic, some very fine grained muscovite, a few thin beds of very fine grained sand, no odor, no sheen.
-14	14:20	0	-	25	100				
				20	100	62			
				22	100				SAND with interbedded Silts - brown, wet Sand, moist Silt, no odor, no sheen.
-15	14:30	0	-	15	100	63		SP	
				-	100			SM	Silty SAND - brown, wet, very fine grained, loose, no odor, no sheen.
				-	100	64			
-16	14:50	0	ND	-	100			SP	SAND - brown, wet, fine grained no odor, no sheen.
						65		Bedrock	Bedrock - vesicular basalt fragments in end of sampler at depth of sampler refusal at depth of 64.5 feet bgs.
						66			
						67			
						68			
						69			
						70			
						71			
						72			
						73			
						74			
						75			
						76			
						77			
						78			
						79			
						80			

Boring terminated at 66 feet bgs on 6/29/99
Monitoring well installed to 66 feet bgs

Materials:
5 feet 2-inch ID, 0.010-inch slot stainless steel screen
65 feet 2-inch diameter Schedule 40 PVC blank casing
40 feet 8-inch diameter steel conductor casing
5 50# bag 10/20 sand
13 50# bag of bentonite pellets
10 50# bags bentonite grout
15 100# bags cement
1 6-inch PVC sump
1 locking cap
flush well monument

* Sample Prefix Number is 2708-990629 -

Boring: B-1

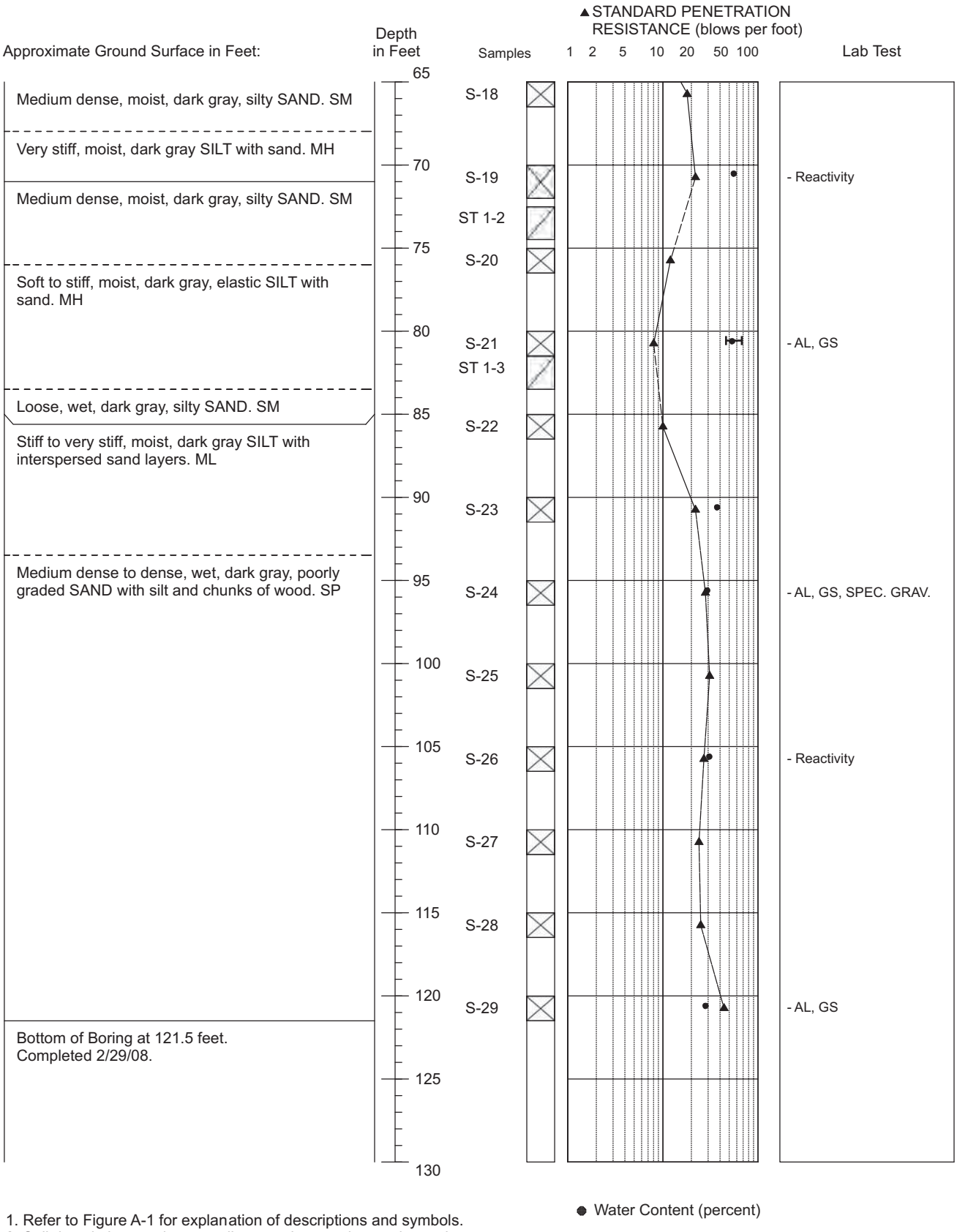


1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive, and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

Draft
Figure
Boring B-1
Gasco

ANCHOR ENVIRONMENTAL, L.L.C.

Boring: B-1



1. Refer to Figure A-1 for explanation of descriptions and symbols.
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Draft
Figure
Boring B-1
Gasco

ANCHOR ENVIRONMENTAL, L.L.C.

Boring: B-2

Approximate Ground Surface in Feet:

Depth in Feet

Samples

▲STANDARD PENETRATION RESISTANCE (blows per foot)

1 2 5 10 20 50 100

Lab Test

Loose to very dense, dry to moist, dark brown to orange/red and gray with black staining, silty GRAVEL with sand and chunks of concrete. GM

- Lampblack

Loose, oily, dark gray with black staining, poorly graded SAND. SP

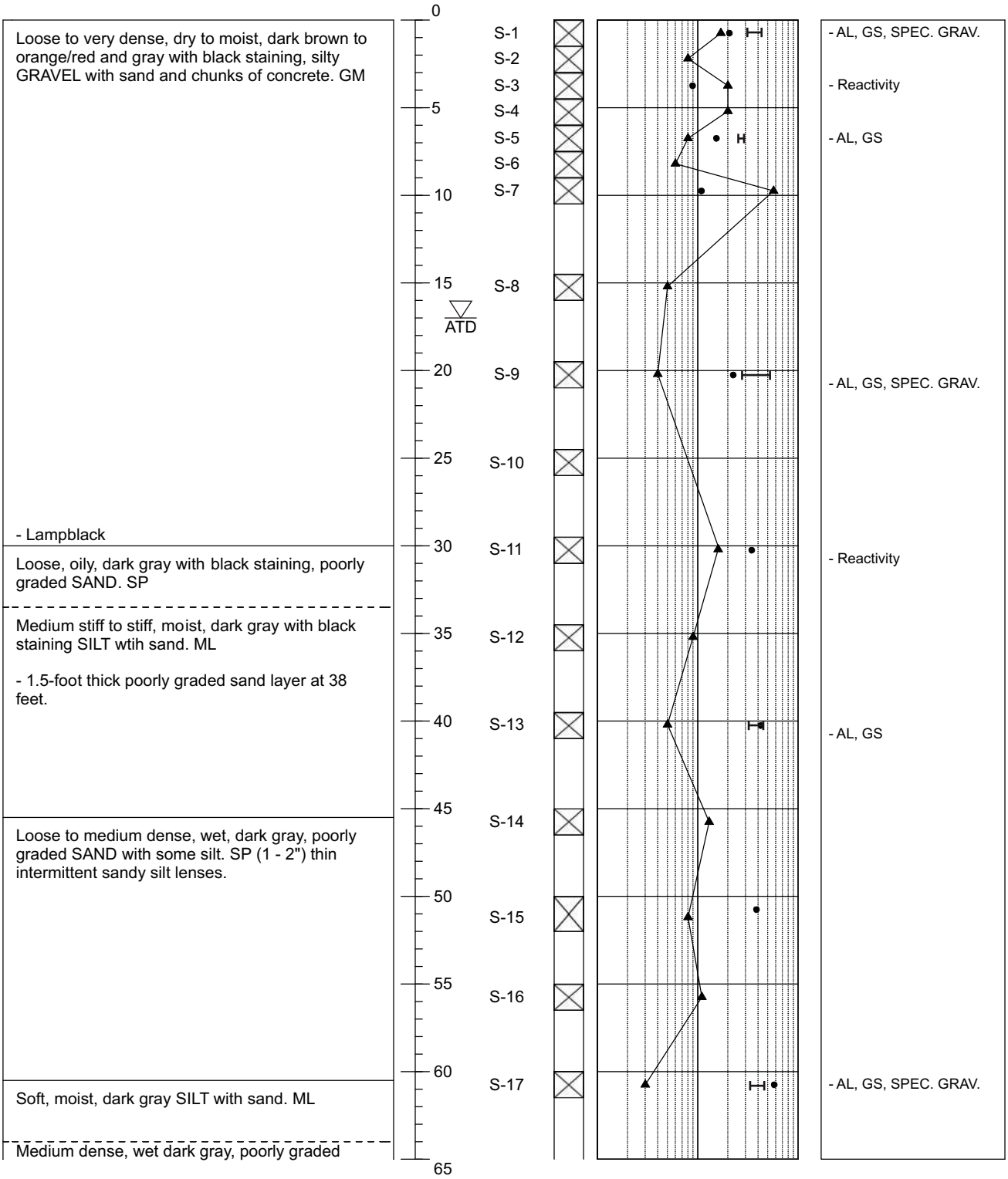
Medium stiff to stiff, moist, dark gray with black staining SILT wtih sand. ML

- 1.5-foot thick poorly graded sand layer at 38 feet.

Loose to medium dense, wet, dark gray, poorly graded SAND with some silt. SP (1 - 2") thin intermittent sandy silt lenses.

Soft, moist, dark gray SILT with sand. ML

Medium dense, wet dark gray, poorly graded



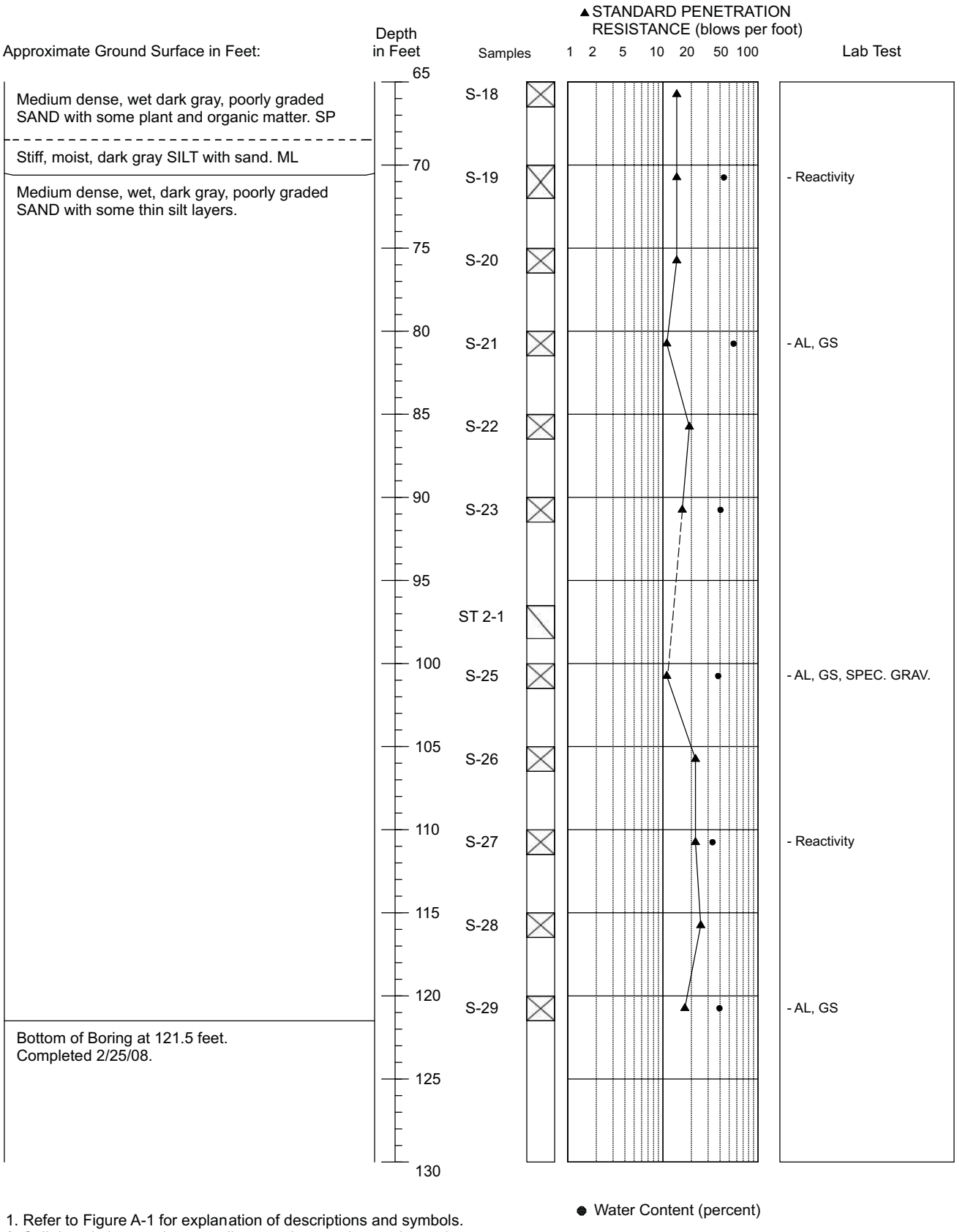
● Water Content (percent)

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. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

Draft
Figure
Boring B-2
Gasco

ANCHOR ENVIRONMENTAL, L.L.C.

Boring: B-2

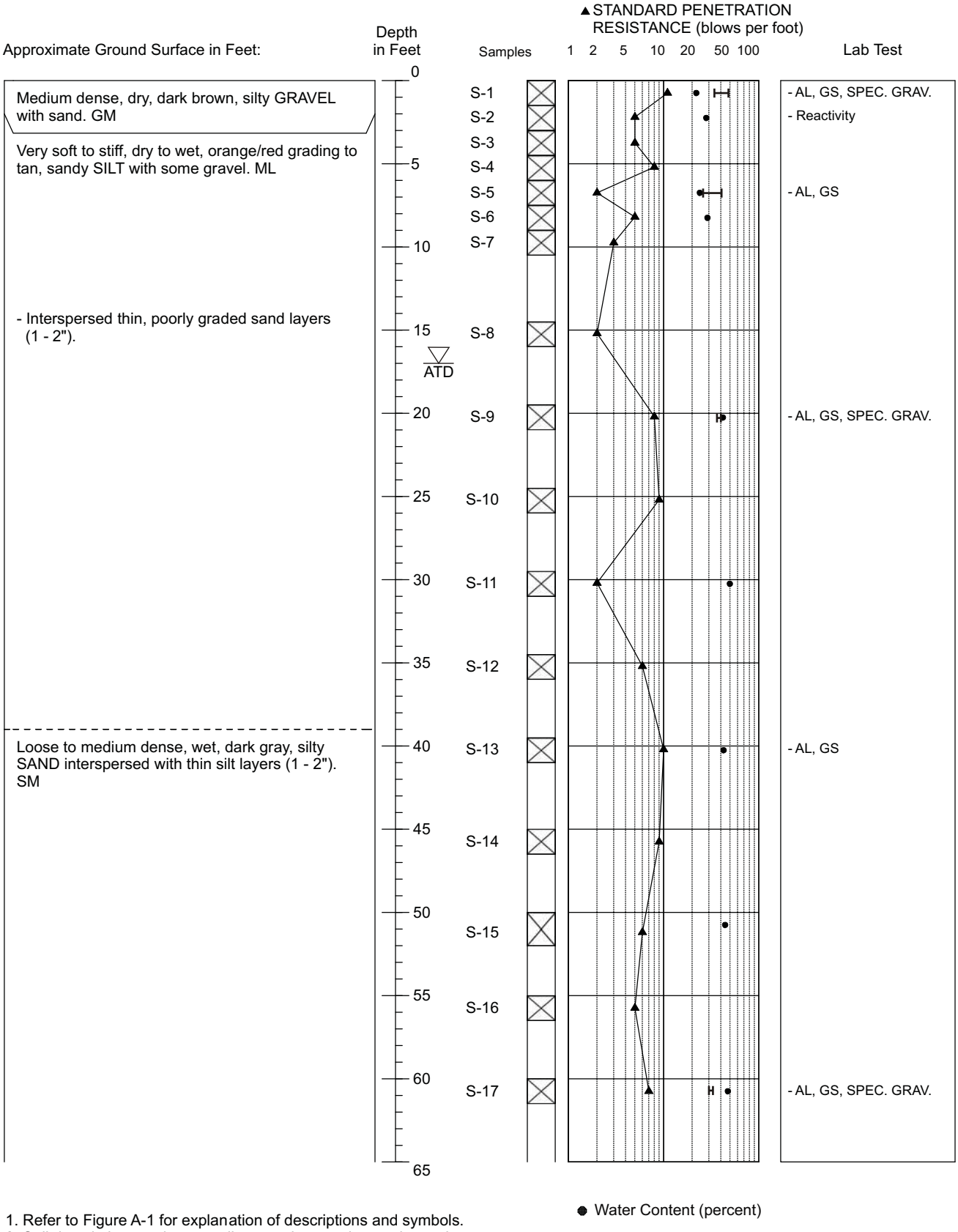


1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive, and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

Draft
Figure
Boring B-2
Gasco

ANCHOR ENVIRONMENTAL, L.L.C.

Boring: B-3

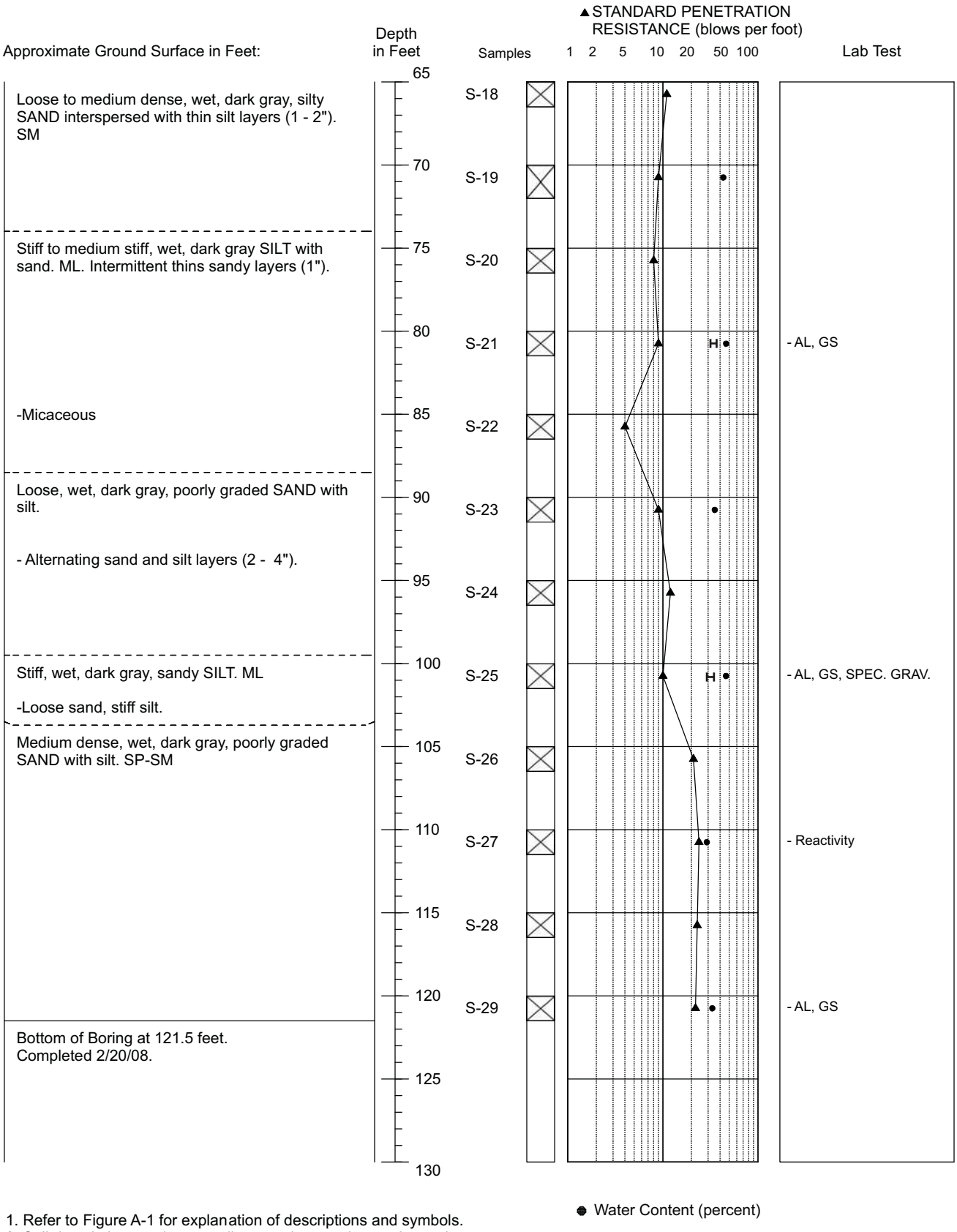


1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive, and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

Draft
Figure
Boring B-3
Gasco

ANCHOR ENVIRONMENTAL, L.L.C.

Boring: B-3



1. Refer to Figure A-1 for explanation of descriptions and symbols.
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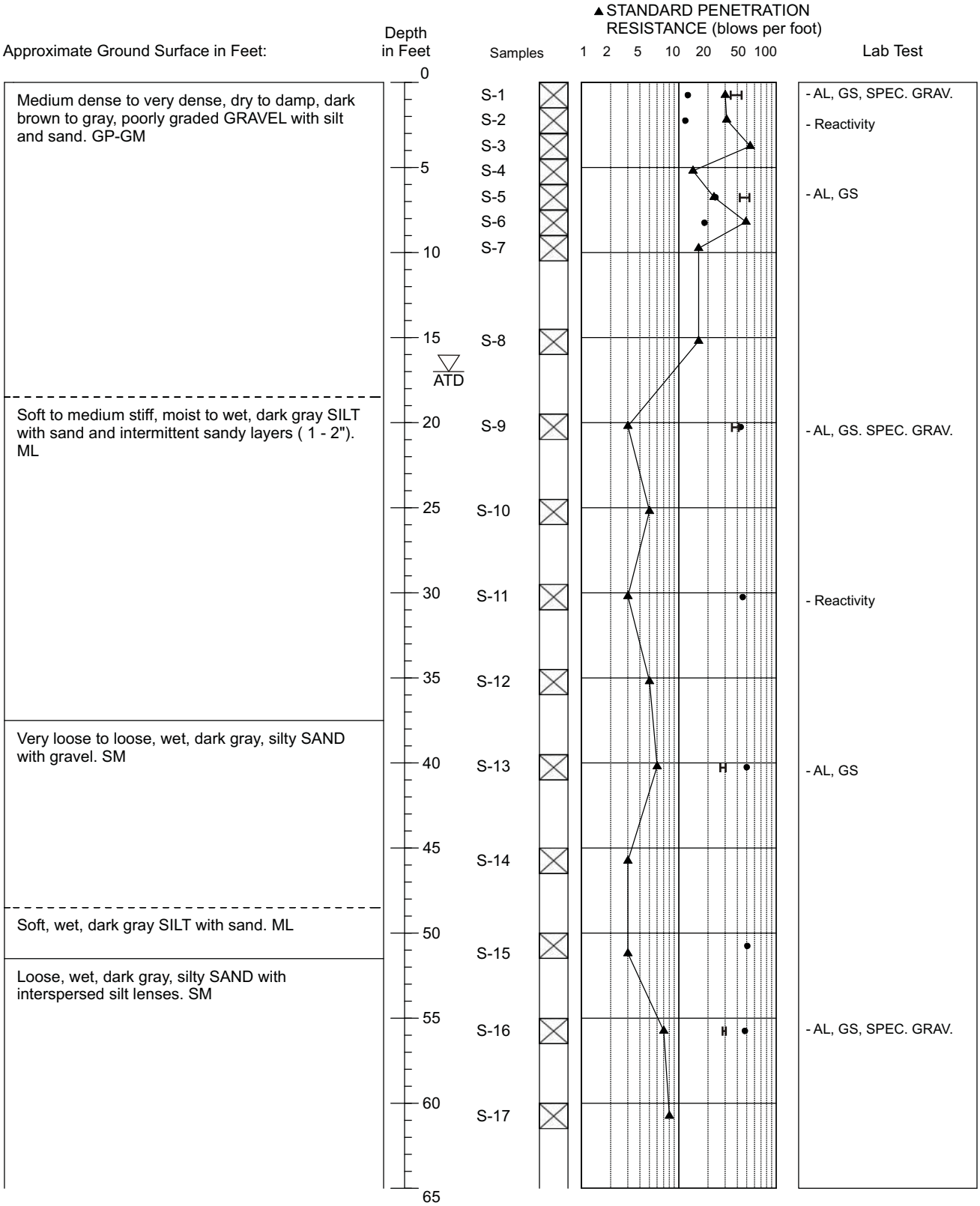
3. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

ANCHOR ENVIRONMENTAL, L.L.C.

Draft
Figure
Boring B-3
Gasco

Boring: B-4

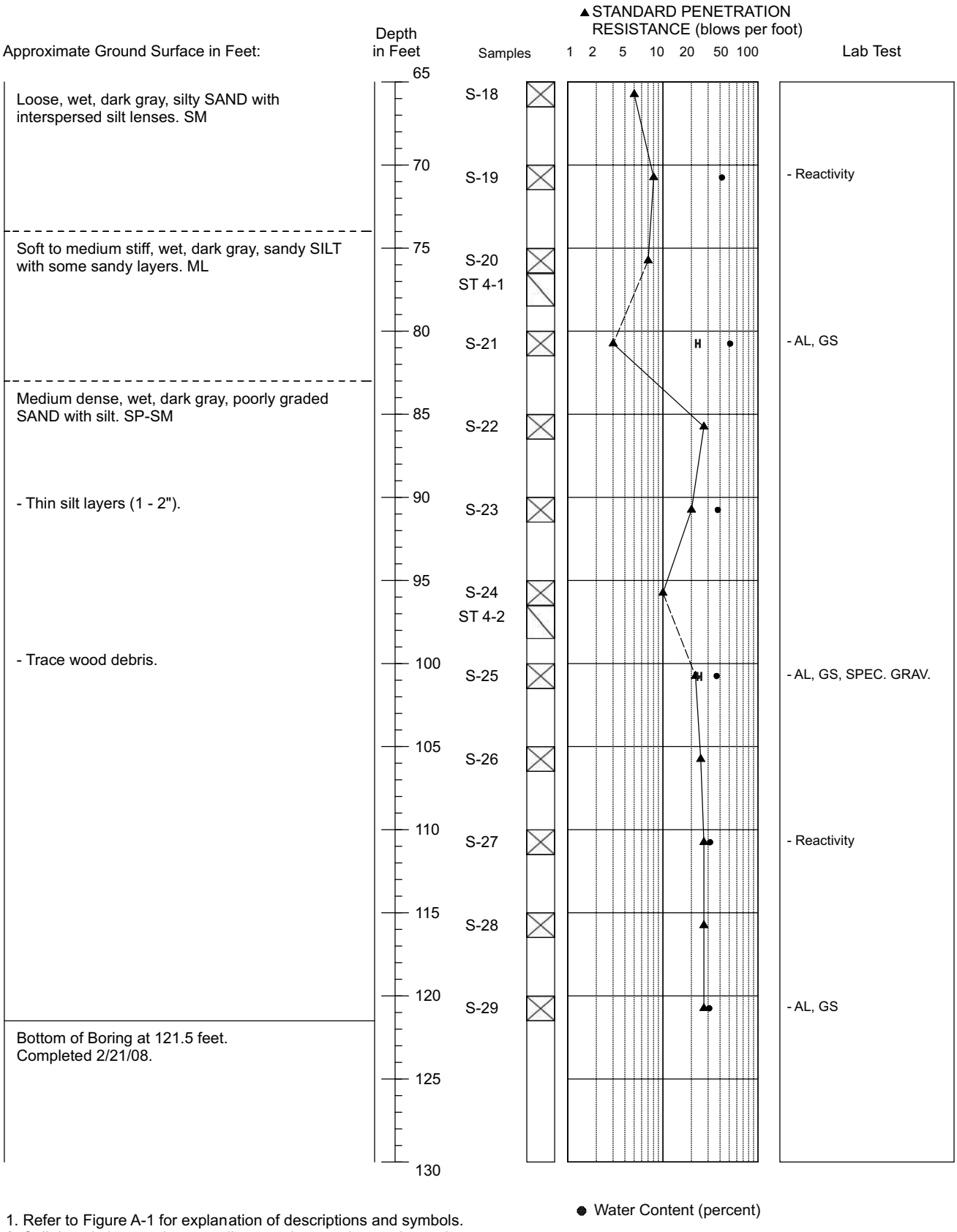


1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive, and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

ANCHOR ENVIRONMENTAL, L.L.C.

Draft
Figure
Boring B-4
Gasco

Boring: B-4



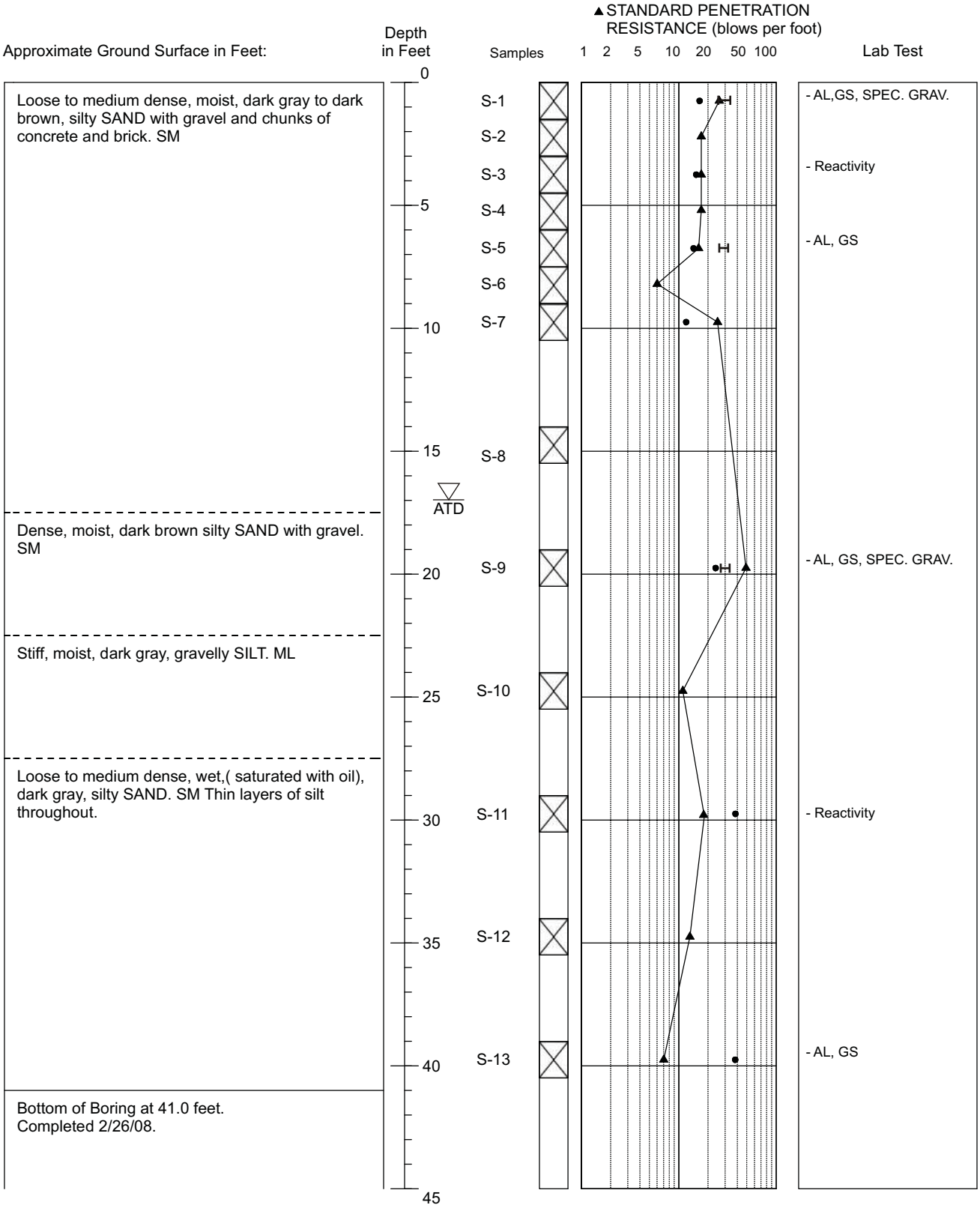
● Water Content (percent)

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. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

Draft
Figure
Boring B-4
Gasco

ANCHOR ENVIRONMENTAL, L.L.C.

Boring: B-5



● Water Content (percent)

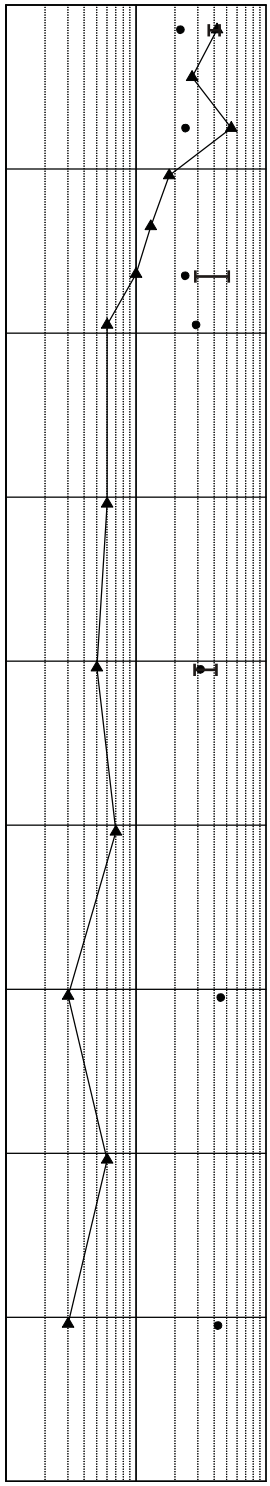
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive, and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

Draft
Figure
Boring B-5
Gasco

ANCHOR ENVIRONMENTAL, L.L.C.

Boring: B-6

Approximate Ground Surface in Feet:	Depth in Feet	Samples	Lab Test
Loose to very dense, dry, orangish red, silty SAND with gravel. SM	0	S-1	- AL, GS, SPEC. GRAV.
		S-2	
- Yellow orange and brown mottling.		S-3	- Reactivity
	5	S-4	
		S-5	
		S-6	- AL, GS
Medium stiff, dry to moist, orange-red to yellowish ornage, sandy SILT with gray, black, gray-tan and yellow mottling. ML	10	S-7	
	15	S-8	
	ATD		
	20	S-9	- AL, GS, SPEC. GRAV.
Loose to medium stiff, moist to wet, dark gray SILT with sand and orange-red mottling. ML			
- Lampblack layer.	25	S-10	
	30	S-11	- Reactivity
Loose, damp dark gray, silty SAND. SM			
	35	S-12	
Very loose, wet, dark gray, poorly graded SAND with interspersed silt layers. SP			
	40	S-13	- AL, GS
Bottom of Boring at 41.0 feet. Comleted 2/18/08.			
	45		



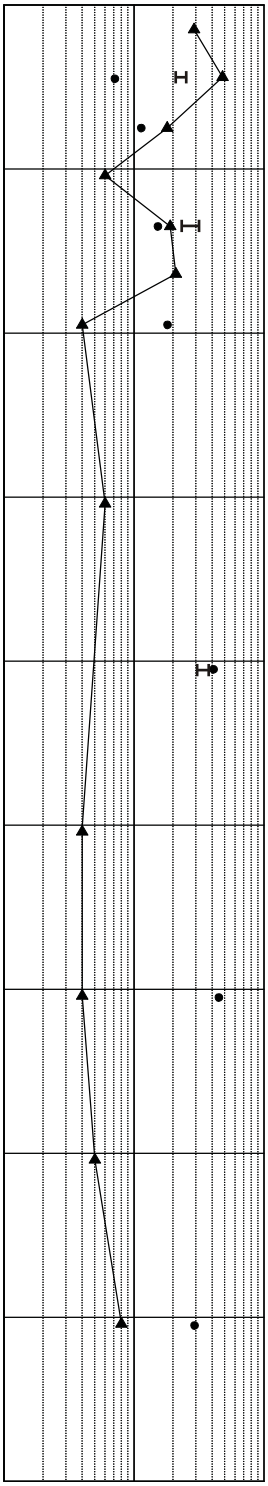
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive, and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

Draft
Figure
Boring B-6
Gasco

ANCHOR ENVIRONMENTAL, L.L.C.

Boring: B-7

Approximate Ground Surface in Feet:	Depth in Feet	Samples	Lab Test
Loose to very dense,moist, dark bronw, silty GRAVEL with sand. GM - Red, tan, and white mottling.	0 5	S-1 S-2 S-3 S-4 S-5 S-6	- AL, GS, SPEC. GRAV. - Reactivity - AL, GS
Soft, moist, dark reddish brown, sandy, gravelly SILT. ML	10	S-7	
Loose damp, dark gray, silty SAND. SM - Lampblack, wet, fissile.	15 ATD	S-8	
Soft, moist, dark gray, sandy SILT. ML	20 25	S-9 S-10	- AL, GS, SPEC. GRAV.
Loose, wet, dark gray, poorly graded, silty SAND. SP	30	S-11	- Reactivity
Soft, moist, dark gray, sandy SILT. ML			
Loose, wet, dark gray, silty SAND. SM	35	S-12	
	40	S-13	- AL, GS
Bottom of Boring at 41.0 feet. Completed 2/18/08.	45		



● Water Content (percent)

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. Ground water level, if indicated, is at time of drilling or at the time and date specified. Ground water level may vary with time.

ANCHOR ENVIRONMENTAL, L.L.C.

Draft
Figure
Boring B-7
Gasco

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-00**
LOCATION	**Portland, Oregon**	PAGE	**1 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**85.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**11/2/06**
		MUDLINE ELEVATION	**35.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								0 to 4.0 feet: SILTY SAND (SM); light brown; 70 percent fine sand; 30 percent medium plasticity fines; trace to 20 percent fine to coarse angular to subangular gravel; loose; dry. Gravel percentage increases with depth.
GS-00-S(4-6)[2]	5 (0-10)	5		X				**4.0 to 5.0 feet: GRAVELLY SAND (SP)**; light gray; 60 to 70 percent fine to coarse sand; 30 to 40 percent fine to coarse, angular to subrounded gravel; <5 percent fines; loose; dry.
								5.0 to 6.0 feet: GRAVELLY SILTY SAND (SM); light brown to red; 50 percent fine to coarse sand; 30 percent fine to coarse angular to rounded gravel; 20 percent medium plasticity fines; loose; dry. @ 5.0 to 6.0 feet: red brick fragments (coarse sand-sized and fine to medium gravel-sized).
GS-00-S(9-11)[2]		10		X				**6.0 to 10.5 feet: SANDY GRAVEL WITH SILT (GP)**; light brown; 60 percent fine to coarse angular to subangular gravel; 25 percent fine to coarse sand; 15 percent medium plasticity fines; loose to medium density; dry to damp.
								10.5 to 14.0 feet: SANDY SILT (ML); black; 60 percent medium plasticity fines; 40 percent fine sand; moist. Hydrogen sulfide-like to hydrocarbon-like odor; soft.
	3 (10-16)							@ 14.0 feet: 0.3' x 0.25' subangular cobble; ¼-inch-wide lens of light brown to tan sandy silt.
		15						**14.0 to 22.0 feet: SAND (SP)**; black; 90 to 95 percent fine to medium sand; 5 to 10 percent fines; loose; damp to moist. Hydrogen sulfide-like to hydrocarbon-like odor.
	7 (16-23)							
		20						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-00**
LOCATION	**Portland, Oregon**	PAGE	**2 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**85.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**11/2/06**
		MUDLINE ELEVATION	**35.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-00-S(20-23)[2]				X				**14.0 to 22.0 feet: SAND (SP)**, continued.
GS-00-W(23-27)[1]			X					**22.0 to 23.0 feet: SILT (ML)**; black; 90 percent low to medium plasticity fines; 10 percent fine sand; trace fine root hairs; firm to stiff; moist. Hydrogen sulfide-like to hydrocarbon-like odor.
	3 (23-28)	25						**23.0 to 27.0 feet: SAND (SP)**; dark gray to black; fine to medium sand; <5 percent fines; wet. Hydrogen sulfide-like to hydrocarbon-like odor.
								27.0 to 28.0 feet: SILT (ML); light gray mottled with dark gray/black; medium to high plasticity fines; trace sand; firm to stiff; moist to damp.
		30						**28.0 to 34.5 feet: SILTY SAND (SM)**; brownish gray; 60 to 70 percent fine to medium sand; 30 to 40 percent medium plasticity fines; wet to moist.
								@ 31.5 to 32.0 feet: color change to tan to brown.
	10 (28-38)							
		35						**34.5 to 38.0 feet: SILT (ML)**; light gray mottled with tan and dark gray; 90 percent low to medium plasticity fines; 10 percent fine sand; trace charred wood up to ½-inch in length; stiff; damp.
								38.0 to 38.5 feet: SILT (ML); grayish-brown; medium plasticity fines; 5 to 10 percent fine to medium sand; soft; wet.
		40						**38.5 to 44.5 feet: INTERBEDDED SILT (ML), SILTY**

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-00**
LOCATION	**Portland, Oregon**	PAGE	**3 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**85.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**11/2/06**
		MUDLINE ELEVATION	**35.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	12 (38-48)							**SAND (SM), SAND WITH SILT (SP), AND SANDY SILT (ML)**; grayish-brown; wet. Beds 3-inches to 1.5 feet.
GS-00-S(45-48)[2]		45						
GS-00-W(48-52)[1]								**44.5 to 48.0 feet: SAND WITH SILT (SP)**; grayish-brown; 85 to 90 percent fine to medium sand; 10 to 15 percent fines; wet.
		50						**48.0 to 57.0 feet: SILTY SAND (SM)**; grayish-brown; 70 percent fine to medium sand; 30 percent medium plasticity fines; wet. @ 48.0 to 54.0 feet: trace fine to coarse angular to subrounded gravel.
	3.5 (48-57)							
		55						
								57.0 to 65.0 feet: SAND (SP); grayish-brown; 90 to 95 percent fine to medium sand; 5 to 10 percent fines; wet. Trace silt nodules up to 1-inch in diameter.
		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-00**
LOCATION	**Portland, Oregon**	PAGE	**4 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**85.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**11/2/06**
		MUDLINE ELEVATION	**35.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								57.0 to 65.0 feet: SAND (SP), continued.
	10 (57-67)							
GS-00-W(65-69)[1]		65						**65.0 to 70.0 feet: SANDY GRAVEL WITH SILT (GP)**; grayish-brown; 60 to 65 percent fine to coarse angular to subrounded gravel; 30 percent fine to medium sand; 5 to 10 percent fines; wet.
	3 (67-73)	70						**70.0 to 72.5 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; wet.
								72.5 to 73.0 feet: GRAVEL (GP); grayish-brown; fine to coarse, angular to subangular gravel; 5 to 10 percent sand; 5 to 10 percent fines. Cobbles 3-inches in diameter.
								73.0 to 75.0 feet: SANDY GRAVEL WITH SILT (GP); grayish-brown; 60 to 70 percent fine to coarse angular gravel; 20 to 30 percent fine to coarse sand; 10 to 20 percent fines; moist to wet.
		75						
	7 (73-80)							**75.0 to 76.0 feet: SILTY GRAVEL (GM)**; brownish-gray; 60 to 70 percent fine to coarse gravel; 30 percent fines; 10 percent sand; fine to coarse angular gravel; dense; moist.
								76.0 to 77.0 feet: BASALT
								77.0 to 78.0 feet: SILTY GRAVEL (GP); brown, 50 to 60 percent fine to coarse, angular gravel; 40 to 50 percent fines; trace sand; damp. Weathered.
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-00**
LOCATION	**Portland, Oregon**	PAGE	**5 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**85.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**11/2/06**
		MUDLINE ELEVATION	**35.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	5 (80-85)	85						**78.0 to 80.0 feet: BASALT** **80.0 to 85.0 feet: SILTY GRAVEL (GM)**; brownish-gray; 80 percent fine to coarse angular gravel; 20 percent low to medium plasticity fines; dense; damp; moist. @ 82.5 to 85.5 feet: color change to grayish-brown; weathered. Bottom of boring = 85.0 feet.
		90						
		95						
		100						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-01**
LOCATION	**Portland, Oregon**	PAGE	**1 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**80.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/26/06**
		MUDLINE ELEVATION	**7.3 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-01-W(4-6)[1] GS-01-S(4-6)[2] GS-01-W(9-11)[1] GS-01-S(9-11)[2] GS-01-S(10-12)[3]	16.5 (0-23)	5 10 15 20	X X	X X	X			**0 to 23.0 feet: INTERBEDDED SILT (ML); SANDY SILT (ML); SILTY SAND (SM), AND SAND (SP)**; grayish-brown; loose sand; soft to firm silt; trace fine subrounded gravel; wet. Black staining 0 to 2.0 feet. Hydrocarbon-like odor. Odor decreasing with depth. Gravel decreasing with depth.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-01**
LOCATION	**Portland, Oregon**	PAGE	**2 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**80.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/26/06**
		MUDLINE ELEVATION	**7.3 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-01-S(20-23)[2] GS-01-S(20-23)[3]				X	X			**0 to 23.0 feet: INTERBEDDED SILT (ML); SANDY SILT (ML); SILTY SAND (SM); AND SAND (SP)**, continued.
GS-01-W(23-27)[1]		25	X					**23.0 to 28.5 feet: INTERBEDDED SANDY SILT (ML) and SILT (ML)**; grayish-brown; soft to firm; wet. Sand lenses up to 1 inch.
GS-01-S(30.5-33)[3]	24 (23-48)	30			X			**28.5 to 34.0 feet: SAND (SP)**; grayish brown; 95 to 100 percent fine to medium sand; trace to 5 percent fines; loose to medium density; wet. Silt lenses.
		35						**34.0 to 35.5 feet: INTERBEDDED SAND (SP)**; grayish-brown; 95 to 100 percent fine to medium sand; wet; **AND SAND WITH SILT (SP)**; grayish-brown; 85 to 95 percent fine to medium sand; 5 to 15 percent fines; loose; wet. Trace fine, subrounded gravel and cobbles.
		40						**35.5 to 40.0 feet: INTERBEDDED SANDY SILT (ML) AND SILT (ML)**; grayish-brown; soft to firm; wet. Sand lenses up to 4 inches.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-01**
LOCATION	**Portland, Oregon**	PAGE	**3 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**80.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/26/06**
		MUDLINE ELEVATION	**7.3 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-01-S(40-42.5)[3]								**40.0 to 48.0 feet: SAND (SP)**; grayish-brown; 95 to 100 percent fine to medium sand; trace to 5 percent fines; loose to medium density; wet. Silt lenses up to 1 inch.
GS-01-S(45-48)[2]		45						
GS-01-W(48-52)[1]								**48.0 to 77.0 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand; trace fines and coarse sand; loose to medium density; wet. Increasing density with depth.
GS-01-S(50-52)[3]		50						
	24.5 (48-73)							
		55						
GS-01-S(59-61.5)[3]		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-01**
LOCATION	**Portland, Oregon**	PAGE	**4 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**80.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/26/06**
		MUDLINE ELEVATION	**7.3 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								48.0 to 77.0 feet: SAND (SP), continued.
		65						
		70						@ 69.5 to 71.5 feet: silt lenses up to 2-inches thick.
GS-01-S(70.5-73)[3]								
GS-01-W(73-77)[1]								
		75						
	11.5 (73-80)							
		80						**77.0 to 80.0 feet: INTERBEDDED BASALT; GRAVELLY SILT (ML)**; gray; 50 to 60 percent low to medium plasticity fines; 40 to 50 percent fine to coarse, angular to subrounded gravel; firm to stiff; damp to moist; **AND SILTY GRAVEL (GP)**; gray; 50 to 60 percent fine to coarse, angular to subrounded gravel; 40 to 50 percent

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-01**
LOCATION	**Portland, Oregon**	PAGE	**5 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**80.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/26/06**
		MUDLINE ELEVATION	**7.3 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								low to medium plasticity fines; medium to density to dense; damp to moist.
								Bottom of boring = 80.0 feet.
		85						
		90						
		95						
		100						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-02**
LOCATION	**Portland, Oregon**	PAGE	**1 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**90.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/28/06**
		MUDLINE ELEVATION	**6.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								0 to 1.0 foot: GRAVELLY SILT WITH SAND (GP); grayish-brown; 40 percent medium plasticity fines; 30 percent fine to coarse, angular to rounded gravel; 30 percent fine to coarse sand; very soft; wet. Hydrocarbon-like and mild hydrogen-sulfide-like odors.
GS-02-W(4-6)[1] GS-02-S(4-6)[2]	17 (0-23)	5	X	X				**1.0 to 23.0 feet: SILT (ML)**; grayish-brown; 85 to 100 percent medium plasticity fines; 0 to 15 percent very fine to fine sand; trace fine root hairs and subrounded to rounded fine gravel; firm; wet. Slight hydrocarbon-like odor, decreasing with depth. Sand lenses ½ inch to 6 inches. @ 1.0 foot: 3-inch cobble.
GS-02-W(9-11)[1] GS-02-S(9-11)[2] GS-02-S(9-11)[3]		10	X	X	X			
		15						@ 17.5 feet: two twigs; 1.5 to 2 inches in length; 3/4 inch in thickness.
		20						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-02**
LOCATION	**Portland, Oregon**	PAGE	**2 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**90.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/28/06**
		MUDLINE ELEVATION	**6.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-02-S(20-23)[2] GS-02-S(20-23)[3]				X	X			**1.0 to 23.0 feet: SILT (ML)**, continued.
GS-02-W(23-27)[1]		25	X					**23.0 to 35.0 feet: SAND WITH SILT (SP)**; grayish-brown; 90 to 95 percent fine to medium sand; 5 to 10 percent fines; loose to medium density; wet. Silt lenses 1/4- to 1/2-inch thick. @ 24.0 feet: one piece of coarse, sub-rounded gravel.
GS-02-S(29.5-32)[3]	25 (23-48)	30			X			
		35						**35.0 to 36.5 feet: SILT (ML)**; grayish-brown; 100 percent medium plasticity fines; trace very fine sand and fine subrounded gravel; firm; wet. Sand lenses up to 1 inch.
								36.5 to 38.0 feet: SAND WITH SILT (SP); grayish-brown; 90 to 95 percent fine to medium sand; 5 to 10 percent fines; loose to medium density; wet. Silt lenses up to 1 inch.
		40						**38.0 to 42.0 feet: SILT (ML)**; grayish-brown; 100 percent medium plasticity fines; trace very fine sand; firm; wet. Sand lenses up to 3 inches.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-02**
LOCATION	**Portland, Oregon**	PAGE	**3 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**90.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/28/06**
		MUDLINE ELEVATION	**6.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-02-S(40-42)[3]					X			**38.0 to 42.0 feet: SILT (ML)**, continued.
								42.0 to 48.0 feet: SAND WITH SILT (SP); 90 to 95 percent fine to medium sand; 5 to 10 percent fines; loose to medium density; wet. Silt lenses up to 1-inch thick. Decreasing silt with depth.
GS-02-S(45-48)[2]		45		X				
GS-02-W(48-52)[1]			X					**48.0 to 73.0 feet: SAND (SP)**; grayish-brown; 95 to 100 percent fine to medium sand; trace to 5 percent fines; loose to medium density; wet. Decrease in fines with depth.
		50						
GS-02-S(53-54)[3]	20 (48-73)				X			
		55						
		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-02**
LOCATION	**Portland, Oregon**	PAGE	**4 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**90.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/28/06**
		MUDLINE ELEVATION	**6.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-02-S(60-63)[3]								**48.0 to 73.0 feet: SAND (SP)**, continued.
		65						
GS-02-S(70-73)[3]		70						
GS-02-W(73-77)[1]								**73.0 to 86.0 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand; <5 percent fines; loose to medium density; wet. Increase in fines with depth. Silt lenses up to 2-inch thick. Silt nodules up to 2.5 inch in diameter.
	13.5 (73-86)	75						
GS-02-S(78-80)[3]		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-02**
LOCATION	**Portland, Oregon**	PAGE	**5 of 5**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**90.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/28/06**
		MUDLINE ELEVATION	**6.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								73.0 to 86.0 feet: SAND (SP), continued.
		85						
	4.5 (86-90)							**86.0 to 90.0 feet: INTERBEDDED BASALT AND SILT (ML)**; dark grayish-brown to grayish-brown (darker at top); low to medium plasticity fines; moist to damp.
		90						Bottom of boring = 90.0 feet.
		95						
		100						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-03**
LOCATION	**Portland, Oregon**	PAGE	**1 of 7**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**123.5'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/19/06**
		MUDLINE ELEVATION	**5.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-03-W(4-6)[1] GS-03-S(4-6)[2]		5	X	X				**0 to 5.5 feet: SANDY SILT (ML)**; grayish-brown mottled with black; 70 percent low to medium plasticity fines; 30 percent fine to coarse sand; trace medium to coarse gravel and twigs and root hairs; soft; wet. Hydrocarbon-like odor. @ 0 to 2.5 feet: hydrogen sulfide-like odor.
GS-03-S(9-11)[2] GS-03-S(9-11)[3]	16.5 (0-23)	10		X	X			**5.5 to 14.0 feet: SILT (ML)**; grayish-brown; 85 to 100 percent medium plasticity fines; 0 to 15 percent fine sand; trace twigs (up to ½-inch thick) and root hairs. Intermittent sand lenses up to ¼-inch thick; firm; wet.
GS-03-W(13-15)[1]			X					
		15						**14.0 to 15.0 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand; trace fines; wet.
								15.0 to 20.5 feet: SILT (ML); grayish-brown; 85 to 100 percent medium plasticity fines; 0 to 15 percent fine sand; trace fine root hairs; firm; wet.
GS-03-S(19-20)[3]		20			X			

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-03**
LOCATION	**Portland, Oregon**	PAGE	**2 of 7**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**123.5'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/19/06**
		MUDLINE ELEVATION	**5.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-03-S(20-23)[2]								**15.0 to 20.5 feet: SILT (ML)**, continued.
								20.5 to 21.5 feet: SAND (SP); grayish-brown; 100 percent fine to medium sand; trace fines; loose to medium density; wet.
								21.5 to 23.0 feet: SILT (ML); grayish-brown; 85 to 100 percent medium plasticity fines; 0 to 15 percent fine sand; firm; wet.
GS-03-W(23-27)[1]								**23.0 to 41.5 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand; trace fines; loose to medium density; wet.
								@ 23.0 feet: one angular piece of medium gravel.
		25						
GS-03-S(29-32)[3] GS-53-S(29-32)[3]								
		30						
	15 (23-48)							
		35						
								@ 37.5 to 39.0 feet: SILT (ML); grayish-brown; medium plasticity fines; firm; wet.
GS-03-S(39-43)[3]								
		40						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-03**
LOCATION	**Portland, Oregon**	PAGE	**3 of 7**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**123.5'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/19/06**
		MUDLINE ELEVATION	**5.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								23.0 to 41.5 feet: SAND (SP), continued.
								41.5 to 43.0 feet: SILT (ML); grayish-brown; 100 percent medium plasticity fines; trace very fine sand; firm; wet. @ 43.0 feet: 3-inch-thick sand lens, fine to medium sand.
								43.0 to 45.0 feet: SANDY SILT (ML); grayish-brown; 70 percent medium plasticity fines; 30 percent very fine to fine sand; firm; wet.
GS-03-S(45-48)[2]		45						**45.0 to 46.5 feet: SILTY SAND (SM)**; grayish-brown; 60 percent fine sand; 40 percent medium plasticity fines; trace fine rounded to well-rounded gravel; loose to medium density; wet.
								46.5 to 48.0 feet: SANDY SILT (ML); grayish-brown; 70 percent medium plasticity fines; 30 percent fine sand; firm; wet.
GS-03-W(48-52)[1]								**48.0 to 73.0 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand; <5 percent fines; medium density to dense; wet. Increasing density with depth. Silt lenses.
GS-03-S(50-52)[3]		50						
	24.5 (48-73)							
		55						
GS-03-S(59-61)[3]		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-03**
LOCATION	**Portland, Oregon**	PAGE	**4 of 7**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**123.5'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/19/06**
		MUDLINE ELEVATION	**5.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								48.0 to 73.0 feet: SAND (SP), continued.
		65						
GS-03-S(70-73)[3]		70						
GS-03-W(73-77)[1]								**73.0 to 111.0 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand; <5 percent fines; medium density; wet.
		75						
	22.5 (73-98)							
GS-03-S(78-81)[3]								
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-03**
LOCATION	**Portland, Oregon**	PAGE	**5 of 7**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**123.5'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/19/06**
		MUDLINE ELEVATION	**5.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								73.0 to 111.0 feet: SAND (SP), continued.
		85						@ 86.5 feet: silt nodule approximately 1.5 inches in diameter.
GS-03-S(89-92)[3]		90						
GS-03-S(95-98)[2]		95						
GS-03-W(98-102)[1]								@ 98.0 feet: 3-inch thick lens of silt at bottom of run.
		100						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-03**
LOCATION	**Portland, Oregon**	PAGE	**6 of 7**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**123.5'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/19/06**
		MUDLINE ELEVATION	**5.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								73.0 to 111.0 feet: SAND (SP), continued.
		105						
	22.5 (98-123.5)							@ 108.5 to 109.0 feet: SILT (ML).
		110						
								111.0 to 117.5 feet: SILT (ML); grayish-brown; 85 to 100 percent medium plasticity fines; 0 to 15 percent fine to medium sand; firm; wet. Sand lenses up to 3 inches.
		115						
GS-03-W(116-120)[1]								
								117.5 to 119.0 feet: SAND (SP); grayish-brown; fine to medium sand; <5 percent fines; medium to density to dense; wet.
								119.0 to 122.0 feet: SAND (SP); light brown to tan; fine to medium sand; <5 percent fines; dense; wet.
		120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-03**
LOCATION	**Portland, Oregon**	PAGE	**7 of 7**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**123.5'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/19/06**
		MUDLINE ELEVATION	**5.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-03-S(120-122)[2]				X				**119.0 to 122.0 feet: SAND (SP)**, continued.
								122.0 to 123.5 feet: BASALT.
								Bottom of boring = 123.5 feet.
		125						
		130						
		135						
		140						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-04**
LOCATION	**Portland, Oregon**	PAGE	**1 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/14/06**
		MUDLINE ELEVATION	**4.4 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								0 to 3.0 feet: SILT WITH SAND (ML); grayish-brown; 75 to 80 percent medium plasticity fines; 15 percent fine to medium sand; 5 to 10 percent gravel and cobbles; soft; wet.
GS-04-W(4-6)[1] GS-04-S(4-6)[2]	12.5 (0-27)	5	X	X				**3.0 to 6.0 feet: SILT (ML)**; grayish-brown; 100 percent medium plasticity fines; trace fine sand; soft; wet. @ 4.0 feet: twig or root.
GS-04-W(9-11)[1] GS-04-S(9-11)[2] GS-04-S(10-11)[3]		10	X	X	X			**6.0 to 27.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; loose to medium density; wet.
		15						@ 17.0 to 18.0 feet: wood fragments.
GS-04-S(19-21)[3]		20			X			

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-04**
LOCATION	**Portland, Oregon**	PAGE	**2 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/14/06**
		MUDLINE ELEVATION	**4.4 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								6.0 to 27.0 feet: SAND (SP), continued.
GS-04-S(24-27)[2]		25						
GS-04-W(27-31)[1]								**27.0 to 45.0 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand; loose to medium density; wet.
GS-04-S(30-31)[3]		30						
	9.0 (27-48)							@ 33.0 to 48.0 feet: faint hydrocarbon-like odor, decreasing with depth.
		35						
GS-04-S(38-40)[3]								
		40						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-04**
LOCATION	**Portland, Oregon**	PAGE	**3 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/14/06**
		MUDLINE ELEVATION	**4.4 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								27.0 to 45.0 feet: SAND (SP), continued.
GS-04-S(45-48)[2]		45						**45.0 to 46.0 feet: SILT (ML)**; grayish-brown; 100 percent medium plasticity fines; trace fine sand; firm; damp to moist.
								46.0 to 73.0 feet: SAND (SP); grayish-brown; 100 percent fine to medium sand; loose to medium density; wet.
GS-04-W(48-52)[1]								@ 48.0 to 59.0 feet: possible faint unidentifiable odor.
GS-04-S(50-51)[3]		50						
								@ 51.5 feet: silt lens 1-inch thick.
	14 (48-73)							
		55						
								@ 59.0 to 73.0 feet: strong unidentifiable odor, strengthening with depth.
		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-04**
LOCATION	**Portland, Oregon**	PAGE	**4 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/14/06**
		MUDLINE ELEVATION	**4.4 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-04-S(60-61)[3]					X			**46.0 to 73.0 feet: SAND (SP)**, continued.
		65						
GS-04-S(69-70)[2]				X				
GS-04-S(70-71)[3]		70			X			
GS-04-W(73-77)[1]								**73.0 to 98.0 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand, loose to medium density; wet. Faint unidentifiable odor.
		75	X					
	22.5 (73-98)							
GS-04-S(78-81)[3]					X			
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-04**
LOCATION	**Portland, Oregon**	PAGE	**5 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/14/06**
		MUDLINE ELEVATION	**4.4 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								73.0 to 98.0 feet: SAND (SP), continued.
		85						
								@ 88.5 to 91.0 feet: slightly stronger unidentifiable odor.
		90						
GS-04-S(91-93)[3]								
GS-04-S(95-98)[2]		95						
GS-04-W(98-102)[1]								**98.0 to 110.5 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand; <5 percent fines; loose to medium density; wet.
		100						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-04**
LOCATION	**Portland, Oregon**	PAGE	**6 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/14/06**
		MUDLINE ELEVATION	**4.4 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	19.5 (98-123)	105 110 115 120	X					**98.0 to 110.5 feet: SAND (SP)**, continued. @ 98.0 to 123.0 feet: faint unidentifiable odor noted. @ 103.5 to 105.5 feet: SAND WITH SILT (SP); grayish-brown; 85 to 90 percent fine to medium sand; 10 to 15 percent fines; loose to medium density; wet. **110.5 to 114.0 feet: SILT (ML)**; grayish-brown; 100 percent medium plasticity fines, firm to stiff; wet. Sand lenses ½-inch to 3-inches thick. **114.0 to 123.0 feet: SAND (SP)**; grayish-brown; 100 percent fine to medium sand; trace fines; loose to medium density; wet.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-04**
LOCATION	**Portland, Oregon**	PAGE	**7 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/14/06**
		MUDLINE ELEVATION	**4.4 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								114.0 to 123.0 feet: SAND (SP), continued.
GS-04-W(123-127)[1]	20.5 (123-148)	125 130 135 140						**123.0 to 133.0 feet: SAND (SP)**; grayish-brown; 95 percent fine to medium sand; 5 percent fines; medium density; wet. @ 123.0 to 126.5 feet: trace silt nodules up to 3 inches. **133.0 to 134.0 feet: SILT (ML)**; grayish-brown; low to medium plasticity; trace sand; stiff; moist to wet. **134.0 to 148.0 feet: SAND (SP)**; grayish-brown; 95 percent fine to medium sand; 5 to 10 percent fines; dense; wet.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-04**
LOCATION	**Portland, Oregon**	PAGE	**8 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**12/14/06**
		MUDLINE ELEVATION	**4.4 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		145						**134.0 to 148.0 feet: SAND (SP)**, continued.
GS-04-W(148-152)[1]		150						Bottom of boring = 148.0 feet.
		155						
		160						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**1 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								0 to 1.0 foot: RIPRAP
	2 (0-4)							**1.0 to 3.5 feet: SILT (ML)**; grayish-brown; 85 to 90 percent medium to high plasticity fines; 10 to 15 percent fine sand; <5 percent organics (roots, leaves, wood chunks); wet.
GS-05-S(3-4)[2]				X				
GS-05-W(4-6)[1] GS-05-S(4-11)[3]			X		X			**3.5 to 4.0 feet: SILTY SAND (SM)**; dark brown to black; fine to medium sand; medium plasticity fines; trace wood chunks; wet. Sheen.
		5						**4.0 to 23.0 feet: SILTY SAND (SM)**; grayish brown; 70 percent fine to medium sand; 30 percent medium plasticity fines; trace roots; wet. Sand fining with depth. Sheen and hydrocarbon-like odor from 4.0 to 15.5 feet. Free product droplets from 4.0 to 13.0 feet.
GS-05-W(9-11)[1] GS-05-S(9-11)[2]	2 (4-13)	10	X	X	X			
		15						
		20						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**2 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-05-S(20-22)[2] GS-05-S(20-22)[3]	10 (13-23)			X	X			**4.0 to 23.0 feet: SILTY SAND (SM)**, continued.
GS-05-W(23-27)[1]	5.5 (23-28)	25	X					**23.0 to 29.0 feet: SAND (SP)**; grayish brown; 95 percent fine to medium sand; 5 percent fines; wet.
		30						**29.0 to 32.0 feet: SILT (ML)**; grayish-brown; medium to high plasticity fines; trace fine sand; wet. Lenses of sandy silt <1-inch in thickness.
GS-05-S(33-36)[3]	7 (28-38)	35			X			**32.0 to 41.5 feet: INTERBEDDED SILT (ML)**; grayish-brown; medium to high plasticity fines; trace fine sand; wet; **AND SAND WITH SILT (SP)**; grayish brown; 90 percent fine to medium sand; 10 percent medium to high plasticity fines; wet. INTERBEDDED 50:50.
GS-05-S(39-42)[3]		40			X			

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**3 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	9.5 (38-48)							**32.0 to 41.5 feet: INTERBEDDED SILT (ML) AND SAND WITH SILT (SP)**, continued.
								41.5 to 49.0 feet: SAND (SP); grayish-brown; fine to medium sand; <5 percent fines; wet.
GS-05-S(45-48)[2] GS-05-S(45-48)[3]		45						
	7.5 (48-55)	50						**49.0 to 52.0 feet: SILT (ML)**; grayish brown; 90 to 95 percent medium plasticity fines; 5 to 10 percent fine to very fine sand; wet.
								52.0 to 123.0 feet: SAND (SP); grayish-brown; fine to medium sand; <5 percent fines; wet. Unidentifiable odor. @ 53.0 feet: 1-inch lens of silt.
GS-05-W(55-59)[1]		55						
GS-05-S(59-64)[3]		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**4 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								52.0 to 123.0 feet: SAND (SP), continued.
	10 (55-73)	65						
GS-05-S(69-73)[3]		70						
GS-05-W(73-77)[1]	1 (73-78)	75						
GS-05-S(79-82)[3]		80						@ 80.0 feet: one piece of coarse, rounded gravel.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**5 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								52.0 to 123.0 feet: SAND (SP), continued.
	10 (78-88)				X			
		85						
GS-05-S(89-92)[3]					X			
		90						
	9.5 (88-98)							
								@ 94.0 feet: trace fine gravel.
GS-05-S(95-98)[2]		95		X				@ 95.0 to 98.0 feet: trace coarse sand-sized pieces of rounded pumice; white to light gray.
								@ 96.5 feet: wood chunk 1-inch by ½-inch.
GS-05-W(98-102)[1]			X					
	0 (98-103)	100						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**6 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-05-CW(100)[1]			X					**52.0 to 123.0 feet: SAND (SP)**, continued.
	0 (103-108)	105						
	5 (108-113)	110						
		115						@ 116.0 to 117.0 feet: coarse sand-sized pieces of rounded pumice. @ 117.0 to 119.0 feet: wood fragment ½-inch x ½-inch and twig <½-inch long.
	9 (113-123)	120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**7 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-05-S(120-123)[2]				X				**52.0 to 123.0 feet: SAND (SP)**, continued.
GS-05-W(123-127)[1]	5 (123-128)	125	X					**123.0 to 128.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines. No to very faint unidentifiable odor.
	9.5 (128-138)	130 135						**128.0 to 136.0 feet: INTERBEDDED SAND (SP)**; grayish-brown; 95 percent fine to medium sand; 5 percent fines; wet; **AND SILT (ML)**; 90 to 95 percent medium plasticity fines; 5 to 10 percent very fine to fine sand; wet. Beds 1 inch to 1 foot. @ 128.5 feet: one piece of medium, rounded gravel.
		140						**136.0 to 141.5 feet: SAND (SP)**; grayish brown; fine to medium sand; <5 percent fines; wet.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**8 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								136.0 to 141.5 feet: SAND (SP), continued.
								141.5 to 142.5 feet: SILT (ML); grayish-brown; 90 to 95 percent medium plasticity fines; 5 to 10 percent very fine sand; wet.
								@ 142.0 feet: 1-inch thick lens of sand.
	10 (138-148)							**142.5 to 158.5 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; wet.
GS-05-S(145-148)[2]		145						
GS-05-W(148-152)[1]								
	4.5 (148-153)	150						
		155						@ 154.5 feet: 6-inch thick lens of silt.
	9 (153-163)							@ 157.5 feet: one piece of coarse, rounded gravel.
								158.5 to 159.5 feet: GRAVELLY SAND (GP); grayish-brown; 70 percent fine to medium sand; 30 percent fine to coarse gravel; <5 percent fines; wet.
		160						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**9 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								159.5 to 163.0 feet: SAND (SP); grayish-brown; fine to medium sand; <5 percent fines; wet. @ 160.0 feet: 6-inch thick lens of silt.
								163.0 to 165.0 feet: SILTY SAND (SM); grayish-brown; 70 to 80 percent fine to coarse, angular to subrounded sand; 20 to 30 percent fines; wet. Silt nodules ¼- to ½-inch; soft. Faint unidentifiable odor.
		165						**165.0 to 171.0 feet: SAND (SP)**; grayish brown; 95 percent fine to medium sand; <5 percent fines; trace coarse sand; wet. Faint unidentifiable odor.
	4 (163-173)							
GS-05-S(170-173)[2]		170						
								171.0 to 173.0 feet: SILTY SAND (SM); grayish-brown; 80 percent fine to coarse, angular to subrounded sand; 20 percent fines; wet. Some quartzite sand. Faint unidentifiable odor.
GS-05-W(173-177)[1]								**173.0 to 184.0 feet: SAND (SP)**; grayish-brown; fine to coarse sand; <5 percent fines; wet. Very faint unidentifiable odor.
		175						
	2.5 (173-180)							
		180						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**10 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								173.0 to 184.0 feet: SAND (SP), continued.
	9 (180-190)	185						**184.0 to 186.0 feet: SAND (SP)**; grayish-brown; fine to coarse sand; <5 percent fines; trace fine to coarse, subrounded to rounded gravel.
								186.0 to 187.0 feet: SANDY GRAVEL (GP); 60 percent fine to coarse, angular to rounded gravel; 40 percent fine to coarse sand; <5 percent fines; wet. Some quartzite gravel. @ 186.0 feet: one cobble 0.4 x 0.3 feet.
								187.0 to 190.0 feet: SAND (SP); grayish-brown; fine to coarse sand; trace to 10 percent fine to coarse, subangular to rounded gravel; <5 percent fines; wet.
		190						**190.0 to 192.0 feet: GRAVELLY SAND (GP)**; grayish-brown; 80 to 85 percent fine to coarse sand; 15 to 20 percent fine to coarse, angular to rounded gravel; <5 percent fines; wet.
GS-05-W(191-195)[1]								**192.0 to 196.5 feet: GRAVEL WITH SILT (GP)**; grayish brown; 80 percent fine to coarse, angular to rounded gravel; 10 percent fine to coarse sand; 10 percent fines; wet. @ 194.5 feet: cobble 0.35 foot by 0.3 foot. @ 195.0 to 196.5 feet: color change to grayish-brown to brown.
	7.5 (190-200)	195						
								196.5 to 197.0 feet: SANDY GRAVEL WITH SILT (GP); grayish-brown; 50 percent fine to coarse, angular to rounded gravel; 35 percent fine to coarse sand; 15 percent fines; wet. @ 196.5 feet: silt nodule 2 inches x 2 inches; rounded cobble 0.3 foot x 0.2 foot.
		200						**197.0 to 200.0 feet: BASALT**

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-05**
LOCATION	**Portland, Oregon**	PAGE	**11 of 11**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**200.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**10/31/06**
		MUDLINE ELEVATION	**8.0 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								Bottom of boring = 200.0 feet.
		205						
		210						
		215						
		220						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-06**
LOCATION	**Portland, Oregon**	PAGE	**1 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/18/07**
		MUDLINE ELEVATION	**7.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								0 to 2.0 feet: SAND (SP); brown; fine to coarse sand; trace fines and fine to coarse, angular to subrounded gravel; loose; wet. Faint hydrocarbon-like odor. Trace spotty sheen.
	6 (0-7)							**2.0 to 7.0 feet: SANDY SILT (ML)**; grayish-brown; 55 percent low to medium plasticity fines; 45 percent fine sand; soft; wet. One cobble 4 inches in diameter. Faint hydrocarbon-like odor. Trace spotty sheen.
GS-06-W(4-6)[1] GS-06-S(4-6)[2] GS-56-S(4-6)[2]		5	X	X				
GS-06-S(7-20)[3]								**7.0 to 20.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; loose; wet; **AND SILT (ML)**; grayish-brown, medium plasticity fines; trace medium to coarse, angular to subangular gravel; trace twigs; soft; wet. Faint hydrocarbon-like odor. Trace spotty sheen. Note: Intact sample not obtained. Core slipped from core barrel and was recovered from drilling platform.
GS-06-W(9-11)[1] GS-06-S(9-11)[2]		10	X	X				
	2 (7-20)							
		15						
		20						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-06**
LOCATION	**Portland, Oregon**	PAGE	**2 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/18/07**
		MUDLINE ELEVATION	**7.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-06-S(20-23)[2] GS-06-S(20-23)[3]	3 (20-23)			X	X			**20.0 to 23.0 feet: INTERBEDDED SAND (SP)**; grayish brown; fine to medium sand; loose; wet; **AND SILT (ML)**; grayish-brown; medium plasticity fines; soft; wet. Faint hydrocarbon-like odor. Trace spotty sheen.
GS-06-W(23-27)[1] GS-56-W(23-27)[1]		25	X					**23.0 to 28.0 feet: SAND WITH SILT (SP)**; grayish-brown; 90 to 95 percent fine to medium sand; 5 to 10 percent fines; loose; wet.
GS-06-S(28-33)[3] GS-56-S(28-33)[3]		30			X			**28.0 to 44.0 feet: SILT (ML)**; grayish-brown; 85 to 100 percent medium plasticity fines; trace to 15 percent fine to medium sand; soft; wet. Sand lenses.
	13.5 (23-48)	35						
		40						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-06**
LOCATION	**Portland, Oregon**	PAGE	**3 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/18/07**
		MUDLINE ELEVATION	**7.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-06-S(41-44)[2] GS-56-S(41-44)[2] GS-06-S(41-44)[3]				X	X			**28.0 to 44.0 feet: SILT (ML)**, continued.
		45						**44.0 to 48.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; trace to 5 percent fines; loose; wet. Silt lenses.
GS-06-W(48-52)[1] GS-56-W(48-52)[1] GS-06-S(48-52)[3]			X		X			**48.0 to 55.5 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; loose to medium density; wet. Faint unidentifiable odor.
	17 (48-73)	50						
		55						**55.5 to 56.5 feet: SILT (ML)**; grayish-brown; medium plasticity fines, firm to stiff; wet. Faint unidentifiable odor.
								56.5 to 60.5 feet: SILTY SAND (SM); grayish brown; 75 to 85 percent fine to medium sand; 15 to 25 percent fines; loose to medium density; wet. Faint unidentifiable odor.
		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-06**
LOCATION	**Portland, Oregon**	PAGE	**4 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/18/07**
		MUDLINE ELEVATION	**7.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								56.5 to 60.5 feet: SILTY SAND (SM), continued.
GS-06-S(61-64)[3] GS-56-S(61-64)[3]					X			**60.5 to 63.5 feet: SANDY SILT (ML)**; grayish-brown; 85 to 100 percent medium plasticity fines; trace to 15 percent fine to medium sand; soft to firm. Increasing strong unidentifiable odor.
								63.5 to 65.0 feet: SAND (SP); grayish-brown; fine to medium sand; <5 percent fines; loose to medium density; wet. Silt lenses. Increasingly strong unidentifiable odor.
GS-06-S(65-69)[2]		65		X				**65.0 to 73.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; loose to medium density; wet. Increasingly strong unidentifiable odor.
GS-06-S(69-73)[3]		70			X			
								@ 73.0 feet: strong unidentifiable odor.
GS-06-W(73-77)[1]	22.5 (73-98)	75	X					**73.0 to 83.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; medium density; wet. Silt lenses. Moderate to strong unidentifiable odor.
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-06**
LOCATION	**Portland, Oregon**	PAGE	**5 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/18/07**
		MUDLINE ELEVATION	**7.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-06-S(80-83)[3]								**73.0 to 83.0 feet: SAND (SP)**, continued.
		85						**83.0 to 90.0 feet: INTERBEDDED SAND (SP)**; grayish-brown; fine to medium sand; medium density; wet; **AND SILT (ML)**; grayish-brown; low to medium plasticity; firm to stiff; damp to moist. SAND:SILT interbedded 50:50. Moderate to strong unidentifiable odor.
GS-06-S(90-92)[3]		90						**90.0 to 98.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; medium density; wet. Moderate to strong unidentifiable odor.
GS-06-S(95-98)[2]		95						
GS-06-W(98-102)[1]		100						**98.0 to 123.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; trace fines, coarse sand, and fine subrounded to rounded gravel; medium density; wet. Some of the gravel-sized material is pumice. Moderate

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-06**
LOCATION	**Portland, Oregon**	PAGE	**6 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/18/07**
		MUDLINE ELEVATION	**7.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								to strong unidentifiable odor.
		105						
	17 (98-123)							
		110						
		115						@ 116.0 to 117.0 feet: wood chunks and twigs up to 2-inches in length.
		120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-06**
LOCATION	**Portland, Oregon**	PAGE	**7 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/18/07**
		MUDLINE ELEVATION	**7.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								98.0 to 123.0 feet: SAND (SP), continued.
GS-06-W(123-127)[1]								**123.0 to 131.5 feet: SAND (SP)**; grayish-brown; fine to medium sand; trace to 5 percent fines; medium density; wet. Moderate to strong unidentifiable odor.
		125						
	20.5 (123-148)	130						@ 129.0 to 129.5 feet: grayish-brown to brown; fine to coarse sand (coarse fraction mainly pumice); trace wood fragments.
								131.5 to 134.5 feet: SILTY SAND (SM); grayish-brown; 85 percent fine to medium sand; 15 percent fines; medium density; wet. Silt lenses. Moderate to strong unidentifiable odor.
		135						**134.5 to 135.5 feet: SAND (SP)**; grayish-brown; fine to medium sand; trace fines; medium density; wet. Trace coarse sand. Moderate to strong unidentifiable odor.
								135.5 to 140.5 feet: SILTY SAND (SM); grayish-brown; 85 percent fine to medium sand; 15 percent fines, medium to dense; wet. Silt lenses up to 6-inches thick; medium to low plasticity. Moderate to strong unidentifiable odor.
		140						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-06**
LOCATION	**Portland, Oregon**	PAGE	**8 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/18/07**
		MUDLINE ELEVATION	**7.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								135.5 to 140.5 feet: SILTY SAND (SM), continued.
								140.5 to 148.0 feet: SAND (SP); grayish-brown; fine to medium sand; <5 percent fines; trace coarse sand (mostly pumice); medium to dense; wet. Moderate to strong unidentifiable odor.
		145						
GS-06-W(148-152)[1]								@ 148.0 feet: fine to coarse subrounded to rounded gravel and 1 cobble 3.5 inch in diameter.
								Bottom of boring = 148.0 feet.
		150						
		155						
		160						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**1 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								0 to 3.0 feet: SAND WITH SILT (SP); 90 to 95 percent fine to medium sand, 5 to 10 percent nonplastic to low plasticity fines; wet. Light sheen.
GS-07-W(4-6)[1] GS-07-S(4-6)[2] GS-07-S(4-6)[3]	9.0 (0-23)	5	X	X	X			**3.0 to 13.0 feet: SILT (ML)**; gray to black; 85 to 90 percent fines; 10 to 15 percent fine to medium sand. Heavy sheen. Free product droplets and layers, but not flowing.
GS-07-W(9-11)[1] GS-07-S(9-11)[2]		10	X	X				@ 9.0 to 10.0 feet: friable coarse gravel; fine yellow crystals when broken.
GS-07-S(15-18)[3]		15			X			**13.0 to 23.0 feet: SILT (ML)**, grayish brown; 85 to 90 percent low to medium plasticity fines; 10 to 15 percent fine sand; <5 percent organics (root hairs, grasses); wet. Trace sand lenses <0.1-foot thick; fine to medium sand.
		20						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**2 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								13.0 to 23.0 feet: SILT (ML), continued.
GS-07-W(23-27)[1] GS-07-S(23-27)[2]	2 (23-28)	25	X	X				**23.0 to 27.0 feet: SILTY SAND (SM)**; grayish brown to gray; 80 to 85 percent fine to medium sand; 15 to 20 percent medium plasticity fines; trace organics (grasses and root hairs); loose. Sheen. Strong hydrocarbon-like odor.
GS-07-S(28-30)[3]	9 (28-38)	30 35 40			X			**27.0 to 48.0 feet: SILTY SAND (SM)**; grayish brown; 70 to 80 percent fine to medium sand; 20 to 30 percent fines; trace organics. Sand lenses 0.1 to 0.2-feet thick; fine to medium sand. Silt lenses 0.1 to 0.2-feet thick; medium to high plasticity fines. Faint hydrocarbon-like odor. @ 28.0 to 29.0 feet: trace spotty sheen.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**3 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-07-S(41-43)[3]	10 (38-48)	45			X			**27.0 to 48.0 feet: SILTY SAND (SM)**; continued. @ 41.0 to 48.0 feet: thin (<1mm) organic layers of grasses.
GS-07-W(48-52)[1] GS-07-S(48-52)[2]	3 (48-53)	50	X	X				**48.0 to 52.0 feet: SAND (SP)**; grayish brown; fine to medium sand; <5 percent fines; wet. Silt lenses 0.2 to 3 feet; high plasticity fines; wet.
GS-07-S(53-55)[3]	9 (53-63)	55 60			X			**52.0 to 63.0 feet: SILTY SAND (SM)**; grayish-brown; interbedded sand and silt layers. Fine to medium sand. Medium to high plasticity fines. Overall 20 to 30 percent fines.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**4 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								52.0 to 63.0 feet: SILTY SAND (SM), continued.
GS-07-S(62-63)[3]					X			
								63.0 to 81.0 feet: SAND (SP); grayish-brown; 95 percent fine to medium sand; 5 percent fines. Faint hydrocarbon-like odor.
		65						
	10 (63-73)							
GS-07-S(70-72)[3]		70			X			@ 70.0 feet: silt layer; medium plasticity fines.
								@ 72.0 feet: silt layer, medium plasticity fines.
GS-07-W(73-77)[1] GS-57-W(73-77)[1]			X					@ 73.0 feet: silt layer, medium plasticity fines.
	5 (73-78)	75						
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**5 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-07-S(80-82)[3]								**63.0 to 81.0 feet: SAND (SP)**, continued.
	9 (78-88)	85						**81.0 to 88.0 feet: SILTY SAND (SM)**; grayish-brown; interbedded sand and silt layers. Fine to medium sand. Medium to high plasticity fines. Overall 20 to 30 percent fines.
								88.0 to 89.0 feet: SILT (ML); grayish-brown; medium to high plasticity fines; <5 percent sand.
GS-07-S(90-92)[3]		90						**89.0 to 92.0 feet: INTERBEDDED SAND (SP) AND SILT (ML)**; medium to high plasticity fines. Interbedded 50:50.
	10 (88-98)	95						**92.0 to 98.0 feet: SAND (SP)**; grayish brown; fine to medium sand. Trace silt lenses 0.1- to 0.2-foot thick; medium plasticity fines.
GS-07-W(98-102)[1] GS-07-S(98-102)[2]		100						**98.0 to 148.0 feet: SAND (SP)**; gray; fine to medium sand; trace fines; wet. No odor.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**6 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-07-CW(100)[1]			X	X				**98.0 to 148.0 feet: SAND (SP)**, continued.
	5 (98-103)							
		105						
	9 (103-113)							
		110						
								@ 113.0 to 123.0 feet: trace silt nodules up to 0.1-feet in diameter; low to medium plasticity fines. No odor.
		115						@ 115.0 feet: 3-inch x ½-inch wood chunk.
	11 (113-123)							
		120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**7 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								98.0 to 148.0 feet: SAND (SP), continued.
GS-07-W(123-127)[1] GS-07-S(123-127)[2]			X	X				@ 123.0 to 127.0 feet: pumice (coarse sand- to fine gravel-sized) and wood chips up to 1-inch in diameter.
		125						
								@ 127.0 to 138.0 feet: trace pumice (coarse sand-sized).
	9 (123-138)							
		130						@ 130.0 feet: <1-inch-thick layer of wood fragments.
		135						
								@ 137.5 feet: 0.3-foot-thick silt lens; medium to high plasticity fines.
		140						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**8 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								98.0 to 148.0 feet: SAND (SP), continued.
								@ 141.0 feet: trace silt nodules up to 0.2-foot in diameter.
	10 (138-148)							@ 144.0 feet: leaf in middle of silt nodule.
GS-07-S(145-148)[2]		145						
								@ 147.5 feet: silt; medium to high plasticity; twigs and wood chips.
GS-07-W(148-152)[1]	0.5 (148-153)							**148.0 to 153.0 feet: SILTY SAND (SM)**; grayish-brown; 80 percent fine to coarse sand (mostly coarse; coarse sand appears to be pumice); 20 percent fines; with wood fragments.
		150						
								Note: Only 0.5-foot recovered for 5-foot core.
								153.0 to 161.0 feet: SAND (SP); grayish-brown; fine to medium sand; <5 percent fines. Sand coarsening with depth.
		155						
	9 (153-163)							
								@ 158.5 to 161.0 feet: trace to 10 percent fine to coarse gravel; subrounded to rounded.
		160						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**9 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								153.0 to 161.0 feet: SAND (SP), continued.
								161.0 to 168.0 feet: SANDY GRAVEL (GP); grayish-brown; 70 to 80 percent angular to rounded, fine to coarse gravel; 20 to 30 percent fine to coarse sand; trace fines. Some quartzite gravel.
		165						
	10 (163-173)							
								168.0 to 169.0 feet: GRAVEL (GP); grayish brown; fine to coarse, subangular to well rounded gravel; trace fines and sand. Some quartzite gravel.
								169.0 to 173.0 feet: SANDY GRAVEL (GP); grayish-brown; 70 to 80 percent angular to rounded, fine to coarse gravel; 20 to 30 percent fine to coarse sand; trace fines. Some quartzite gravel.
GS-07-W(170-174)[1] GS-07-S(170-173)[2]		170						
								173.0 to 188.0 feet: GRAVEL (GP); grayish-brown; fine to coarse, subangular to well rounded gravel and cobbles; trace fines and sand. Some quartzite gravel.
		175						
	10 (173-183)							
		180						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**10 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								173.0 to 188.0 feet: GRAVEL (GP); continued.
		185						
	10 (183-193)							@ 187.5 feet: 0.4-foot quartzite cobble.
								188.0 to 190.0 feet: VESICULAR BASALT; cores up to 0.5 foot.
		190						**190.0 to 193.0 feet: VESICULAR BASALT**; 10 to 15 precent sandy silt; medium to high plasticity fines.
								Bottom of boring = 193.0 feet.
		195						
		200						

REMARKS

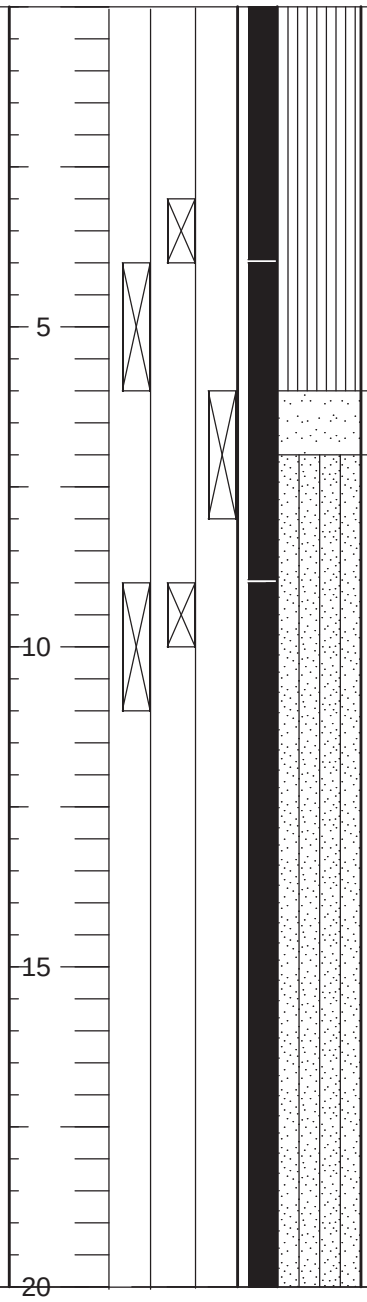
*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-08**
LOCATION	**Portland, Oregon**	PAGE	**1 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/27/06**
		MUDLINE ELEVATION	**10.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	LITHOLOGIC DESCRIPTION
	4 (0-4)	**0 to 6.0 feet: SANDY SILT (ML)**; yellowish-brown to rust-brown; medium plasticity fines; moist. Gravel, cobbles, and riprap in sandy silt matrix.
GS-08-S(3-4)[2]		@ 2.5 to 3.5 feet: color change to grayish-brown; wet.
GS-08-W(4-6)[1]		@ 3.5 to 6.0 feet: color change to gray.
GS-08-S(6-8)[3]	3.5 (4-9)	**6.0 to 7.0 feet: SAND (SP)**; dark gray; fine to medium sand; wet. Heavy sheen. Fine product droplets.
		7.0 to 30.0 feet: SILTY SAND (SM); grayish-brown; 80 to 85 percent fine sand; 15 to 20 percent medium plasticity fines; trace organics (wood chunks, roots).
GS-08-W(9-11)[1] GS-08-S(9-10)[2]		@ 9.0 to 12.0 feet: sheen in sand laminations. @ 9.0 to 30.0 feet: increase in silt percentage to 20 to 30 percent. Hydrocarbon-like odor.
	11 (9-23)	



REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-08**
LOCATION	**Portland, Oregon**	PAGE	**2 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/27/06**
		MUDLINE ELEVATION	**10.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-08-S(20-23)[2] GS-08-S(20-23)[3]				X	X			**7.0 to 30.0 feet: SILTY SAND (SM)**; continued.
GS-08-W(23-27)[1]			X					
		25						
	3 (23-30)							
GS-08-S(29-30)[3]					X			
		30						**30.0 to 40.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; wet.
	7 (30-43)	35						
		40						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-08**
LOCATION	**Portland, Oregon**	PAGE	**3 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/27/06**
		MUDLINE ELEVATION	**10.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-08-S(40-43)[3]								**40.0 to 46.0 feet: SILTY SAND (SM)**; grayish-brown; 70 to 80 percent fine to medium sand; 20 to 30 percent medium plasticity fines; wet.
GS-08-S(43-45)[2] GS-58-S(43-45)[2]								
	5 (43-48)	45						
								46.0 to 47.0 feet: SILT (ML); grayish-brown; medium to high plasticity fines; <5 percent organics (root hairs, saw dust-like particles).
								47.0 to 55.0 feet: SILTY SAND (SM); grayish-brown; 70 to 80 percent fine to medium sand; 20 to 30 percent medium plasticity fines; wet.
GS-08-W(48-52)[1] GS-58-W(48-52)[1]								
GS-08-S(50-53)[3]		50						
		55						
	6 (48-63)							**55.0 to 63.0 feet: SILT (ML)**; grayish-brown; 85 to 90 percent medium to high plasticity fines; 10 to 15 percent fine sand; trace organics (root hairs); wet. Intermittent sand lenses; fine to medium sand.
		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-08**
LOCATION	**Portland, Oregon**	PAGE	**4 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/27/06**
		MUDLINE ELEVATION	**10.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								55.0 to 63.0 feet: SILT (ML), continued.
GS-08-S(63-65)[3]								**63.0 to 76.0 feet: SILTY SAND (SM)**; grayish-brown; 80 to 85 percent fine to medium sand (mostly fine); 15 to 20 percent low to medium plasticity fines; trace organics with white specks. @ 64.0 to 64.5 feet: silt lens.
		65						
	10 (63-73)							
GS-08-S(69-70)[3]								
		70						
GS-08-W(73-77)[1]								
		75						
	13 (73-88)							**76.0 to 84.5 feet: SILTY SAND (SM)**; grayish-brown; 50 to 80 percent sand; 20 to 50 percent medium to high plasticity fines; trace organics (root hairs). Sand-filled fissures. Layered sand and silt.
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-08**
LOCATION	**Portland, Oregon**	PAGE	**5 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/27/06**
		MUDLINE ELEVATION	**10.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								76.0 to 84.5 feet: SILTY SAND (SM), continued.
GS-08-S(82-84)[3]					X			
		85						**84.5 to 86.0 feet: SILT (ML)**; grayish-brown; medium to high plasticity fines; <5 percent fine sand; trace organics; (root hairs).
								@ 85.0 feet: sand lamination.
								86.0 to 87.0 feet: SILTY SAND (SM); grayish-brown; 50 to 80 percent sand; 20 to 50 percent medium to high plasticity fines; trace organics (root hairs). Sand-filled fissures. Layered sand and silt.
								87.0 to 89.0 feet: SILT (ML); grayish-brown; medium to high plasticity fines; <5 percent fine sand; trace organics (root hairs).
GS-08-S(90-92)[3]		90			X			**89.0 to 98.0 feet: SILTY SAND (SM)**; grayish-brown; 50 to 80 percent sand; 20 to 50 percent medium to high plasticity fines; trace organics (root hairs). Sand-filled fissures. Layered sand and silt.
	10 (88-98)							
GS-08-S(95-98)[2]		95		X				
GS-08-W(98-102)[1]			X					**98.0 to 118.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; wet.
		100						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-08**
LOCATION	**Portland, Oregon**	PAGE	**6 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/27/06**
		MUDLINE ELEVATION	**10.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-08-CW(100)[1]			X					**98.0 to 118.0 feet: SAND (SP)**, continued.
	8 (98-113)	105						
		110						
		115						
	10 (113-123)							**118.0 to 123.0 feet: SAND (SP)**; grayish-brown; 10 percent silt interbeds and nodules; medium to high plasticity.
		120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-08**
LOCATION	**Portland, Oregon**	PAGE	**7 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/27/06**
		MUDLINE ELEVATION	**10.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								118.0 to 123.0 feet: SAND (SP), continued.
GS-08-W(123-127)[1]	5 (123-128)	125	X					**123.0 to 148.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; trace fines.
		130						
	10 (128-138)	135						
		140						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-08**
LOCATION	**Portland, Oregon**	PAGE	**8 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/27/06**
		MUDLINE ELEVATION	**10.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	10 (138-148)	145						**123.0 to 148.0 feet: SAND (SP)**, continued. @ 141.0 to 145.0 feet: increase in fines to 10 to 15 percent. @ 142.0 to 142.5 feet: 6-inch silt lens. @ 144.0 feet: thin (1 mm) organic (wood chip) layer. @ 145.0 to 147.0 feet: color change to brown. @ 147.0 to 148.0 feet: increase in fines to 10 to 15 percent.
GS-08-W(148-152)[1]		150 155 160	X					Bottom of boring = 148.0 feet.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-07**
LOCATION	**Portland, Oregon**	PAGE	**6 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**193.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/20/06**
		MUDLINE ELEVATION	**3.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-07-CW(100)[1]			X	X				**98.0 to 148.0 feet: SAND (SP)**, continued.
	5 (98-103)							
		105						
	9 (103-113)							
		110						
								@ 113.0 to 123.0 feet: trace silt nodules up to 0.1-feet in diameter; low to medium plasticity fines. No odor.
		115						@ 115.0 feet: 3-inch x ½-inch wood chunk.
	11 (113-123)							
		120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-09**
LOCATION	**Portland, Oregon**	PAGE	**2 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**187.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/13/06**
		MUDLINE ELEVATION	**5.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-09-W(23-27)[1] GS-09-S(23-27)[2] GS-09-S(23-27)[3]	12 (23-33)	25 30	X	X	X			**12.5 to 31.0 feet: SILTY SAND (SM)**, continued.
	9.5 (33-43)	35 40						**31.0 to 47.5 feet: SANDY SILT (ML)**; grayish-brown; 60 percent medium plasticity fines; 40 percent fine sand; trace organics.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-09**
LOCATION	**Portland, Oregon**	PAGE	**3 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**187.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/13/06**
		MUDLINE ELEVATION	**5.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	5 (43-48)	45						**31.0 to 47.5 feet: SANDY SILT (ML)**, continued.
GS-09-W(48-52)[1] GS-09-S(48-52)[2]	11 (48-58)	50, 55, 60	X	X				**47.5 to 64.0 feet: SILTY SAND (SM)**; grayish-brown; 70 percent fine to medium (mostly fine) sand; 30 percent low to medium plasticity fines.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-09**
LOCATION	**Portland, Oregon**	PAGE	**4 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**187.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/13/06**
		MUDLINE ELEVATION	**5.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								47.5 to 64.0 feet: SILTY SAND (SM), continued.
	10 (58-68)							**64.0 to 65.0 feet: SANDY SILT (ML)**; grayish-brown; 85 to 90 percent medium to high plasticity fines; 10 to 15 percent fine sand; trace root hairs; firm; moist to wet. Hydrocarbon-like odor.
GS-09-S(65-66)[3]		65			X			**65.0 to 66.5 feet: SILTY SAND (SM)**; grayish brown; medium to high plasticity fines. Sand-filled fissures.
								66.5 to 70.5 feet: SAND WITH SILT (SM); 85 to 90 percent sand; 10 to 15 percent low to medium plasticity fines; firm; moist to wet. Hydrocarbon-like odor.
								@ 69.0 to 70.0 feet: fine gravel-sized pumice.
		70						
	6 (68-73)							**70.5 to 93.0 feet: SILTY SAND (SM)**; grayish brown; medium to high plasticity fines. Sand-filled fissures. Hydrocarbon-like odor.
GS-09-W(73-77)[1]			X					
		75						
	9.5 (73-83)							
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-09**
LOCATION	**Portland, Oregon**	PAGE	**5 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**187.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/13/06**
		MUDLINE ELEVATION	**5.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								70.5 to 93.0 feet: SILTY SAND (SM), continued.
		85						
	10 (83-93)							
		90						
								93.0 to 95.5 feet: SAND WITH SILT (SP-SM); grayish-brown; 90 to 95 percent fine to medium sand; 5 to 10 percent low plasticity fines.
		95						
	5 (93-98)							**95.5 to 98.0 feet: SILTY SAND (SM)**; grayish-brown; medium to high plasticity fines. Sand-filled fissures. Firming with depth. Hydrocarbon-like odor.
GS-09-S(97-98)[3]					X			
GS-09-W(98-102)[1] GS-09-S(98-102)[2]			X	X				@ 97.5 feet: approximately 2-inch in diameter very dense clay/silt nodule with trace organics (grass) noted inside when broken.
		100						**98.0 to 108.0 feet: SAND WITH SILT (SM)**; 90 to 95 percent fine to medium sand; 5 to 10 percent low

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-09**
LOCATION	**Portland, Oregon**	PAGE	**6 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**187.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/13/06**
		MUDLINE ELEVATION	**5.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-09-CW(100)[1]								plasticity fines. Faint hydrocarbon-like odor. **98.0 to 108.0 feet: SAND WITH SILT (SM)**, continued.
	9.5 (98-108)	105						@ 107.5 feet: silt nodules 1- to 2-inches in diameter, one nodule 2-inches thick x 3-inches in diameter. **108.0 to 133.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines. No odor.
		110						
	14.5 (108-123)	115						
		120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-09**
LOCATION	**Portland, Oregon**	PAGE	**7 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**187.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/13/06**
		MUDLINE ELEVATION	**5.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								108.0 to 133.0 feet: SAND (SP), continued.
GS-09-W(123-127)[1] GS-09-S(123-127)[2]	8.0 (123-133)	125 130	X	X				
								133.0 to 143.0 feet: SAND (SP); grayish-brown; 95 percent fine to medium sand; 5 percent fines. No odor.
	9.3 (133-143)	135 140						@ 140.0 feet: two silt lenses 1/2-centimeter wide each.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-09**
LOCATION	**Portland, Oregon**	PAGE	**8 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**187.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/13/06**
		MUDLINE ELEVATION	**5.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								133.0 to 143.0 feet: SAND (SP), continued.
								143.0 to 169.0 feet: SAND (SP); grayish-brown; fine to medium sand; trace fines. No odor.
		145						
	6 (143-153)							
GS-09-W(148-152)[1] GS-09-S(148-152)[2]			X	X				
		150						
		155						
	10 (153-163)							
								@ 158.0 to 169.0 feet: slight increase in fines to 5 percent.
		160						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-09**
LOCATION	**Portland, Oregon**	PAGE	**9 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**187.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/13/06**
		MUDLINE ELEVATION	**5.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								143.0 to 169.0 feet: SAND (SP), continued.
		165						@ 166.0 to 169.0 feet: wood chunks; trace fine to medium, subrounded to well rounded gravel; silt cobble.
	10 (163-173)							
		170						**169.0 to 180.0 feet: GRAVEL (GP)**; 80 to 90 percent fine to coarse subangular to well rounded gravel with cobbles; 5 to 10 percent sand; 5 to 10 percent fines. Mostly basalt gravel. Trace quartzite gravel. Increase in fines with depth; possible ground rock/gravel from drilling.
GS-09-W(173-177)[1] GS-09-S(173-177)[2]			X	X				
	6 (173-177)	175						
		180						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-09**
LOCATION	**Portland, Oregon**	PAGE	**10 of 10**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**187.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**10/13/06**
		MUDLINE ELEVATION	**5.1 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	10 (177-187)	185						**180.0 to 187.0 feet: BEDROCK BASALT** @ 181.0 to 183.0 feet: pulverized to powder; dry; orange, yellow and brown weathered surface. @ 186.0 feet: weathered basalt, weathered to clay-like matrix; dry.
								Bottom of boring = 187.0 feet.
		190						
		195						
		200						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-10**
LOCATION	**Portland, Oregon**	PAGE	**1 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**1/3/07**
		MUDLINE ELEVATION	**2.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	5 (0-5)							**0 to 3.0 feet: SAND (SP)**; grayish-brown; fine to coarse sand; <5 percent fine to coarse cobbles; trace fines; wet.
GS-10-W(4-6)[1] GS-10-S(4-6)[2]		5	X	X				**3.0 to 5.0 feet: SILT (ML)**; grayish-brown with brown and black mottles; trace root hairs; wet. Oily. Strong hydrocarbon-like odor.
								5.0 to 7.0 feet: SAND (SP); grayish-brown; fine to coarse sand; trace fines; wet. Oily. Hydrocarbon-like odor.
GS-10-W(9-11)[1] GS-10-S(9-11)[2] GS-10-S(9-11)[3]		10	X	X	X			**7.0 to 9.0 feet: SANDY SILT (ML)**; 70 to 80 percent medium plasticity fines; 20 to 30 percent fine to medium sand; trace wood fragments and root hairs. Hydrocarbon-like odor. @ 9.0 feet: 2-inch-thick tar lens. **9.0 to 11.0 feet: SILT (ML)**; grayish-brown; medium to high plasticity fines; trace fine organics; wet. Black, oily laminations. Hydrocarbon-like odor.
	17 (5-23)	15						**11.0 to 27.0 feet: SILT (ML)**; grayish-brown; 80 to 85 percent medium to high plasticity fines; 15 to 20 percent fine sand; trace fine organics (root hairs); wet. Hydrocarbon-like odor to 23 feet. @ 12.0 feet: sheen stops.
		20						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-10**
LOCATION	**Portland, Oregon**	PAGE	**2 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**1/3/07**
		MUDLINE ELEVATION	**2.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-10-S(20-23)[2] GS-10-S(20-23)[3] GS-10-W(23-27)[1]		25						**11.0 to 27.0 feet: SILT (ML)**, continued.
GS-10-S(29-31)[3]	20 (23-48)	30						**27.0 to 32.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; trace low plasticity fines; wet. No odor.
								32.0 to 33.0 feet: SILT (ML); grayish brown; medium plasticity fines.
		35						**33.0 to 44.0 feet: SILTY SAND (SM)**; grayish-brown; fine sand; 20 to 30 percent medium to high plasticity fines; trace organics (root hairs and fine wood chips); wet.
GS-10-S(39-41)[3]		40						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-10**
LOCATION	**Portland, Oregon**	PAGE	**3 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**1/3/07**
		MUDLINE ELEVATION	**2.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								33.0 to 44.0 feet: SILTY SAND (SM), continued.
GS-10-S(45-48)[2]		45						**44.0 to 56.0 feet: SAND (SP)**; grayish-brown; fine sand; trace fines; wet.
GS-10-W(48-52)[1] GS-10-S(48-50)[3]		50						
	21 (48-73)	55						
								56.0 to 60.0 feet: SILT (ML); grayish-brown; 90 to 95 percent medium to high plasticity fines; 5 to 10 percent fine sand; trace fine organics; wet.
GS-10-S(59-61)[3]		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-10**
LOCATION	**Portland, Oregon**	PAGE	**4 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**1/3/07**
		MUDLINE ELEVATION	**2.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								60.0 to 63.0 feet: SILTY SAND (SM); grayish-brown; 80 to 90 percent fine to medium sand; 10 to 20 percent medium plasticity fines; wet.
								63.0 to 66.0 feet: SILT (ML); grayish-brown; medium plasticity fines; trace to <10 percent fine to medium sand; wet.
		65						
								66.0 to 70.0 feet: SAND (SP); grayish-brown; fine sand; trace fines; wet.
GS-10-S(69-71)[3]								
		70						**70.0 to 71.0 feet: SILT (ML)**; grayish-brown; medium to high plasticity fines; wet.
								71.0 to 76.0 feet: SAND (SP); grayish-brown; fine sand; trace fines; firm; wet.
GS-10-W(73-77)[1]								
		75						
								76.0 to 76.5 feet: SILT (ML); grayish-brown; medium to high plasticity fines; trace fine sand; wet.
								76.5 to 82.0 feet: SILT WITH SAND (ML); grayish-brown; medium to high plasticity fines with fine to medium sand lenses in fissures; 20 to 30 percent fine to medium sand; wet.
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-10**
LOCATION	**Portland, Oregon**	PAGE	**5 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**1/3/07**
		MUDLINE ELEVATION	**2.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-10-S(80-83)[3]								**76.5 to 82.0 feet: SILT WITH SAND (ML)**, continued.
								82.0 to 85.0 feet: SILT (ML); grayish-brown; 85 to 90 percent medium to high plasticity fines; 10 to 15 percent fine to medium sand laminations and fissures; wet.
		85						**85.0 to 87.0 feet: SILT (ML)**; grayish-brown; medium to high plasticity fines; 10 to 15 percent fine to medium sand lamination and fissures; 10 to 15 percent organics (root hairs, reeds, leaves, wood fibers); wet.
	23 (73-98)							**87.0 to 90.0 feet: SILT WITH SAND (ML)**; grayish-brown; medium to high plasticity fines with fine to medium sand lenses in fissures; 20 to 30 percent fine to medium sand; trace organics; wet.
GS-10-S(90-93)[3]		90						**90.0 to 98.0 feet: SILT (ML)**; grayish-brown; medium to high plasticity fines. @ 90.0, 91.0 and 92.0 feet: 1- to 2-inch sand laminations. @ 93.0 to 94.0 feet, 95.0 to 96.0 feet and 96.0 to 98.0 feet: sand fissures.
GS-10-S(95-98)[2]		95						
GS-10-W(98-102)[1]								**98.0 to 119.0 feet: SAND (SP)**; brownish-gray; fine to medium sand; trace fines; wet.
		100						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-10**
LOCATION	**Portland, Oregon**	PAGE	**6 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**1/3/07**
		MUDLINE ELEVATION	**2.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
			X					**98.0 to 119.0 feet: SAND (SP)**, continued.
								@ 104.0 feet: 0.1-foot silt lens.
		105						
	16 (98-123)							
		110						
		115						
								119.0 to 120.0 feet: SILT (ML); grayish-brown; 80 to 85 percent medium to high plasticity fines; 15 to
		120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-10**
LOCATION	**Portland, Oregon**	PAGE	**7 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**1/3/07**
		MUDLINE ELEVATION	**2.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								20 percent sand laminations and fissures.
								@ 120.0 feet: 0.2-foot silt lens.
								120.0 to 122.0 feet: SAND (SP); grayish-brown; fine to medium sand; trace fines; wet.
								122.0 to 123.0 feet: SILT (ML); grayish-brown; 80 to 85 percent medium to high plasticity fines; 15 to 20 percent sand laminations and fissures.
GS-10-W(123-127)[1]								**123.0 to 129.0 feet: SILT WITH SAND (ML)**; grayish-brown; 60 to 70 percent medium to high plasticity fines; 30 to 40 percent fine to medium sand; trace organics (wood fibers); wet. Silt nodules and lenses with sand fissures.
		125						
								129.0 to 148.0 feet: SAND (SP); brownish-gray; fine to medium sand; trace fines; wet.
		130						
	21 (123-148)							@ 132.0 feet: 0.1-foot-thick silt nodule/lens.
		135						
		140						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-10**
LOCATION	**Portland, Oregon**	PAGE	**8 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**1/3/07**
		MUDLINE ELEVATION	**2.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								129.0 to 148.0 feet: SAND (SP), continued.
								@ 141.0 feet: 0.1-foot-thick silt nodule/lens.
		145						
								@ 146.0 feet: sticks/wood debris 0.1-foot thick.
GS-10-W(148-152)[1]								Bottom of boring = 148.0 feet. Water sample from 148.0 to 152.0 feet.
		150						
		155						
		160						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-11**
LOCATION	**Portland, Oregon**	PAGE	**1 of 9**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**175.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**1/9/07**
		MUDLINE ELEVATION	**4.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-11-W(4-6)[1] GS-11-S(4-6)[2]		5	X	X				**0 to 8.0 feet: SILTY SAND (SM)**; grayish-brown; 80 to 85 percent fine to coarse sand; 15 to 20 percent low to medium plasticity fines; <5 percent fine to coarse, angular to subrounded gravel and cobbles. Sheen.
GS-11-W(9-11)[1] GS-11-S(9-11)[2]	15 (0-23)	10 15 20	X	X				**8.0 to 23.0 feet: SANDY SILT (ML)**; grayish-brown; 60 to 70 percent medium plasticity fines; 30 to 40 percent fine to medium sand (mostly fine); trace fine subrounded gravel; trace organics (leaves, root hairs, sticks). No sheen. No odor. @ 17.0 to 18.0 feet: sand lens; fine to medium sand; trace coarse angular gravel. @ 19.0 feet: 1-inch-diameter stick fragments 3-inches long.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-11**
LOCATION	**Portland, Oregon**	PAGE	**2 of 9**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**175.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**1/9/07**
		MUDLINE ELEVATION	**4.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-11-S(20-23)[2]				X				**8 to 23.0 feet: SANDY SILT (ML)**, continued.
GS-11-W(23-27)[1]			X					**23.0 to 24.0 feet: SAND (SP)**; grayish-brown; 90 to 95 percent fine sand; 5 to 10 percent nonplastic fines; wet.
	7 (23-30)	25						**24.0 to 30.0 feet: SANDY SILT (ML)**; grayish-brown; 60 to 70 percent medium to high plasticity fines; 30 to 40 percent fine to medium sand; trace organics (leaves, roots, wood fibers); wet. @ 25.0 feet: organic lens (leaves, reeds and wood fibers); wet. @ 25.5 feet: sand lens 0.2-foot thick, fine to medium sand; wet. @ 28.0 to 29.0 feet: sand lens, fine to medium sand; wet.
		30						**30.0 to 51.0 feet: SAND (SP)**; grayish-brown; fine sand; <10 percent nonplastic to low plasticity fines; trace organics; loose; wet; soupy.
	17 (30-48)	35						@ 37.5 to 38.0 feet: silt lens; medium plasticity; soft.
		40						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-11**
LOCATION	**Portland, Oregon**	PAGE	**3 of 9**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**175.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**1/9/07**
		MUDLINE ELEVATION	**4.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								30.0 to 51.0 feet: SAND (SP), continued. @ 40.0 to 44.0 feet: increase in fines to 20 to 30 percent.
								@ 44.0 feet: trace medium gravel.
GS-11-S(45-48)[2]		45		X				
GS-11-W(48-52)[1] GS-61-W(48-52)[1]			X					
		50						
								51.0 to 52.0 feet: SILTY SAND (SM); grayish-brown; 60 to 70 percent fine sand; 30 to 40 percent low to medium plasticity fines; wet.
	25 (48-73)							**52.0 to 54.0 feet: SILT (ML)**; medium to high plasticity fines; trace fine sand; <5 percent organics.
		55						**54.0 to 56.0 feet: SANDY SILT (ML)**; grayish brown; 60 to 70 percent medium plasticity fines with sand lenses and fissures; 30 to 40 precent sand; <5 percent organics (root hairs, leaves, reeds, wood fibers).
								56.0 to 58.0 feet: SAND (SP); grayish-brown; 80 to 90 percent fine sand; 10 to 20 percent medium plasticity fines; trace organics; wet.
								58.0 to 59.0 feet: SILT (ML); grayish-brown; medium to high plasticity fines; trace organics; wet.
		60						**59.0 to 61.0 feet: SAND (SP)**; grayish-brown; fine sand; trace fines; few silt lenses.

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-11**
LOCATION	**Portland, Oregon**	PAGE	**4 of 9**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**175.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**1/9/07**
		MUDLINE ELEVATION	**4.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								59.0 to 61.0 feet: SAND (SP), continued.
								61.0 to 67.0 feet: SANDY SILT (ML); grayish-brown; 60 to 70 percent medium to high plasticity fines; 30 to to 40 percent fine sand; trace organics. Sand laminations and fissures.
		65						
								67.0 to 73.0 feet: SILT (ML); grayish-brown; medium to high plasticity fines; trace organics. Sand laminations and fissures.
		70						
GS-11-W(73-77)[1]								@ 73.0 feet: fine to medium-sized gravel, silt nodules, hard.
								73.0 to 89.0 feet: SAND (SP); grayish-brown; fine to medium sand; trace to 5 percent fines; trace fine to medium rounded gravel; loose to medium density; wet. Silt nodules (most firm, some dry and hard) up to 3 inches; silt lenses up to 4 inches; silt fissures.
		75						
	19.5 (73-98)							
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-11**
LOCATION	**Portland, Oregon**	PAGE	**5 of 9**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**175.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**1/9/07**
		MUDLINE ELEVATION	**4.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		85						**73.0 to 89.0 feet: SAND (SP)**, continued.
		90						**89.0 to 98.0 feet: INTERBEDDED SAND (SP)**; grayish-brown; fine to medium sand; and **SILT (SM)**; low to medium plasticity; trace to 10 percent fine sand. Interbedded 60:40 - SAND:SILT. Beds ½-inch to 6-inches.
GS-11-S(95-98)[2]		95		X				
GS-11-W(98-102)[1]		100	X					**98.0 to 123.0 feet: SAND WITH SILT (SP)**; grayish-brown; 85 to 95 percent fine to medium sand; 5 to 15 percent fines; trace coarse sand; medium density; wet. Decrease in fines with depth. Silt nodules and

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-11**
LOCATION	**Portland, Oregon**	PAGE	**6 of 9**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**175.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**1/9/07**
		MUDLINE ELEVATION	**4.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	21 (98-123)	105						lenses (mostly firm) up to 3-inches. @ 98.0 to 102.5 feet: abundant silt nodules. @ 102.5 to 123.0 feet: trace silt nodules. @ 108.5 to 110.5 feet: trace twigs and wood chunks (<1 inch).
		110						
		115						
		120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-11**
LOCATION	**Portland, Oregon**	PAGE	**7 of 9**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**175.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**1/9/07**
		MUDLINE ELEVATION	**4.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-11-S(120-123)[2]				X				**98.0 to 123.0 feet: SAND WITH SILT (SP)**, continued.
GS-11-W(123-127)[1]			X					**123.0 to 133.5 feet: SAND (SP)**; grayish-brown; 95 percent fine to medium sand; 5 percent fines; medium density; wet. Trace coarse sand. Silt nodules and lenses ¼ to 3 inches.
		125						
	20.5 (123-148)							
		130						
								133.5 to 135.0 feet: SILT (ML); grayish-brown; medium plasticity fines; trace fine sand; firm; moist to damp. Sand lenses up to 1 inch.
		135						**135.0 to 140.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; 5 percent fines; medium density; wet. Trace coarse sand. Silt lenses and nodules up to 4 inches.
		140						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-11**
LOCATION	**Portland, Oregon**	PAGE	**8 of 9**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**175.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**1/9/07**
		MUDLINE ELEVATION	**4.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								140.0 to 144.0 feet: SILT (ML); grayish-brown; medium to high plasticity; firm to stiff; damp to moist. Sand fissures and lenses up to 1.5 inch.
GS-11-S(145-148)[2]		145		X				**144.0 to 148.0 feet: SAND (SP)**; grayish-brown; 95 percent fine to medium sand; 5 percent fines; trace coarse sand; medium density; wet. Silt lenses and nodules up to 3 inches.
GS-11-W(148-152)[1]			X					**148.0 to 150.0 feet: SAND (SP)**; grayish-brown; 95 percent fine to coarse sand; 5 percent fines; trace fine to medium, subangular to subrounded gravel; loose to medium density; wet.
	21 (148-173)	150						**150.0 to 173.0 feet: INTERBEDDED SAND (SP)**; grayish-brown; fine to coarse sand; loose to medium density; wet; **AND SILT (ML)**; grayish-brown; medium plasticity fines; firm to stiff; wet. Silt nodules. Trace fine to medium, subangular to subrounded gravel (some quartzite gravel).
		155						@ 154.5 feet: one piece of medium, sub-rounded quartzite gravel.
		160						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-11**
LOCATION	**Portland, Oregon**	PAGE	**9 of 9**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**175.0'**
LOGGED BY	**Kelly Titkemeier/John Renda**	DATE COMPLETED	**1/9/07**
		MUDLINE ELEVATION	**4.5 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								150.0 to 173.0 feet: INTERBEDDED SAND (SP) AND SILT (ML), continued. @ 160.0 to 163.0 feet: SAND (SP) with frequent silt nodules. @ 161.5 feet: one piece of medium, sub-rounded quartzite gravel. @ 163.0 to 165.0 feet: SAND (SP) with silt nodules - small and infrequent.
		165						
GS-11-S(170-173)[2]		170		X				
GS-11-W(173-177)[1]	4 (173-175)		X					@ 173.0 feet: one cobble of basalt (approximately 4 inches in diameter). **173.0 to 174.0 feet: SILTY GRAVEL WITH SAND (GP)**; brownish-gray; 60 percent fine to coarse, angular to rounded gravel; 25 to 30 percent medium plasticity fines; 10 to 15 percent fine to coarse sand; firm; damp to moist. Several cobbles up to 4 inches.
		175						**174.0 to 175.0 feet: BASALT** Bottom of boring = 175.0 feet.
		180						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-12**
LOCATION	**Portland, Oregon**	PAGE	**1 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/11/07**
		MUDLINE ELEVATION	**5.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	6 (0-7)							@ 0 feet: fine to coarse, subangular to subrounded gravel with sand. **0 to 3.0 feet: SILT (ML)**; grayish-brown; low plasticity fines; soft; wet.
GS-12-W(4-6)[1] GS-12-S(4-6)[2]		5	X	X				**3.0 to 14.5 feet: SANDY SILT (ML)**; grayish-brown; 70 percent medium plasticity fines; 30 percent fine to medium sand; soft to firm; wet. Sand lenses. Silt lenses.
GS-12-W(9-11)[1] GS-12-S(9-11)[2] GS-62-S(9-11)[2]	10 (7-23)	10	X	X				
		15						**14.5 to 19.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; loose to medium density; wet.
		20						**19.0 to 22.0 feet: SILT (ML)**; grayish-brown; 90 to 95 percent medium plasticity fines; 5 to 10 percent very

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-12**
LOCATION	**Portland, Oregon**	PAGE	**2 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/11/07**
		MUDLINE ELEVATION	**5.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
GS-12-S(20-23)[1]				X				fine to fine sand; soft to firm; wet. Sand lenses up to 4-inches thick.
								22.0 to 23.0 feet: SAND (SP); grayish-brown; fine to medium sand; trace fines and coarse sand; loose to medium density; wet.
GS-12-W(23-27)[1] GS-62-W(23-27)[1]			X					**23.0 to 41.0 feet: INTERBEDDED SAND (SP)**; grayish-brown; fine to medium sand; loose to medium density; wet, **SANDY SILT (ML)**; grayish-brown; 60 percent medium plasticity fines; 40 percent fine to medium sand; soft to firm; wet, **AND SILT (ML)**; grayish-brown; medium plasticity fines; soft to firm; wet. Trace fine twigs.
	0 (23-36)	25						
		30						
		35						
		40						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-12**
LOCATION	**Portland, Oregon**	PAGE	**3 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/11/07**
		MUDLINE ELEVATION	**5.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								23.0 to 41.0 feet: INTERBEDDED SAND (SP), SANDY SILT (ML) AND SILT (ML), continued.
	12 (36-48)	45						**41.0 to 48.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; trace to 5 percent fines (decreasing fines with depth); medium density; wet.
GS-12-S(45-48)[2]								
GS-12-W(48-52)[1]		50						**48.0 to 73.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; loose to medium density; wet. Frequent silt lenses 1 to 8 inches; grayish-brown; medium plasticity fines; firm to stiff; damp.
	22.5 (48-73)	55						
		60						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-12**
LOCATION	**Portland, Oregon**	PAGE	**4 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/11/07**
		MUDLINE ELEVATION	**5.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		65						**48.0 to 73.0 feet: SAND (SP)**, continued.
		70						
GS-12-W(73-77)[1] GS-62-W(73-77)[1]	17 (73-98)	75	X					**73.0 to 90.5 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; medium density; wet. Silt nodules. Silt lenses 1/2- to 6-inches thick.
		80						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-12**
LOCATION	**Portland, Oregon**	PAGE	**5 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/11/07**
		MUDLINE ELEVATION	**5.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								73.0 to 90.5 feet: SAND (SP), continued.
		85						
		90						
								90.5 to 94.5 feet: SANDY SILT (ML); grayish-brown; 60 percent medium plasticity fines; 40 percent fine to medium sand; firm to stiff; wet.
								@ 93.5 to 94.5 feet: two sand lenses 1- to 2-inches thick.
GS-12-S(95-98)[2] GS-62-S(95-98)[2]		95		X				**94.5 to 98.0 feet: SAND (SP)**; grayish-brown; fine to medium sand; <5 percent fines; medium density; wet.
GS-12-W(98-102)[1]			X					**98.0 to 123.0 feet: INTERBEDDED SAND (SP)**; grayish-brown; fine to medium sand; medium density to dense; wet; **AND SILT (ML)**; grayish-brown; medium plasticity fines; firm to stiff; moist. Beds ½-inch to
		100						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-12**
LOCATION	**Portland, Oregon**	PAGE	**6 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/11/07**
		MUDLINE ELEVATION	**5.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								1.5-feet thick. Interbedded 70:30 - SAND:SILT.
		105						
	23.5 (98-123)							
		110						
		115						
		120						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-12**
LOCATION	**Portland, Oregon**	PAGE	**7 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/11/07**
		MUDLINE ELEVATION	**5.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								98.0 to 123.0 feet: INTERBEDDED SAND (SP), continued.
GS-12-W(123-127)[1]								**123.0 to 132.5 feet: SILT (ML)**; grayish-brown; low to medium plasticity fines; stiff; damp to moist. Sand lenses up to 3-inches thick.
		125						
	24 (123-148)	130						@ 130.0 to 131.0 feet: trace organics (evergreen-like needles or roots?).
								132.5 to 138.5 feet: SAND (SP); grayish-brown; fine to medium sand; trace fines; medium density to dense; wet. Silt lenses up to 6 inches.
		135						
								138.5 to 141.5 feet: INTERBEDDED SAND (SP) AND SILT (ML): Interbedded 50:50 - SAND:SILT. Beds 1- to 5-inches thick.
		140						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**GS-12**
LOCATION	**Portland, Oregon**	PAGE	**8 of 8**
DRILLED BY	**Prosonic**	HOLE DIAMETER	**4-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**148.0'**
LOGGED BY	**Kelly Titkemeier**	DATE COMPLETED	**1/11/07**
		MUDLINE ELEVATION	**5.2 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	SOIL CHEMISTRY SAMPLE	GEOTECHNICAL SAMPLE	CORE INTERVAL	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
								138.5 to 141.5 feet: INTERBEDDED SAND (SP) AND SILT (ML), continued.
								141.5 to 142.5 feet: SILT (ML); grayish-brown; low to medium plasticity fines; stiff; damp to moist.
								142.5 to 145.5 feet: SAND (SP); grayish-brown; 95 percent fine to medium sand; 5 percent fines; medium density to dense; wet. Silt lenses up to 2 inches.
		145						
								145.5 to 147.0 feet: SILT (ML); grayish-brown; low to medium plasticity; stiff; damp to moist.
								147.0 to 148.0 feet: SAND (SP); grayish-brown; 95 percent fine to medium sand; 5 percent fines; trace coarse sand; medium dense to dense; wet.
GS-12-W(148-152)[1]								Bottom of boring = 148.0 feet.
		150						
		155						
		160						

REMARKS

*City of Portland Datum. [1]Water Sample. [2]Soil Chemistry Sample. [3]Geotechnical Sample.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GSM-07**
LOCATION	**Portland, Oregon**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	GROUND SURFACE ELEVATION	**15.33' NAVD88**
DRILL METHOD	**Direct Push - GeoProbe 7822**	TOTAL DEPTH	**20.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**9/27/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**8.25-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
1 1 4	SS	GSM-07SO-0-5-100927	0.0	0.0	No	0.9/1.5		**0 to 8.3 feet: GRAVELLY SILT (ML)**, dark brown, moist, low plasticity silt, trace plant debris, fine to coarse angular gravel, soft. (FILL)	30	0	70
	CB		0.1	0.0	No	1.9/3.5					
	ST	GSM-07SO-5-7.5-100927	NA	NA	NA	1.3/2.5	5	@ 5.1 feet: large piece of metal debris. @ 5.7 to 6.0 feet: silty sand layer, trace gravel. @ 6.0 to 6.4 feet: sandy silt layer, moderate wood debris.			
2 1 0	SS	GSM-07SO-7.5-10-100927	0.2	0	1	1.5/1.5		**8.3 to 15.0 feet: SANDY SILT (ML)**, with intermittent sand layers, dark gray to black, wet, low plasticity silt, fine sand, very soft, slight hydrocarbon-like odor. (ALLUVIUM)	0	40	60
	CB					0/1					
1 0 1	SS	GSM-07SO-10-15-100927	0.4	0	1	1.5/1.5	10	@ 8.3 to 8.5 feet: spotty sheen; rubbery texture. @ 8.7 to 8.9 feet: sand layer.			
	CB		NA	NA	NA	0/3.5		@ 11.5 to 15.0 feet: no recovery.			
1 1 1	SS	GSM-07SO-15-20-100927	2.4	1	2	1.5/1.5	15	**15.0 to 17.6 feet: SAND (SP)**, black, loose, wet, fine grained, poorly graded, strong hydrocarbon-like odor, occasional weathered tar blebs. (ALLUVIUM) @ 16.3 to 16.5 feet: spotty sheen.	0	100	0
	CB		23.3	1	2	3.5/3.5		**17.6 to 20.0 feet: SILT (MH)**, black, very soft, wet, highly plastic, strong hydrocarbon-like odor, sheen, blebs of weathered tar throughout, rubbery texture. @ 19.0 to 19.2 feet: sandy layer, highly saturated with oil. @ 19.0 to 20.0 feet: oily.	0	0	100
							20	Total depth = 20.0 feet.			

REMARKS

[1] Yellow smears on sample bag. [2] Yellow smears on sample bag; dull orange fluorescence in sample. [3] No well installed in boring. Boring abandoned following reaching total depth.
[4] Substantial product from 19.0 to 20.0 feet. The presence of substantial product was identified per the specific definition in Section 3.6.2.1 of the Statement of Work - Gasco Sediments Site, Portland Harbor Superfund Site, Portland, Oregon, except that modifying factor 3 was not applied.
CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-inch foot Shelby tube.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GSM-08**
LOCATION	**Portland, Oregon**	PAGE	**1 of 2**
DRILLED BY	**Stratus**	GROUND SURFACE ELEVATION	**15.33' NAVD88**
DRILL METHOD	**Direct Push - GeoProbe 7822**	TOTAL DEPTH	**15.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**9/28/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**8.25-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
2 8 4	SS	GSM-08SO-0-5-100928	0.0	0	No	0.9/1.5		**0 to 8.3 feet: SILTY GRAVEL (GM)**, dark brown, coarse to cobble size, angular gravel, medium plasticity silt, moist, medium dense, well graded. (FILL)	55	0	45
	CB		0.0	0	No	2.2/3.5					
2 2 2	SS[1]	GSM-08SO-5-7.5-100928	0.0	0	No	0.7/1.5	5				
	CB					1/1					
	ST	GSM-08SO-7.5-10-100928	NA	NA	NA	NA		@ 7.1 feet: color change to gray. @ 7.5 feet: strong hydrocarbon-like odor.			
								8.3 to 8.9 feet: SANDY SILT (ML), black, damp, low plasticity, strong hydrocarbon-like odor, sheen visible on sample, oil present in sand layers. (ALLUVIUM)	0	30	70
							5		0	85	15
1 1 2	SS	GSM-08SO-10-15-100928	5.9	0	2	1.5/1.5	10	**8.9 to 10.0 feet: SILTY SAND (SM)**, black, wet, strong hydrocarbon-like odor, sheen visible on sample, saturated with oil. (ALLUVIUM)	0	100	0
	CB					3.5/3.5			0	5	95
			0.8	0	3			**10.0 to 10.7 feet: SAND (SP)**, black, wet, loose, poorly graded, fine to medium grained, strong hydrocarbon-like odor, heavy sheen, saturated with oil. (ALLUVIUM) @ 10.0 feet: slight hydrocarbon-like odor.	0	95	5
									0	10	90
								10.7 to 12.0 feet: SILT (ML), dark grayish brown, moist, low plasticity, soft, trace fine sand, strong hydrocarbon-like odor. (ALLUVIUM)	0	95	5
							15	**12.0 to 12.7 feet: SAND (SP)**, dark grayish brown, loose, wet, fine to medium grained, poorly graded, trace silt, sheen present, strong hydrocarbon-like odor. (ALLUVIUM)			
								12.7 to 13.9 feet: SILT WITH SAND (ML), dark grayish brown, low plasticity, soft, wet, fine sand, moderate hydrocarbon-like odor. (ALLUVIUM)			
							20				

REMARKS

[1] Tried to push a shelby tube here but had refusal, large rock stuck in opening. [2] Yellow smears on sample bag; dull orange fluorescence in sample. [3] Yellow smears on sample bag. [4] No well installed in boring. Boring abandoned following reaching total depth. [5] Substantial product from 8.3 to 10.7 feet. The presence of substantial product was identified per the specific definition in Section 3.6.2.1 of the Statement of Work - Gasco Sediments Site, Portland Harbor Superfund Site, Portland, Oregon, except that modifying factor 3 was not applied.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GSM-08**
LOCATION	**Portland, Oregon**	PAGE	**2 of 2**
DRILLED BY	**Stratus**	GROUND SURFACE ELEVATION	**15.33' NAVD88**
DRILL METHOD	**Direct Push - GeoProbe 7822**	TOTAL DEPTH	**15.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**9/28/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**8.25-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
									13.9 to 15.0 feet: SAND (SP), dark grayish brown, loose, wet, fine to medium grained, poorly graded, trace silt, moderate hydrocarbon-like odor. (ALLUVIUM)			
									Total depth = 15.0 feet.			
							25					
							30					
							35					
							40					

REMARKS

[1] Tried to push a shelby tube here but had refusal, large rock stuck in opening. [2] Yellow smears on sample bag; dull orange fluorescence in sample. [3] Yellow smears on sample bag. [4] No well installed in boring. Boring abandoned following reaching total depth. [5] Substantial product from 8.3 to 10.7 feet. The presence of substantial product was identified per the specific definition in Section 3.6.2.1 of the Statement of Work - Gasco Sediments Site, Portland Harbor Superfund Site, Portland, Oregon, except that modifying factor 3 was not applied.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GSM-14**
LOCATION	**Portland, Oregon**	PAGE	**1 of 1**
DRILLED BY	**Stratus**	GROUND SURFACE ELEVATION	**10.91' NAVD88**
DRILL METHOD	**Direct Push - GeoProbe 7822**	TOTAL DEPTH	**17.5 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/15/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**8.25-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
1 7 8	SS	GSM-14SO-0-5-101015	0.0	0	No	0.5/1.5		**0 to 1.4 feet: SILTY SANDY GRAVEL (GM)**, dark brown, loose, wet, fine to cobble size, angular gravel, fine to coarse sand. (FILL)	60	20	20
	CB		0.0	0	No	3.0/3.5		**1.4 to 2.6 feet: ROCK - RIP-RAP**. (FILL)	--	--	--
								2.6 to 6.7 feet: SAND (SW), dark brown, wet, loose, medium to coarse grained, well graded, trace silt. (FILL)	0	95-100	0-5
3 6 3	SS	GSM-14SO-5-10-101015	0.0	0	No	1.4/1.5	5	@ 5.0 feet: color change to dark brown and dark gray mixed. @ 5.0 to 6.7 feet: trace fine gravel.			
	CB		0.0	0	No	3.3/3.5		**6.7 to 13.8 feet: SILT WITH SAND (MH)**, dark grayish brown, wet, firm, highly plastic, fine sand. (ALLUVIUM) @ 7.3 to 7.5 feet: medium sand layer. @ 9.4 to 9.5 feet: medium sand layer.	0	10	90
	ST	GSM-14SO-10-12.5-101015	NA	NA	NA	2.5/2.5	10	@ 10.6 to 11.8 feet: sand with silt layer.	0	85	15
1 1 1	SS	GSM-14SO-12.5-17.5-101015	0.0	0	No	1.5/1.5					
	CB		0.0	0	No	3.5/3.5	15	@ 14.1 to 14.3 feet: highly plastic silt layer. @ 14.9 to 15.4 feet: highly plastic silt layer. @ 15.8 to 16.2 feet: highly plastic silt layer.	0	70	30
								17.0 to 17.5 feet: SILT (MH), dark grayish brown, firm, wet, highly plastic.	0	0	100
							20	Total depth = 17.5 feet.			

REMARKS

[1] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-01**
LOCATION	**Portland, Oregon**	PAGE	**1 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**31.81' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/1/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
2 5 6	SS	GST-01SO-0-5-101001	0.0	0	No	0.6/1.5		**0 to 5.3 feet: GRAVELLY SILT (ML)**, dark brown, moist, low plasticity, stiff, fine to cobble size, rounded to angular gravel. (FILL)	30	0	70
	CB		0.2	0	No	3.5/5		@ 3.5 feet: dry, hard, very dense and compacted silt with cobble size gravel.			
6 5 4	SS	GST-01SO-5-10-101001	0.1	0	No	0.3/1.5	5	**5.3 to 5.9 feet: SANDY GRAVEL (GW)**, black, loose, dry, sooty with lampblack, fine to coarse gravel, coarse sand, well graded. (FILL)	80	20	0
	CB		0.1	0	No	3/3.5		**5.9 to 6.7 feet: SAND (SP)**, yellowish brown, loose, dry, fine to medium grained, poorly graded. (FILL)	0	100	0
								6.7 to 10.9 feet: GRAVELLY SANDY SILT (ML), yellowish brown with bands of blue-green, low plasticity silt, fine sand, angular coarse gravel. (FILL) @ 6.7 to 7.0 feet: thin bluish laminations and banding.	20	20	60
7 8 9	SS	GST-01SO-10-15-101001	0.1	2	No	1.5/1.5	10	**10.9 to 15.1 feet: SAND WITH SILT (SP-SM)**, light brown with gray and rust brown patches, slightly cohesive, slightly moist, medium dense, fine grained, poorly graded. (FILL)	0	90	10
	CB		0.0	5	No	3.5/3.5		@ 13.6 to 13.9 feet: dark gray, moist, fine sand layer.			
12 20 22	SS[1]	GST-01SO-15-20-101004	0.3	0	No	0.8/1.5	15	**15.1 to 16.3 feet: SAND (SP)**, black, dense, fine grained, poorly graded, hydrogen sulfide-like odor, moist. (FILL)	0	100	0
	CB					3.5/3.5		@ 16.0 feet: mottled black and dark gray.	0	20	80
			0.1	6	No			**16.3 to 17.0 feet: SANDY SILT (SM)**, dark gray, firm, low plasticity, trace rootlets, slight reduced hydrogen sulfide-like odor, fine sand, moist. (ALLUVIUM)	0	90	10
							20	**17.0 to 18.5 feet: SAND SITH SILT (SP-SM)**, black, wet, loose, fine grained, reduced hydrogen sulfide-like odor. (ALLUVIUM)	0	10	90

REMARKS

[1] Tried to push shelby tube at 15.0 feet but had refusal. [2] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-01**
LOCATION	**Portland, Oregon**	PAGE	**2 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**31.81' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/1/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
	ST	GST-01SO-20-22.5-101004	NA	NA	NA	0.8/2.5		**18.5 to 26.7 feet: SILT WITH SAND (MH)**, dark gray with rust colored mottling, soft, moist, moderately plastic, fine sand. (ALLUVIUM)	0	10	90
2 2 2	SS	GST-01SO-22.5-25-101004	0.1	1	No	1.5/1.5		@ 23.4 to 23.5 feet: sand layer.			
	CB					1.0/1.0					
1 2 3	SS	GST-01SO-25-30-101004	0.2	0	No	1.5/1.5	25	@ 26.1 to 26.4 feet: sand layer.			
	CB		0.1	0	No	3.5/3.5		**26.7 to 29.5 feet: SILTY SAND (SM)**, gray with rust colored mottling, loose, wet, fine to medium sand. (ALLUVIUM)	0	70	30
							30	**29.5 to 30.0 feet: SILT WITH SAND (ML)**, dark grayish brown, very soft, wet, low plasticity, fine sand. (ALLUVIUM)	0	10	90
								Total depth = 30.0 feet.			
							35				
							40				

REMARKS

[1] Tried to push shelby tube at 15.0 feet but had refusal. [2] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-02**
LOCATION	**Portland, Oregon**	PAGE	**1 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**32.64' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/4/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
1 3 8	SS	GST-02SO-0-5-101004	2.5	1	No	1.5/1.5		**0 to 25.2 feet: GRAVELLY SILT (ML)**, dark brown, dry, stiff, coarse to cobble size gravel, low plasticity silt, subrounded to rounded gravel, trace pieces of brick and concrete rubble. (FILL)	40	0	60
	CB		0.1	0	No	3.5/3.5		@ 3.5 feet: very hard and compacted.			
4 22 25	SS	GST-02SO-5-10-101004	1.3	1	No	1.5/1.5	5				
	CB		3.8	2	No	3.5/3.5		@ 6.3 feet: color change to black, strong naphthalene-like odor, trace metal debris.			
17 12 7	SS	GST-02SO-10-12.5-101004	1.0	1	No	0.5/1.5	10				
	CB					1/1					
	CB	NA[1]	NA	NA	NA	0/2.5					
7 6 5	SS	GST-02SO-15-20-101004	1.4	1	No	1.0/1.5	15	@ 15.5 feet: yellow/brown sand mixed with gravelly silt.			
	CB		0.9	1	No	3.5/3.5		@ 17.0 to 21.1 feet: 100 percent lampblack, dry, brittle, friable.			
							20				

REMARKS

[1] No recovery from 12.5 to 15.0 feet. Tried to push shelby tube at 12.5 feet - refused. Went in with core barrel, got no recovery. [2] Could not collect a shelby tube sample - no appropriate cohesive material was encountered. [3] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-02**
LOCATION	**Portland, Oregon**	PAGE	**2 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**32.64' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/4/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
25 44 35	SS	GST-02SO-20-25-101004	0.7	1	No	1.5/1.5		**0 to 25.2 feet: GRAVELLY SILT (ML)**, continued. @ 21.1 feet: granular yellow-brown gravel. @ 21.3 to 21.5 feet: dark purplish-red brick-like material. @ 22.0 feet: strong reduced hydrogen sulfide-like odor and hydrocarbon-like odor. @ 22.5 to 23.0 feet: sand layer. @ 23.0 to 23.2 feet: black, slight bluish. @ 23.0 to 25.2 feet: wood chips, loose, moist, hydrocarbon-like odor.	40	0	60
	CB		0.7	2	No	3.5/3.5					
							25				
4 2 5	SS	GST-02SO-25-30-101004	0.8	1	No	1.5/1.5		**25.2 to 28.2 feet: SANDY SILT (ML)**, dark grayish brown, wet, soft, trace rust colored mottling, fine sand, slightly cohesive, intermittent thin sand layers. (ALLUVIUM)	0	40	60
	CB					3.5/3.5					
			0.0	0	No			**28.2 to 30.0 feet: SILTY SAND (SM)**, dark grayish brown, wet, loose, slightly cohesive, fine sand. (ALLUVIUM)	0	60	40
							30	Total depth = 30.0 feet.			
							35				
							40				

REMARKS

[1] No recovery from 12.5 to 15.0 feet. Tried to push shelby tube at 12.5 feet - refused. Went in with core barrel, got no recovery. [2] Could not collect a shelby tube sample - no appropriate cohesive material was encountered. [3] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-03**
LOCATION	**Portland, Oregon**	PAGE	**1 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**34.73' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/5/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
2 4 9	SS	GST-03SO-0-5-101005	0.1	1	No	1.5/1.5		**0 to 3.4 feet: SILT WITH GRAVEL (ML)**, brown, dry, loose, nonplastic, coarse angular gravel, many roots and rootlets. (TOPSOIL/FILL)	10	0	90
	CB		1.9	1	No	3.5/3.5					
2 5 5	SS	GST-03SO-5-6-101005	2.3	2	No	0.5/1.5	5	**3.4 to 23.9 feet: LAMPBLACK WITH GRAVEL, RUBBLE AND DEBRIS**, black, dry, loose, crumbly, friable, trace brick and concrete debris, gravel is fine to cobble size, lampblack comprises 60 percent of sample, slight naphthalene-like odor, large cobble-size brick chunk blocked core barrel at 6.0 feet. (FILL)	40	--	--
	CB	NA				1.0/3.5		@ 6.0 to 10.0 feet: no recovery.			
5 6			NA	NA	NA						
3 6 7	SS	No sample collected. Only large brick chunks in core.	0.3	1	No	0.1/1.5	10	@ 10.0 to 18.0 feet: large cobble-size chunks of brick coated in lampblack powder.			
	CB		NA	NA	NA	1.0/3.5					
7 8 9	SS	GST-03SO-15-20-101005	1.4	2	No	0.5/1.5	15				
	CB		5.0	4	No	3.0/3.5		@ 18.0 feet: black, wet, brittle, crumbly, brick and lampblack, one chunk of asphalt, naphthalene-like odor, light blocky, platey sheen.			
							20				

REMARKS

[1] No shelby tube sample collected. No appropriate cohesive material interval existed. [2] No well installed in boring. Boring abandoned following reaching total depth.
CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-03**
LOCATION	**Portland, Oregon**	PAGE	**2 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**34.73' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/5/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
6 13 14	SS	GST-03SO-20-22-101005	5.5	8	No	1.5/1.5		**3.4 to 23.9 feet: LAMPBLACK WITH GRAVEL, RUBBLE AND DEBRIS**, continued. (FILL)	40	--	--
	CB					2.8/3.5					
		GST-03SO-22-27-101005	1.2	2	No						
								23.9 to 25.0 feet: WOOD CHIPS WITH SAND, heavily weathered. (FILL)	--	--	--
2 8 4	SS		0.5	1	No	1.5/1.5	25	**25.0 to 30.0 feet: SILT (MH)**, dark grayish brown, soft, moist, moderate plasticity, trace rootlets, slight hydrocarbon-like odor. (ALLUVIUM)	0	0	100
	CB					1.1/3.5					
		NA	0.3	1	No						
							30	Total depth = 30.0 feet.			
							35				
							40				

REMARKS

[1] No shelby tube sample collected. No appropriate cohesive material interval existed. [2] No well installed in boring. Boring abandoned following reaching total depth.
CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-04**
LOCATION	**Portland, Oregon**	PAGE	**1 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**33.21' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/6/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
4 4 9	SS	GST-04SO-0-5-101006	0.0	2	No	0.5/1.5		**0 to 18.5 feet: GRAVELLY SILT (ML)**, dark brown, dry, stiff, low plasticity, fine to cobble-sized, angular to rounded gravel, trace brick pieces and black lampblack-like material. (FILL)	30	0	70
	CB		2.9	2	No	3.5/3.5		@ 4.0 feet: hard, compacted.			
7 6 32	SS	GST-04SO-5-10-101006	0.2	2	No	0.9/1.5	5	@ 5.0 feet: color change to mixed black, red, and brown.			
	CB		0.2	2	No	2.5/3.5		@ 7.5 feet: color change to black, slight hydrocarbon-like odor.			
	ST	GST-04SO-10-12-101006	NA	NA	NA	1.4/2.0	10	@ 10.0 feet: slightly moist. @ 11.0 to 11.3 feet: blue discoloration, strong naphthalene-like odor.			
19 39 8	SS	GST-04SO-12-15-101006	0.0	0	No	0.8/1.5		@ 12.8 feet: large chunk of concrete.			
	CB					1.5/1.5					
4 8 9	SS	GST-04SO-15-20-101006	11.6	3	No	1.1/1.5	15				
	CB		2.7	3	No	3.5/3.5					
								18.5 to 20.0 feet: SILTY SAND (SM), dark gray to black, loose, dry, moderate hydrocarbon-like odor. (FILL)	0	70	30
							20				

REMARKS

[1] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-04**
LOCATION	**Portland, Oregon**	PAGE	**2 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**33.21' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/6/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
7 5 5	SS	GST-04SO-20-21-101006	2.4	29	No	1.5/1.5			@ 19.5 feet: powdered yellow brick-like material.	0	100	0
	CB	GST-04SO-21-26-101006	0.6	11	No	3.5/3.5			**20.0 to 25.0 feet: SAND (SP)**, dark gray, dry, loose, fine to medium grained, poorly graded, trace (anthropogenic) wood pieces. (FILL)			
0 0 0	SS		0.3	3	No	1.5/1.5	25		**25.0 to 30.0 feet: SILT (MH)**, dark grayish brown, very soft, wet, highly plastic, trace fine sand, many rootlets, intermittent thin (0.1 foot) sand layers. (ALLUVIUM)	0	5	95
	CB					3.5/3.5						
		NA	0.2	3	No							
							30		Total depth = 30.0 feet.			
							35					
							40					

REMARKS

[1] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-05**
LOCATION	**Portland, Oregon**	PAGE	**1 of 1**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**26.05' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**20.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/6/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
7 14 16	SS	GST-05SO-0-5-101005	0.1	1	No	0.5/1.5		**0 to 1.1 feet: GRAVEL (GP)**, dark gray, loose, dry, poorly graded, angular, coarse. (FILL)	100	0	0
	CB		0.3	1	No	3.5/3.5		**1.1 to 7.8 feet: GRAVELLY SILT (ML)**, dark brownish gray, dry, low plasticity, stiff, coarse to cobble size, angular to rounded gravel. (FILL)	40	0	60
30 13 10	SS	GST-05SO-5-10-101005	0.3	1	No	0.5/1.5	5	@ 5.0 feet: very dry, loose.			
	CB		0.2	1	No	2.1/3.5		**7.8 to 14.9 feet: GRAVELLY SILT (MH)**, dark brown, moist, moderate plasticity, fine to coarse gravel, trace red brick pieces. (FILL)	20	0	80
33 17 23	SS	GST-05SO-10-13.7-101005[1]	0.2	1	No	0.5/1.5	10	@ 10.4 to 14.9 feet: large cobble-sized pieces of red brick and concrete.			
	CB		0.0	0	No	2.1/3.5		@ 14.3 feet: wet.			
6 4 4	SS	GST-05SO-13.7-18.7-101005	0.2	1	No	1.5/1.5	15	**14.9 to 15.8 feet: GRAVELLY SAND (SP)**, dark gray, loose, wet, fine to medium grained sand, fine gravel, trace fines, slight hydrocarbon-like odor. (FILL)	20	80	0-5
	CB		0.0	0	No	2.1/3.5		**15.8 to 20.0 feet: SILT**, dark grayish brown, soft, wet, high plasticity, abundant thin intermittent sand layers, slight hydrocarbon-like odor. (ALLUVIUM)	0	0-5	95-100
		NA					20	Total depth = 20.0 feet.			

REMARKS

[1] Attempted to push shelby tube at 10.0 feet - refusal. No Shelby tube sample collected. [2] No well installed in boring. Boring abandoned following reaching total depth.
CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-06**
LOCATION	**Portland, Oregon**	PAGE	**1 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**32.07' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/7/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
2 10 28	SS	GST-06SO-0-5-101007	0.7	0	No	1.0/1.5		**0 to 10.0 feet: GRAVELLY SILT (ML)**, dark brown, hard, dry, low plasticity, subrounded to rounded, coarse to cobble-sized gravel. (FILL) @ 0 to 1.0 feet: rootlets. @ 1.5 to 2.5 feet: trace large red brick pieces and wood chips.	40	0	60
	CB		23.5	0	No	3.5/3.5		@ 3.5 feet: cobble size chunk of concrete. @ 4.0 feet: large cobble size chunk of concrete, hard drilling.			
35 16 19	SS	[4] GST-06SO-5-10-101007	0.2	2	No	0.7/1.5	5				
	CB		0.3	0	No	2.0/3.5		@ 6.5 to 9.0 feet: chunks of concrete, dry.			
5 9 4	SS	GST-06SO-10-12-101007	0.4	0	No	1.0/1.5	10	**10.0 to 20.0 feet: GRAVELLY SILT (ML)**, stiff, moist, slight plasticity, fine to coarse gravel, trace sand to cobble-sized red brick pieces. (FILL)	30	0	70
	CB					0.5/0.5					
	ST	GST-06SO-12-1415-101007	10.3	3	No	0.5/2.5					
	NA	NA				NA					
14 15 50/6	SS	[1] GST-0650-15-20-101007	5.8	3	No	1.1/1.5	15	@ 15.5 to 16.5 feet: concrete, black material (lampblack), dry, small flecks of blue plastic.			
	CB		7.0	0	No	2.7/3.5		@ 17.0 to 18.0 feet: concrete. @ 18.0 feet: wet, hydrocarbon-like odor, stained black, light, blocky, platy sheen present.			
							20				

REMARKS

[1] NW natural additional sample collected at 19.0 to 20.0 feet GST-06SO-19-20-101007. [2] Additional NW natural sample GST-06SO-26-26.5-101007. [3] Additional NW natural sample GST-06SO-27-27.5-101007. [4] Minor yellow fluorescence. [5] Bright yellow smears on sample bags. Dark orange-red glow in sample. [6] Substantial product from 25.8 to 30.0 feet. The presence of substantial product was identified per the specific definition in Section 3.6.2.1 of the Statement of Work - Gasco Sediments Site, Portland Harbor Superfund Site, Portland, Oregon, except that modifying factor 3 was not applied. [7] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-06**
LOCATION	**Portland, Oregon**	PAGE	**2 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**32.07' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/7/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
19 50/2 --	SS	GST-06SO-25-30-101007	1.7	0	No	0.2/1.5		**20.0 to 22.1 feet: WOOD**. (FILL)	--	--	--
	CB					3.5/3.5					
			9.3	2	4			**22.1 to 25.4 feet: SILTY SAND (SM)**, dark grayish brown to black, medium dense, moist, nonplastic silt, fine sand, abundant wood pieces. (FILL) @ 23.0 feet: light sheen on sample, slight hydrocarbon-like odor.	0	60	40
	CB	NA	107.0	5	5	5.0/5.0	25	**25.4 to 25.8 feet: SILT (MH)**, black, stiff, moist, highly plastic, rubbery texture, strong hydrocarbon-like odor. (ALLUVIUM)	0	0	100
		[2] NA							0	90	10
		[3] NA						**25.8 to 26.7 feet: SAND WITH SILT BLEBS (SP-SM)**, black, fine to medium grained, saturated with oil, strong hydrocarbon-like odor. (ALLUVIUM)	0	0	100
		NA	330	4	5		6	**26.7 to 27.5 feet: SILT (MH)**, oily, rubbery texture. (ALLUVIUM)	--	--	--
		GST-06SO-29-30-101007						**27.5 to 27.9 feet: HIGHLY WEATHERED TAR**, black. (ALLUVIUM)	0	50	50
							30	**27.9 to 29.8 feet: SAND AND SILT (SP/MH)**, black, oily, rubbery texture. (ALLUVIUM)	0	0	100
								29.8 to 30.0 feet: SILT (MH), dark grayish brown with black banding, highly plastic, soft, moist, strong hydrocarbon-like odor. (ALLUVIUM)			
								Total depth = 30.0 feet.			
							35				
							40				

REMARKS

[1] NW natural additional sample collected at 19.0 to 20.0 feet GST-06SO-19-20-101007. [2] Additional NW natural sample GST-06SO-26-26.5-101007. [3] Additional NW natural sample GST-06SO-27-27.5-101007. [4] Minor yellow fluorescence. [5] Bright yellow smears on sample bags. Dark orange-red glow in sample. [6] Substantial product from 25.8 to 30.0 feet. The presence of substantial product was identified per the specific definition in Section 3.6.2.1 of the Statement of Work - Gasco Sediments Site, Portland Harbor Superfund Site, Portland, Oregon, except that modifying factor 3 was not applied. [7] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-09**
LOCATION	**Portland, Oregon**	PAGE	**1 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**25.54' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/8/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
4 8 10	SS	GST-09SO-0-5-101008				0.8/1.5		**0 to 16.6 feet: GRAVELLY SILT (ML)**, dark brown, very stiff, dry, crumbly, nonplastic, fine to cobble size subangular to angular gravel, roots at surface, trace brick and concrete pieces. (FILL)	40	0	60
	CB		0.0	0	No	3.5/3.5		@ 2.2 to 2.7 feet: hard, concrete.			
			0.0	0	No			@ 2.7 to 16.6 feet: abundant coarse to cobble size gravel and concrete chunks.			
12 8 5	SS	GST-09SO-5-10-101008	0.0	0	No	0.5/1.5	5	@ 5.0 feet: rusted metal door hinge.			
	CB					0.3/3.5		@ 7.0 feet: core blockage - large chunk of concrete in bit of sampler.			
			NA	NA	NA						
50/4 -- --	SS	GST-09-10-15-101008	0.0	0	No	0.2/1.5	10	@ 10.0 feet: wood fragments. @ 10.0 to 10.5 feet: vesicular basalt cobble.			
	CB					2.7/3.5		@ 12.0 feet: moist.			
			0.1	0	No						
17 12 16	SS	GST-09-15-20-101008[4, 5]	90.0	0	1	0.1/1.5	15	@ 15.0 feet: very stiff, damp. @ 15.4 feet: black, strong hydrocarbon-like odor.			
	CB					3.5/3.5	6	**16.6 to 18.0 feet: SAND (SP)**, black, loose, damp, fine to medium grained, poorly graded, sticky, strong hydrocarbon-like odor, semi-solid product throughout, oily. (FILL)	0	100	0
			55.0	0	2			**18.0 to 19.0 feet: LAMPBLACK AND WOODCHIPS**. (FILL)	NA	NA	NA
							20	**19.0 to 21.1 feet: SILT WITH SAND (MH)** on following page.	0	10	90

REMARKS

[1] Bright yellow smears on sample bag; dull orange glow in sample. [2] Bright yellow smears on sample bag; dull orange glow and yellow bands and streaks in sample. [3] No well installed in boring. Boring abandoned following reaching total depth. [4] TCLP sample GST-09SO-16.5-18-101008. [5] Additional NW Natural Sample GST-09SO-17-18-101008. [6] Substantial product from 16.6 to 18.0 feet. The presence of substantial product was identified per the specific definition in Section 3.6.2.1 of the Statement of Work - Gasco Sediments Site, Portland Harbor Superfund Site, Portland, Oregon, except that modifying factor 3 was not applied.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-09**
LOCATION	**Portland, Oregon**	PAGE	**2 of 2**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**25.54' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**30.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/8/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
	ST	GST-09SO-20-22.5-101008	NA	NA	NA	2.5/2.5		**19.0 to 21.1 feet: SILT WITH SAND (MH)**, dark olive gray, wet, soft, medium plasticity, fine sand, moderate hydrocarbon-like odor. (ALLUVIUM)	0	10	90
								21.1 to 23.0 feet: SAND (SP), dark gray, wet, poorly graded fine sand with thin silt bands. (ALLUVIUM)	0	95	0
3	SS	NA				1.5/1.5					
2		GST-09SO-23-28-101008	4.6	2	No			**23.0 to 25.0 feet: SAND (SP)**, dark grayish brown with rust colored mottling, loose, wet, poorly graded fine sand, slight hydrocarbon-like odor.	0	100	0
3	CB					1.0/1.0					
							25				
3	SS					1.5/1.5		**25.0 to 30.0 feet: SANDY SILT (ML)**, dark gray with rust colored mottling, very soft, wet, low plasticity, intermittent thin sand layers, soupy, slight hydrocarbon-like odor.	0	40	60
4			0.2	0	No						
5	CB					1.0/3.5					
		NA	0.0	0	No						
							30	Total depth = 30.0 feet.			
							35				
							40				

REMARKS

[1] Bright yellow smears on sample bag; dull orange glow in sample. [2] Bright yellow smears on sample bag; dull orange glow and yellow bands and streaks in sample. [3] No well installed in boring. Boring abandoned following reaching total depth. [4] TCLP sample GST-09SO-16.5-18-101008. [5] Additional NW Natural Sample GST-09SO-17-18-101008. [6] Substantial product from 16.6 to 18.0 feet. The presence of substantial product was identified per the specific definition in Section 3.6.2.1 of the Statement of Work - Gasco Sediments Site, Portland Harbor Superfund Site, Portland, Oregon, except that modifying factor 3 was not applied.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-11**
LOCATION	**Portland, Oregon**	PAGE	**1 of 3**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**36.22' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**45.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/11/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
NA	HA	GST-11SO-0-5-101011	0.0	0	No	5/5		**0 to 21.5 feet: SAND (SW)**, dark brown, dry, very loose, well graded, fine to coarse, trace fine gravel. (FILL)	0-5	95-100	0
			0.0	0	No			@ 2.0 feet: cobble size gravel piece.			
NA	HA	GST-11SO-5-10-10101	0.0	0	No	5/5	5				
			0.0	0	No						
7 11 12	SS	GST-11SO-10-15-101011	0.0	0	No	1.5/1.5	10	@ 10.0 feet: medium dense.			
	CB		0.0	0	No	3.5/3.5		@ 12.0 to 12.5 feet: slightly cohesive, dense, slight hydrocarbon-like odor (naphthalene-like).			
								@ 14.5 to 15.6 feet: dense, slightly cohesive, silty sand layer.	0	80	20
16 15 12	SS	GST-11SO-15-20-101011	0.2	3	No	1.5/1.5	15		0-5	95-100	0
	CB					3.0/3.5					
			0.0	8	No			@ 18.0 feet: moist.			
							20				

REMARKS

[1] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube. HA = hand auger.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-11**
LOCATION	**Portland, Oregon**	PAGE	**2 of 3**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**36.22' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**45.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/11/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
3 15 27	SS	GST-11SO-20-25-101011	0.4	10	No	1.5/1.5		**0 to 21.5 feet: SAND (SW)**, continued. @ 20.0 to 21.1 feet: dry, hard, dense, silty fine sand.	0	80	20
	CB		1.0	2	No	3.5/3.5		@ 21.1 to 21.5 feet: wet, mottled dark red and black, medium to coarse sand. **21.5 to 27.1 feet: SILTY SAND WITH GRAVEL (SM)**, black, medium dense, dry, fine to medium sand, fine to coarse gravel, low plasticity silt, slight hydrocarbon-like odor, trace wood pieces, metal, broken glass. (FILL)	10	70	20
11 26 17	SS	GST-11SO-25-30-101011	2.0	17	No	1.5/1.5	25	@ 21.5 feet: basalt chunk, slight hydrocarbon-like odor.			
	CB		0.5	33	No	3.5/3.5		@ 26.4 to 27.1 feet: compacted, dense, slightly cohesive. **27.1 to 30.8 feet: SAND WITH GRAVEL (SW)**, dark brownish gray, loose, wet, well graded, fine to coarse sand, well rounded, fine to coarse gravel. (FILL)	10	90	0
7 4 4	SS	GST-11SO-30-32-101011	0.7	46	No	1.5/1.5	30				
	CB					0.5/0.5		**30.8 to 32.0 feet: SANDY SILT (ML)**, dark brownish gray with rust colored mottling, firm, wet, low plasticity, trace hydrocarbon-like odor. (ALLUVIUM)	0	20	80
	ST	GST-11SO-32-34.5-101011	0.2	2	No	2.0/2.5		**32.0 to 33.1 feet: SAND WITH SILT (SP-SM)**, brown, loose, very wet, fine grained, poorly graded, no odor. (ALLUVIUM)	0	90	10
	NA	NA				NA		**33.1 to 34.5 feet: SANDY SILT (ML)**, dark grayish brown, moist, low plasticity, fine sand, slight hydrocarbon-like odor. (ALLUVIUM).	0	40	60
1 1 1	SS	GST-11SO-35-39-101011	0.1	2	No	1.5/1.5	35	**34.5 to 43.3 feet: SAND WITH SILT (SP)**, dark gray, loose, wet, poorly graded, fine grained. (ALLUVIUM) @ 35.0 to 35.7 feet: silt layer.	0 0	0 90-95	100 5-10
	CB		0.1	0	No	3.3/3.5					
							40				

REMARKS

[1] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube. HA = hand auger.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-11**
LOCATION	**Portland, Oregon**	PAGE	**3 of 3**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**36.22' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**45.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/11/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
3 4 1	SS	GST-11SO-39-44-101011 GST-61SO-39-44-101011	0.0	2	No	1.5/1.5		**35.7 to 43.3 feet: SAND WITH SILT (SP)**, continued.	0	90-95	5-10
	CB					3.5/3.5					
			0.0	1	No			**43.3 to 44.5 feet: SILT (MH)**, dark grayish brown, moist, firm, highly plastic, trace fine sand. (ALLUVIUM)	0	0	100
		NA					45	**44.5 to 45.0 feet: SAND WITH SILT (SP-SM)**, dark brownish gray, wet, loose, poorly graded, fine sand. (ALLUVIUM)	0	90-95	5-10
								Total depth = 45.0 feet.			
							50				
							55				
							60				

REMARKS

[1] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube. HA = hand auger.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-13**
LOCATION	**Portland, Oregon**	PAGE	**1 of 3**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**35.31' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**45.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/12/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
NA	HA	GST-13SO-0-5-101012	0.0	0	No	5/5		**0 to 1.9 feet: SILT WITH ORGANIC MATERIAL (ML)**, brown, dry, loose, many roots and rootlets, low plasticity. (TOPSOIL/FILL)	0	0	100
			0.0	0	No			**1.9 to 25.3 feet: SAND WITH GRAVEL (SW)**, dark brown, dry, loose, well graded, fine to coarse sand, fine to coarse, well rounded gravel, trace rootlets. (FILL)	10	90	0
NA	HA	GST-13SO-5-10-101012	0.0	0	No	5/5	5				
			0.0	0	No						
13 19 20	SS	GST-13SO-10-15-101012	0.1	4	No	1.5/1.5	10				
	CB					3.0/3.5					
			0.0	1	No			@ 13.2 to 13.7 feet: dense, compacted layer.			
								@ 13.7 to 15.6 feet: slightly silty.	10	80	10
								@ 14.5 to 15.6 feet: dense, compacted layer.	10	80	10
8 16 12	SS	GST-13SO-15-20-101012	0.1	1	No	1.5/1.5	15	@ 15.6 feet: moist.			
	CB					3.5/3.5		@ 16.5 to 20.6 feet: slightly silty, slightly compacted.	10	80	10
			0.1	2	No		20				

REMARKS

[1] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube. HA = hand auger.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-13**
LOCATION	**Portland, Oregon**	PAGE	**2 of 3**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**35.31' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**45.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/12/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
10 16 20	SS	GST-13SO-20-25-101012	0.1	2	No	1.5/1.5		**1.9 to 25.3 feet: SAND WITH GRAVEL (SW)**, continued. (FILL)	10	90	0
	CB					3.5/3.5		@ 20.0 feet: dry.			
								@ 20.6 feet: very moist.			
								@ 21.7 to 22.1 feet: mixed dark gray and dark brown sand.			
			0.2	2	No			@ 23.0 to 23.5 feet: dark gray sand.			
							25				
10 7 5	SS	GST-13SO-25-30-101012	1.9	32	No	1.5/1.5		@ 25.0 to 25.3 feet: slightly silty compacted layer.	10	80	10
	CB					2.5/3.5		**25.3 to 30.1 feet: SAND (SW)**, dark gray, wet, loose, well graded, medium to coarse sand, slight hydrocarbon-like odor, trace well rounded gravel. (FILL)	0-5	95-100	0
			0.4	10	No						
							30				
1 4 3	SS	GST-13SO-30-32.5-101012	0.2	7	No	1.5/1.5		**30.1 to 36.5 feet: SILT (MH)**, dark gray with rust colored mottling, wet, firm, moderate to high plasticity, trace fine sand. (ALLUVIUM)	0	0-5	95-100
	CB					1.0/1.0					
	ST	GST-13SO-32.5-35-101012	0.1	3	No	2.4/2.5		@ 32.7 to 32.9 feet: silty sand layer.			
								@ 33.8 to 35.0 feet: silty fine sand layer.			
							35				
2 2 3	SS	GST-13SO-35-38-101012	0.1	1	No	1.5/1.5		@ 35.3 to 35.4 feet: fine sand layer.			
								@ 36.0 to 36.1 feet: fine sand layer.			
	CB					3.5/3.5		@ 36.3 to 36.5 feet: fine sand layer.	0	30	70
								36.5 to 40.0 feet: SANDY SILT (MH), dark grayish brown, wet, firm, moderate to high plasticity, fine sand.	0	70	30
		GST-13SO-38-43-101012	0.1	2	No			@ 37.5 to 38.4 feet: silty fine sand layer.			
								@ 38.4 to 38.9 feet: high plasticity silt layer.			
								@ 39.3 to 39.7 feet: highly plasticity silt layer.			
							40				

REMARKS

[1] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube. HA = hand auger.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco Data Gaps Riverbank Borings**	BORING NO.	**GST-13**
LOCATION	**Portland, Oregon**	PAGE	**3 of 3**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**35.31' NAVD88**
DRILL METHOD	**Rotosonic-AMS 17-C Mini Sonic**	TOTAL DEPTH	**45.0 ft.**
LOGGED BY	**Matt Wilson**	DATE COMPLETED	**10/12/10**
SAMPLING METHOD	**See below**		
BOREHOLE DIAMETER	**6-inches**		

SPT BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	VOC HEADSPACE (ppm)	HCN HEADSPACE (ppm)	UV FLUORESCENCE	RECOVERY (feet)	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
3 5 6	SS	GST-13SO-38-43-101012		1		1.5/1.5		**40.0 to 45.0 feet: SILT (MH)**, dark grayish brown, firm, high plasticity, moist, trace fine sand, intermittent thin (<0.1 ft.) sand layers). (ALLUVIUM)	0	0	100
	CB		0.1		No	3.5/3.5					
		NA	0.1	1	No			@ 42.2 to 42.4 feet: fine silty sand layer.	0	60	40
								@ 42.6 to 43.1 feet: fine silty sand layer.	0	60	40
								@ 43.6 to 44.0 feet: fine to medium silty sand layer.	0	60	40
								@ 44.3 to 45.0 feet: silty fine sand layer.	0	60	40
							45	Total depth = 45.0 feet.			
							50				
							55				
							60				

REMARKS

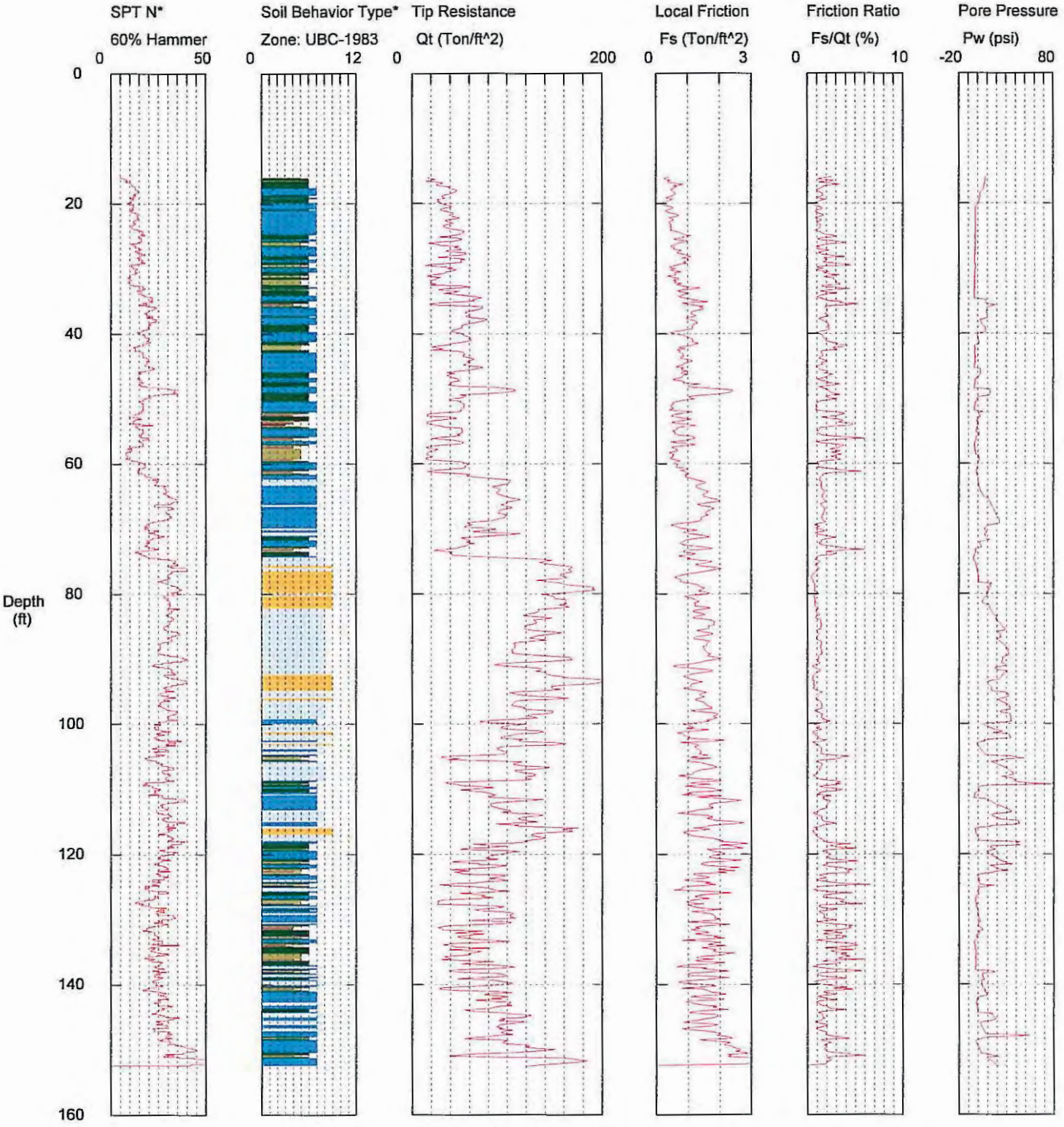
[1] No well installed in boring. Boring abandoned following reaching total depth.

CB = 3-inch by 5-foot core barrel. SS = 2-inch by 1.5-foot split-spoon. ST = 3-inch by 2.5-foot Shelby tube. HA = hand auger.

HAHN & ASSOC. / TG1 / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO21
Cone Used: 4CH

CPT Date/Time: 08-27-07 06:41
Location: TG1 NW7900ST.H R
Job Number: HAHN/2708/GASCO



Maximum Depth = 152.56 feet

Depth Increment = 0.164 feet

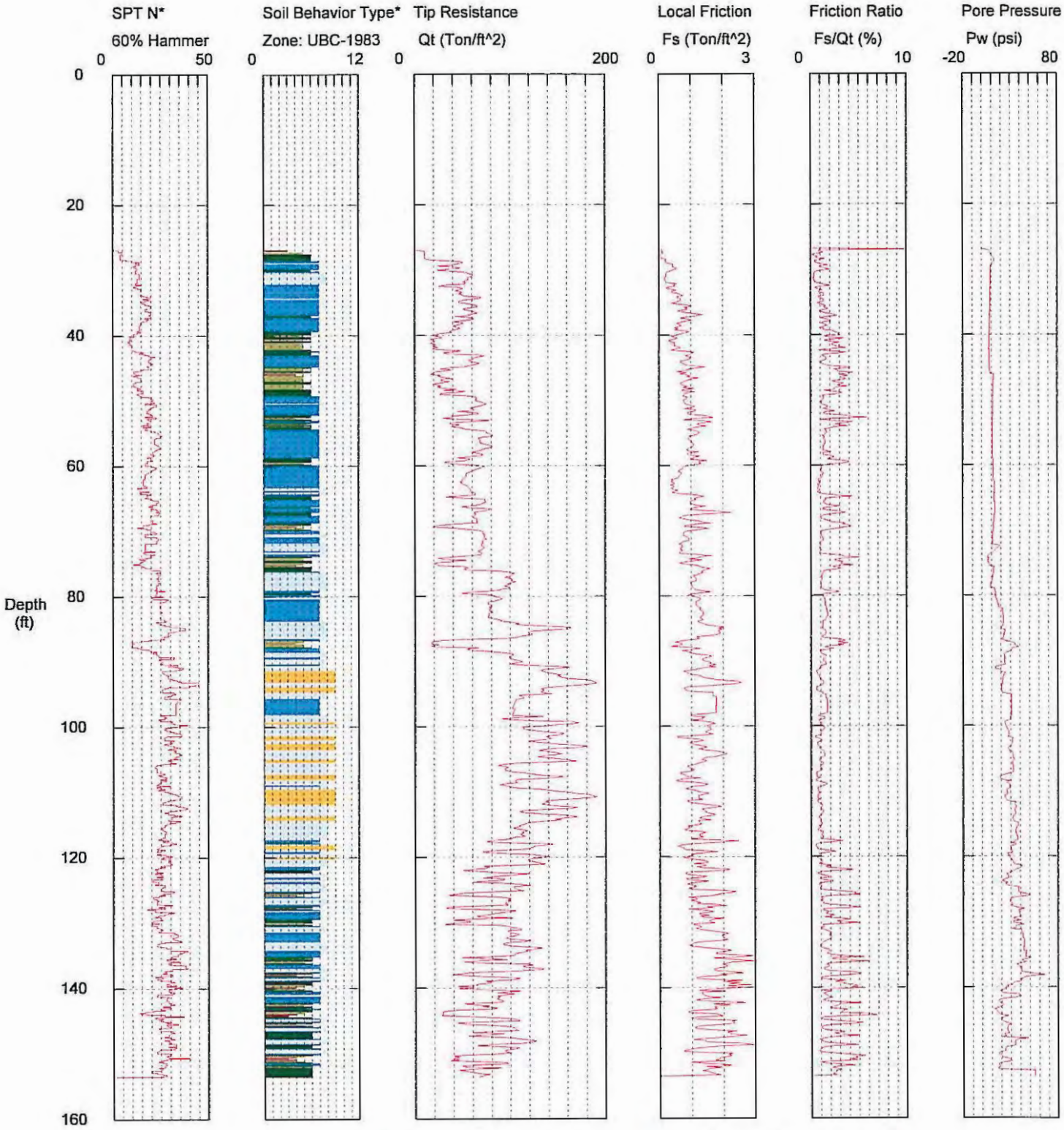
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG2 / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO15
Cone Used: 4CH

CPT Date/Time: 08-24-07 06:27
Location: TG2 NW7900 ST HR
Job Number: HAHN/2708/GASCO



Maximum Depth = 153.71 feet

Depth Increment = 0.164 feet

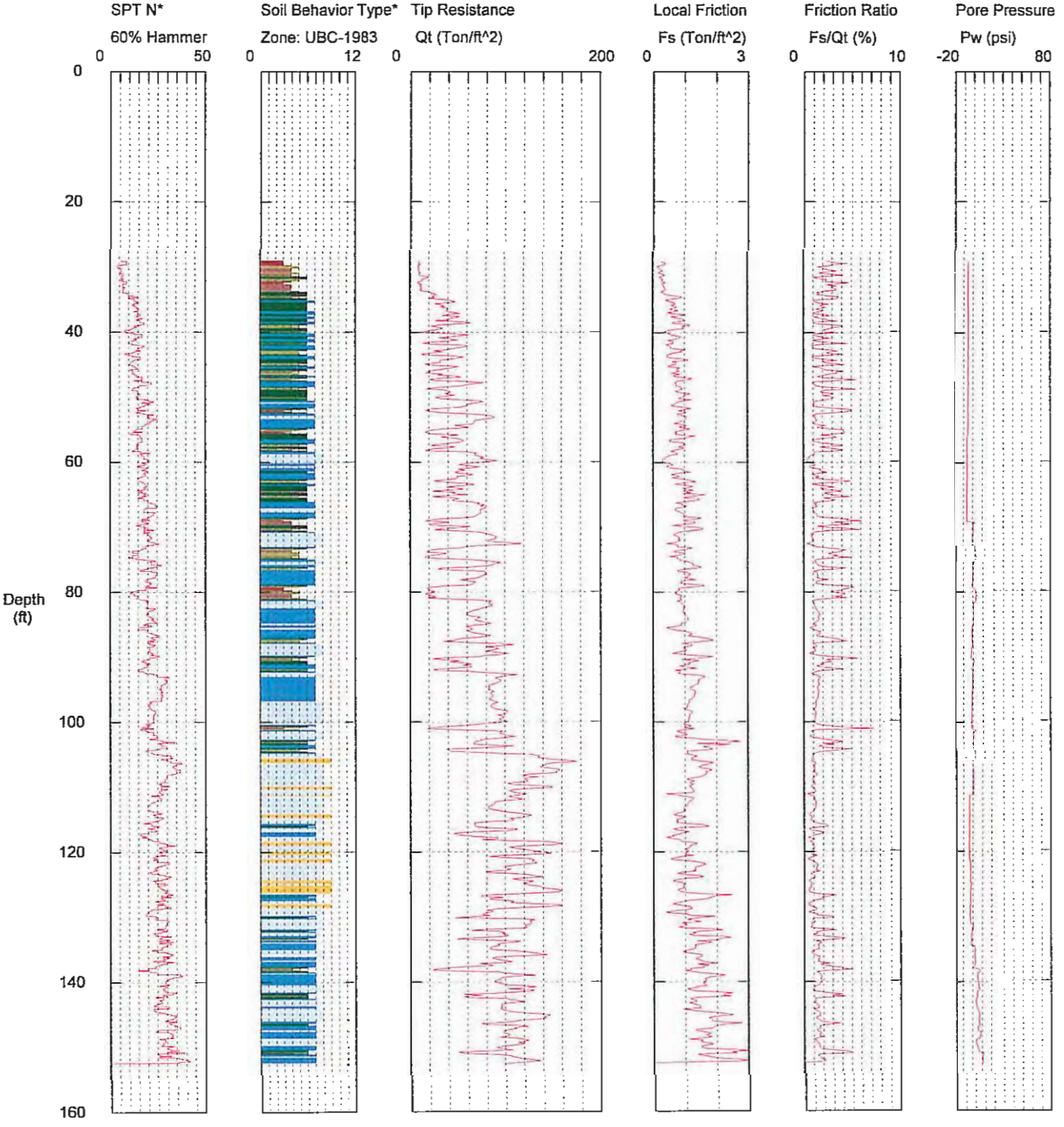
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG3 / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO14
Cone Used: 4CH

CPT Date/Time: 08-23-07 08:02
Location: TG3 NW7900ST H R
Job Number: HAHN/2708/GASCO



Maximum Depth = 152.56 feet

Depth Increment = 0.164 feet

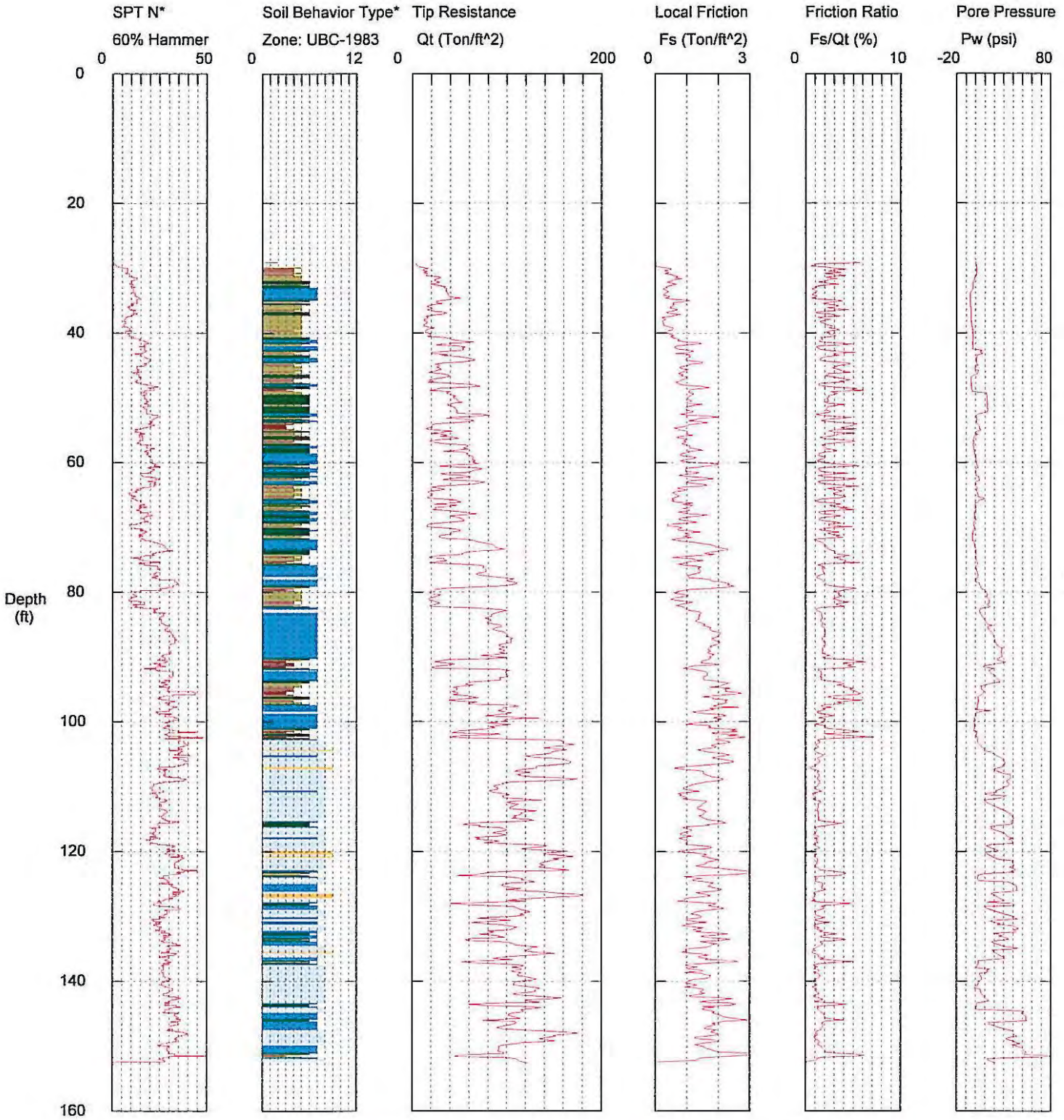
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG4 / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO20
Cone Used: 4CH

CPT Date/Time: 08-26-07 10:19
Location: TG4 NW7900ST.H R
Job Number: HAHN/2708/GASCO



Maximum Depth = 152.56 feet

Depth Increment = 0.164 feet

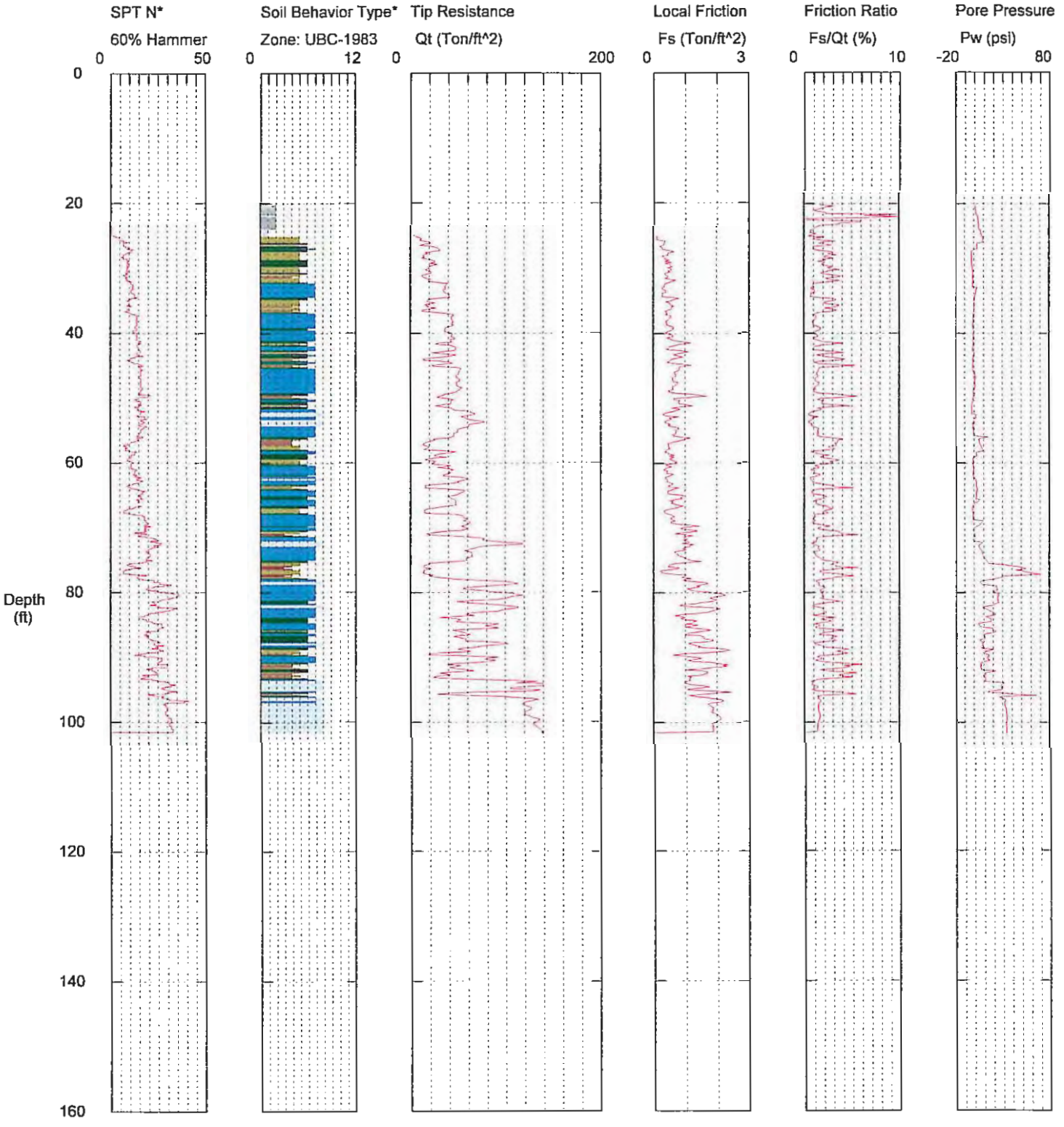
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG5 / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO18
Cone Used: 4CH

CPT Date/Time: 08-26-07 06:15
Location: TG5 NW7900ST.H R
Job Number: HAHN/2708/GASCO



Maximum Depth = 101.71 feet

Depth Increment = 0.164 feet

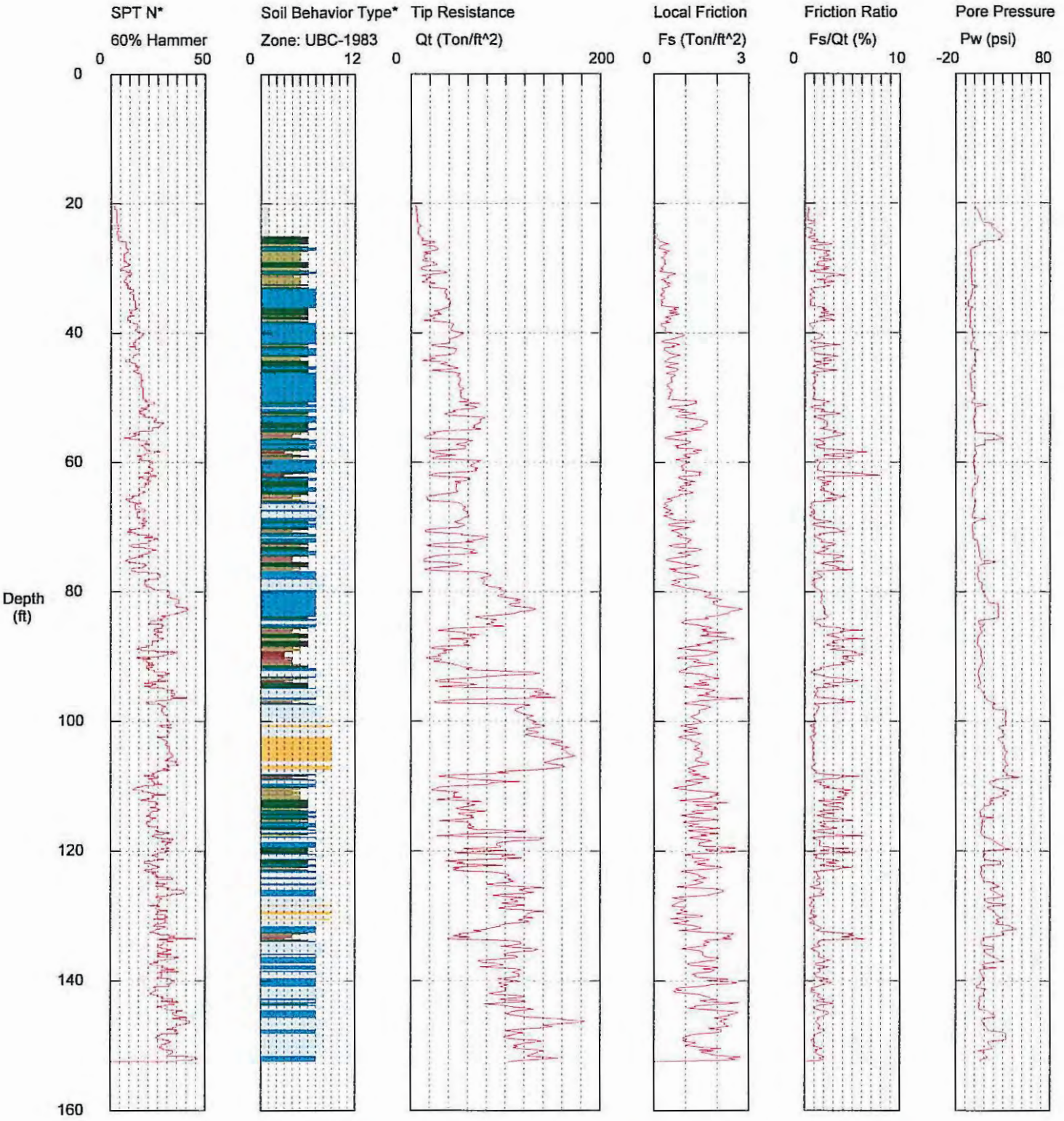
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG5A / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO31
Cone Used: R4CH

CPT Date/Time: 09-08-07 06:31
Location: TG5A NW7900 ST H
Job Number: HAHN/2708-43/GC



Maximum Depth = 152.56 feet

Depth Increment = 28.215 feet

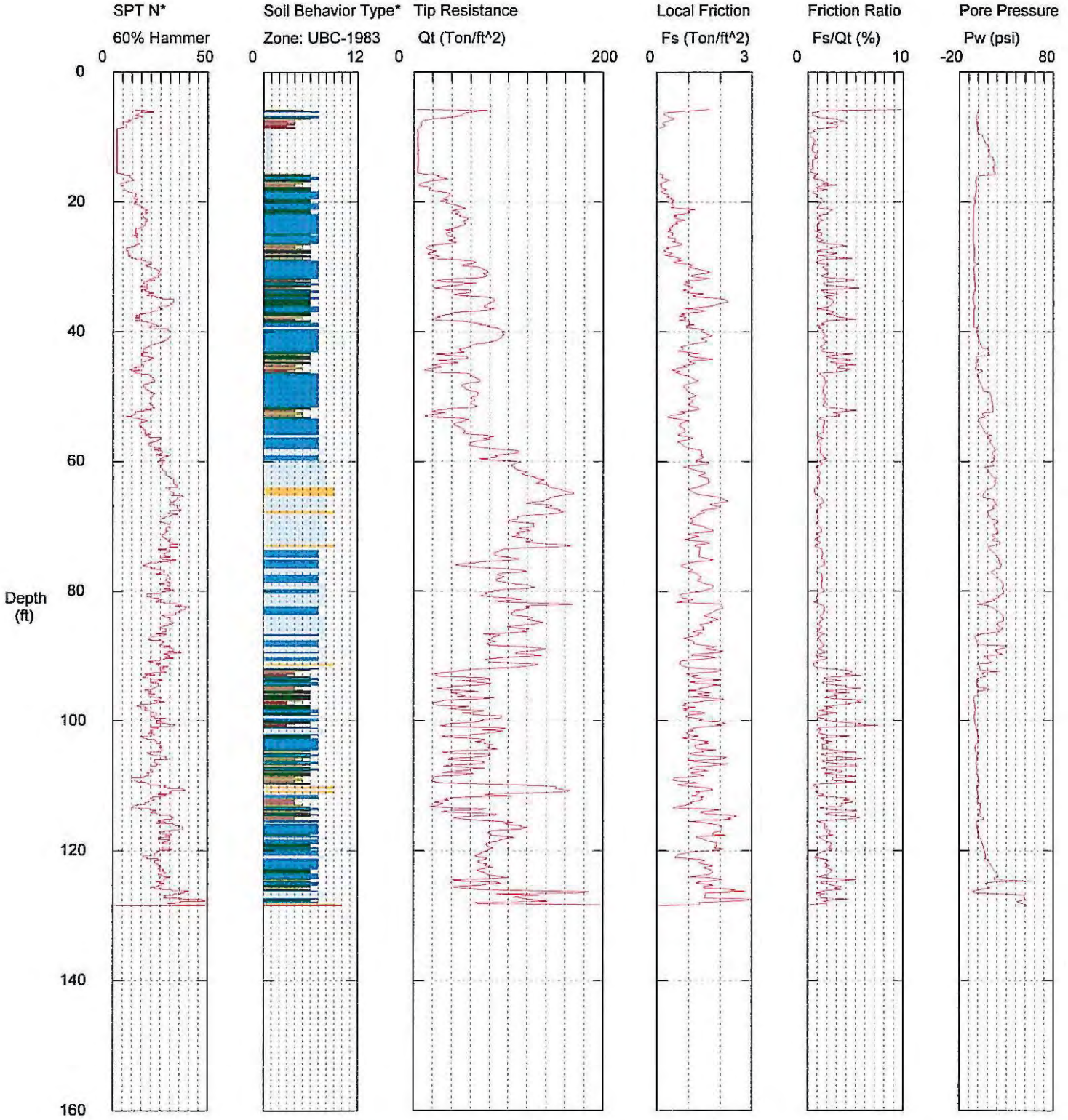
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG6 / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO22
Cone Used: 4CH

CPT Date/Time: 08-27-07 11:12
Location: TG6 NW7900ST.H R
Job Number: HAHN/2708/GASCO



Maximum Depth = 128.61 feet

Depth Increment = 0.164 feet

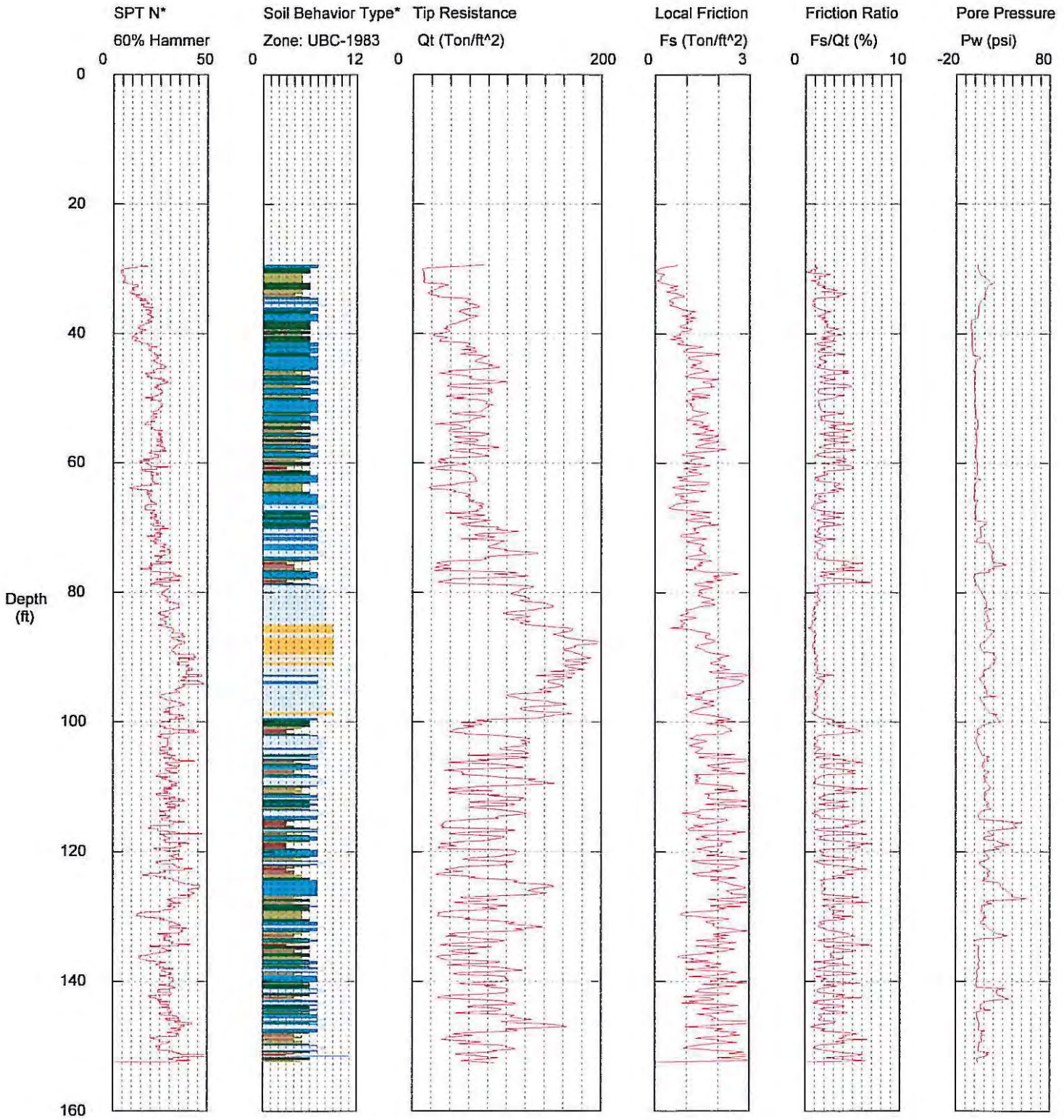
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG7 / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO16
Cone Used: 4CH

CPT Date/Time: 08-24-07 11:02
Location: TG7 NW7900 STH R
Job Number: HAHN/2708/GASCO



Maximum Depth = 152.56 feet

Depth Increment = 0.164 feet

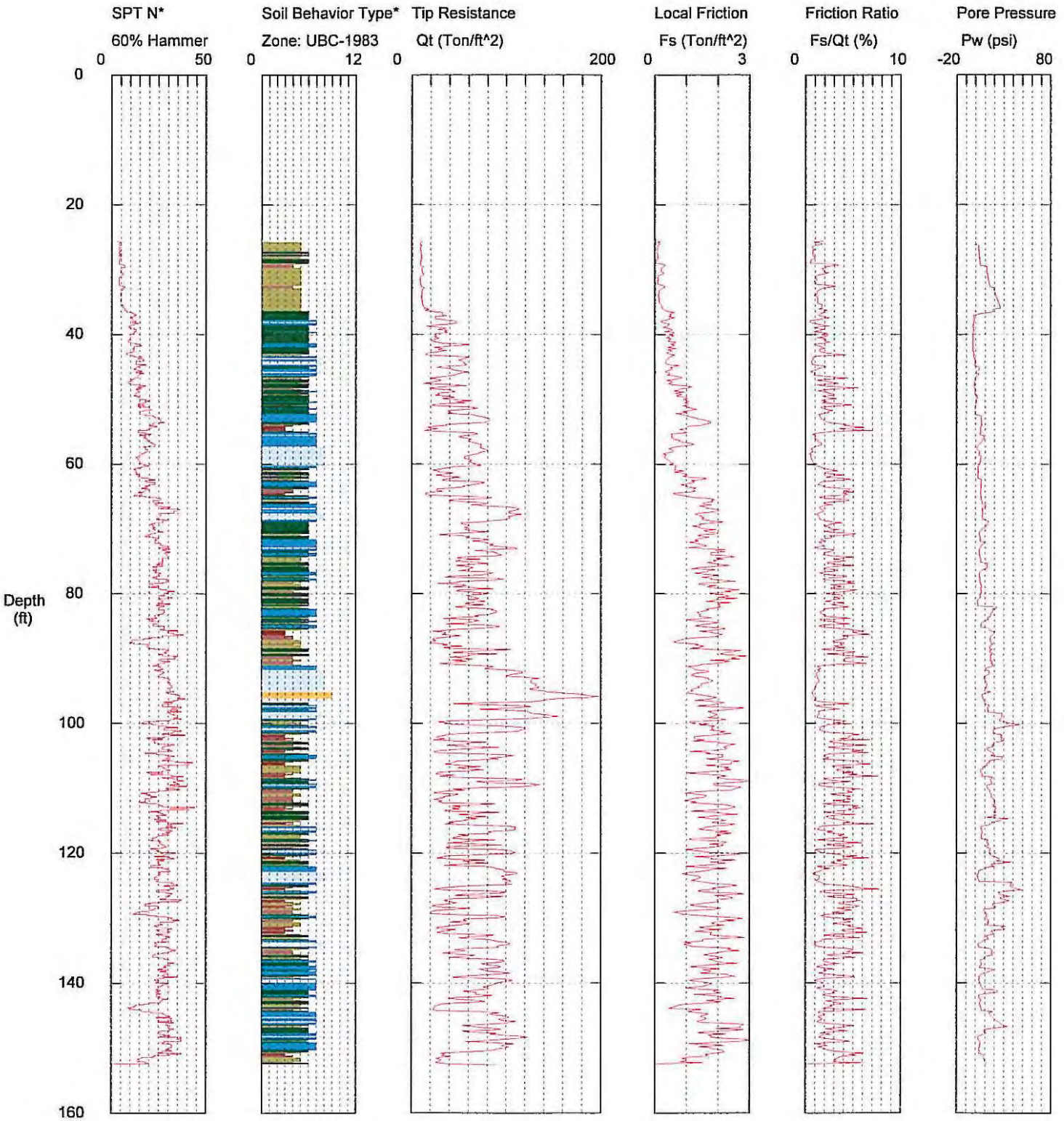
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG8 / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO17
Cone Used: 4CH

CPT Date/Time: 08-25-07 06:36
Location: TG8 NW7900 ST.HR
Job Number: HAHN/2708/GASCO



Maximum Depth = 152.56 feet

Depth Increment = 0.164 feet

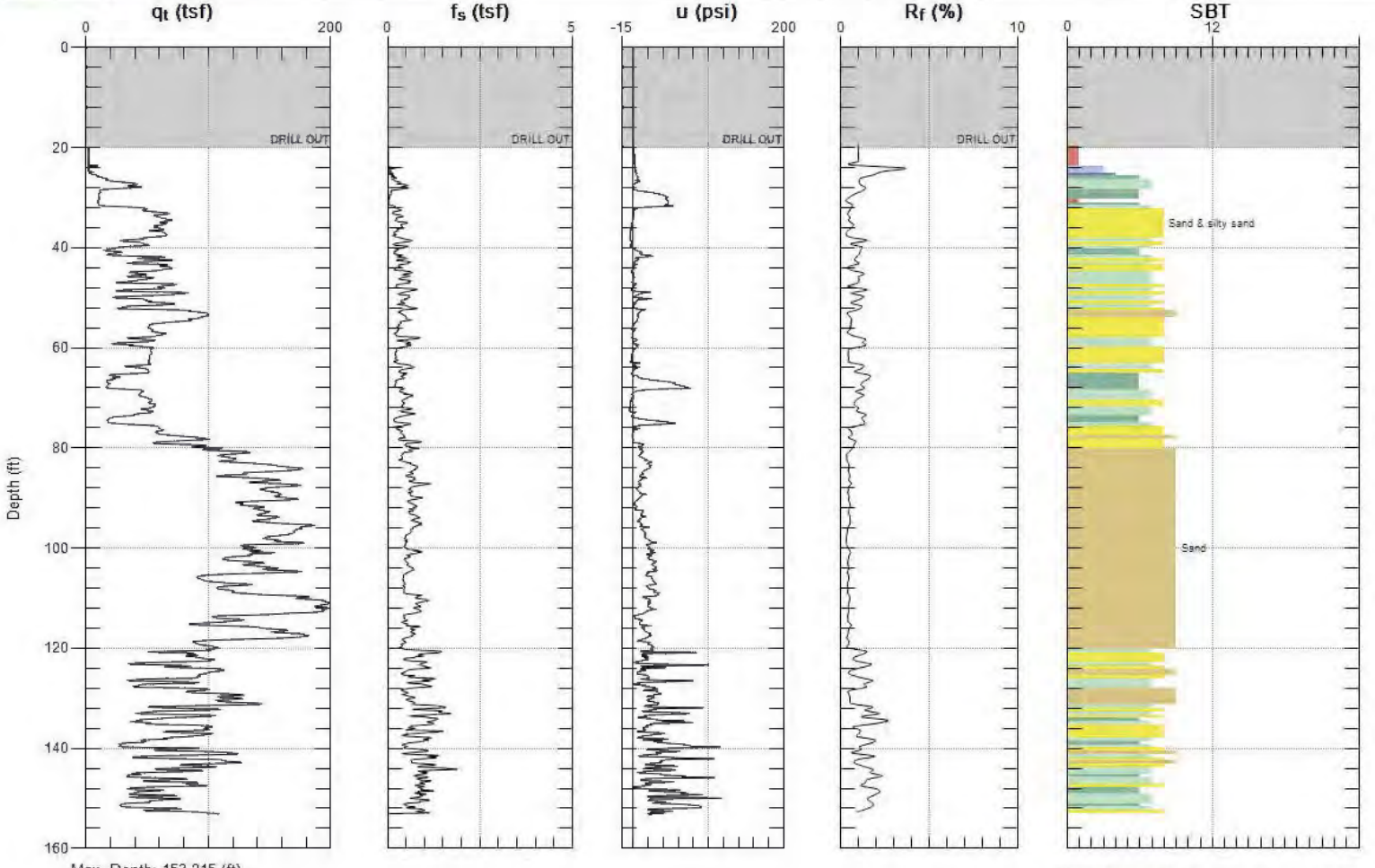
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-9

Engineer: R.EDE
Date: 3/28/2008 02:01



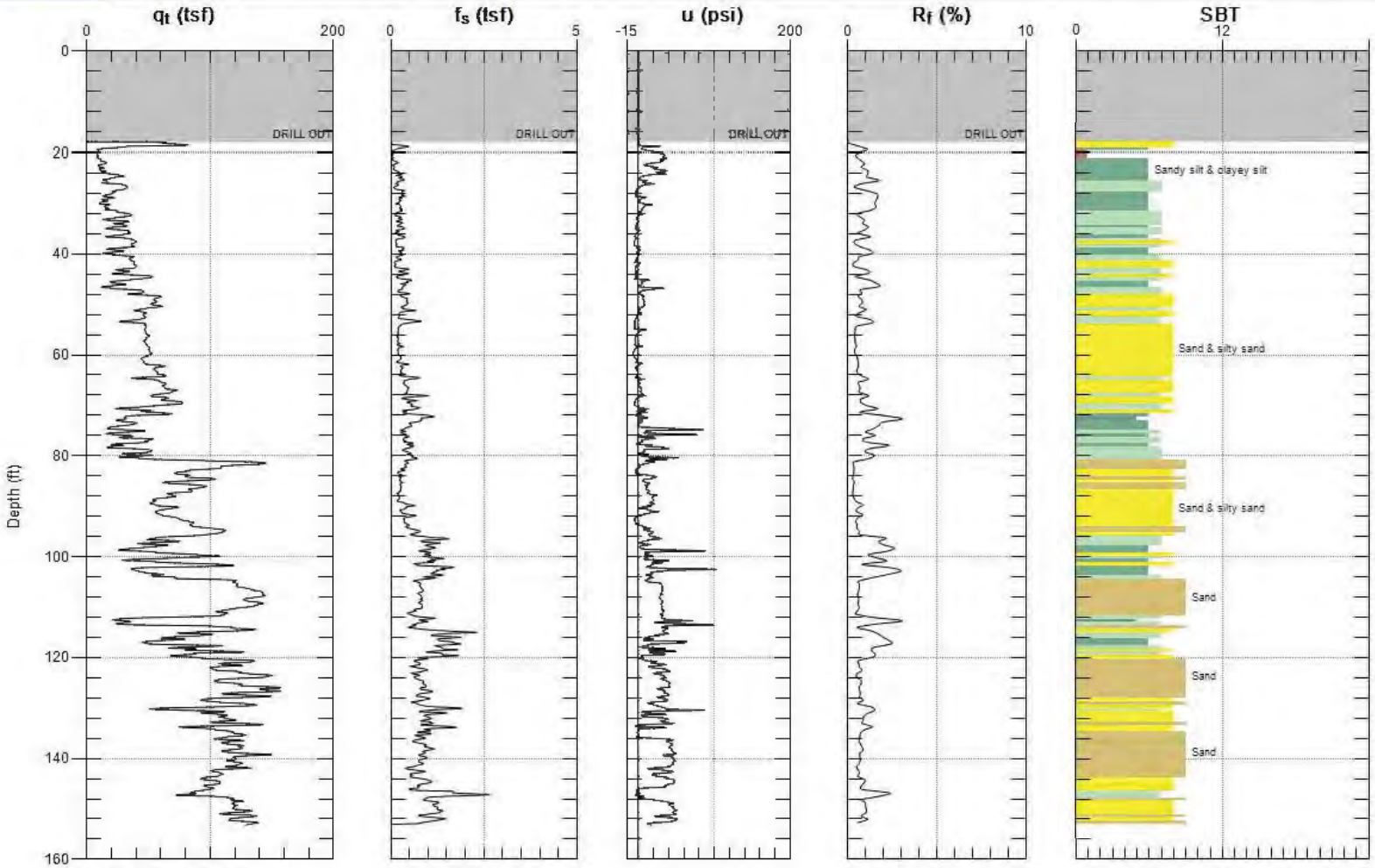
Max. Depth: 153.215 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-10

Engineer: R.EDE
Date: 3/29/2008 03:09



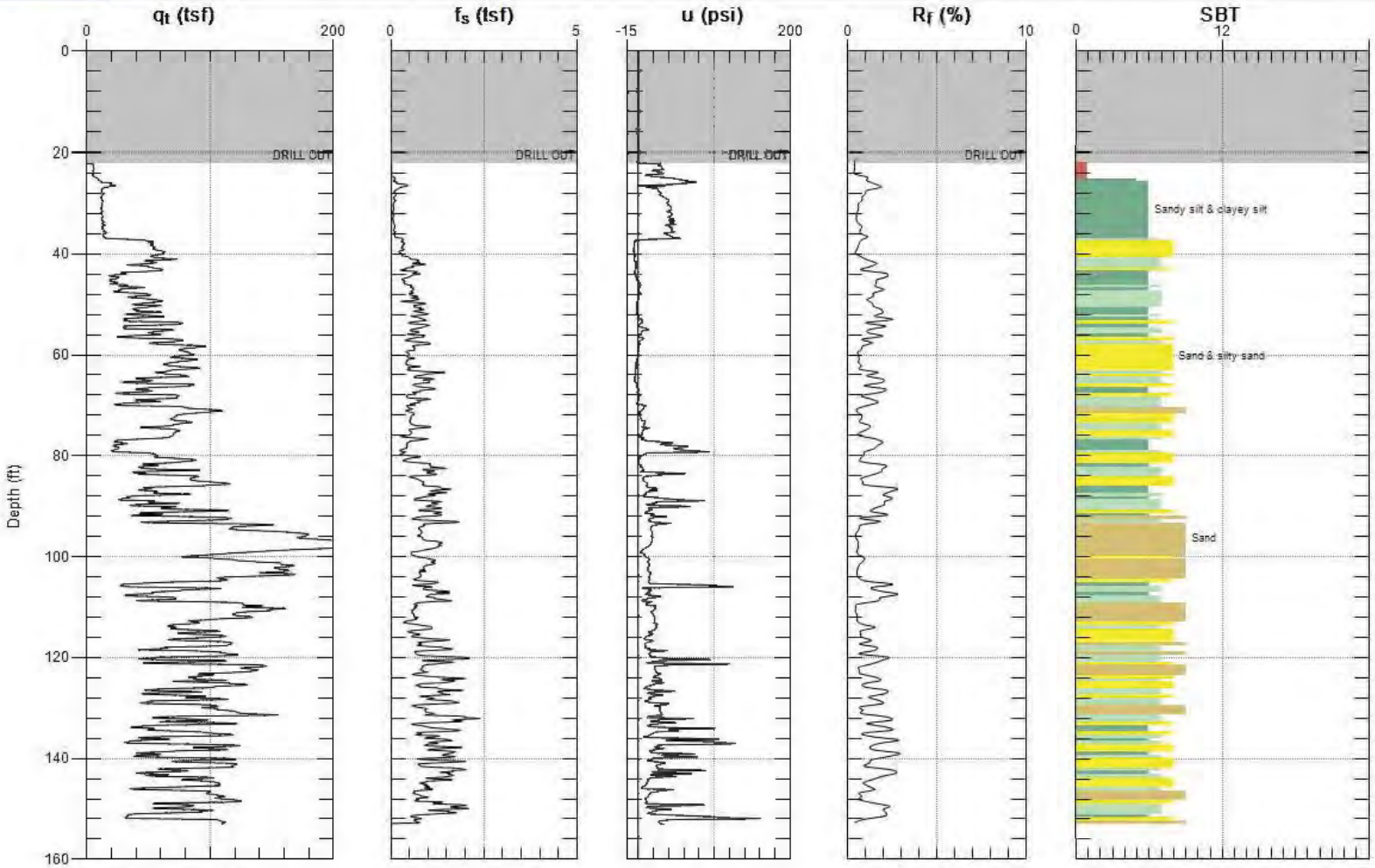
Max. Depth: 153.215 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-11

Engineer: R.EDE
Date: 3/29/2008 08:18

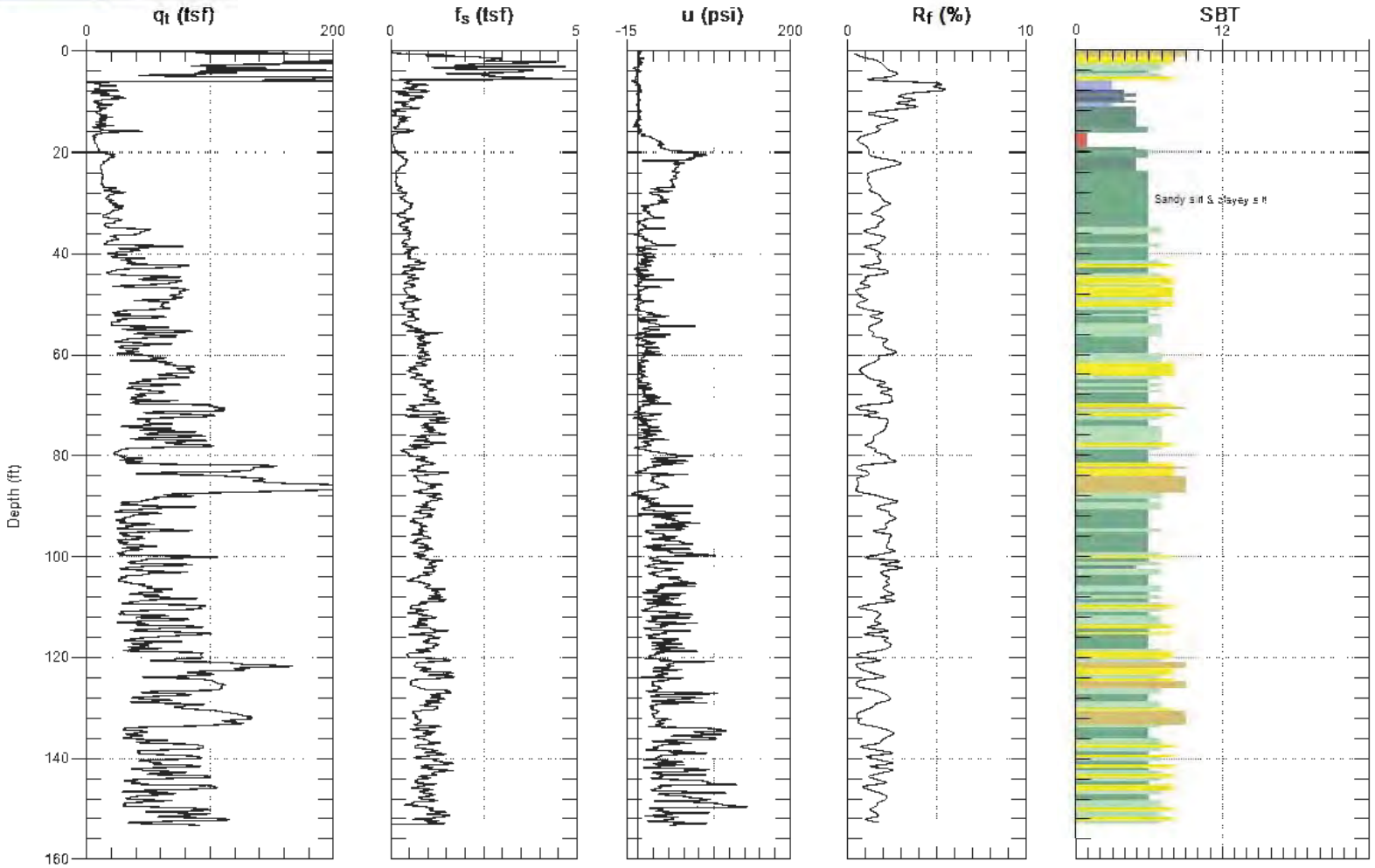


Max. Depth: 153.051 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-12
Engineer: R.EDE
Date: 3/28/2008 09:28



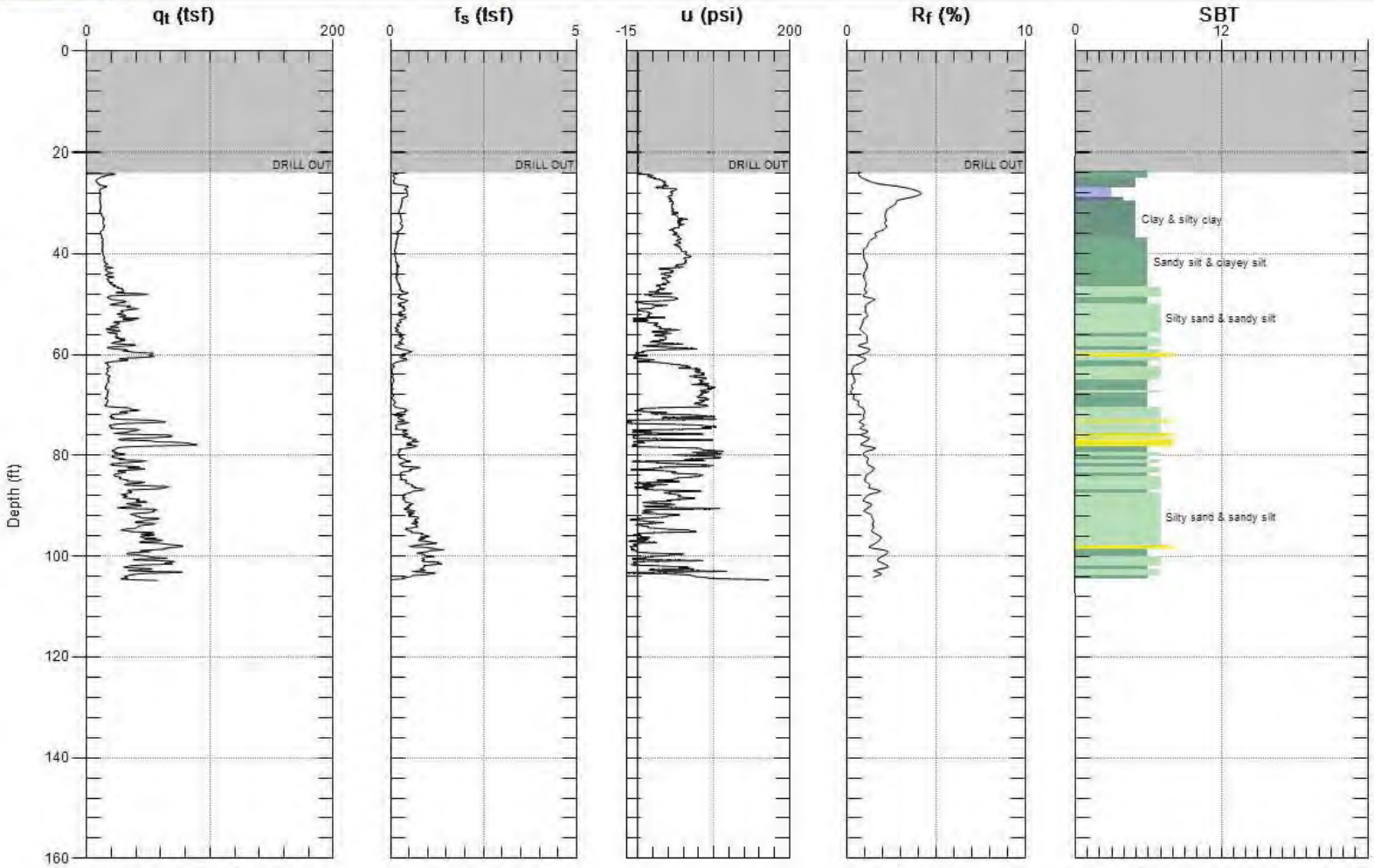
Max. Depth: 153.215 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-13

Engineer: R.EDE
Date: 3/30/2008 01:44



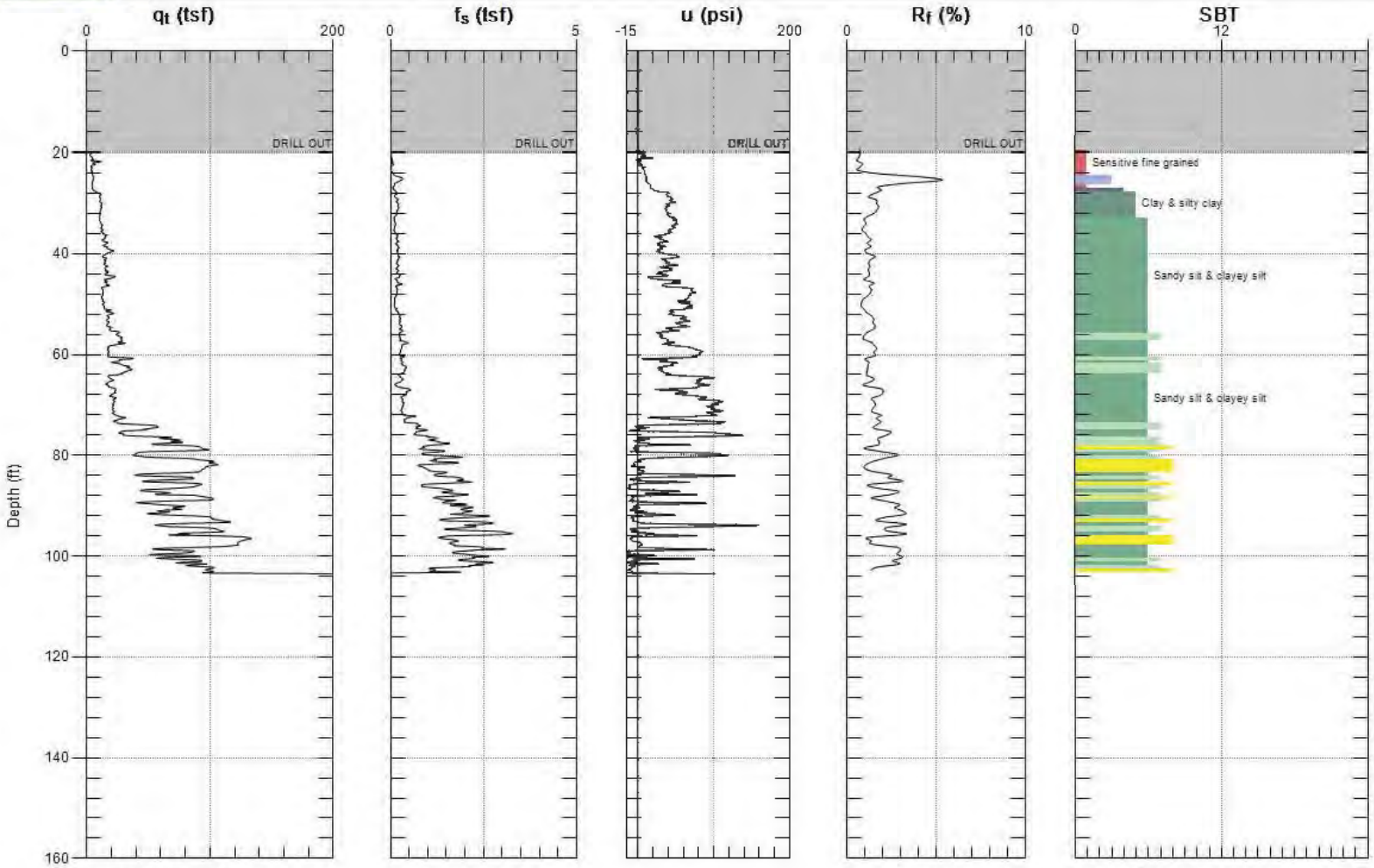
Max. Depth: 104.823 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-14

Engineer: R.EDE
Date: 3/28/2008 12:09



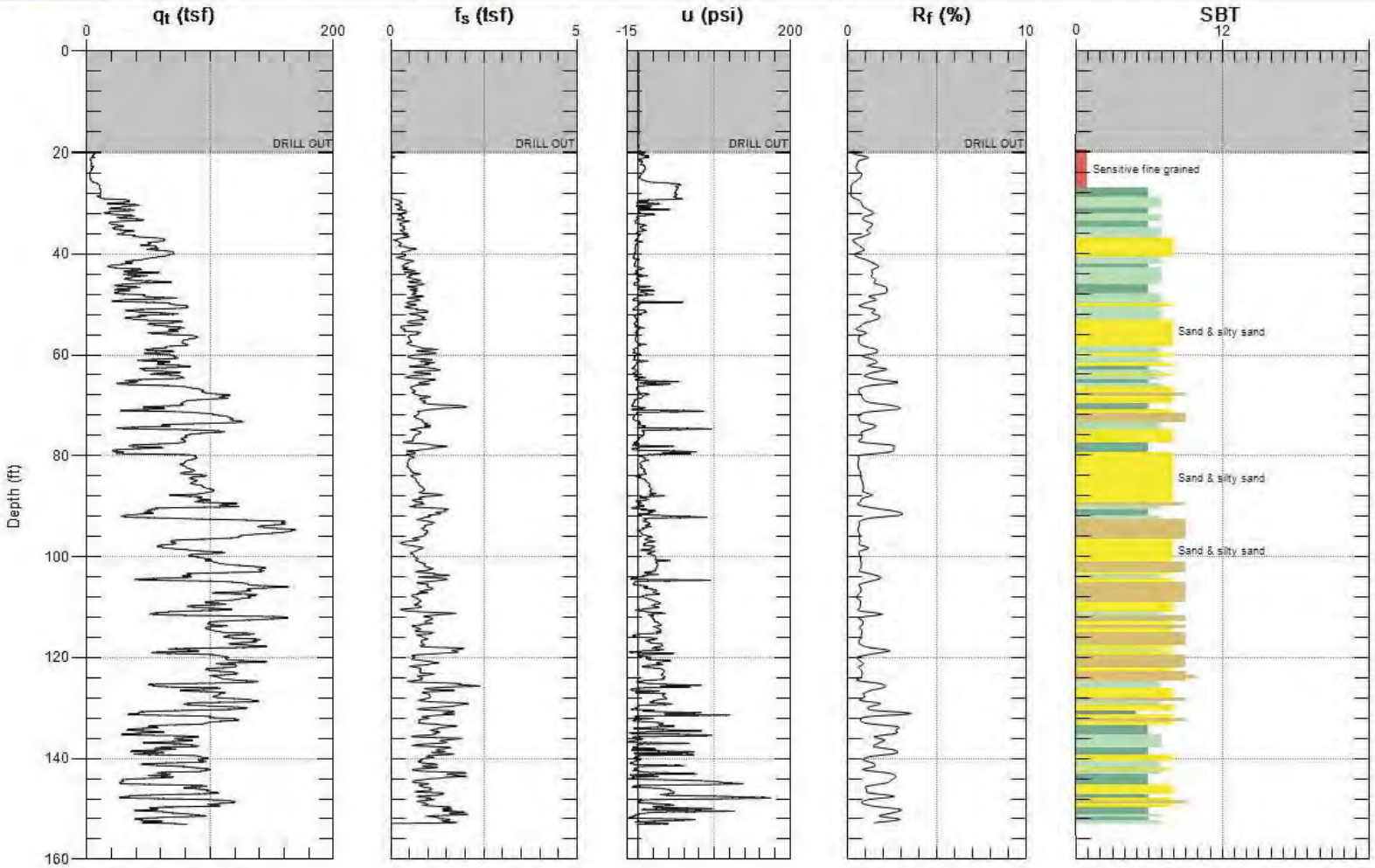
Max. Depth: 103.511 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-15

Engineer: R.EDE
Date: 3/29/2008 12:31



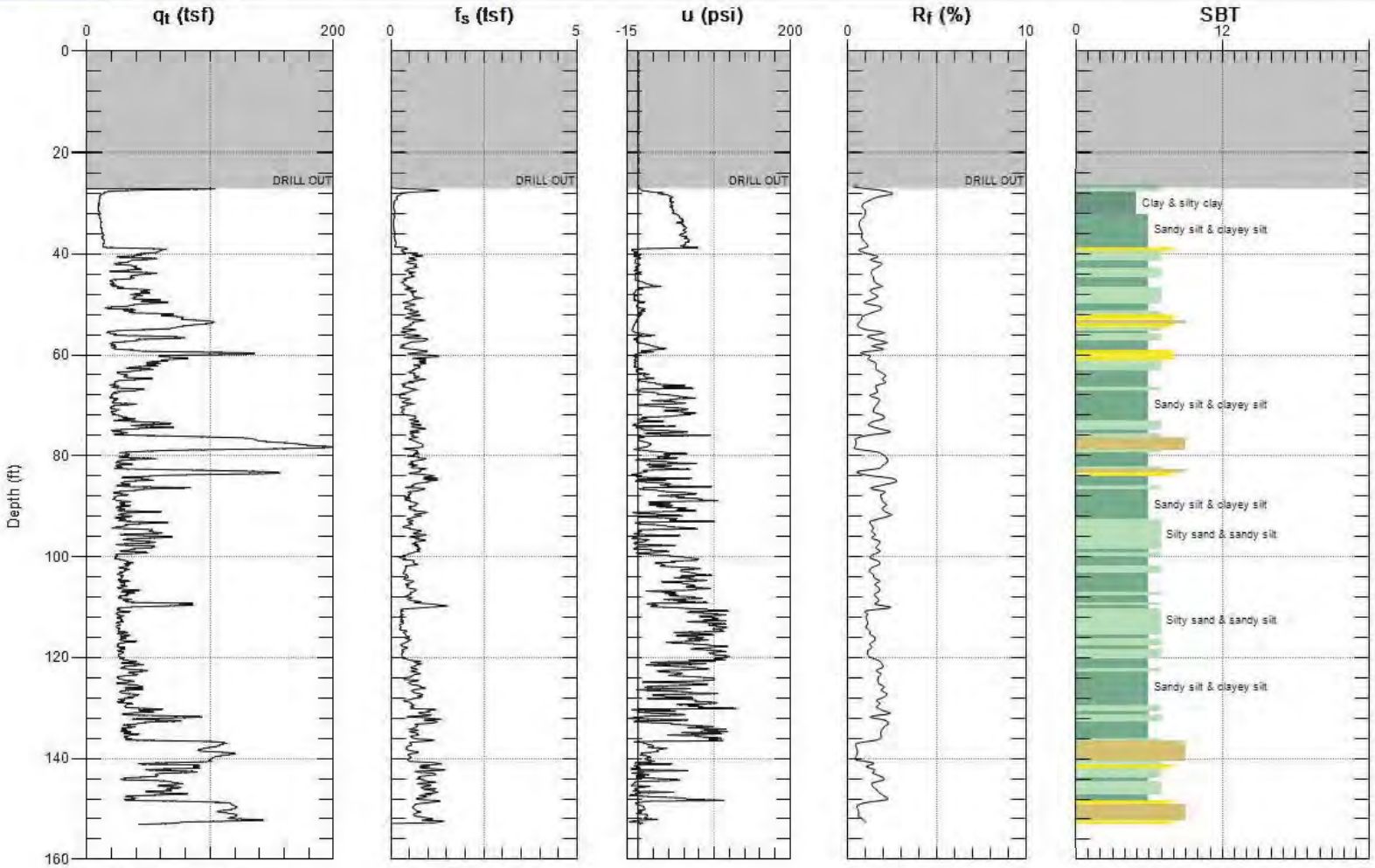
Max. Depth: 153.051 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-16

Engineer: R.EDE
Date: 3/30/2008 10:43



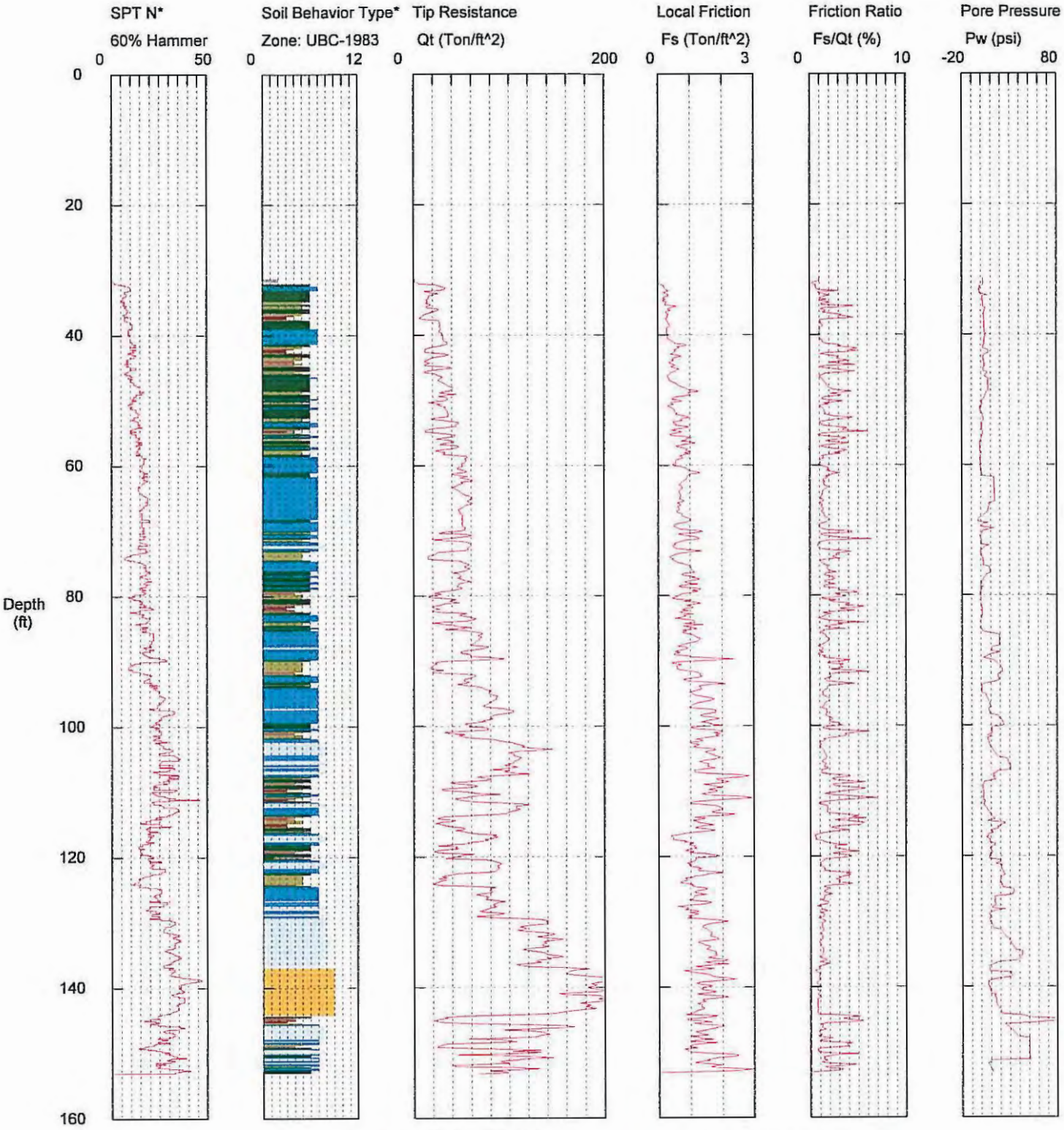
Max. Depth: 153.051 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOC. / TG1S / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO23
Cone Used: 4CH

CPT Date/Time: 09-04-07 12:49
Location: TG1S NW7900ST HR
Job Number: HAHN/5237-41/SIL



Maximum Depth = 153.22 feet

Depth Increment = 0.164 feet

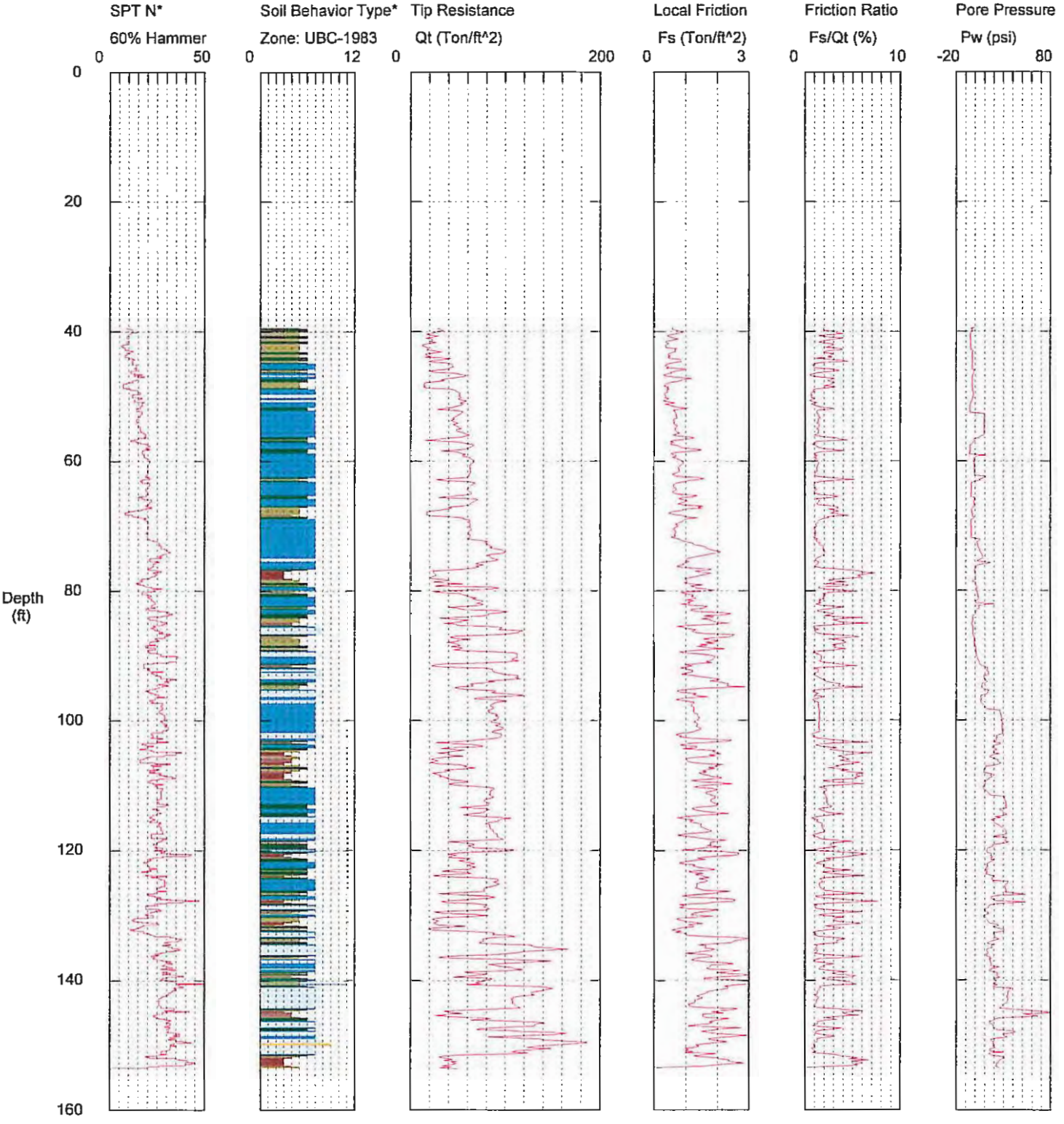
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG2S / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO27
Cone Used: 4CH

CPT Date/Time: 09-06-07 08:30
Location: TG2S NW7900 STHR
Job Number: HAHN/5237-41/SIL



Maximum Depth = 153.54 feet

Depth Increment = 0.164 feet

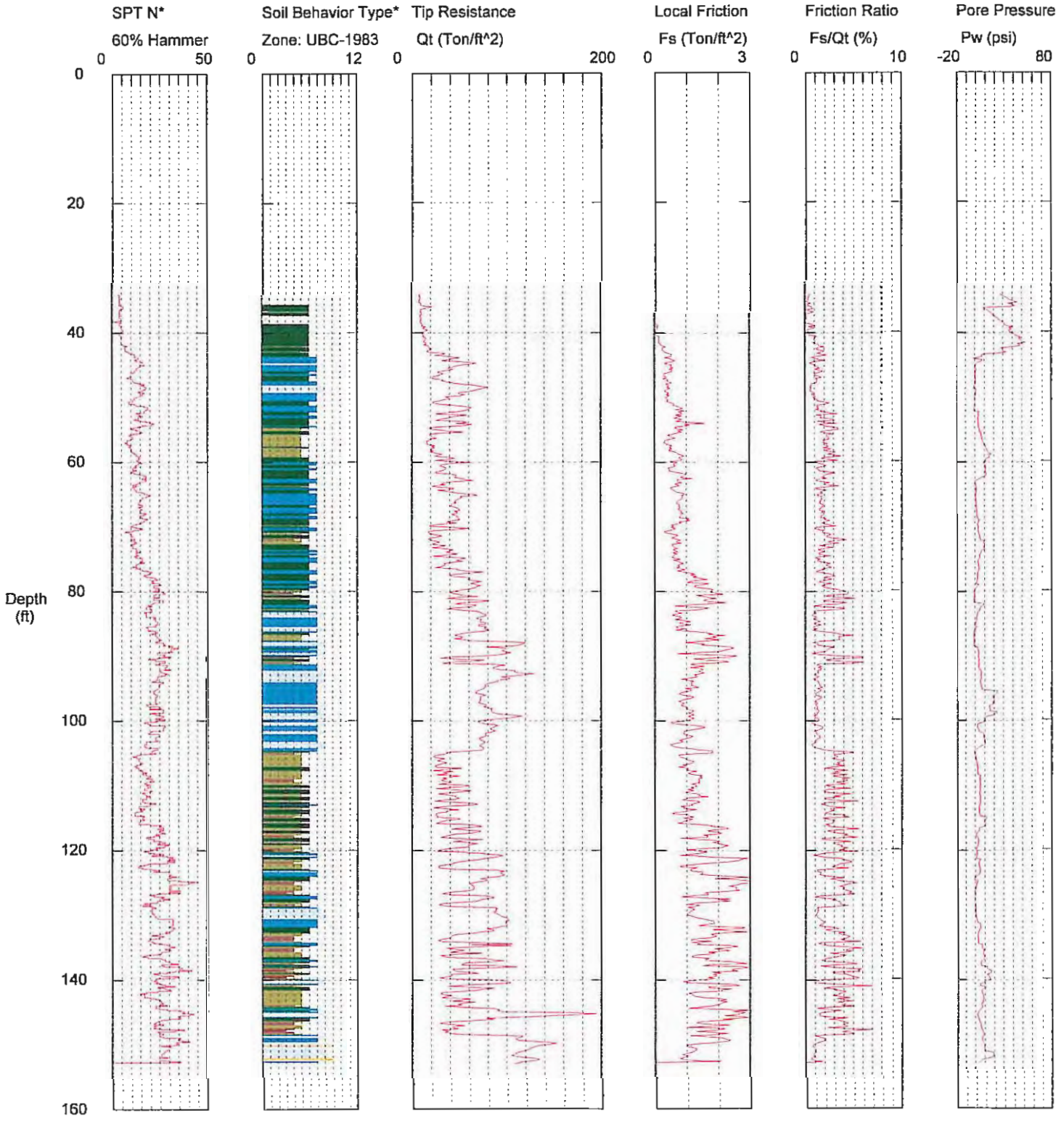
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG3S / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO30
Cone Used: 4CH

CPT Date/Time: 09-07-07 11:36
Location: TG3S NW7900 STHR
Job Number: HAHN/5237-41/SIL



Maximum Depth = 152.89 feet

Depth Increment = 0.164 feet

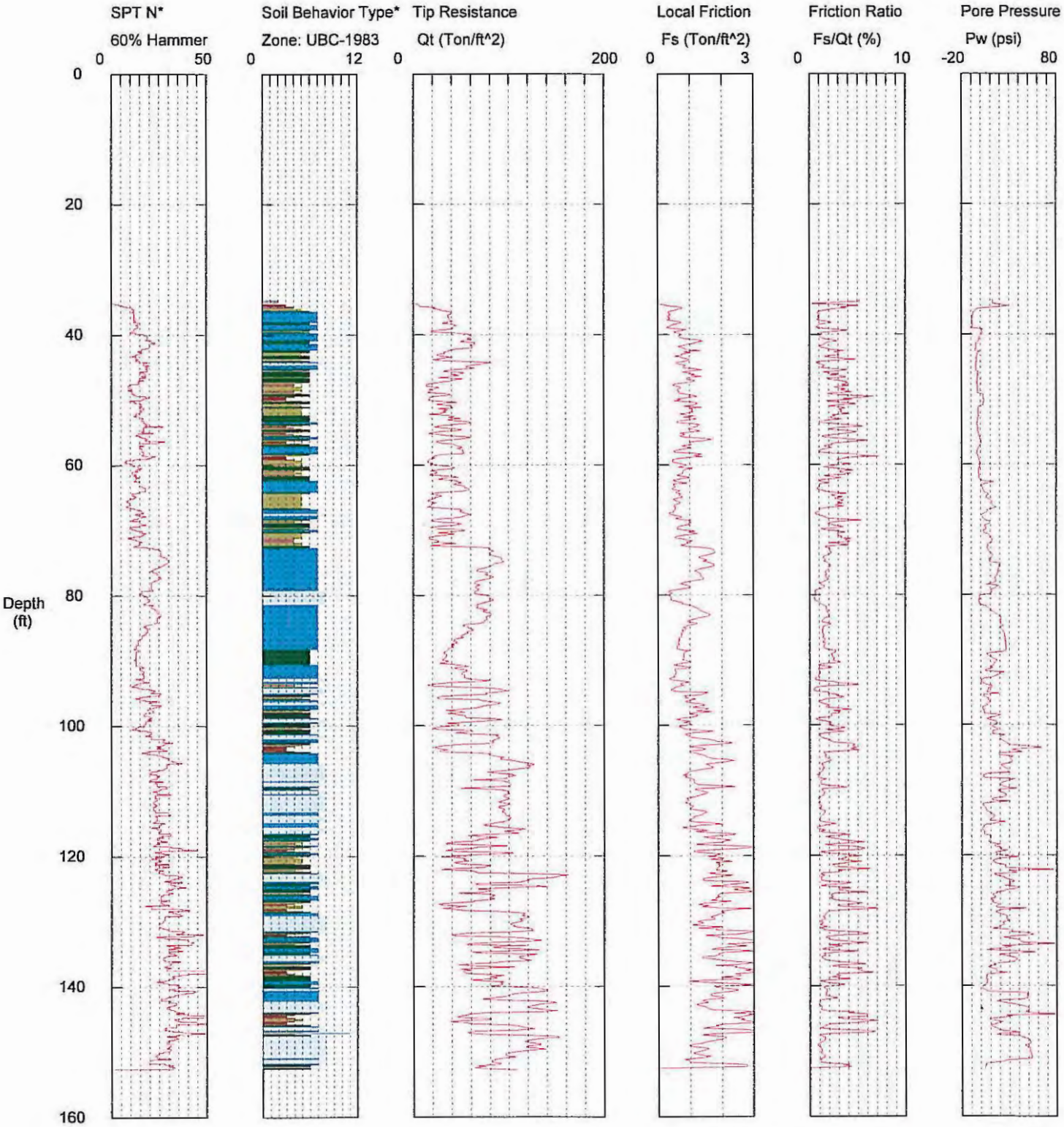
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG4S / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO28
Cone Used: 4CH

CPT Date/Time: 09-06-07 12:52
Location: TG4S NW7900 STHR
Job Number: HAHN/5237-41/SIL



Maximum Depth = 152.72 feet

Depth Increment = 0.164 feet

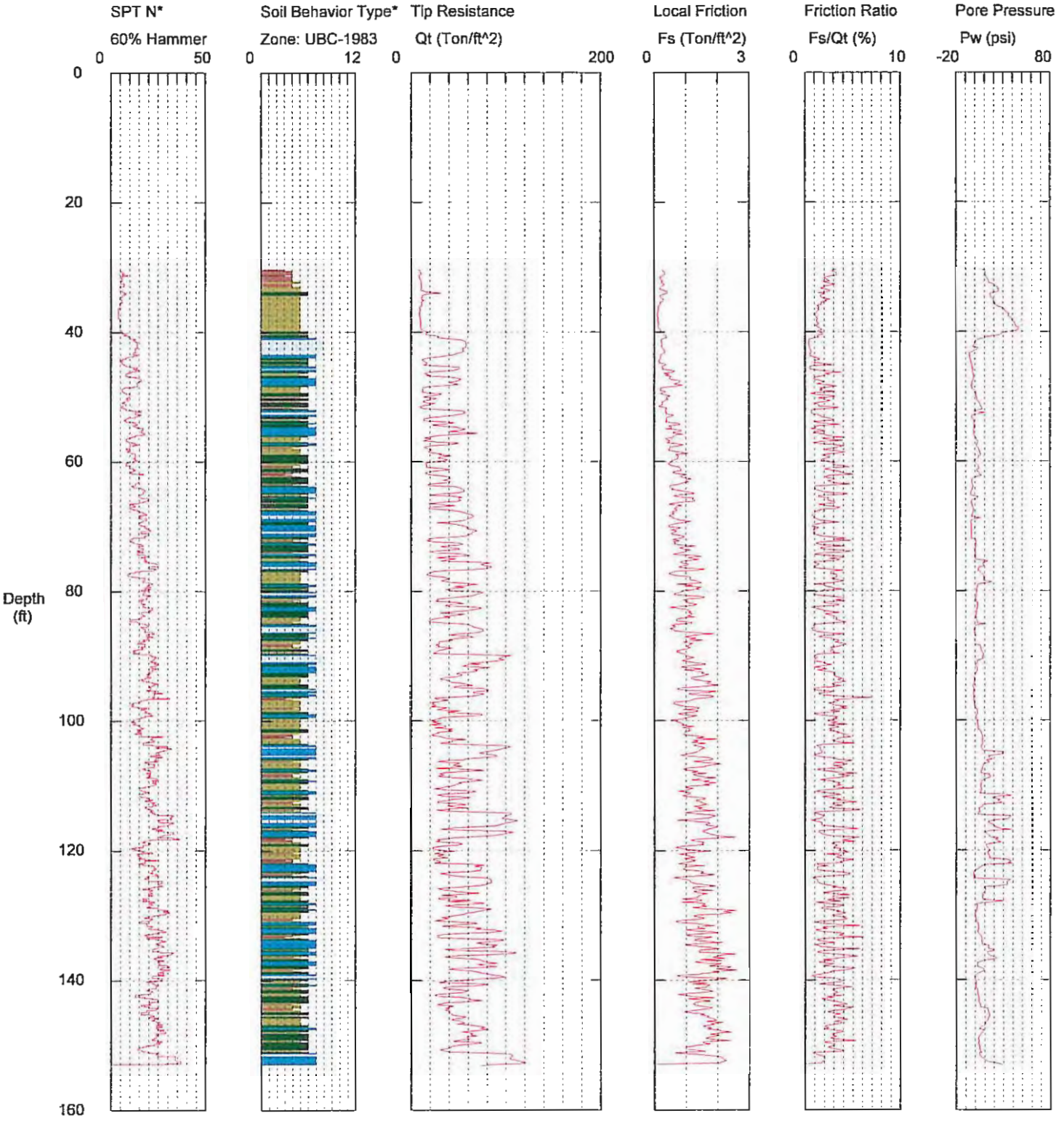
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / TG5S / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO25
Cone Used: 4CH

CPT Date/Time: 09-05-07 11:05
Location: TG5S NW7900 STHR
Job Number: HAHN/5237-41/SIL



Maximum Depth = 153.05 feet

Depth Increment = 0.164 feet

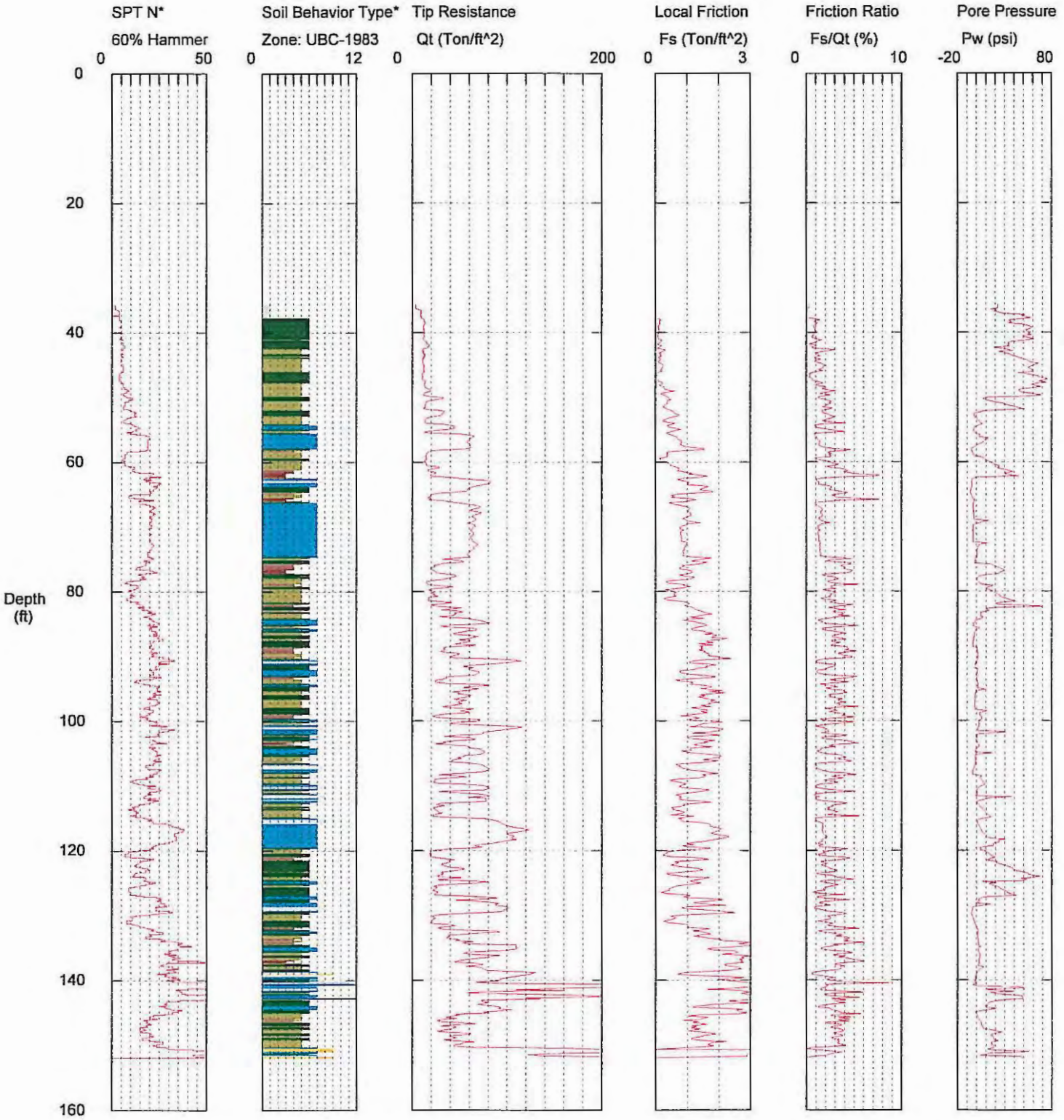
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOC. / T6S / NW 7900 ST HELENS RD

Operator: JSP/SVAN/VAN EXP
Sounding: FILO29
Cone Used: 4CH

CPT Date/Time: 09-07-07 07:05
Location: TG6S NW7900 STHR
Job Number: HAHN/5237-41/SIL



Maximum Depth = 152.07 feet

Depth Increment = 0.164 feet

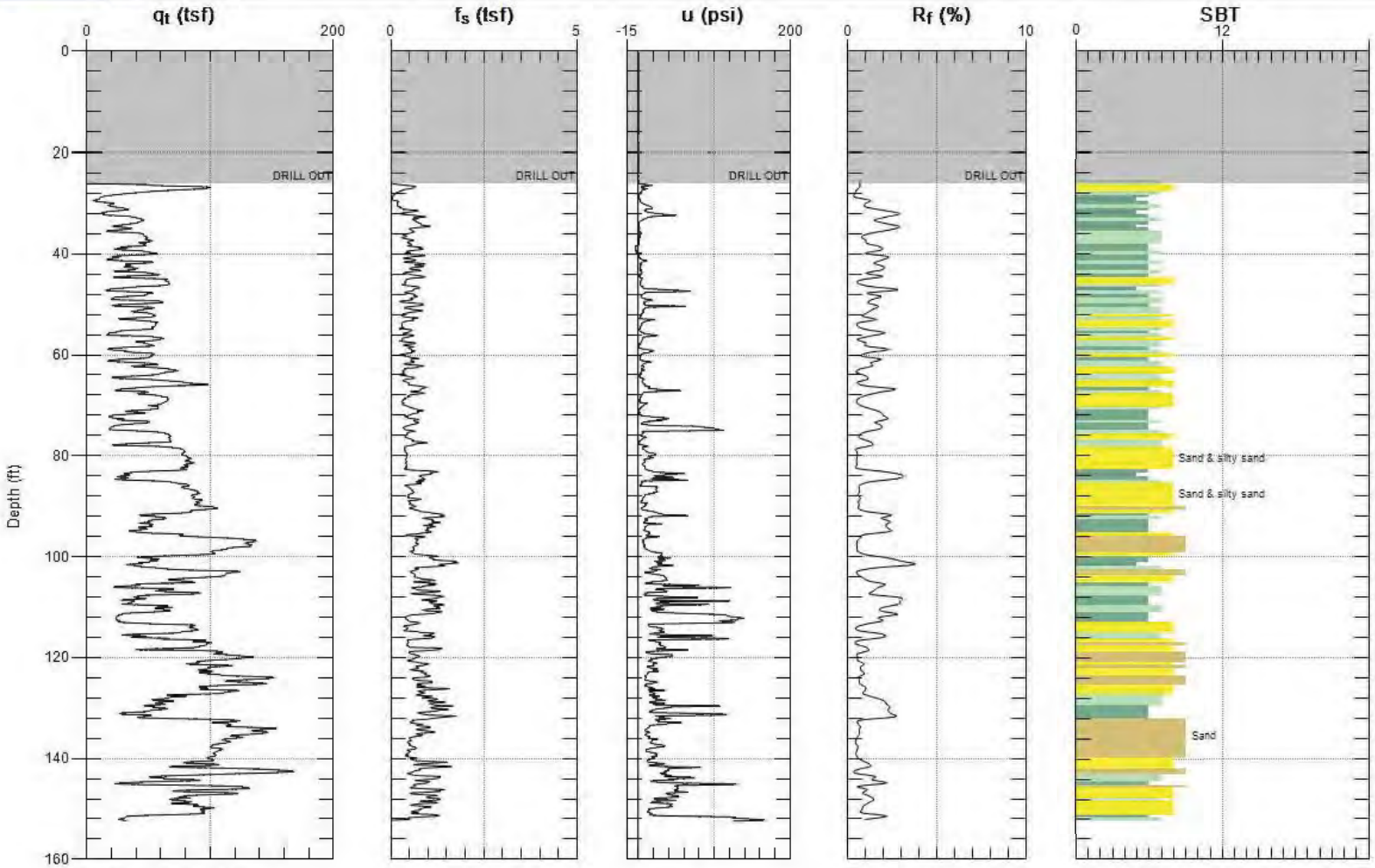
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-7S

Engineer: R.EDE
Date: 3/26/2008 09:31



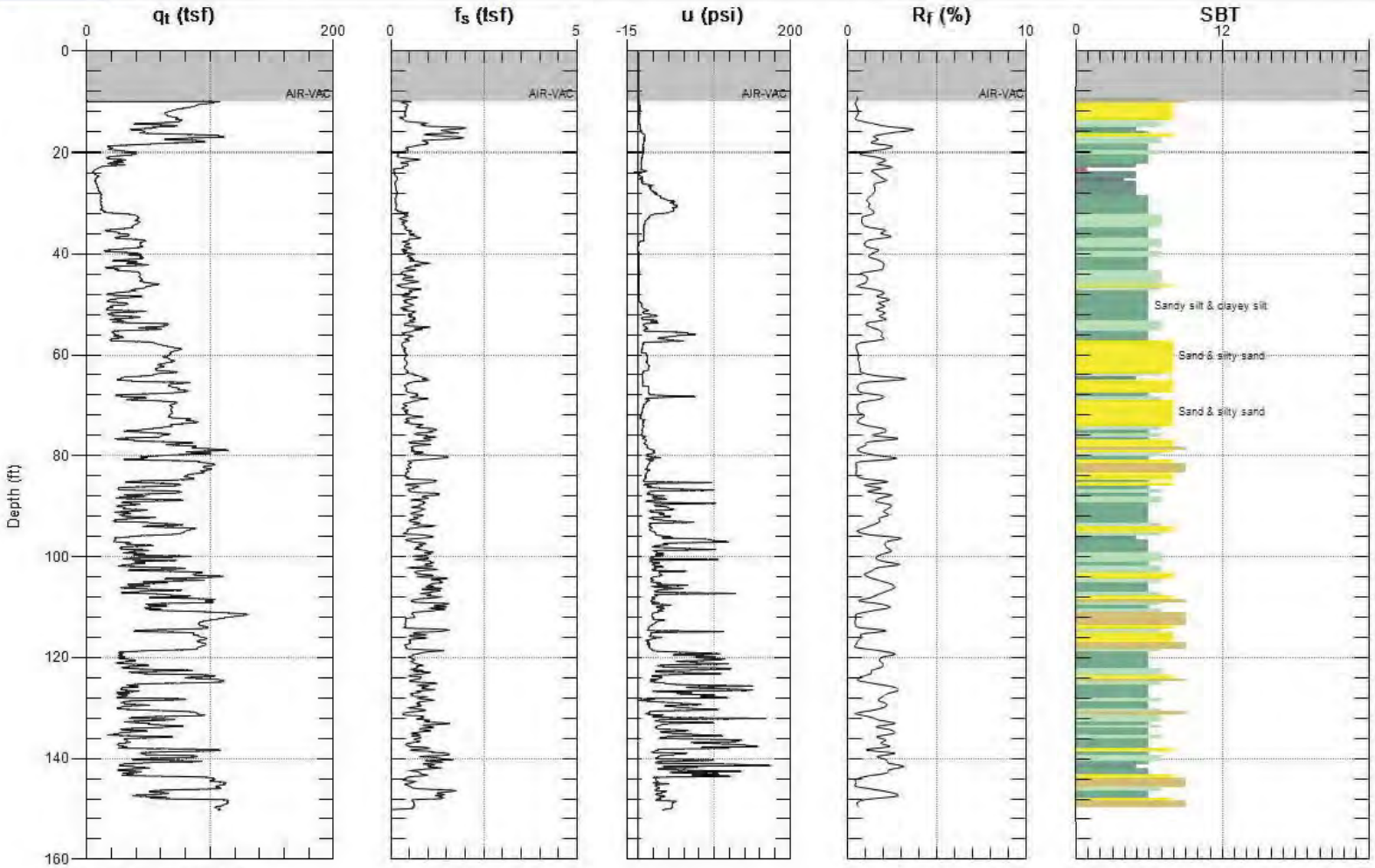
Max. Depth: 152.395 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-8S

Engineer: R.EDE
Date: 3/25/2008 11:22



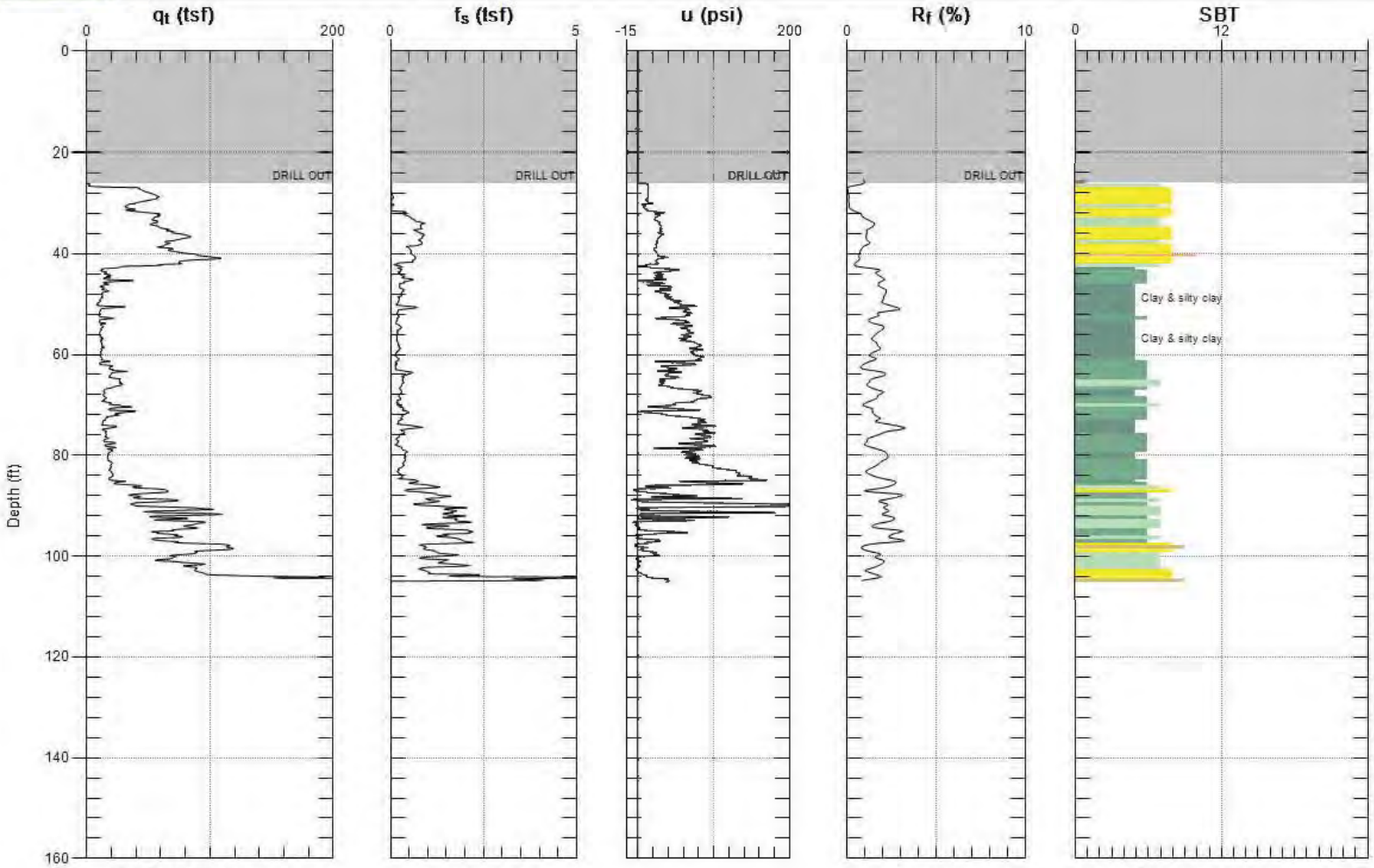
Max. Depth: 150.262 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-9S

Engineer: R.EDE
Date: 3/26/2008 11:56



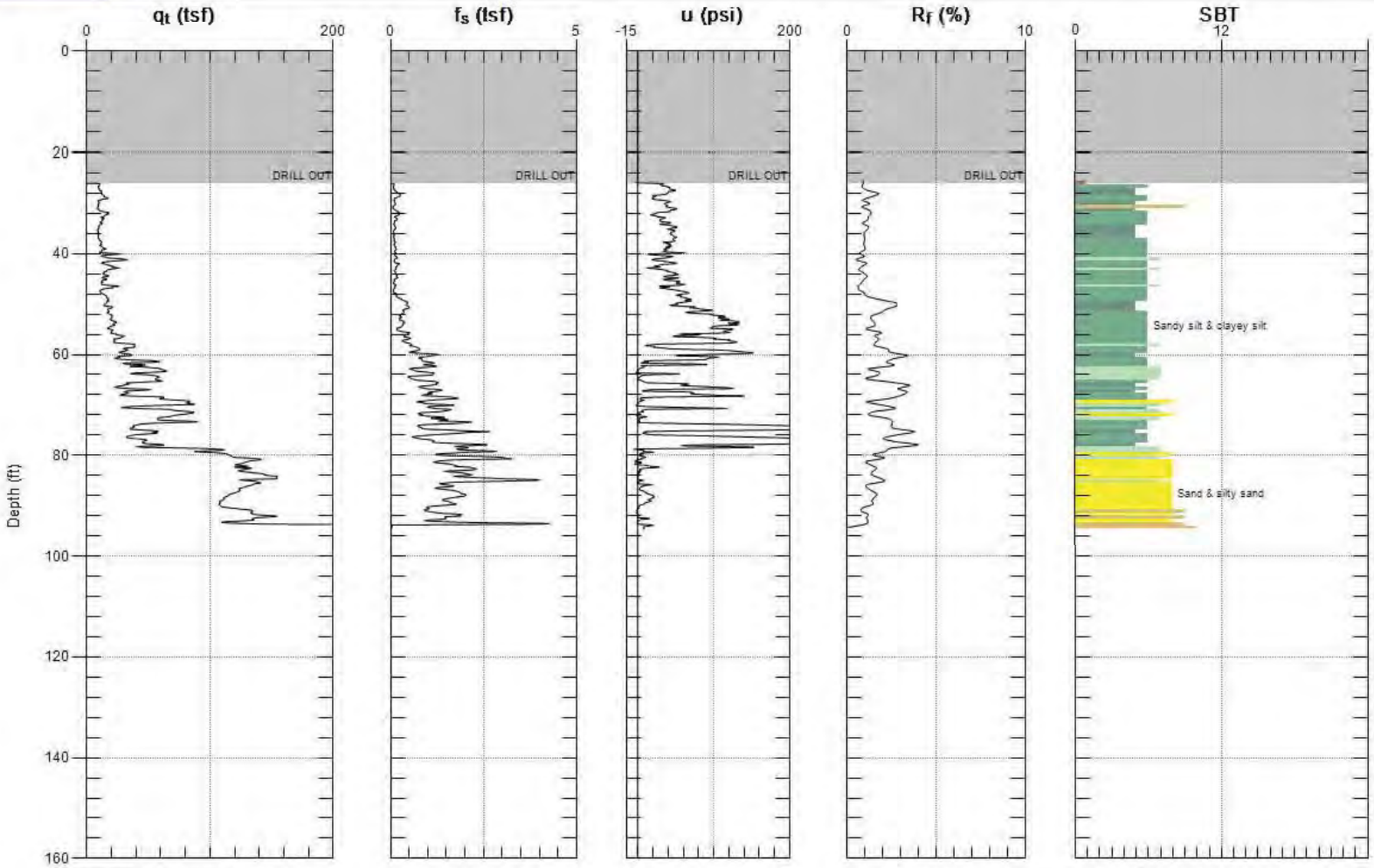
Max. Depth: 105.151 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-10S

Engineer: R.EDE
Date: 3/26/2008 03:03



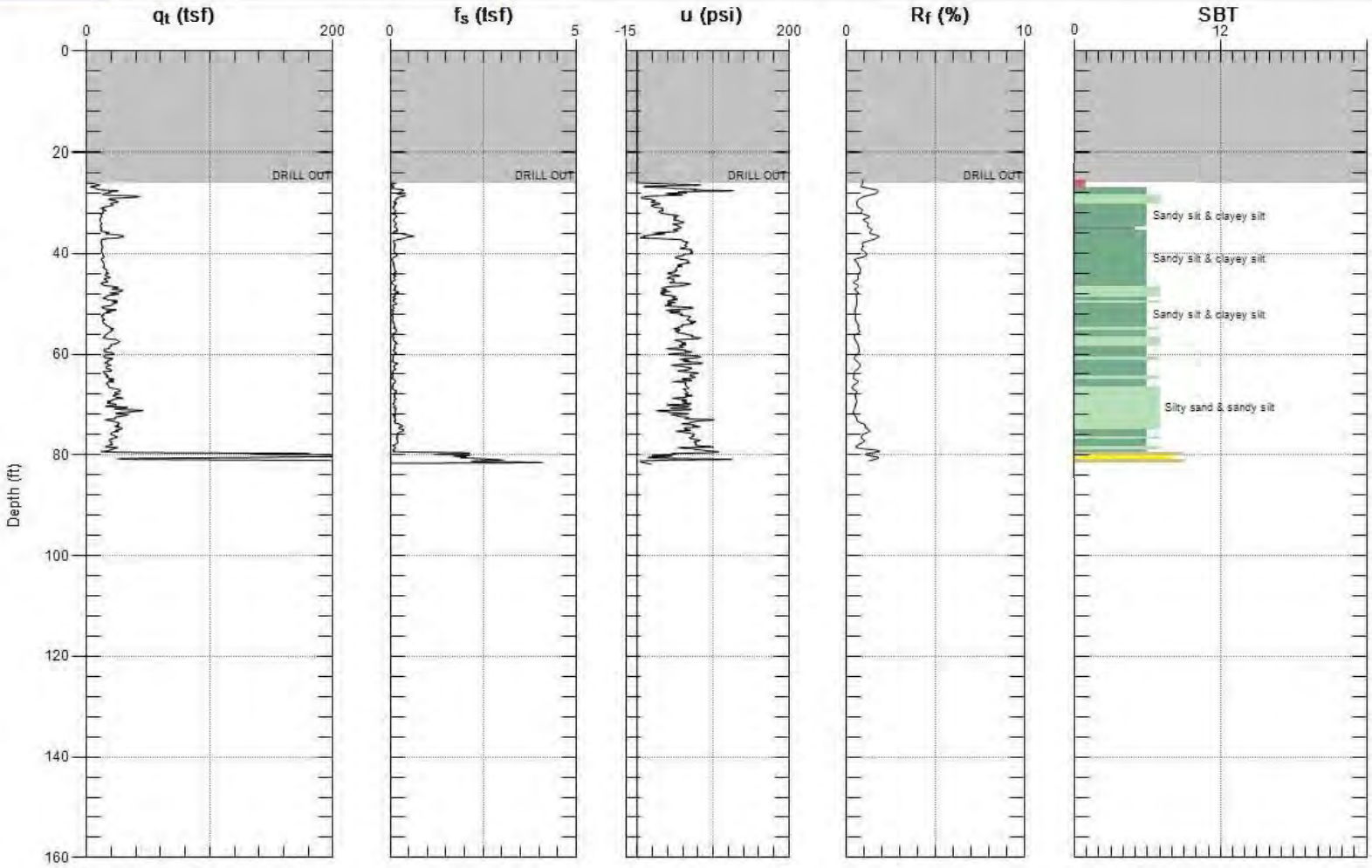
Max. Depth: 94.652 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-11S

Engineer: R.EDE
Date: 3/26/2008 04:56

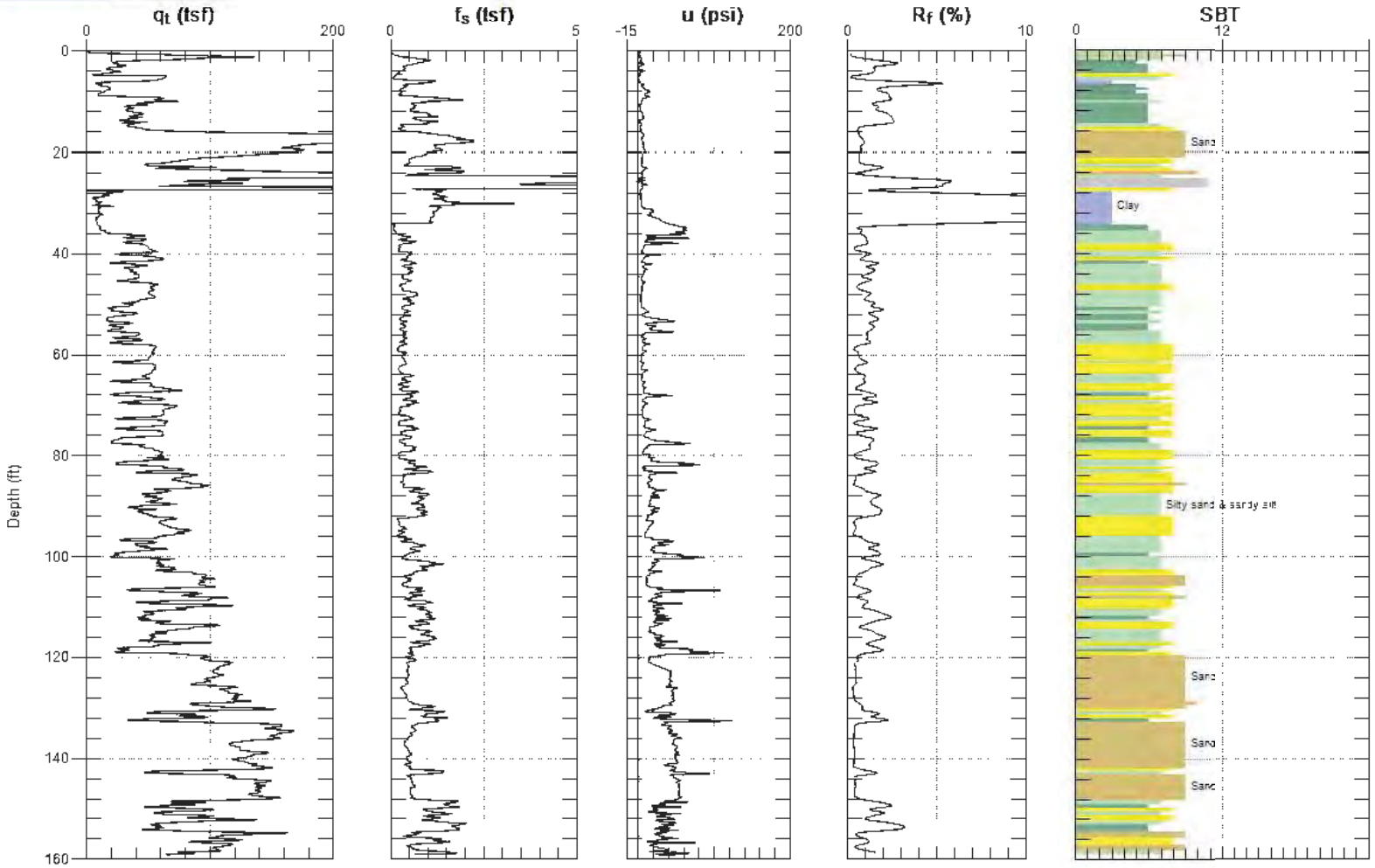


Max. Depth: 81.857 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

HAHN & ASSOCIATES

Site: GASCO - TARGOST
Sounding: TG-12S
Engineer: R.EDE
Date: 3/27/2008 09:27



Max. Depth: 159.121 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: **SB-01**

Site Location: US Moorings	Drill Rig Type: Geoprobe 7720DT	Drill Method: DPT
Location Description:		
Establishing Company: TEC Inc.	Geologist: Shawn MacMillan	Drilling Company: Cascade Drilling Co.
Drilling Foreman: Mark Chalona	Ground Surface Elevation:	Datum:
Sampling Device: Macro Core w/ liners	Borehole Diameter (inches): 2.25"	Total Depth (Feet): 20' bgs
Date/Time Drilling Started: 3/7/2008 0858	Date/Time Total Depth Reached: 3/7/2008 1045	

Depth (Feet)	Sampling: % Recovery	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID (ppm)	USCS	Lithologic Code	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
1 2 3 4	75%	X	na	0.0	GP		0-1' Asphalt 1'-4' Gravel fill w/ sand and fines, gray (Gley1 5/N), dry, soft, loose, non-plastic 70% gravel 20% sand 10% fines.	0858
5 6 7 8	50%	X	na	0.0	SW		Poorly graded sand w/ fines, fine to medium grained, very dark brown (7.5YR 2.5/2), dry, loose to medium dense, well sorted, subrounded, 90% sand, 10% fines.	0920
9 10 11 12	70%	X	na	0.0	GM-SW		8'-10' Gravel fill w/ sand and fines, gray (Gley1 5/N), dry, soft, loose, non-plastic 70% gravel 20% sand 10% fines. 10'-12' Poorly graded sand w/ fines, fine to medium grained, very dark brown (7.5YR 2.5/2), wet, loose to medium dense, well sorted, subrounded, 90% sand, 10% fines	0942 ▼ N
13 14 15 16	0%						No Recovery	1015
17 18 19 20	75%	X	na	0.0	CH		Silty clay, black (Gley1 2.5/N), wet, soft, non to low plasticity, 100% fines.	1045

Notes:

▼ = Estimated water level from soil core.

N = Estimated native soil interface.

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: **SB-07**

Site Location: US Moorings	Drill Rig Type: Geoprobe 7720DT	Drill Method: DPT
Location Description:		
Establishing Company: TEC Inc.	Geologist: Shawn MacMillan	Drilling Company: Cascade Drilling Co.
Drilling Foreman: Mark Chalona	Ground Surface Elevation:	Datum:
Sampling Device: Macro Core w/ liners	Borehole Diameter (inches): 2.25"	Total Depth (Feet): 28' bgs
Date/Time Drilling Started: 3/5/2008 1358	Date/Time Total Depth Reached: 3/5/2008 1505	

Depth (Feet)	Sampling: % Recovery	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID (ppm)	USCS	Lithologic Code	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
1 2 3 4	75%	X	na	0.0	SW		0-8" Asphalt Poorly graded sand w/ fines, fine to medium grained, very dark brown (7.5YR 2.5/2), dry, loose to medium dense, well sorted, subrounded, 90% sand, 10% fines.	1358
5 6 7 8	65%	X	na	0.0	SW		Poorly graded sand w/ fines, fine to medium grained, very dark brown (7.5YR 2.5/2), dry, loose to medium dense, well sorted, subrounded, 90% sand, 10% fines. ~6" of gravel at 5' bgs ~6" of clay at 6' bgs	1400
9 10 11 12	40%	X	na	0.0	SW		Silty sand, very fine to fine grained, very dark brown (7.5YR 2.5/2), moist, loose to medium dense, well sorted, subrounded, 80% sand, 20% fines.	1427 N ▼
13 14 15 16	75%	X	na	0.0	SW-CH		12'-14' Silty sand, very fine to fine grained, very dark brown (7.5YR 2.5/2), wet, loose to medium dense, well sorted, subrounded, 80% sand, 20% fines. 14'-16' Fat clay, black (Gley1 2.5/N), wet, firm, medium to high plasticity, 100% fines w/organic matter <5%.	1445
17 18 19 20	85%		na	0.0	CH		Fat clay, black (Gley1 2.5/N), wet, firm, medium to high plasticity, 100% fines w/organic matter <5%.	1457
21 22 23 24	90%		na	0.0	CH		Fat clay, black (Gley1 2.5/N), wet, firm, medium to high plasticity, 100% fines w/organic matter <5%.	1505
25 26 27 28	90%		na	0.0	CH		Fat clay, black (Gley1 2.5/N), wet, firm, medium to high plasticity, 100% fines w/organic matter <5%.	1525

Notes:

▼ = Estimated water level from soil core.

N = Estimated native soil interface.

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: **SB-11**

Site Location: US Moorings	Drill Rig Type: Geoprobe 7720DT	Drill Method: DPT
Location Description:		
Establishing Company: TEC Inc.	Geologist: Shawn MacMillan	Drilling Company: Cascade Drilling Co.
Drilling Foreman: Mark Chalona	Ground Surface Elevation:	Datum:
Sampling Device: Macro Core w/ liners	Borehole Diameter (inches): 2.25"	Total Depth (Feet): bgs
Date/Time Drilling Started:	Date/Time Total Depth Reached:	

Depth (Feet)	Sampling: % Recovery	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID (ppm)	USCS	Lithologic Code	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
1 2 3 4	75%	X	na	0.0	SW		0-5" Asphalt Poorly graded sand w/ fines, fine to medium grained, very dark brown (7.5YR 2.5/2), dry, loose to medium dense, well sorted, subrounded, 90% sand, 10% fines.	Hand Auger 1300
5 6 7 8	50%	X	na	0.0	GM		Gravel fill w/ sand and fines, gray (Gley1 5/N), dry, soft, loose, non-plastic 70% gravel 20% sand 10% fines.	1338
9 10 11 12	75%	X	na	0.0	GC		Clave gravel, dark gray (Gley1 2.5/N),dry, soft loose, non-plastic 90% gravel 10%fines.	1400 ▼ N
13 14 15 16	100%	X	na	0.0	SM		Silty clay, black (Gley1 2.5/N), wet, soft, non to low plasticity, 100% fines.	1425
17 18 19 20	100%		na	0.0	CH		Fat clay, black (Gley1 2.5/N), wet, firm, medium to high plasticity, 100% fines w/organic matter <5%.	1445

Notes:

▼ = Estimated water level from soil core.

N = Estimated native soil interface.

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: **SB-12**

Site Location: US Moorings	Drill Rig Type: Geoprobe 7720DT	Drill Method: DPT
Location Description:		
Establishing Company: TEC Inc.	Geologist: Shawn MacMillan	Drilling Company: Cascade Drilling Co.
Drilling Foreman: Mark Chalona	Ground Surface Elevation:	Datum:
Sampling Device: Macro Core w/ liners	Borehole Diameter (inches): 2.25"	Total Depth (Feet): bgs
Date/Time Drilling Started: 3/8/2008 1333	Date/Time Total Depth Reached: 3/8/2008 1455	

Depth (Feet)	Sampling: % Recovery	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID (ppm)	USCS	Lithologic Code	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
1 2 3 4	75%	X	na	0.0	SW		0-5" Asphalt Poorly graded sand w/ fines, fine to medium grained, very dark brown (7.5YR 2.5/2), dry, loose to medium dense, well sorted, subrounded, 90% sand, 10% fines.	1300
5 6 7 8	65%	X	na	0.0	SW		Poorly graded sand, fine to medium grained, dark reddish brown (5YR 3/3), moist, loose to meduim dense, well sorted, subrounded, 90% sand, 10% fines.	1347
9 10 11 12	75%	X	na	0.0	SW		Well graded sand, fine to medium grained, black (Gley1 2.5/N), wet, loose to medium dense, well sorted, subrounded, 100% sand, <5% fines.	1400 ▼ N
13 14 15 16	75%	X	na	0.0	SW		Poorly graded sand, fine to medium grained, black (Gley1 2.5/N), wet, loose to medium dense, well sorted, subrounded, 100% sand, <5% fines.	1450
17 18 19 20	100%		na	0.0	CH		Fat clay, black (Gley1 2.5/N), wet, firm, medium to high plasticity, 100% fines w/organic matter <5%.	1455

Notes:

▼ = Estimated water level from soil core.

N = Estimated native soil interface.

GEOLOGIC BOREHOLE LOG

Borehole (Location) ID: **SB-16**

Site Location: US Moorings	Drill Rig Type: Geoprobe 7720DT	Drill Method: DPT
Location Description: SB-16		
Establishing Company: TEC Inc.	Geologist: Shawn MacMillan	Drilling Company: Cascade Drilling Co.
Drilling Foreman: Mark Chalona	Ground Surface Elevation:	Datum:
Sampling Device: Macro Core w/ liners	Borehole Diameter (inches): 2.25"	Total Depth (Feet): 20' bgs
Date/Time Drilling Started: 3/9/08 0900	Date/Time Total Depth Reached: 3/9/08 1020	

Depth (Feet)	Sampling: % Recovery	Sampling: Sample Depth	Sampling: Blow Counts	Sampling: PID (ppm)	USCS	Lithologic Code	Lithology Description: SOIL TYPE, modifiers/grain size, sorting, color, cement/ lithification, moisture content, porosity, permeability/fracturing	Remarks: Drilling Problems, Equipment, Water levels, Weather, Time
1 2 3 4	75%	X	na	0.0	SW		0-8" Concrete 8"-1.5' Cobble gravel fill with metal scraps <4" 1.5'-4' Poorly graded sand w/fines, medium to coarse grained, dark brown - black (7.5YR3/4 - Gley1 2.5/N), dry, medium dense, well sorted, subrounded, 90% sand, 10% fines, (thin grease/tar layer <2cm thick making up <1% of sample).	Hand Auger 0910
5 6 7 8	65%	X	na	0.0	SW		Poorly graded sand w/ fines, fine to medium grained, very dark brown (7.5YR 2.5/2), dry, loose to medium dense, well sorted, subrounded, 90% sand, 10% fines.	0925
9 10 11 12	75%	X	na	0.0	SC		8' - 10.5' Poorly graded Sand w/ fines, medium to coarse grained, strong brown (7.5YR 5/6), moist, medium dense, well sorted, subrounded 90% sand, 10% fines. 10.5' - 12' Poorly graded Sand w/ fines and gravel, medium to coarse grained, dark brown (7.5YR 3/3), wet, medium dense, well sorted, subrounded 90% sand, 10% fines.	0950 N ▼
13 14 15 16	100%	X	na	0.0	SW		Poorly graded sand, fine to medium grained, black (Gley1 2.5/N), wet, loose to medium dense, well sorted, subrounded, 100% sand, <5% fines.	1005
18 19 20	100%	X	na	0.0	SW CH		16' - 18.5' Poorly graded Sand w/ fines, very fine to fine grained, black (Gley 2.5/N), wet, loose, well sorted, subrounded 95% sand, 5% fines w/organic matter. 18.5' - 20' Slity clay, black (Gley1 2.5/N), wet, firm, medium plasticity, 100% fines	1020

Notes:

▼ = Estimated water level from soil core.

N = Estimated native soil interface.

Maul Foste & Alongi, Inc.

Geologic orehole Log/Well Const uctionr

Project NumberG	Well NumberG	SheetG
8128.01.12s	WS44-29s	1 of 2s

Project NameG	Siltronic Corporation - Fill Zone Monitoring Well Installations	TOC Elevation (feet)G	NAs
Project LocationG	7200 NW Front Avenue, Portland, Oregon 97210s	Surface Elevation (feet)G	NAs
Start/End DateG	8/16/13 to 8/16/13s	NorthingG	
Driller/EquipmentG	Cascade Drilling/Geoprobe 7720 DTs	EastingG	
Geologist/EngineerG	K. Titkemeiers	Hole Depth	35.0-feets
Sample MethodG	Direct Pushs	Outer Hole DiamG	4.5-inchs

Depth (feet, BGS)G	WellG DetailsG	IntervalG	Percent RecoveryG	Collection MethodG	Sample DataG NumberG	Name (Type)G	Blows/6"G	Lithologic ColumnG	Soil DescriptionG
1G, 2G, 3G, 4G, 5G, 6G, 7G, 8G, 9G			0s	GRABs					0 - 10.0 feetGair knifed, logged by downhole observation. AppearsGto be SANDY GRAVEL; brown; grades to SANDGND, dry; then grades to GRAVELLY SGND; brown; dry. (Fill)G
10G, 11G			90%s	GPs		PID = 12.s s	ms		10.0 to 11.5 feetGSGNDY GRGVEL (GP); very dark grayish brown. 60-70% fine to medium gravel; 30-40% fine to medium sand; dry to damp. (Fill)G
12G, 13G, 14G									11.5 to 15.0 feetGGRGVELLY SGND (SP); very dark grayish brown; 70-90% fine to medium sand; 10-30% fine to medium gravel; trace coarse sand; loose; dry to damp; micaceous; gravelGsand ratio varies with depth. (Fill)G
15G, 16G			90%s	GPs		PID = 13.0 s	ms		15.0 to 15.8 feetGSILTY SGND (SM); very dark gray; 55% very fine to fine sand; 45% non- to low-plasticity fines; trace wood debris; medium dense; dry to damp; micaceous. (Fill)G
									15.8 to 16.1 feetGSGND (SP); very dark grayish brown; fine to medium sand; trace fine gravel; loose; dry to damp. (Fill)G
17G, 18G									16.1 to 16.4 feetGSGND (SP); black; fine to medium sand; trace coarse sand and fine gravel; dense; damp; stained; slightly tacky;G strong hydrocarbon-like odor; blue sheen when wet; micaceous. (Fill)G
19G									16.4 to 17.2 feetGGRGVELLY SGND (SP); very dark grayish brown; 60% fine to medium sand; 40% fine to medium gravel; loose; dry to damp; mild hydrocarbon-like odor. (Fill)
									@ 17.0 feetGTrace cobble.G
20G									17.2 to 19.0 feetGSGND (SP); very dark grayish brown; 90-95% fine toG

NOTES:4s1. bgs = below ground surface. 2. GP = Geoprobe macro core sampler. 3. PID = photo ionization detector, soil head space reading in parts per million. 4.G ppm = parts per million. 5. PVC = poly vinyl chloride. 6. TOC = top of casing. 7. Depths are relative to feet below ground surface. 8. 2-inch diameter 5-footG long direct-push macro sampler. 9. NAPL = Non-aqueous phase liquid. 10. No groundwater encountered.G

Maul Foste & Alongi, Inc.

Geologic orehole Log/Well Const uction

Project Number	Well Number	Sheet
8128.01.12	WS44-29	2 of 2

Depth (feet, BGS)	Well Details	Interval	Percent Recovery	Collection Method	Sample Number	Name (Type)	Blows/6"	Lithologic Column	Soil Description
			90%	GP		PID = 14.5 ppm			medium sand; 5-10% fine to coarse gravel; loose; dry to damp; very mild hydrocarbon-like odor. (Fill)
21									19.0 to 20.0 feet: GRAVELLY SANDY SILT (ML); very dark gray; 60% low to medium plasticity fines; 30% fine to coarse sand; 10% fine to coarse gravel; trace wood fragments; damp; mild hydrocarbon-like odor. (Fill)
22									@ 19.6 feet: Cobble.
									@ 19.7 feet: Thin copper wire.
23									20.0 to 23.0 feet: SILTY SAND (SM); very dark gray; 75% fine to medium sand; 15% fines; 10% fine to medium gravel; loose to medium dense; damp to moist; silt lenses. (Fill)
24						WSs -S-2s-26			@ 21.0 feet: Copper wire and copper piece.
						WSs -S-2s-29			@ 21.5 feet: Large wood fragment.
25			120%	GP		PID = 4.9 ppm			23.0 to 26.0 feet: CLAYEY GRAVEL (GC); very dark brown; 55% fine to coarse gravel; 35% clay; 10% fine to coarse sand; dense to very dense; damp to moist; sticky; trace rootlets, wood fragments, and brick fragments. (Fill)
26						WSs -S-26-29			@ 23.0 feet: Large wood fragment.
									@ 23.5 feet: Brick fragment.
									@ 24.0 feet: Reddish brown.
27									@ 25.0 to 30.0 feet: Drillers note that material is expansive.
									26.0 to 28.9 feet: SILTY SAND (SP); very dark gray; 55% fine sand; 45% low plasticity fines; moist; SANDY SILT (ML); very dark gray; 55% low plasticity fines; 45% fine sand; moist; alternating layers of SP and ML up to 0.5 feet thick; trace rootlets and wood fragments; micaceous. (Fill)
28									
29									28.9 to 31.5 feet: SANDY SILT (ML); dark gray with reddish brown mottling; 55-60% low- to medium-plasticity fines; 40-45% very fine sand; stiff; damp; micaceous.
30			100%	GP		PID = 5.2 ppm			@ 30.0 feet: Moist to wet.
31									@ 31.0 to 31.3 feet: SILTY SAND; wet; soft to medium stiff.
32									31.5 to 34.5 feet: Alternating 3 inch to 1 foot thick layers of SILTY SAND (SM); very dark gray with reddish brown mottling, grades to very dark brown with depth; 55% fine sand; 45% low plasticity fines; wet; and SANDY SILT (ML); mottled very dark gray and reddish brown grades to very dark brown with depth; 55% low plasticity fines; 45% fine sand; wet; micaceous.
33									
34									
35									34.5 to 35.0 feet: SAND (SP); brown; 95% fine sand; 5% fines; dense; moist; micaceous.

Total Depth = 35 feet below ground surface

Completion Details:

Oregon Water Resources Department Well Start Card: 1020739
Oregon Water Resources Department Well Identification: 111345

Boring:
0.0 to 1.5 feet bgs: Flush mount Sherwood vault and concrete seal.
1.5 to 22.0 feet bgs: Bentonite chips hydrated with potable water.
22.0 to 29.7 feet bgs: 10X20 Colorado silica sand.
29.7 to 35.0 feet bgs: Bentonite chips hydrated with potable water.

Well:
0.8 to 24.4 feet bgs: Schedule 40 PVC blank riser pipe.
24.4 to 29.4 feet bgs: Schedule 40 PVC 0.010 machine slot prepack screen.
29.4 to 29.7 feet bgs: Schedule 40 PVC sump with 3X1/8 inch holes drilled in the bottom for drainage.

NOTES: 1. bgs = below ground surface. 2. GP = Geoprobe macro core sampler. 3. PID = photo ionization detector, soil head space reading in parts per million. 4. ppm = parts per million. 5. PVC = poly vinyl chloride. 6. TOC = top of casing. 7. Depths are relative to feet below ground surface. 8. 2-inch diameter 5-foot long direct-push macro sampler. 9. NAPL = Non-aqueous phase liquid. 10. No groundwater encountered.

Maul Foste & Alongi, Inc.

Geologic orehole Log/Well Const uctionr

Project NumberG	Well NumberG	SheetG
8128.01.12s	WS45-23s	1 of 3s

Project NameG	Siltronic Corporation - Fill Zone Monitoring Well Installations	TOC Elevation (feet)G	NAs
Project LocationG	7200 NW Front Avenue, Portland, Oregon 97210s	Surface Elevation (feet)G	NAs
Start/End DateG	8/16/13 to 8/22/13s	NorthingG	
Driller/EquipmentG	Cascade Drilling/Geoprobe 7720 DTs	EastingG	
Geologist/EngineerG	K. Titkemeiers	Hole Depth	40.0-feets
Sample MethodG	Direct Pushs	Outer Hole DiamG	3.25-inchs

Depth (feet, BGS)G	WellG DetailsG	Sample DataG: IntervalG	Percent RecoveryG	Collection MethodG	NumberG	Name (Type)G	Blows/6"G	Lithologic ColumnG	Soil DescriptionG
1G, 2G, 3G, 4G, 5G, 6G, 7G, 8G, 9G, 10G			0s	GRABs					0 to 10.0 feetG Air knifed, logged by downhole observation. Appears toG be SANDY GRAVEL and SAND; brown; dry. (Fill)G
11G, 12G, 13G, 14G, 15G			100%s	GPs		PID = 4.0 s ms			10.0 to 12.0 feetG SILTY SAND (SM); very dark brown grading to very dark gray; 75-85% fine to medium sand; 10-15% fines; 5-10% fine to medium gravel; loose, increasing density with depth to medium dense; damp to moist; micaceous; mild hydrocarbon-like odor. (Fill)G
									12.0 to 15.0 feetG CLAYEY GRAVEL (GC); brown with orange mottling; 70% fine to coarse gravel and cobbles, decreasingG gravel size with depth; 20-25% fines (silt and clay), increasing fines with depth; 5-10% fine to coarse sand; very dense; damp to moist; micaceous; trace rootlets and small wood fragments. (Fill)G
16G, 17G, 18G, 19G, 20G			0%s	GPs		PID = 15.1 s ms			15.0 to 18.0 feetG No recovery.G
						WSs5-S-18-23s			18.0 to 18.3 feetG SINGLE SOLID PIECE OF WOOD.G
									18.3 to 19.3 feetG SANDY GRAVEL (GP); black; 80% fine to coarse gravel and cobbles; 15% fine to coarse sand; 5% fines; moist to damp; possible brick fragments (red porous); some of the gravel-sized material appears to be charred wood; sheen whenG wet; strong hydrocarbon-like odor. (Fill)G

NOTES:4s 1. bgs = below ground surface. 2. GP = Geoprobe macro core sampler. 3. PID = photo ionization detector, soil head space reading in parts per million. 4.G ppm = parts per million. 5. PVC = poly vinyl chloride. 6. TOC = top of casing. 7. Depths are relative to feet below ground surface. 8. 2-inch diameter 5-footG long direct-push macro sampler. 9. NAPL = Non-aqueous phase liquid. 10. No groundwater encountered.G

Maul Foste & Alongi, Inc.

Geologic orehole Log/Well Const uction

Project Number	Well Number	Sheet
8128.01.12s	WS45-23s	2 of 3s

Depth (feet, BGS)	Well Details	Interval	Percent Recovery	Collection Method	Sample Number	Name (Type)	Blows/6"	Lithologic Column	Soil Description
21			90%	GPs		PID = 15.6 ppm			19.3 to 21.0 feet: SAND Y GRAVEL WITH SILT AND CLAY (GP-GM/GC); very dark brown with orange and dark grayish olive mottling; 70% fine to coarse gravel; 20% fine to medium sand; 10% fines; damp; brick fragments; wood fragment; mild hydrocarbon-like odor. (Fill)
22									21.0 to 22.7 feet: SAND WITH SILT (SP-SM); very dark brown; 90% fine to medium sand; 10% fines; moist to wet; micaceous; mild to moderate hydrocarbon-like odor. (Fill)
23									22.7 to 25.0 feet: SILT (ML); dark gray; 80-90% medium plasticity fines; 10-20% very fine sand; moist; trace rootlets; micaceous; strong hydrocarbon-like odor; increasing sheen and trace rootlets with depth. @ 23.3 to 23.7 feet: Very dark gray/black laminations. @ 24.2 feet: Heavy sheen/staining; increase in sand content.
24									
25			80%	GPs		PID = 139.1 ppm			@ 25.0 feet: Veins of tacky/black =SILT (MH); 90-95% medium to high plasticity fines; 5-10% sand.
26									25.0 to 25.2 feet: SAND (SP); very dark gray; 90-95% fine to medium sand; 5-10% fines; trace fine gravel; wet; micaceous; sheen; strong hydrocarbon-like odor.
27									25.2 to 29.7 feet: SILT (ML); very dark gray; 75-95% medium to high plasticity fines (variable throughout); 5-25% very fine to fine sand; moist to wet; micaceous; strong hydrocarbon-like odor; brown staining; sheen; NAPL globules; trace rootlets throughout.
28									
29									
30			100%	GPs		PID = 396 ppm			29.7 to 30.7 feet: SILTY SAND (SM); very dark gray; 70% fine to medium sand; 30% fines; moist to wet; slightly tacky; micaceous; strong hydrocarbon-like odor; brown staining; sheen.
31									@ 30.0 feet: Increase in sand; 75-80% fine to medium sand; 20-25% fines.
32									30.7 to 34.6 feet: SAND (SP); very dark gray; 90% fine sand; 10% fines; wet; strong hydrocarbon-like odor; strong rainbow sheen; brown staining; NAPL globules (abundant, increasing with depth); micaceous; soupy.
33									@ 30.7 to 30.8 feet: SANDY SILT (ML); very dark gray; moist. @ 31.1 to 31.2 feet: SANDY SILT (ML); very dark gray with rust orange mottling; trace roots; moist.
34									@ 32.0 to 32.8 feet: SANDY SILT (ML); very dark gray with rust orange mottling; 60-70% fines; 30-40% very fine to fine sand; moist to wet; micaceous; trace rootlets; sheen; brown staining; NAPL globules; hydrocarbon-like odor.
35			95%	GPs		PID = 611 ppm			34.6 to 35.0 feet: SANDY SILT (ML); very dark gray with rust orange mottling; 60-70% medium plasticity fines; 30-40% very fine to fine sand; micaceous; moist to wet; trace rootlets.
36									35.0 to 38.8 feet: SAND (SP); very dark gray; 90-95% fine to medium sand; 5-10% fines; wet; strong hydrocarbon-like odor; strong rainbow sheen; heavy brown staining; abundant NAPL.
37									
38									
39									38.8 to 40.0 feet: SANDY SILT (ML); dark gray with rust orange mottling; wet; interbedded with SILTY SAND (SM); very dark gray; wet; same sheen/odor/staining as above.
40									

NOTES: 1. bgs = below ground surface. 2. GP = Geoprobe macro core sampler. 3. PID = photo ionization detector, soil head space reading in parts per million. 4. ppm = parts per million. 5. PVC = poly vinyl chloride. 6. TOC = top of casing. 7. Depths are relative to feet below ground surface. 8. 2-inch diameter 5-foot long direct-push macro sampler. 9. NAPL = Non-aqueous phase liquid. 10. No groundwater encountered.

Maul Foste & Alongi, Inc.	Geologic orehole Log/Well Const uction		
	Project NumberG **8128.01.12s**	Well NumberG **WS45-23s**	SheetG **3 of 3s**

Depth (feet, BGS)G	WellG DetailsG	Sample DataG: IntervalG	Percent RecoveryG	Collection MethodG	NumberG	Name (Type)G	Blows/6"G	Lithologic ColumnG	Soil DescriptionG

Total Depth = 40 feet below ground surfaceG

Comsletion Details

BoringG

0.0 to 1.5 feet bgsGFlush mount Sherwood vault and concrete seal.
1.5 to 15.5 feet bgsGBentonite chips hydrated with potable water.G
15.1 to 23.0 feet bgsG10X20 Colorado silica sand.
23.0 to 40.0 feet bgs:GSlough.

Well:G

0.7 to 17.7 feet bgsGSchedule 40 PVC blank riser pipe.
17.7 to 22.7 feet bgs:GSchedule 40 PVC 0.010 machine slot prepack screen.G
22.7 to 23.0 feet bgs:GSchedule 40 PVC sump with 3X1/8 inch holes drilled in the bottom for drainage.G

NOTES:s *1. bgs = below ground surface. 2. GP = Geoprobe macro core sampler. 3. PID = photo ionization detector, soil head space reading in parts per million. 4.G ppm = parts per million. 5. PVC = poly vinyl chloride. 6. TOC = top of casing. 7. Depths are relative to feet below ground surface. 8. 2-inch diameter 5-footG long direct-push macro sampler. 9. NAPL = Non-aqueous phase liquid. 10. No groundwater encountered.G*

Maul Foste & Alongi, Inc.

Geologic orehole Log/Well Const uctionr

Project NumberG	Well NumberG	SheetG
8128.01.12s	WS46-33s	1 of 2s

Project NameG	Siltronic Corporation - Fill Zone Monitoring Well Installations	TOC Elevation (feet)G	NAs
Project LocationG	7200 NW Front Avenue, Portland, Oregon 97210s	Surface Elevation (feet)G	NAs
Start/End DateG	8/1s/13 to 8/15/13s	NorthingG	
Driller/EquipmentG	Cascade Drilling/Geoprobe 7720 DTs	EastingG	
Geologist/EngineerG	K. Titkemeiers	Hole Depth	35.0-feets
Sample MethodG	Direct Pushs	Outer Hole DiamG	4.5-inchs

Depth (feet, BGS)G	WellG DetailsG	Sample DataG: IntervalG	Percent RecoveryG	Collection MethodG	NumberG	Name (Type)G	Blows/6"G	Lithologic ColumnG	Soil DescriptionG
			0s	GRABs					0 to 0.3 feetGASPHALT.G
1G									0.3 to 2.0 feet; Gir knifed, logged by downhole observation; SGNDYG RGVEL (GW); brown; 65% fine to coarse gravel; 35% fine to medium sand; dry. (Fill)G
2G									2.0 to 10.0 feetGGir knifed, logged by downhole observation. AppearsG to be SGND (SP); dark grayish-brown; fine to medium sand; loose; dry to damp. (Fill)AG
3G									
4AG									
5AG									
6AG									
7AG									
8AG									
9AG									
10G			32%s	GPs		PID = 0.5 s ms			10.0 to 15.0 feetGSGND (SP); dark grayish-brown; fine to mediumA sand, trace mica; loose; dry to damp. (Fill)AG
11AG									
12G									
13G									
14G									@ 14.0 feetGLaminations of black sand.G
15G			60%s	GPs		PID = 0.3 s ms			15.0 to 20.0 feetGSGND (SP); very dark grayish-brown; fine toA medium sand; loose; damp; trace silt laminations; trace mica.A (Fill)G
16AG									
17G									
18G									@ 18.0 feetGDamp to moist.G
19G									
20G									@ 19.5 feetGVery dark gray.G

NOTES:4s1. bgs = below ground surface. 2. GP = Geoprobe macro core sampler. 3. PID = photo ionization detector, soil head space reading in parts per million. 4.G ppm = parts per million. 5. PVC = poly vinyl chloride. 6. TOC = top of casing. 7. Depths are relative to feet below ground surface. 8. 2-inch diameter 5-footG long direct-push macro sampler. 9. NAPL = Non-aqueous phase liquid.G

Water level = 21.15 feet below TOCs

Maul Foste & Alongi, Inc.

Geologic Borehole Log/Well Construction

Project Number	Well Number	Sheet
8128.01.12	WS44-6-33	2 of 2

Depth (feet, BGS)	Well Details	Interval	Percent Recovery	Collection Method	Sample Data: Number	Name (Type)	Blows/6"	Lithologic Column	Soil Description
21			75%	GP		PID = 1.0 ppm			20.0 to 21.5 feet: SAND (SP); very dark gray; fine to medium sand; wet. (Fill)
22			75%	GP		PID = 18.3 ppm			21.5 to 24.0 feet: SANDY SILT (ML); very dark gray; 60-70% low plasticity fines; 30-40% very fine sand; trace fine gravel; moist; mild hydrocarbon-like odor; micaceous. (Fill) @ 22.0 to 24.0 feet: Trace rootlets and wood debris, up to 1 inch wood chunks.
23									
24			75%	GP		PID = 6.8 ppm			24.0 to 26.0 feet: SAND WITH SILT (SP-SM); very dark gray; 80-85% fine to medium sand; 15-20% fines; trace fine gravel; wet; mild hydrocarbon-like odor. (Fill)
25									
26			75%	GP		PID = 0.0 ppm			26.0 to 28.0 feet: GRAVELLY SANDY SILT (ML); very dark gray; 45% low plasticity fines; 35% very fine sand; 20% fine to coarse gravel; trace wood debris; micaceous; wet; mild hydrocarbon-like odor. (Fill) @ 26.0 feet: SILT (ML); very dark gray.
27									
28			75%	GP		PID = 36.9 ppm WS6-S-28.5-33.5			28.0 to 29.3 feet: SANDY SILT/SILTY SAND (ML/SM); very dark gray; 45% very fine to fine sand; 45% fines; 10% fine gravel; very loose; wet; trace rootlets; mild hydrocarbon-like odor; soupy. (Fill) @ 28.0 feet: SAND WITH SILT (SP-SM); very dark gray.
29									29.3 to 30.0 feet: SAND (SP); very dark gray; fine to medium sand; wet; micaceous; mild hydrocarbon-like odor; rootlets. (Fill)
30			80%	GP		PID = 6.5 ppm			30.0 to 32.0 feet: Alternating layers up to 1 inch thick of SANDY SILT and SILTY SAND (SP/SM); very dark gray; 50% fine to medium sand; 50% low plasticity fines; moist to wet; mild hydrocarbon-like odor; trace rootlets; micaceous. (Fill) @ 30.0 feet: Gravelly silty sand; dark gray, with wood fragments.
31									
32									32.0 to 33.6 feet: SAND (SP); very dark gray; fine to medium sand; wet; micaceous; mild hydrocarbon-like odor. (Fill)
33									
34									33.6 to 35.0 feet: SILT (ML); 80% low to medium plasticity fines; 20% very fine sand; stiff; moist; micaceous; mild hydrocarbon-like odor. @ 33.6 feet: 1/2 inch thick lens of SILT (ML); black; low plasticity fines; strong hydrocarbon-like odor; sheen. @ 33.8 to 33.9 feet: Laminations of SILT; black; strong hydrocarbon-like odor; sheen.
35									

Total Depth = 35 feet below ground surface

Completion Details:

Oregon Water Resources Department Well Start Card: 1020736
Oregon Water Resources Department Well Identification: 111344

Boring:
0.0 to 1.5 feet bgs: Flush mount Sherwood vault and concrete seal.
1.5 to 11.0 feet bgs: Bentonite chips hydrated with potable water.
11.0 to 15.0 feet bgs: Granular bentonite hydrated with potable water.
15.0 to 26.5 feet bgs: Bentonite chips hydrated with potable water.
26.5 to 33.65 feet bgs: 10X20 Colorado silica sand.
33.65 to 35.0 feet bgs: Slough.

Well:
0.45 to 28.35 feet bgs: Schedule 40 PVC blank riser pipe.
28.35 to 33.35 feet bgs: Schedule 40 PVC 0.010 machine slot prepack screen.
33.35 to 33.65 feet bgs: Schedule 40 PVC sump with 3X1/8 inch holes drilled in the bottom for drainage.

NOTES: 1. bgs = below ground surface. 2. GP = Geoprobe macro core sampler. 3. PID = photo ionization detector, soil head space reading in parts per million. 4. ppm = parts per million. 5. PVC = poly vinyl chloride. 6. TOC = top of casing. 7. Depths are relative to feet below ground surface. 8. 2-inch diameter 5-foot long direct-push macro sampler. 9. NAPL = Non-aqueous phase liquid.

Water level = 21.15 feet below TOCs