APPENDIX 2B
Supplemental Investigation Data Reports and Geochemical Evaluation, 2014 and 2016 Play Area Investigations

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APPENDICES

APPENDIX 2B
SUPPLEMENTAL INVESTIGATION DATA REPORTS AND GEOCHEMICAL EVALUATION, 2014 AND 2016 PLAY AREA INVESTIGATIONS

1.0 INTRODUCTION

During manufactured gas plant (MGP) operations, a Thylox process facility operated in the eastern portion of the upland (near the present-day Play Area). The Thylox process used a concentrated sodium thioarsenate solution for hydrogen sulfide removal from the gas. Releases of thioarsenate solution from the Thylox process infiltrated the underlying soil and resulted in arsenic contaminating the groundwater and unique geochemical conditions.

The Supplemental Investigation (SI) (Appendix 2A) conducted in 2013 encountered elevated arsenic concentrations in soil and groundwater in the vicinity of the Play Area and eastern shoreline. Subsurface groundwater at a deep well downgradient of the Play Area contained the highest arsenic concentrations of all SI samples.

Additional work was performed to further delineate the vertical and lateral extent and characterize the nature of arsenic-impacted soil and groundwater near the Play Area and adjacent shoreline because of a planned project by Seattle Parks and Recreation to improve the Play Area for park visitors. A Play Area investigation (PAI) (Appendix 2B-1) conducted in 2014, was performed to supplement the SI arsenic data. Following the PAI, a geochemical evaluation (Appendix 2B-2) was conducted using select PAI soil and groundwater samples. Another PAI (Appendix 2B-3) was conducted in 2016 to further characterize arsenic in groundwater and soil in the Play Area and to inform the design and operation of the groundwater treatment system installed at the Play Area in 2017. Both studies helped understand the fate and transport of arsenic and develop the arsenic conceptual site model presented in the RI.

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PLAY AREA INVESTIGATION DATA REPORT

1.0 INTRODUCTION

The 2014 Play Area Investigation (PAI) was performed to supplement the Gas Works Park Site (GWPS) Supplemental Investigation (SI) conducted under the March 2013 Work Plan (SIWP) (GeoEngineers 2013), approved by Washington State Department of Ecology (Ecology) on March 11, 2013. The SI, conducted in Spring and Fall 2013, encountered elevated arsenic concentrations in soil and groundwater in the vicinity of the Play Area and eastern shoreline. Subsurface soil at boring GEI-3, and groundwater at a deep well downgradient of the Play Area along the shoreline (MW-36D), contained the highest arsenic concentrations of all SI samples. Seattle Parks and Recreation Department (SPR) is planning a Play Area improvements project in the area currently scheduled for implementation in Fall 2016 through Spring 2017.

The purpose of the PAI was to further delineate the vertical and lateral extent and characterize the nature of arsenic-impacted soil and groundwater within the proposed Play Area improvements footprint and adjacent shoreline area. The PAI was designed to characterize arsenic in soil, evaluate arsenic leaching to groundwater, and potential arsenic offshore transport in groundwater. Ecology approved the proposed Play Area investigation on December 4, 2014, via e-mail. The PAI field work was completed from December 8 to 15, 2014 and consisted of direct-push soil sampling, collection of groundwater samples from direct push borings and two monitoring wells, and a professional survey of the borings. The PAI was conducted in accordance with the SI Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) Addendum No. 1 (GeoEngineers 2014).

Prior to drilling, on-site utilities were located using the Utility Notification Center One-Call, a private utility locator from Applied Professional Services (APS), and SPR utility crews. APS also conducted a subsurface storm drain "lateral launch" video survey to mark the storm drain pipes beneath the PAI footprint.

2.0 SOIL INVESTIGATION

A direct push rig was used to advance all the PAI explorations. PAI explorations, as shown on Figure 2B-1-1, include environmental soil borings (PAI-1 through PAI-12, PAI-2B, PAI-3B, PAI-6B, and PAI-11B) and temporary wells (PAI-2B, PAI-10, PAI-11B and PAI-12)[1]. Boring logs are included in Attachment 2B-1-1. Photographs of the soil cores are included in Attachment 2B-1-2.

The PAI started by targeting subsurface soil at primary locations around GEI-3 and potential historical primary source structures, and step-outs to contingent locations to delineate arsenic impacts. Field screening with a handheld x-ray fluorescence (XRF) analyzer provided real-time approximate total arsenic concentrations; the results were used to evaluate whether to step out to contingent locations.

General field procedures for drilling, logging and sampling are discussed below.

[1] Two borings were drilled at four locations: PAI-2B, PAI-3B, and PAI-11B were drilled to collect adequate soil volume and/or grab groundwater samples, and PAI-6B was drilled because PAI-6 met refusal.

2.1. Drilling

Soil borings were drilled for the following purposes:

- Collect soil samples for visual observation, field screening and chemical analysis,
- Collect soil samples for arsenic soil sequential extraction, and
- Install temporary wells.

Drilling activities conformed to state and local regulations including Washington Administrative Code (WAC) 173-160, *Minimum Standards for Construction and Maintenance of Wells*. Before entering the area of investigation (AOI), the drilling rigs and equipment were visually inspected for signs of contamination. Only clean, unused sampling sleeves and bags were used. Management of investigation-derived waste (IDW) generated during drilling is discussed in Section 6. To avoid drilling through shallow utilities, including the park irrigation system, a post-hole digger was used to excavate the first 2 feet of soil at each location before drilling. Discrete soil samples were collected in laboratory-supplied containers and submitted for chemical analysis. The soil sampling approach is described in Sections 2.3 and 2.4.

Environmental soil borings were advanced using a track-mounted GeoProbe. The direct-push method uses hydraulically driven probes and a 5-foot soil sampler until reaching the planned boring depth or probe refusal. Soil sampler probes were lined with disposable polyvinyl chloride (PVC) sleeves.

2.2. Lithologic Logging and Field Screening

Lithology and field screening observations are recorded on the boring logs.

2.2.1. Lithologic Logging

As outlined in the SIWP, lithology was described in accordance with ASTM International (ASTM) D 2488 *Standard Practice for Description and Identification of Soils* and recorded on the boring logs. Percent recoveries, and sample depths are also recorded on the logs.

2.2.2. XRF Screening

A handheld XRF analyzer was used to field-screen soil for approximate arsenic concentrations. Soil was screened at approximate 12-inch depth intervals from the surface to the base of each boring. Results were stored electronically in the XRF analyzer's hard-drive and are recorded on the boring logs.

2.2.3. Field Screening

Soil samples were field-screened for evidence of possible contamination using four methods: visual screening, water sheen screening, headspace vapor screening and shake testing, as described in the SIWP and below.

2.2.3.1. Visual Screening

Visual screening was performed as prescribed in the SIWP SAP. Soil samples, samplers and gloves were observed for potential signs of contamination. Unusual odor, staining, color and any other evidence of nonaqueous phase liquid (NAPL) were recorded in the boring logs. Sidewalls of the sampling sleeves were observed for signs of staining. The nature of saturation and type of liquid (water or NAPL) as noted for wet soil.

2.2.3.2. Water Sheen Screening and Headspace Vapor Screening

Water sheen screening and headspace vapor screening were performed as prescribed in the SIWP SAP.

Water sheen screening involved placing approximately 1 cubic inch or about 1 tablespoon of soil in a black plastic pan partially filled with water and observing the water surface for signs of sheen. Naturally occurring sheen, which is often found in the field, was discerned from hydrocarbon sheen by its ability to dissolve or break up upon agitation. Results of the sheen tests were characterized using the guidelines noted in the following table:

Appearance	Visual Description	Percent Coverage
Color and Shape of Sheen Observations		
Rainbow	Multicolored	-
Metallic	Metallic gray-colored	-
Florets	Circular and multicolored	-
Blebs	Circular and black/brown	-
Streaks	Long and flowing shape	-
Sheen Classification		
None, trace	-	<2
Slight	-	2-15
Moderate	-	15-40
Moderate to heavy	-	40-70
Heavy	-	>70

Headspace vapor screening involved placing soil in a plastic bag, closing the bag and shaking the bag to release soil vapors. The probe of a photoionization detector (PID) was then inserted into the bag and the PID measured the concentration of volatile organic vapors present within the sample bag headspace.

2.2.3.3. Shake Testing

NAPL shake testing was performed on select samples where NAPL was suspected or observed to evaluate the presence of NAPL. A small volume of soil (5 to 10 grams) was removed from the sampler and placed in a small glass container (typical 4-ounce jar). Water was added until the container was approximately two-thirds full. The container was vigorously shaken until NAPL, if present, was displaced from the core matrix.

2.3. Discrete Soil Sampling for Chemical Analysis

Samples were generally collected in the lower unsaturated zone (above the seasonal high water table), upper saturated zone (near the water table), above the till, and from the interval with the highest arsenic field screening concentrations in the fill and outwash deposits. Soil samples for potential chemical analysis were placed into laboratory-supplied containers, lightly but securely packed, and capped with a plastic lid. The samples were maintained on ice and delivered under chain-of-custody to the analytical laboratory Analytical Resources, Inc. (ARI). Soil sampling was completed according to the SAP and QAPP Addendum No. 1 (GeoEngineers 2014). Field quality control (QC) samples collected include equipment-rinsate blanks, trip blanks and field duplicates.

2.4. Soil Sampling for Sequential Extraction and Related Tests

In addition to the soil samples described above, 11 soil samples were collected at targeted depth intervals under anoxic conditions and eight of those were submitted for arsenic sequential extraction testing. Sample volumes were collected from the same intervals for acid-extractable sulfide and acid insoluble sulfur. The targeted intervals for sequential extraction sampling were determined based on the XRF arsenic readings, groundwater table, and proximity to the shoreline. Soil core samples were collected using a soil sampler with clean PVC liners driven by the geoprobe rig to span the target depth. Liners were kept sealed (to maintain anoxic conditions) and ends were capped. Soil samples submitted for arsenic sequential extraction testing were immediately labeled, bagged, and placed in coolers containing dry ice. Samples were maintained on dry ice and delivered under chain-of-custody to the analytical laboratory ARI. ARI subcontracted analysis to Applied Speciation and Consulting LLC of Bothell, Washington, and Horizon Laboratories of North Price, Utah.

2.5. Bulk/Composite Soil Sampling

Two 5-gallon buckets of bulk composite soil were collected from unused soil retrieved from the soil sampler for potential future analysis. One 5-gallon bucket was filled with saturated soil from fill and outwash deposits (a composite of all PAI- series borings), and the second 5-gallon bucket was filled with unsaturated soil from fill deposits (a composite of all PAI- series borings). The buckets were sealed with a lid, labeled and archived in the refrigerator at GeoEngineers' Redmond office.

3.0 GROUNDWATER INVESTIGATION

Groundwater sampling was conducted to characterize arsenic in groundwater downgradient from arsenic detected in upland soil and along the shoreline. Grab groundwater samples were collected from temporary wells, and groundwater samples were collected from existing wells MW-36S and MW-36D.

3.1. Grab Groundwater Sampling

Groundwater "grab samples" were collected from four temporary wells. One of the samples was collected as close as possible to the location where the highest arsenic soil concentration was measured, two samples were collected along the shoreline, and one was collected between the location where the highest arsenic soil concentration was measured and the shoreline. Temporary wells (PAI-2B, PAI-10, PAI-11B and PAI-12) were installed and screened across intervals with the highest XRF arsenic concentrations and saturated zones. Temporary wells were constructed of ¾ inch inside diameter, schedule 40 PVC pipe with 5-foot sections of pre-packed 0.010-inch slot well screen. The wells were purged using a peristaltic pump. Low-flow sampling was conducted using water quality instruments including Horiba U-50, turbidity meter and ferrous iron field kit. Samples were collected once turbidity readings were less than 5 nephelometric turbidity units (NTU) or once three well volumes had been removed and parameters generally varied by less than 10 percent on three consecutive measurements. The PVC screens were pulled and disposed of after sampling, and the borings were tremie-grouted. Temporary well screen intervals, groundwater elevations and recorded groundwater parameters are presented in Table 2B-1-1.

3.2. Monitoring Well Sampling

Groundwater samples were collected from MW-36S and MW-36D using procedures described in the SI SAP.

3.3. Groundwater Sampling for Arsenic Speciation (Anoxic)

Anoxic groundwater samples were collected from each temporary well and from MW-36S and MW-36D, for arsenic speciation analysis. Anoxic sampling methodology is described in Attachment A of the SI SAP and QAPP Addendum No. 1 (GeoEngineers 2014).

4.0 RESULTS

This section presents analytical results (including arsenic speciation results) from the 2014 PAI. It also presents comparison of the laboratory soil arsenic results to the XRF field arsenic concentrations. Analytical results are discussed and evaluated in the main body of the remedial investigation (RI).

4.1. Chemical Results

Selected soil and groundwater samples were submitted to ARI for chemical analyses. Chain-of-custody reports, laboratory reports and data validation reports are available in Attachment 2B-1-3.

4.1.1. Soil

Soil samples were selected for analysis based on XRF results and preliminary field findings. Chemical analysis included arsenic (29 samples), polycyclic aromatic hydrocarbons (PAHs; 19 samples), and benzene, toluene, ethylbenzene, and xylenes (BTEX; 19 samples). Soil analytical methods and results are presented in Table 2B-1-2. Arsenic soil analytical results are posted on Figure 2B-1-2. Cross sections with posted arsenic results are presented in Figures 2B-1-3 and 2B-1-4.

4.1.2. Groundwater

Groundwater chemical analysis included arsenic, PAHs, BTEX, and conventional parameters (sulfate, sulfide, dissolved iron, ferrous iron, total and dissolved organic carbon, cations [calcium, magnesium, manganese, potassium and sodium], nitrate, chloride, alkalinity and total dissolved solids). Groundwater analytical methods and results are presented in Table 2B-1-3. Dissolved arsenic groundwater results from the PAI are presented in Figure 2B-1-5.

4.2. Speciation and Sequential Extraction Results

Anoxic soil and groundwater samples were submitted by ARI to Applied Speciation for analysis. Laboratory reports are available in Attachment 2B-1-4.

4.2.1. Soil

Anoxic soil samples were analyzed for arsenic and iron sequential extraction. Analytical results, including total summed arsenic and iron fractions, are presented in Table 2B-1-4.

4.2.2. Groundwater

Anoxic field-filtered groundwater samples were analyzed for arsenic species. Analytical results including arsenite, arsenate and total arsenic are presented in Table 2B-1-5.

4.3. XRF Results

Soil laboratory arsenic concentrations were compared to the XRF analyzer arsenic field readings (Table 2B-1-6). PAI arsenic XRF field readings and PAI arsenic laboratory concentrations show a general

strong positive correlation (linear correlation coefficient equals 0.91) over the range of concentrations measured in PAI samples (8 to 9,000 milligrams per kilogram [mg/kg]). The relationship between laboratory and field measurements (as compiled on Table 2B-1-6) is illustrated in Figure 2B-1-6, based on natural log-transformed data. On average, XRF readings are 36 percent higher than laboratory concentrations. Raw (uncorrected) XRF arsenic results were used to supplement the vertical distribution of arsenic in soil across the PAI borings. Both results (analytical and XRF) are posted in the cross sections presented in Figure 2B-1-3 and Figure 2B-1-4. The XRF arsenic data are included as Attachment 2B-1-5.

5.0 PROFESSIONAL SURVEY

All PAI explorations (including locations where refusal was encountered or multiple attempts were made) were surveyed on December 15, 2014 by the Washington-licensed professional land surveyor True North Land Surveying of Seattle, Washington. Locations were surveyed for X-Y-Z coordinates. The horizontal and vertical accuracy of the locations was 0.01 feet.

Elevations were referenced to U. S. Army Corps of Engineers (USACE) (Locks) datum. Horizontal coordinates were referenced to the North American Vertical Datum 83 (NAD83), Washington State Plane North coordinate system. Survey results are included on boring logs (Attachment 2B-1-1).

6.0 DECONTAMINATION PROCEDURES AND INVESTIGATION-DERIVED WASTE

Decontamination was performed using procedures outlined in the SIWP SAP. IDW, including soil cuttings, groundwater, decontamination water, disposable sampling supplies and disposable personal protective equipment, was placed in labeled 30-gallon and 55-gallon steel drums. The drums were sealed, chained to each other and stored several feet from structures within the Cracking Towers fenced area during the PAI field activities. Composite drum samples were collected and analyzed for waste profile purposes.

Two 30-gallon and two 55-gallon drums of IDW were generated during the PAI. On February 10, 2015, Kleen Environmental Technologies, Inc. removed the drums for disposal at an approved offsite disposal facility (Chemical Waste Management of the NW in Arlington, Oregon).

7.0 REFERENCES

GeoEngineers, Inc. 2013. Supplemental Investigation Work Plan, Gas Works Park Site, Seattle, Washington.

GeoEngineers, Inc. 2014. Sampling and Analysis Plan and Quality Assurance Project Plan Addendum No. 1, Supplemental Upland Investigation (Play Area Investigation), Gas Works Park Site, Seattle, Washington. December 5.

Table 2B-1-1

Groundwater Elevations and Water Quality Parameter Readings

Gas Works Park Site - Play Area Investigation Data Report

Seattle, Washington

Exploration [1]	Sample ID	Ground Surface Elevation (ft USACE)	Screen Start Depth (ft bgs)	Screen End Depth (ft bgs)	Groundwater Elevation (ft USACE)	Observed Geology in Screen Interval	pH	Conductivity	Turbidity	Dissolved Oxygen	Temperature	ReDox Potential	Total Dissolved Solids	Salinity	Ferrous Iron [2]
								µS/cm	NTU	mg/L	degrees C	millivolts	g/L	%	mg/L
PAI-2B	PAI-2-GW	28.78	14.79	19.79	20.33	FIll	6.30	830	9.54	0.51	15.1	-147.0	0.663	0.052	0.6
PAI-10	PAI-10-GW	29.87	19.09	24.09	21.02	Fill	6.37	445	4.73	0.24	14.3	-173.1	0.363	0.027	2.6
PAI-11B	PAI-11-GW	28.43	18.09	23.09	20.18	Fill	6.43	388	14.50	0.20	14.0	-22.4	0.320	0.024	0.6
PAI-12	PAI-12-GW	34.20	13.29	18.27	20.20	Fill	5.79	378	0.52	1.98	13.6	8.8	0.314	0.023	2.0
MW-36S	MW-36S-141215	30.13	8.00	22.80	20.67	Fill	6.19	350	3.20	0.77	15.2	3.1	0.280	0.021	2.0
MW-36D	MW-36D-141215	29.99	29.30	33.80	20.82	Qvr	8.92	3,120	--	1.67	13.5	-178.0	2.60	0.212	0.0

Notes:

[1] PAI-2B, PAI-10, PAI-11B, and PAI-12 were temporary wells installed for grab groundwater sampling purposes; MW-36D and MW-36S are existing monitoring wells.

[2] Field filtered results.

degrees C = degrees Celsius

ft bgs = feet below ground surface

g/L = grams per liter

mg/L = milligrams per liter

NTU = nephelometric turbidity units

Qvr = Vashon Recessional Outwash

USACE = U.S. Army Corps of Engineers (Locks) vertical datum

µS/cm = microsiemens per centimeter

-- = no reading

Table 2B-1-2

Soil Analytical Results[1]

Gas Works Park Site - Play Area Investigation Data Report

Seattle, Washington

Exploration	Sample ID	Ground Surface Elevation (ft USACE)	Start Depth (ft bgs)	End Depth (ft bgs)	Sample Type	Observed Geology	Arsenic by SW6010C	PAHs by SW8270-SIM																
							Arsenic	cPAH[2]	Total PAH	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a)-anthracene	Benzo(a)-pyrene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Total benzofluoran-thenes (b+k (+j))	Benzo(g,h,i)-perylene	Chrysene	Dibenzo(a,h)-anthracene	Fluoran-thene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphtha-lene	Phenan-threne	Pyrene
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
PAI-1	PAI-1-13.8-14.3	33.81	13.8	14.3	discrete	Fill	3880																		
PAI-1	PAI-1-14.5-15.0	33.81	14.5	15.0	discrete	Fill		24 JT	830 JT	5.6	14	19	19	18	13	6.1	26	13	22	3.7 U	58	17	9.9	460	80	66
PAI-1	PAI-1-24.0-24.5	33.81	24.0	24.5	discrete	Qvr	33																		
PAI-2	PAI-2-12.5-13.0	28.80	12.5	13.0	discrete	Fill	80	0.35 JT	99 JT	3.2	0.53	0.77	0.31 J	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.34 J	0.48 U	1.5	1.8	0.48 U	85	3.8	1.6 J
PAI-2	PAI-2-18.0-18.5	28.80	18.0	18.5	discrete	Fill	4140	1.3 JT	730 JT	14	3.6	7.5	2.1	0.85	0.84	0.53	1.9	0.43	2.2	0.11	12	11	0.36	640	28	9.6
PAI-2	PAI-2-28.0-28.5	28.80	28.0	28.5	discrete	Qvr	22																		
PAI-2	PAI-2-18.0-18.5-DUP	28.80	18.0	18.5	QAQC	Fill	6000																		
PAI-2B	PAI-2-17.5-18	28.78	17.5	18.0	discrete/anoxic	FIll																			
PAI-2B	PAI-2-19-19.5	28.78	19.0	19.5	discrete/anoxic	FIll																			
PAI-3	PAI-3-13.0-13.5	30.63	13.0	13.5	discrete	Fill	120	18 JT	1300 JT	23	12	17	19	12 J	14	7.8	29	1.6 J	20	3.2	51	23	7.7	920	70	45 J
PAI-3	PAI-3-15.5-16.0	30.63	15.5	16.0	discrete	Fill	669																		
PAI-3	PAI-3-27.5-28.0	30.63	27.5	28.0	discrete	Qvr	14																		
PAI-3	PAI-3-33.5-34.0	30.63	33.5	34.0	discrete	Qvr	28	0.056 JT	2.4 JT	0.058	0.025	0.013 J	0.014 J	0.047 J	0.015	0.0086 J	0.036	0.011 J	0.022	0.014 U	0.039	0.036	0.026	1.9	0.094	0.11 J
PAI-3B	PAI-3-33.5-34.0	30.85	33.5	34.0	discrete/anoxic	Qvr																			
PAI-4	PAI-4-13.0-13.5	30.31	13.0	13.5	discrete	Fill	181																		
PAI-4	PAI-4-16.0-16.5	30.31	16.0	16.5	discrete	Fill	26	48 JT	2400 JT	15	140	85	76	30 J	33	17	70	2.7 J	93	8.1	190	130	18	940	400	160 J
PAI-4	PAI-4-9.5-10.0	30.31	9.5	10.0	discrete	Fill	1430																		
PAI-5	PAI-5-13.5-14.0	34.31	13.5	14.0	discrete	Fill	531																		
PAI-5	PAI-5-8.0-8.5	34.31	8.0	8.5	discrete	Fill	290																		
PAI-6	PAI-6-9.0-9.5	29.91	9.0	9.5	discrete	Fill	2990	7.4 JT	190 JT	1.4	4.7	4.9	5.3	5.4	4.2	2.2	8.6	4.6	5.3	0.93	15	5.2	4.4	79	24	18
PAI-7	PAI-7-10.0-10.5	30.43	10.0	10.5	discrete	Qvr	354	9.8 JT	99 JT	0.67	4.2	3.1	4.6	7.6	5.2	2.5	10	7.7	6.0	0.92	13	1.7	5.4	7.4	11	16
PAI-7	PAI-7-22.5-23.0	30.43	22.5	23.0	discrete	Qvr	8	14 JT	790 JT	28	45	28	14	11	4.0	2.7	10	3.4	14	1.3	28	55	3.1	390	120	43
PAI-7	PAI-7-5.5-6.0	30.43	5.5	6.0	discrete	Fill	704																		
PAI-8	PAI-8-14.5-15.0	30.10	14.5	15.0	discrete	Qvr	41	0.046 JT	2.1 JT	0.035	0.081	0.11	0.072	0.028 J	0.037	0.023	0.079	0.015 R	0.071	0.015 U	0.23	0.11	0.017	0.67	0.45	0.15 J
PAI-8	PAI-8-27.5-28.0	30.10	27.5	28.0	discrete	Qva	8																		
PAI-8	PAI-8-8.5-9.0	30.10	8.5	9.0	discrete	Fill	2150																		
PAI-9	PAI-9-12.5-13.0	32.50	12.5	13.0	discrete	Fill	478 J	0.019 JT	13 JT	0.095 J	0.037 J	0.18 J	0.017 J	0.014 J	0.0086 J	0.0049 J	0.018 J	0.010 J	0.018 J	0.0047 U	0.27 J	0.29 J	0.0071 J	11 J	1.1 J	0.24 J
PAI-9	PAI-9-23-23.5	32.50	23.0	23.5	discrete	Qvr	60 J																		
PAI-9	PAI-9-9.5-10.0	32.50	9.5	10.0	discrete	Fill	160																		
PAI-9	PAI-9-12.5-13.0DUP	32.50	12.5	13.0	QAQC	Fill	463 J	0.051 JT	14 JT	0.16 J	0.062 J	0.53 J	0.056 J	0.037 J	0.023 J	0.013 J	0.050 J	0.026 J	0.058 J	0.0045 J	0.94 J	0.59 J	0.019 J	7.6 J	2.6 J	0.86 J
PAI-10	PAI-10-19.5-20.0	28.97	19.5	20.0	discrete	Fill		0.11 JT	31 JT	3.3	0.72	0.46	0.13	0.076	0.070	0.035	0.14	0.045	0.16	0.0068	1.8	1.5	0.031	20	1.4	1.5
PAI-10	PAI-10-24.5-25.0	28.97	24.5	25.0	discrete	Fill	610 J	1.2 JT	340 JT	9.0	5.1	3.9	1.2	0.88	0.65	0.38	1.4	0.50	1.3	0.090 J	6.1	9.8	0.39	270	22	5.6
PAI-10	PAI-10-29.5-30.0	28.97	29.5	30.0	discrete	Qvr		0.18 JT	9.8 JT	0.091	0.067	0.084	0.12	0.13	0.11	0.059	0.22	0.15	0.14	0.022	0.31	0.089	0.11	7.6	0.33	0.30
PAI-10	PAI-10-9.5-10.0	28.97	9.5	10.0	discrete	Fill	19.3 J	140 JT	7600 JT	180	36	84	85	110	73	40	150	110	95	19	290	99	72	5600	420	280
PAI-10	PAI-10-31.5-32.0	28.97	31.5	32.0	discrete/anoxic	Qvr																			
PAI-11	PAI-11-18-18.5	27.60	18.0	18.5	discrete	Fill		0.36 JT	7.6 JT	0.10	0.075	0.46	0.30	0.26	0.21	0.11	0.43	0.25	0.39	0.039	1.6	0.27	0.17	0.53	1.2	1.5
PAI-11	PAI-11-9.5-10	27.60	9.5	10.0	discrete	Fill	110	11 JT	180 JT	6.1	4.6	6.2	8.1	8.3	6.4	3.4	13	6.6	9.2	1.5	22	8.6	4.9	30	23	24
PAI-11	PAI-11-12.0-12.5	27.60	12.0	12.5	discrete/anoxic	Fill																			
PAI-11	PAI-11-22-22.5	27.60	22.0	22.5	discrete/anoxic	Qvr																			
PAI-12	PAI-12-13.5-14	34.20	13.5	14.0	discrete/anoxic	Fill																			
PAI-12	PAI-12-19.5-20	34.20	19.5	20.0	discrete/anoxic	Fill		21 JT	1100 JT	6.9	13	27	17	16	9.4	5.4	21	10	20	2.0	48	31	7.4	700	110	52
PAI-12	PAI-12-8.5-9	34.20	8.5	9.0	discrete/anoxic	Fill																			

Exploration	Sample ID	Ground Surface Elevation (ft USACE)	Start Depth (ft bgs)	End Depth (ft bgs)	BETX by SW8260C					Sulfide by E376.2	Preserved Total Solids by SM2540C	Acid Insoluble Sulfur by ASTM E1915
					Benzene	Ethylbenzene	m, p-Xylene	o-Xylene	Toluene	Sulfide	Solids	Sulfur
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%
PAI-1	PAI-1-13.8-14.3	33.81	13.8	14.3								
PAI-1	PAI-1-14.5-15.0	33.81	14.5	15.0	20	7.6	24	12	29			
PAI-1	PAI-1-24.0-24.5	33.81	24.0	24.5								
PAI-2	PAI-2-12.5-13.0	28.80	12.5	13.0	28	3.7	2.5	0.49	1.6			
PAI-2	PAI-2-18.0-18.5	28.80	18.0	18.5	11	14	11	6.4	7.1			
PAI-2	PAI-2-28.0-28.5	28.80	28.0	28.5								
PAI-2	PAI-2-18.0-18.5-DUP	28.80	18.0	18.5								
PAI-2B	PAI-2-17.5-18	28.78	17.5	18.0						2880 J	66.47	1.31
PAI-2B	PAI-2-19-19.5	28.78	19.0	19.5						918 J	84.94	0.28
PAI-3	PAI-3-13.0-13.5	30.63	13.0	13.5	15	36	30	8.0	51			
PAI-3	PAI-3-15.5-16.0	30.63	15.5	16.0								
PAI-3	PAI-3-27.5-28.0	30.63	27.5	28.0								
PAI-3	PAI-3-33.5-34.0	30.63	33.5	34.0	2.5	0.94	0.61	0.35	0.19			
PAI-3B	PAI-3-33.5-34.0	30.85	33.5	34.0						105 J	61.60	0.03
PAI-4	PAI-4-13.0-13.5	30.31	13.0	13.5								
PAI-4	PAI-4-16.0-16.5	30.31	16.0	16.5	16	2.0	7.8	2.9	18			
PAI-4	PAI-4-9.5-10.0	30.31	9.5	10.0								
PAI-5	PAI-5-13.5-14.0	34.31	13.5	14.0								
PAI-5	PAI-5-8.0-8.5	34.31	8.0	8.5								
PAI-6	PAI-6-9.0-9.5	29.91	9.0	9.5	2.2	0.58	4.9	1.9	6.1			
PAI-7	PAI-7-10.0-10.5	30.43	10.0	10.5	0.17	0.048 U	0.056	0.048 U	0.12			
PAI-7	PAI-7-22.5-23.0	30.43	22.5	23.0	110	310	280	140	180			
PAI-7	PAI-7-5.5-6.0	30.43	5.5	6.0								
PAI-8	PAI-8-14.5-15.0	30.10	14.5	15.0	0.73	0.20	0.25	0.12	0.45			
PAI-8	PAI-8-27.5-28.0	30.10	27.5	28.0								
PAI-8	PAI-8-8.5-9.0	30.10	8.5	9.0								
PAI-9	PAI-9-12.5-13.0	32.50	12.5	13.0	0.56 U	0.56 U	0.56 U	0.56 U	0.56 U			
PAI-9	PAI-9-23-23.5	32.50	23.0	23.5								
PAI-9	PAI-9-9.5-10.0	32.50	9.5	10.0								
PAI-9	PAI-9-12.5-13.0DUP	32.50	12.5	13.0	0.078	0.12	0.047 J	0.057 U	0.045 J			
PAI-10	PAI-10-19.5-20.0	28.97	19.5	20.0	22	3.4	4.3	1.2	2.9			
PAI-10	PAI-10-24.5-25.0	28.97	24.5	25.0	22	25	11	3.3	4.7			
PAI-10	PAI-10-29.5-30.0	28.97	29.5	30.0	0.67	0.26	0.38	0.12	0.18			
PAI-10	PAI-10-9.5-10.0	28.97	9.5	10.0	16	71	82	46	15			
PAI-10	PAI-10-31.5-32.0	28.97	31.5	32.0						10.8 J	90.01	0.04
PAI-11	PAI-11-18-18.5	27.60	18.0	18.5	0.0018	0.0013 U	0.0013 U	0.0013 U	0.0013 U			
PAI-11	PAI-11-9.5-10	27.60	9.5	10.0	5.2	1.3	1.9	0.50 J	1.6			
PAI-11	PAI-11-12.0-12.5	27.60	12.0	12.5						752 J	68.07	0.56
PAI-11	PAI-11-22-22.5	27.60	22.0	22.5						851 J	83.03	0.12
PAI-12	PAI-12-13.5-14	34.20	13.5	14.0						5.46 J	63.72	0.63
PAI-12	PAI-12-19.5-20	34.20	19.5	20.0	2.0	2.7	6.3	4.6	1.9			
PAI-12	PAI-12-8.5-9	34.20	8.5	9.0						4.4 J	77.58	0.37

Notes:

[1] Non-anoxic samples analyzed by Analytical Resources, Inc. (ARI). Acid Insoluble Sulfur analyzed by Horizon Laboratories.

[2] Carcinogenic polycyclic aromatic hydrocarbons, as TEQ (toxicity equivalency quotient) calculated using ½ the RL for non-detects.

BETX = benzene, ethylbenzene, toluene, and xylene

cPAH = carcinogenic polycyclic aromatic hydrocarbons

ft bgs = feet below ground surface

J = estimated value

mg/kg = milligrams per kilogram

PAHs = polycyclic aromatic hydrocarbons

Qva = Vashon Advance Outwash

Qvr = Vashon Recessional Outwash

T = summed result

U = not detected above reporting limit

USACE = U.S. Army Corps of Engineers (Locks) vertical datum

Table 2B-1-3

Groundwater Analytical Results[1]

Gas Works Park Site - Play Area Investigation Data Report

Seattle, Washington

Exploration [2]	Sample ID	Ground Surface Elevation (ft USACE)	Screen Start Depth (ft bgs)	Screen End Depth (ft bgs)	Sample Type	Observed Geology	Arsenic by E200.8	PAHs by SW8270-SIM																					
							Arsenic	cPAH[3]		Total PAH		Acenaphthene		Acenaphthylene		Anthracene		Benzo(a)anthracene		Benzo(a)pyrene		Benzo(b)fluoranthene		Benzo(k)fluoranthene		Total benzofluoranthenes (b+k (+j))		Benzo(g,h,i)perylene	
							D	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T
							µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
PAI-2B	PAI-2-GW	28.78	14.79	19.79	grab gw	FIll	50200	0.71 UT	7.1 UT	1400 JT	1800 JT	6.7	7.2 J	5.0	7.8 J	1.0 U	10 U	1.0 U	10 U	1.0 U	10 U	1.0 U	10 U	1.0 U	10 U	1.0 U	10 U	1.0 U	10 U	1.0 U	10 U
PAI-10	PAI-10-GW	29.87	19.09	24.09	grab gw	Fill	2470	0.071 UT	0.13 JT	1700 JT	2000 JT	12	16	1.1	1.4	0.54	1.0	0.10 U	0.10	0.10 U	0.090 J	0.10 U	0.06 J	0.10 U	0.10 U	0.10 U	0.15	0.10 U	0.11
PAI-11B	PAI-11-GW	28.43	18.09	23.09	grab gw	Fill	120	0.071 UT	0.071 UT	7.0 JT	10 JT	0.10 U	0.050 J	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
PAI-12	PAI-12-GW	34.20	13.27	18.27	grab gw	Fill	2030	0.71 UT	0.75 JT	940 JT	750 JT	2.4	2.3	2.6	3.0	0.97 J	1.4	1.0 U	0.54	1.0 U	0.57	1.0 U	0.36	1.0 U	0.22	1.0 U	0.79	1.0 U	0.44
MW-36S	MW-36S-141215	30.13	8.0	22.8	gw	Fill	70 J	0.71 UT	0.71 UT	5200 JT	5900 JT	12	12	32	31	2.8	3.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-36D	MW-36D-141215	29.99	29.3	33.8	gw	Qvr	81800 J	0.71 UT	0.71 UT	6400 JT	7000 JT	34	35	13	15	4.4	5.2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Exploration [2]	Sample ID	Ground Surface Elevation (ft USACOE)	Screen Start Depth (ft bgs)	Screen End Depth (ft bgs)	PAHs by SW8270-SIM																BETX by SW8260C				
					Chrysene		Dibenzo(a,h)anthracene		Fluoranthene		Fluorene		Indeno(1,2,3-cd)pyrene		Naphthalene		Phenanthrene		Pyrene		Benzene	Ethylbenzene	m, p-Xylene	o-Xylene	Toluene
					D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	T	T	T	T	T
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
PAI-2B	PAI-2-GW	28.78	14.79	19.79	1.0 U	10 U	1.0 U	10 U	0.56 J	10 U	3.4	10 U	1.0 U	10 U	1400	1800	5.2	7.2 J	1.00 U	10 U	3600	460	910	500	240
PAI-10	PAI-10-GW	29.87	19.09	24.09	0.10 U	0.11	0.10 U	0.10 U	0.47	1.6	4.2	4.8	0.10 U	0.070 J	1700	2000	5.2	6.8	0.29	1.1	250	150	91	46	15
PAI-11B	PAI-11-GW	28.43	18.09	23.09	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.06 J	0.10 U	0.10 U	0.10 U	0.10 U	7.0	10	0.10 U	0.060 J	0.10 U	0.060 J	1.2	0.20 U	0.40 U	0.20 U	0.20 U
PAI-12	PAI-12-GW	34.20	13.27	18.27	1.0 U	0.65	1.0 U	0.08 J	0.83 J	2.3	5.8	5.5	1.0 U	0.32	920	720	8.2	8.7	0.74 J	2.5	800	94	300	200	60
MW-36S	MW-36S-141215	30.13	8.0	22.8	1.0 U	1.0 U	1.0 U	1.0 U	2.6	4.1	13	14	1.0 U	1.0 U	5100	5800	18	20	1.9	3.2	260	310	2100	850	800
MW-36D	MW-36D-141215	29.99	29.3	33.8	1.0 U	1.0 U	1.0 U	1.0 U	4.3	5.3	15	16	1.0 U	1.0 U	6300	6900	25	27	3.1	3.9	9100	2200	1300	880	540

Exploration [2]	Sample ID	Ground Surface Elevation (ft USACOE)	Screen Start Depth (ft bgs)	Screen End Depth (ft bgs)	Ions by E200.8					Total Iron by E200.8	Ferrous Iron by SM3500-Fe	Total Dissolved Solids by SM2540C	Alkalinity by SM2320				Chloride by E300.0	Nitrate by E300.0	Sulfate by E300.0	Sulfide by E376.2 or SM4500S2D	Organic Carbon by 5310B	
					Calcium	Magnesium	Manganese	Potassium	Sodium	Iron	Ferrous Iron	Total Dissolved Solids	Alkalinity	Bicarbonate	Carbonate	Hydroxide	Chloride Anion	N-Nitrate	Sulfate	Sulfide	Total Organic	Dissolved Organic
					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	T	D
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L $CaCO_3$	mg/L $CaCO_3$	mg/L $CaCO_3$	mg/L $CaCO_3$	mg/L	mg-N/L	mg/L	mg/L	mg/L	mg/L
PAI-2B	PAI-2-GW	28.78	14.79	19.79	45.9	5.60	0.120	3.00	166	0.800	0.551	801	306	306	1.00 U	1.00 U	8.50	1.00 U	202	84.4		
PAI-10	PAI-10-GW	29.87	19.09	24.09	63.0	10.2	0.365	3.25	46.5	1.01	0.957	388	243	243	1.00 U	1.00 U	5.70	0.100 U	35.1	39.1		
PAI-11B	PAI-11-GW	28.43	18.09	23.09	60.5	14.2	0.483	4.40	20.9	0.390	0.388	154	244	244	1.00 U	1.00 U	7.60	0.100 U	1.40	1.66 J		
PAI-12	PAI-12-GW	34.20	13.27	18.27	63.6	4.87	0.200	2.00	15.1	3.66	3.72	302	74.4	74.4	1.00 U	1.00 U	3.20	1.10	122	38.5		
MW-36S	MW-36S-141215	30.13	8.0	22.8	41.6	7.06	0.407	2.70	27.9	14.1	13.1	288	166	166	1.00 U	1.00 U	4.20	0.100 U	29.2	0.512	10.5	8.32 J
MW-36D	MW-36D-141215	29.99	29.3	33.8	3.20	2.20	0.0380	3.00	979	1.60	0.220	2940	1000	893	112	1.00 U	15.2	0.500 U	604	141	7.09	6.85 J

Notes:

[1] Non-anoxic samples analyzed by Analytical Resources, Inc. (ARI). Presents field-filtered dissolved (D) and non-filtered total (T) results.

[2] PAI-2B, PAI-10, PAI-11B, and PAI-12 were temporary wells installed for grab groundwater sampling purposes; MW-36D and MW-36S are existing monitoring wells.

[3] cPAH (carcinogenic polycyclic aromatic hydrocarbons), as TEQ (toxicity equivalency quotient) calculated using 1/2 the RL for non-detects.

BETX = benzene, ethylbenzene, toluene, and xylene

$CaCO_3$ = calcium carbonate

Fe = iron

ft bgs = feet below ground surface

gw = groundwater

J = estimated value

mg/L = milligrams per liter

PAHs = polycyclic aromatic hydrocarbons

Qvr = Vashon Recessional Outwash

T = summed result

U = not detected above reporting limit

µg/L = micrograms per liter

USACE = U.S. Army Corps of Engineers (Locks) vertical datum

Table 2B-1-4

Soil Arsenic Sequential Extraction Results[1]

Gas Works Park Site - Play Area Investigation Data Report

Seattle, Washington

							Arsenic[2]						Iron[2]					
						Reagent	0.05 M $(NH_4)_2SO_4$	0.05 M $(NH_4)H_2PO_4$	0.2M $(NH_4)_2C_2O_4$	0.2M $(NH_4)_2C_2O_4$ + 0.1M Ascorbic acid	HNO_3/H_2O_2		0.05 M $(NH_4)_2SO_4$	0.05 M $(NH_4)H_2PO_4$	0.2M $(NH_4)_2C_2O_4$	0.2M $(NH_4)_2C_2O_4$ + 0.1M Ascorbic acid	HNO_3/H_2O_2	
						Phase	Non-specifically adsorbed arsenic	Specifically-sorbed arsenic	Amorphous Fe oxyhydroxide	Crystalline Fe oxyhydroxide	Residual fractions	Total As in Fractions	Non-specifically adsorbed arsenic	Specifically-sorbed arsenic	Amorphous Fe oxyhydroxide	Crystalline Fe oxyhydroxide	Residual fractions	Total Fe in Fractions
						Analysis Method	SW6020 Wenzel F1	SW6020 Wenzel F2	SW6020 Wenzel F3	SW6020 Wenzel F4	SW6020 Wenzel F5	–	SW6020 Wenzel F1	SW6020 Wenzel F2	SW6020 Wenzel F3	SW6020 Wenzel F4	SW6020 Wenzel F5	–
Exploration	Sample ID	Ground Surface Elevation (ft USACE)	Start Depth (ft bgs)	End Depth (ft bgs)	Observed Geology	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
PAI-2B	PAI-2-17.5-18.0	28.78	17.5	18	FIII		354	180	24.7	78.5	9110	9700 T	55.1	255	718	532	6120	7700 T
PAI-2B	PAI-2-19.0-19.5	28.78	19	19.5	Fill		7.86	8.07	3.1	2.89	37.6	60 T	12.1 J	180	799	491	11900	13000 JT
PAI-3B	PAI-3-33.5-34.0	30.85	33.5	34	Qvr		6.84	0.832	0.721	0.578	3.23	12 T	4.6 J	338	1200	715	5970	8200 JT
PAI-10	PAI-10-31.5-32.0	28.97	31.5	32	Qvr		4.68	1.6	1.11	0.493	3.71	12 T	17.1	159	1480	715	6640	9000 T
PAI-11	PAI-11-12.0-12.5	27.60	12	12.5	Fill		0.556 J	2.03	1.47	0.565 J	19.2	24 JT	208	508	2430	731	12700	17000 T
PAI-11	PAI-11-22-22.5	27.60	22	22.5	Qvr		1.93	3.75	0.79	0.845	35.4	43 T	36.8	392	1170	834	13800	16000 T
PAI-12	PAI-12-8.5-9.0	34.20	8.5	9	Fill		18.5	40.6	108	26.8	93	290 T	35	19.2 J	542	1380	1630	3600 JT
PAI-12	PAI-12-13.5-14.0	34.20	13.5	14	Fill		20.3	908	4790	2620	750	9100 T	5.6 J	32.6	19200	4300	4870	28000 JT

Notes:

[1] Anoxic samples analyzed by Applied Speciation and Consulting LLC.

[2] Proprietary information based on that described by Wenzel et al. (Anal Chim Acta 436 [2001], 309–323) (5-stage extraction designed to quantify arsenic in different phases: non-specifically adsorbed arsenic, specifically-sorbed arsenic, amorphous iron oxyhydroxide, crystalline iron oxyhydroxide, and residual fractions).

As = arsenic

Fe = iron

ft bgs = feet below ground surface

J = estimated value

mg/kg = milligrams per kilogram

Qva = Vashon Advance Outwash

Qvr = Vashon Recessional Outwash

T = summed result

USACE = U.S. Army Corps of Engineers (Locks) vertical datum

Table 2B-1-5

Groundwater Arsenic Speciation Results[1]

Gas Works Park Site - Play Area Investigation Data Report
Seattle, Washington

Exploration[2]	Sample ID	Ground Surface Elevation (ft USACE)	Screen Start Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Midpoint (ft bgs)	"Well" Type	Sample Type	Observed Geology	Exploration Groundwater Depth (ft bgs)	Species	As(III)/ Arsenite	As (V)/ Arsenate	Monomethyl-arsonic Acid	Dimethyl-arsinic Acid	Unknown1	Unknown2	Unknown3	Unknown4	Summed Total[3]
										Analysis Method	EPA Method 6800M	EPA Method 6800M	EPA Method 6800M	EPA Method 6800M	EPA Method 6800M	EPA Method 6800M	EPA Method 6800M	EPA Method 6800M	–
										CAS No.	15502-74-6	15584-04-0	124-58-3ÿ	75-60-5	Unknown1 - 8.4	Unknown2 - 9.2	Unknown3 - 10.2	Unknown4 - 13.1	–
										Units	µg/L	µg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PAI-2B	PAI-2GW	28.78	14.79	19.79	17.29	Deep	grab gw	FIll	8.45		42900	1200	110 U	120 U	1100	620	10500	680	57000 T
PAI-10	PAI-10GW	28.97	19.09	24.09	21.59	Deep	grab gw	Fill	8.85		482	15.4 J	4.2 U	4.6 U	102	128	2240	8.2 J	3000 JT
PAI-11B	PAI-11GW	28.43	18.09	23.09	20.59	Deep	grab gw	Fill	8.25		28.9	1.74	0.21 U	0.23 U	14.2	2.94	52.5	7.6	110 T
PAI-12	PAI-12GW	34.20	13.27	18.27	15.77	WT	grab gw	Fill	14.00		702	141	2.1 U	2.3 U	144	7.9 J	120	19.4	1100 JT
MW-36S	MW-36S-141215	30.13	8.0	22.8	15.4	WT	gw	Fill	9.46		37.7	6.41	0.42 U	0.46 U	0.42 U	0.42 U	0.42 U	1.65 J	46 JT
MW-36D	MW-36D-141215	29.99	29.3	33.8	31.55	Deep	gw	Qvr	9.17		39700	790 J	210 U	230 U	3920	1210	19400	18700	84000 JT

Notes:

[1] Anoxic samples analyzed by Applied Speciation and Consulting LLC. Presents field filtered dissolved (D) results.

[2] PAI-2B, PAI-10, PAI-11B, and PAI-12 were temporary wells installed for grab groundwater sampling purposes; MW-36D and MW-36S are existing monitoring wells.

[3] Totals assume zero for summing of non detects.

As = arsenic

ft bgs = feet below ground surface

gw = groundwater

J = estimated value

Qvr = Vashon Recessional Outwash

T = summed result

U = not detected above reporting limit

µg/L = micrograms per liter

USACE = U.S. Army Corps of Engineers (Locks) vertical datum

WT = water table (shallow)

Table 2B-1-6

Arsenic in Soil - Analytical Results vs. XRF Readings

Gas Works Park Site - Play Area Investigation Data Report

Seattle, Washington

Exploration	Analytical Samples				Arsenic by XRF (mg/kg)[2]	Observed Geology
	Sample ID	Start Depth (ft bgs)	End Depth (ft bgs)	Arsenic by EPA 200.8 (mg/kg)[1]		
PAI-1	PAI-1-13.8-14.3	13.8	14.3	3880	3989	Fill
PAI-1	PAI-1-24.0-24.5	24	24.5	33	55	Qvr
PAI-2	PAI-2-12.5-13.0	12.5	13	80	63	Fill
PAI-2	PAI-2-18.0-18.5	18	18.5	5070	8737.5	Fill
PAI-2	PAI-2-28.0-28.5	28	28.5	22	31	Qvr
PAI-3	PAI-3-13.0-13.5	13	13.5	120	46	Fill
PAI-3	PAI-3-15.5-16.0	15.5	16	669	459	Fill
PAI-3	PAI-3-27.5-28.0	27.5	28	14	ND	Qvr
PAI-3	PAI-3-33.5-34.0	33.5	34	28	35	Qvr
PAI-4	PAI-4-9.5-10.0	9.5	10	1430	914	Fill
PAI-4	PAI-4-13.0-13.5	13	13.5	181	190	Fill
PAI-4	PAI-4-16.0-16.5	16	16.5	26	21	Fill
PAI-5	PAI-5-8.0-8.5	8	8.5	290	26	Fill
PAI-5	PAI-5-13.5-14.0	13.5	14	531	514	Fill
PAI-6	PAI-6-9.0-9.5	9	9.5	2990	7888	Fill
PAI-7	PAI-7-5.5-6.0	5.5	6	704	921	Fill
PAI-7	PAI-7-10.0-10.5	10	10.5	354	70	Qvr
PAI-7	PAI-7-22.5-23.0	22.5	23	8	18	Qvr
PAI-8	PAI-8-8.5-9.0	8.5	9	2150	1123	Fill
PAI-8	PAI-8-14.5-15.0	14.5	15	41	13	Qvr
PAI-8	PAI-8-27.5-28.0	27.5	28	8	46	Qva
PAI-9	PAI-9-9.5-10.0	9.5	10	160	219	Fill
PAI-9	PAI-9-12.5-13.0	12.5	13	470.5	1483	Fill
PAI-9	PAI-9-23-23.5	23	23.5	60	38	Qvr
PAI-10	PAI-10-9.5-10.0	9.5	10	19.3	ND	Fill
PAI-10	PAI-10-24.5-25.0	24.5	25	610	224	Fill
PAI-11	PAI-11-9.5-10	9.5	10	110	12	Fill

Notes:

[1] Duplicate soil samples were averaged.

[2] Arsenic x-ray fluorescence (XRF) readings were collected in or very nearby depth interval.

EPA = US Environmental Protection Agency

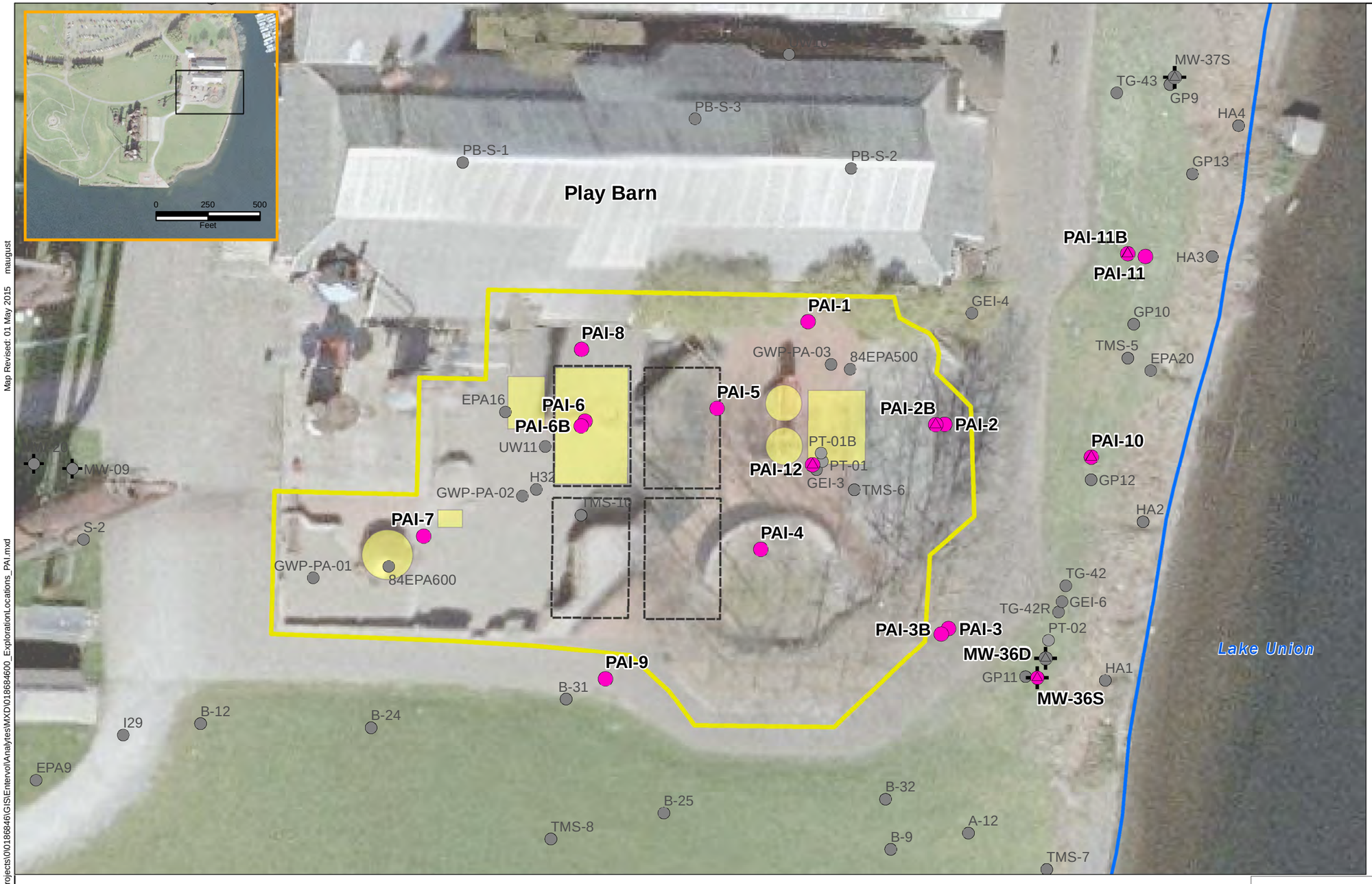
ft bgs = feet below ground surface

mg/kg = milligrams per kilogram

ND = not detected above limit of detection (LOD)

Qva = Vashon Advance Outwash

Qvr = Vashon Recessional Outwash



Legend

- Shoreline
- Play Area Improvement Footprint
- Former Thylox Process Structures
- Former Subsurface Structures

Previous Upland Explorations

- Previous Exploration Location
- Previous Exploration (Monitoring Well)

Play Area Investigation Explorations

- Exploration Location
- Exploration Location (Groundwater Sample Collected)
- Exploration Location (Monitoring Well) (Groundwater Sample Collected)

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Notes:
1. Reference: Richard Haag Associates, 1974: former Thylox process structures. Seattle Parks and Recreation: 2014 Play Area Improvement footprint.
2. Basemap: 2005 USGS aerial photograph. Does not show current conditions.

N W E S

25 0 25
Feet

Exploration Locations

Play Area Investigation Data Report
Gas Works Park Site
Seattle, Washington

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Figure 2B-1-1

Map Revised: 01 May 2015 maugust
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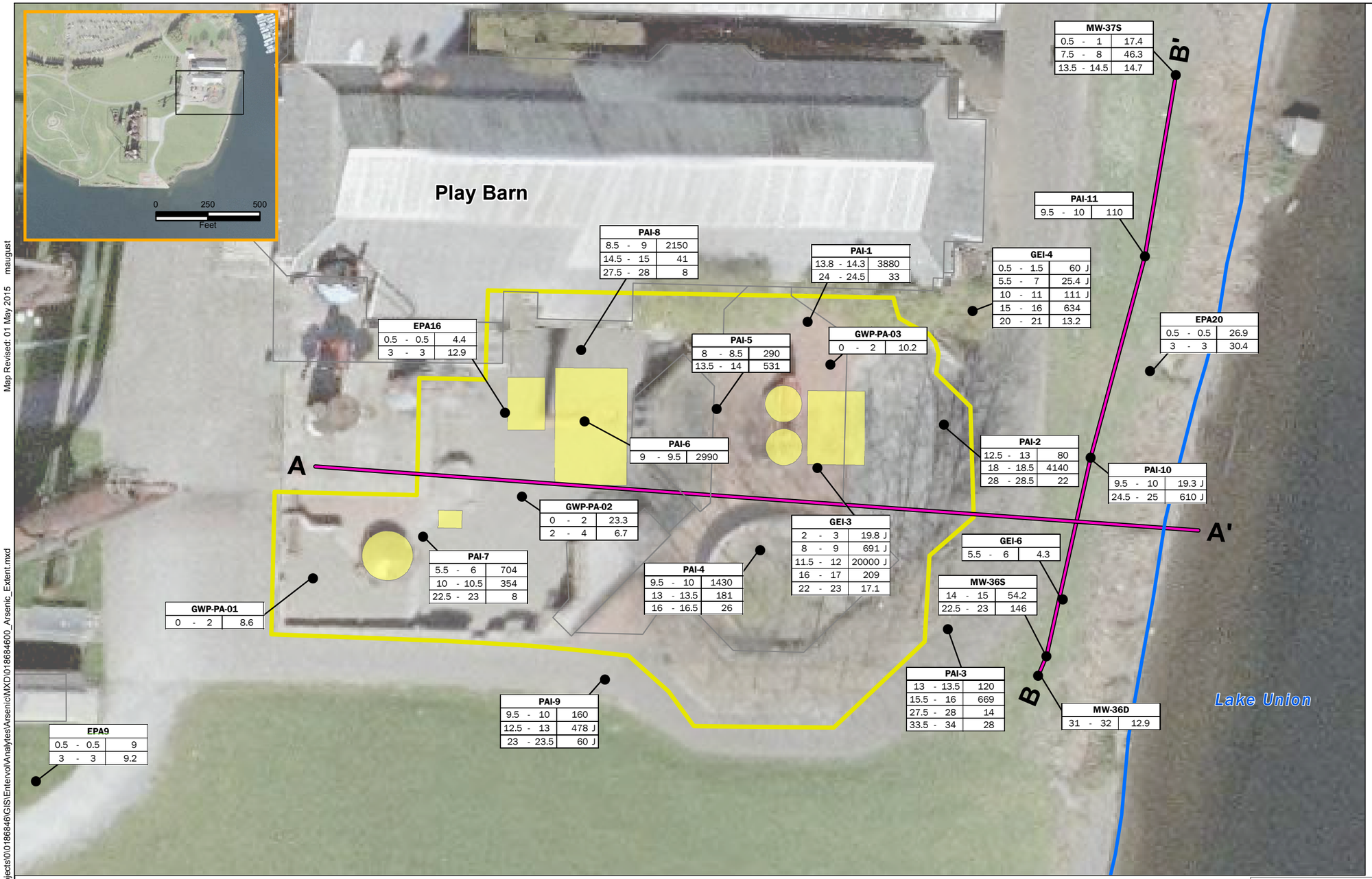

Legend

- Shoreline
- Play Area Improvement Footprint
- Former Thylox Process Structures
- Cross Section
- Exploration with Arsenic Soil Sample

EPA9

Sample Depth Range (ft bgs)	Arsenic Concentration (mg/kg)
0.5 - 0.5	9
3 - 3	9.2

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Notes:
ft bgs = feet below ground surface
mg/kg = milligrams per kilogram
J = estimated value

1. Reference: Richard Haag Associates, 1974: former Thylox process structures. Seattle Parks and Recreation, 2014: Play Area Improvement footprint.
2. Basemap: 2005 USGS aerial photograph. Does not show current conditions.

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

N W E S

25 0 25
Feet

Arsenic in Soil

Play Area Investigation Data Report
Gas Works Park Site
Seattle, Washington

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Figure 2B-1-2

Map Revised: 01 May 2015 maugust
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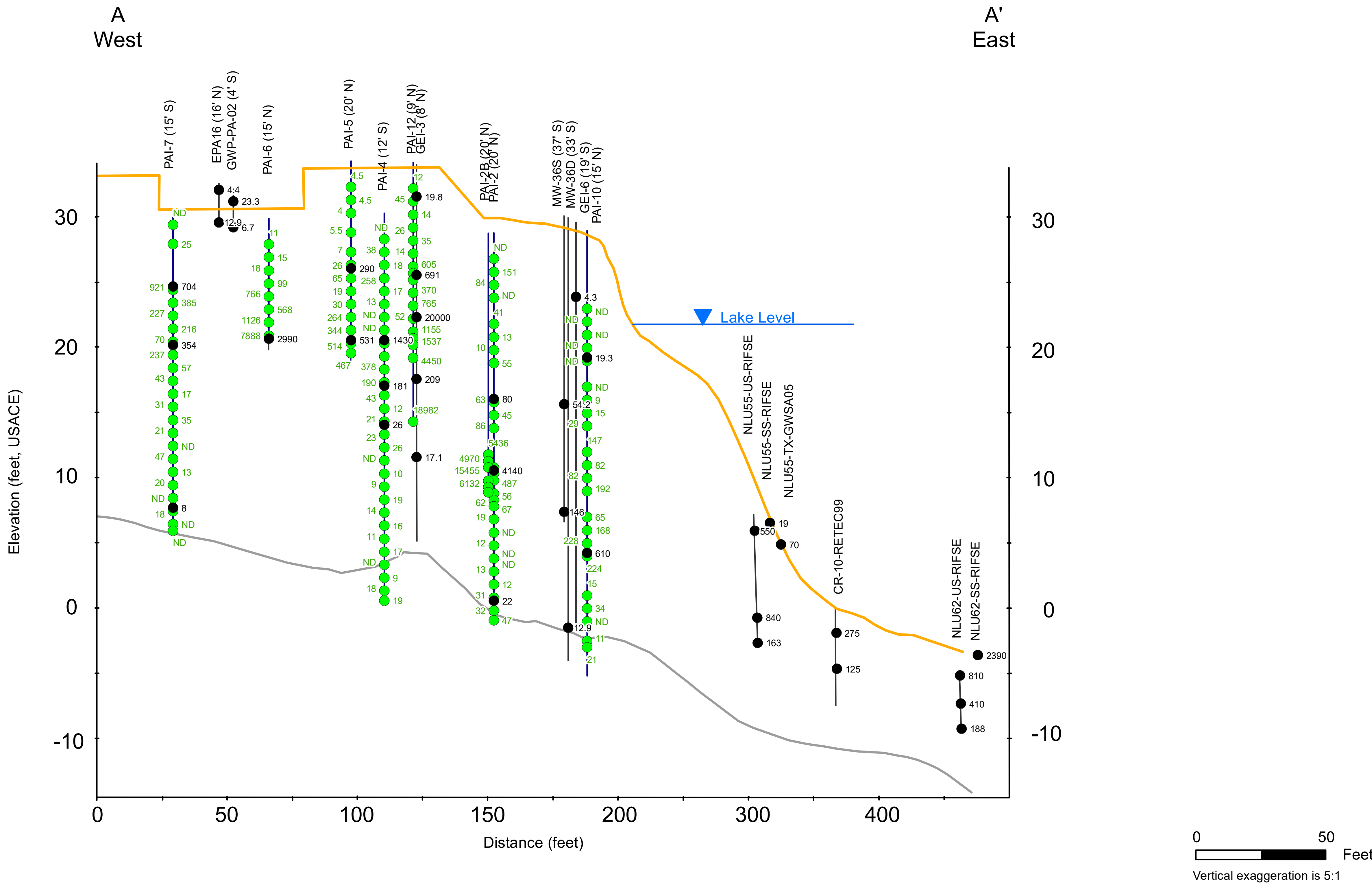

Arsenic Soil Concentration (mg/kg)

26 ● Analytical Result

40 ● XRF Analyzer Field Reading

Approximate Ground Surface

Approximate Top of Till

Notes:
1. Cross-section posts raw XRF data. XRF analyzer field reading and analytical results show an overall strong linear correlation (r around 0.9).
2. ND = result is less than the limit of detection (< LOD). LOD is defined as three times the error on the counting statistics of the measurement. Detection limit for Arsenic is 9 mg/kg.

Arsenic in Soil
Cross-section A-A'

Play Area Investigation Data Report
Gas Works Park Site
Seattle, Washington

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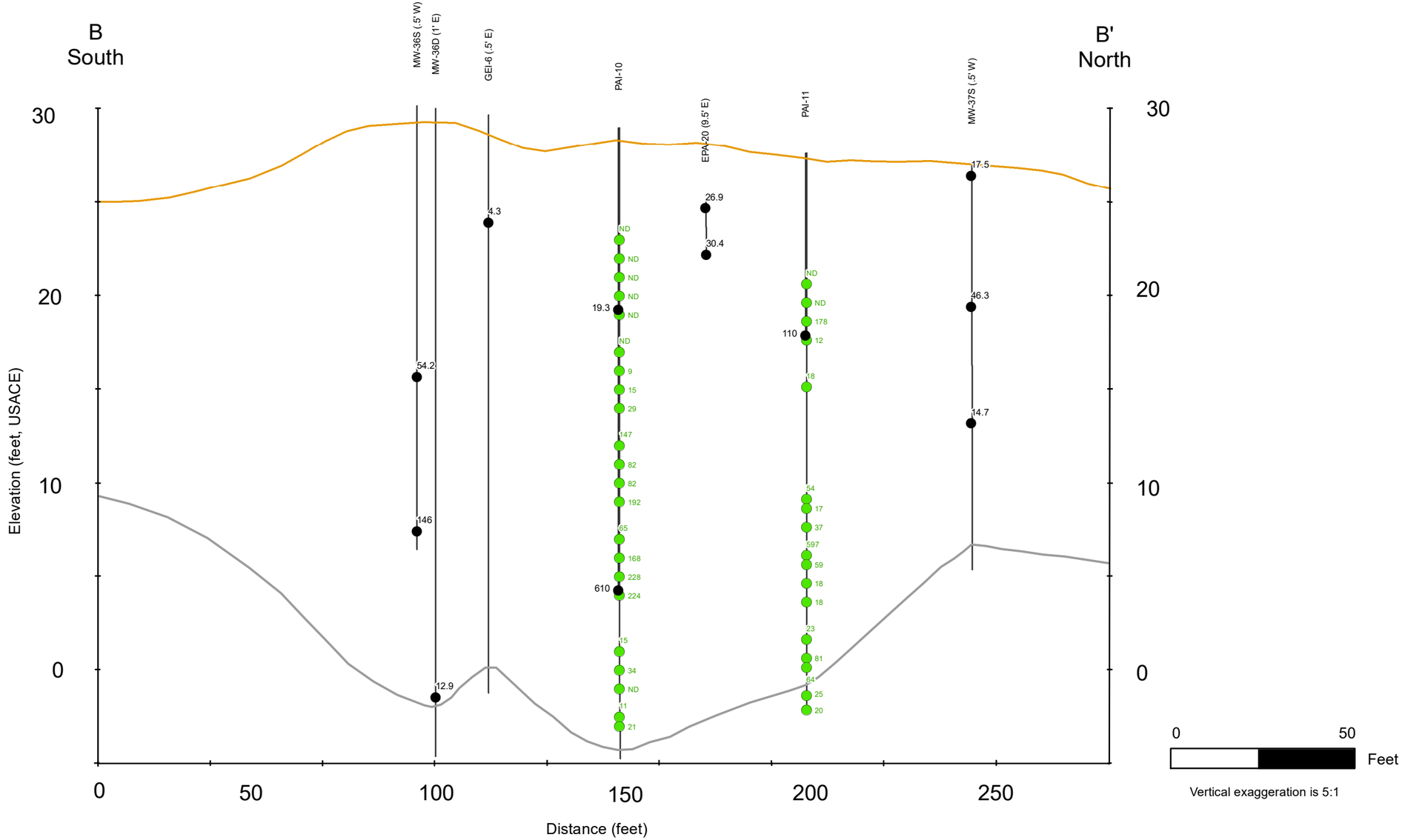
Figure 2B-1-3

Office: SEA
Path: \\sea\projects\0\0186846\GIS\Entervol\Analytes\Arsenic\MXD\018684600_Arsenic_Soil_Sediment_wPAI_XSection_A.mxd
Map Revised: 10 November 2021 glohmeyer



Arsenic Soil Concentration (mg/kg)

26 ● Analytical Result

40 ● XRF Analyzer Field Reading

Approximate Ground Surface

Approximate Top of Till

Notes:
1. Cross-section posts raw XRF data. XRF analyzer field reading and analytical results show an overall strong linear correlation (r around 0.9).
2. ND = result is less than the limit of detection (< LOD). LOD is defined as three times the error on the counting statistics of the measurement. Detection limit for Arsenic is 9 mg/kg.

Arsenic in Soil
Cross-section B-B'

Play Area Investigation Data Report
Gas Works Park Site
Seattle, Washington

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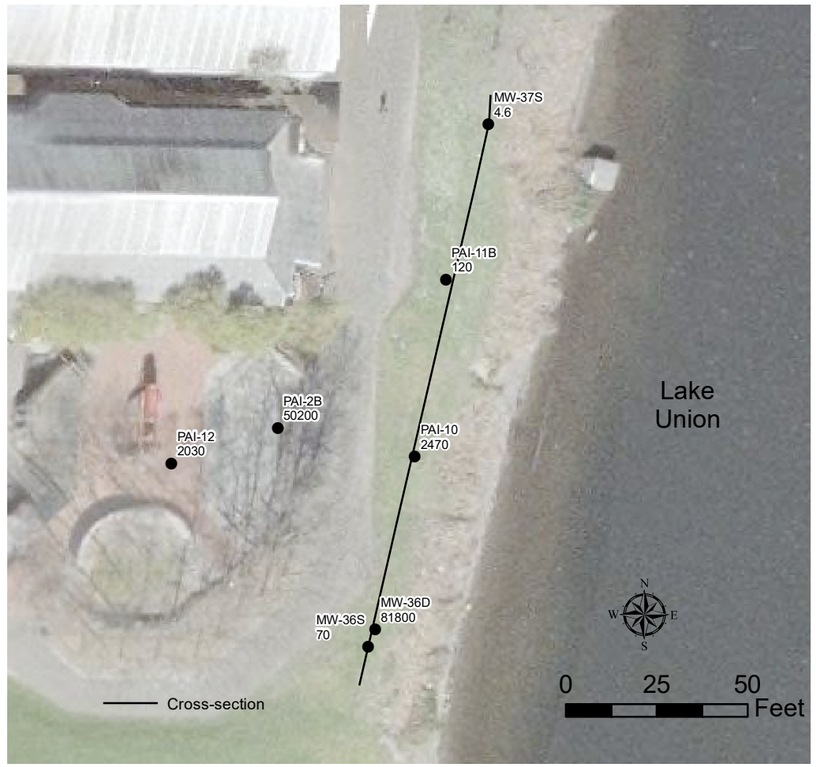
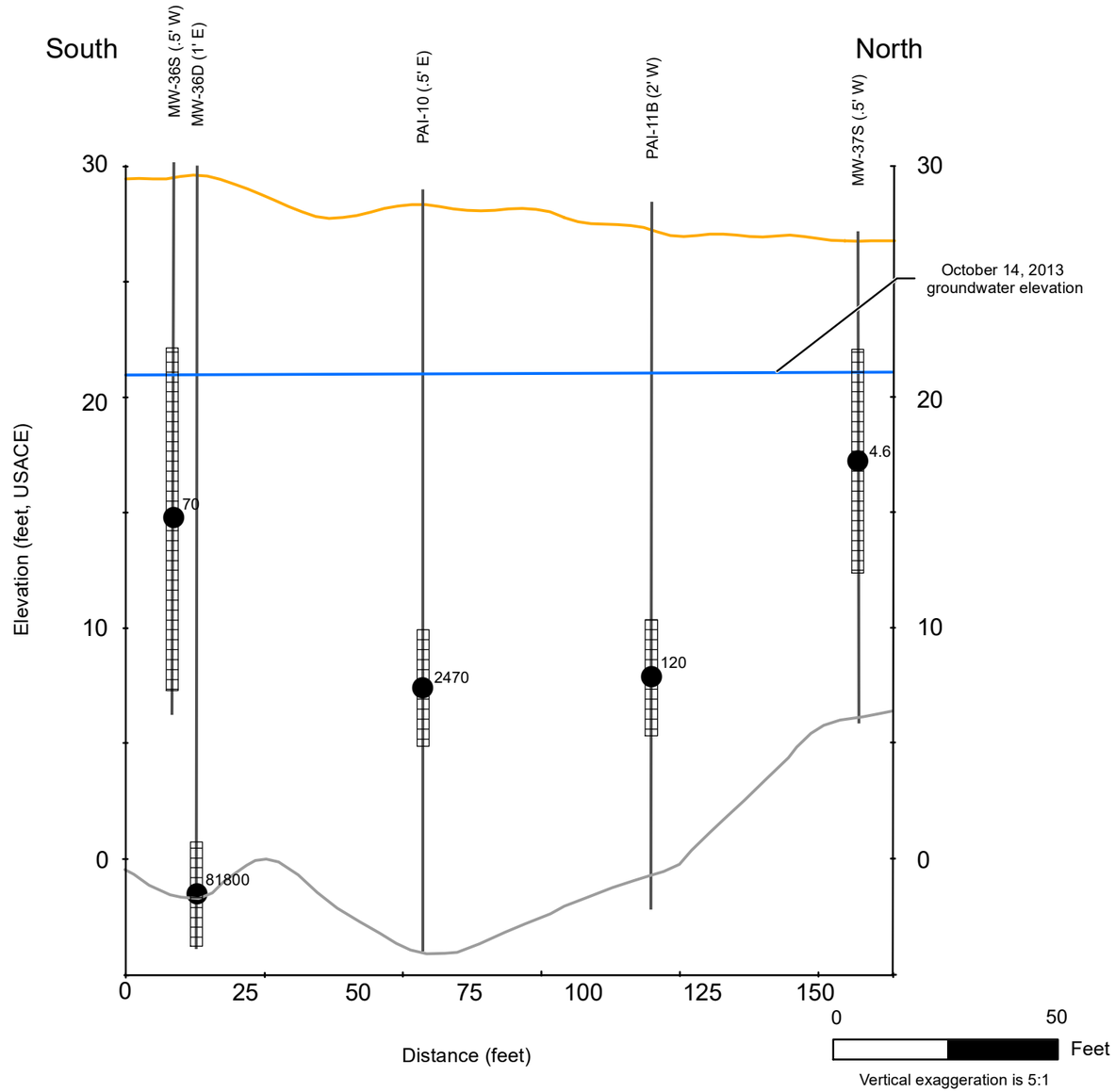
Figure 2B-1-4

Office: SEA Path: \\sea\projects\0\0186846\GIS\Entervol\Analytes\Arsenic\MXD\0186846600_Arsenic_Soil_Sediment_wPAI_XSection_B.mxd Map Revised: 10 November 2021 glohmeyer





Notes:
1. All arsenic groundwater results are from PAI (December 2014) except MW-37S result which is from Supplemental Investigation (October 2013).
2. "PAI" locations were borings/temporary wells where grab groundwater samples were collected; "MW" locations are monitoring wells. All samples were field-filtered.
3. Basemap: 2005 USGS aerial photograph. Does not show current conditions.

Dissolved Arsenic Groundwater Concentration (ug/L)[1, 2]

70 ● Analytical Result (Mid-point of Screen Interval)

Screen Interval

Approximate Ground Surface

Approximate Groundwater Elevation

Approximate Top of Till

Arsenic in Groundwater

Play Area Investigation Data Report
Gas Works Park Site
Seattle, Washington

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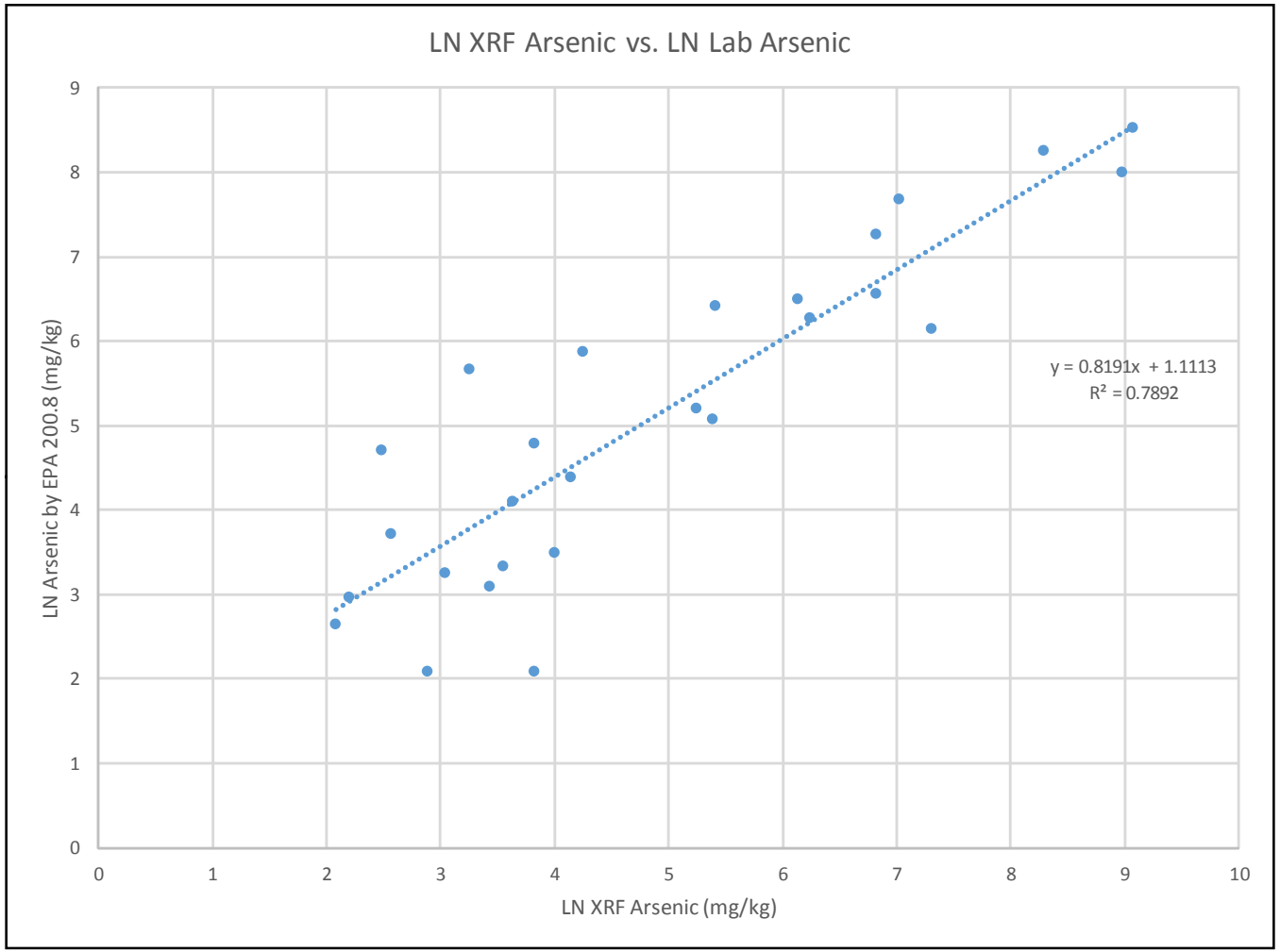
Figure 2B-1-5

Path: \\sea\projects\0\0186846\GIS\Enterval\Analytes\Arsenic\MXD\0186846O0_Arsenic_GW_wPAI_XSection_MW36s_MW37s.mxd Map Revised: 10 November 2021 glohmeyer
Office: SEA



Notes:
1. X-ray fluorescent (XRF) analyzer raw data are included as Attachment Y-5.

Arsenic in Soil -
XRF Field Readings vs. Analytical Results

Play Area Investigation Data Report
Gas Works Park Site
Seattle, Washington

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Figure 2B-1-6

ATTACHMENT 2B-1-1
Boring Logs

ATTACHMENT 2B-1-1
Boring Logs

SOIL CLASSIFICATION CHART

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

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

Sampler Symbol Descriptions

- **2.4-inch I.D. split barrel**
- **Standard Penetration Test (SPT)**
- **Shelby tube**
- **Piston**
- **Direct-Push**
- **Bulk or grab**
- **Continuous Coring**

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

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

ADDITIONAL MATERIAL SYMBOLS

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

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Material Description Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Laboratory / Field Tests

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

Sheen Classification

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

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

KEY TO EXPLORATION LOGS

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FIGURE 2B.1-1.1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	12/8/2014	12/8/2014	30	RNM	ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
33.81	NA	Geoprobe 7730 DT

Easting (X) Northing (Y)	System Datum	Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
1270728.14 239171.8				

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						Pavers	1.5 inches red brick pavers			XRF Readings "As = X ppm"
							SP-SM	Brown fine to medium sand with silt and occasional gravel (medium dense, moist) (fill)	NS	<1	
		30						With occasional orange mottling	SS 5%	<1	As = ND (<26 ppm) Metallic gray
30							SM	Dark brown silty sand with occasional gravel and red brick (medium dense, moist) (fill)	SS 10%	<1	As = ND (<13 ppm) Metallic gray
									SS 10%	<1	As = 22 ppm (±5) Metallic gray
	5			PAI-1 (4.5-5)							
		14						With occasional wood fragments	SS 10%	<1	As = ND (<16 ppm) Metallic gray
								With gravel	MS 30%	<1	As = 55 ppm (±7) Metallic gray florets No recovery from 6 to 12 feet
25							SM	Dark gray silty sand with occasional black soot (medium dense, moist) (fill)			
	10										
		36							SS 10%	<1	As = 28 ppm (±5) Metallic gray
							SP-SM	Dark gray to black with occasional orange mottling medium sand with silt, gravel and occasional red brick (medium dense, moist) (fill)	MS 30%	<1	As = 289 (±10) Metallic gray florets As = 280 ppm (±9)
20				PAI-1 (13.8-14.3)							As = 3,989 ppm (±61)
				PAI-1 (14.5-15)					SS 10%	<1	As = 619 ppm (±14) Metallic gray
	15	24					GP	Dark gray to black gravel-sized vesicular fused agglomerate with sand (medium dense, wet) (fill)	HS 90%	30.7	Groundwater encountered at 14.5 feet at time of drilling Naphthalene-like odor
				PAI-1 (16.5-17)					MS 50%	25.2	Rainbow As = 658 ppm (±13)
							SM	Dark gray to black silty fine to medium sand with occasional gravel (medium dense, wet)	SS 5%	16.2	As = 342 ppm (±9) Orange blebs As = 831 ppm (±14)
15									SS 5%	3	Naphthalene-like odor Metallic gray As = 175 ppm (±7) Metallic gray No recovery from 18 to 20 feet
	20	40									
									SS 5%	2.5	As = 239 ppm (±8) Metallic gray
									NS	1.2	As = 172 ppm (±7)
									NS	<1	As = 148 ppm (±6)
10									NS	<1	As = 67 ppm (±4)
	25			PAI-1 (24-24.5)					SS	1.1	As = 55 pm (±4) Metallic gray
							SM				

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-1

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.2
Sheet 1 of 2

Seattle: Date:2/15/19 Path:P:\0\0186846\GINT\0186846001.GPJ DBTemplate/LibTemplate\GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_STANDARD

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
-5	25		54							Dark gray silty fine sand with occasional gravel (medium dense to dense, wet)	SS	1.5	As = 85 ppm (±5) Metallic gray
											NS	2.5	As = 86 ppm (±5) As = 13 ppm (±3)
											NS	3.1	As = 24 ppm (±6)
										Grades to gray	NS	2.1	As = 15 ppm (±3)
						PAI-1 (29-29.5)					NS	1.4	As = 23 ppm (±3)
	30								SM	Gray silty fine sand with occasional rounded gravel (dense, moist)	NS	1.2	As = 22 ppm (±3)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-1 (continued)

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.2
Sheet 2 of 2

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/9/2014	12/9/2014	30	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
28.8	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater: Date Measured	Depth to Water (ft)	Elevation (ft)
1270760.96 / 239147.16				

Notes: Boring PAI-2B drilled approximately 2 feet away to collect groundwater and soil sequential extraction cores.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample / Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		48					AC	2 inches asphalt			XRF Readings "As = X ppm"
								GP	Dark gray fine to coarse gravel with sand and trace silt (medium dense, moist) (fill)			
								SM	Dark brown silty fine to medium sand with gravel (medium dense, moist) (fill)	NS	<1	As = ND (<10 ppm)
									Grades to black with occasional buff and orange sand, red brick fragments and soot	NS	<1	As = 151 ppm (±9)
									With gravel-sized black vesicular fused agglomerate from 3 to 5 feet	NS	<1	As = 84 ppm (±5)
	5		36		PAI-2 (4.5-5)					NS	<1	As = ND (<10 ppm)
								GM	Black silty fine gravel with sand (medium dense, moist) (fill)	NS	<1	As = 41 ppm (±4)
									Becomes wet			Perched groundwater encountered at 7 feet at time of drilling
									Becomes moist	NS	<1	As = NS (<26 ppm)
									With orange-stained fine to medium sand			
									With black vesicular coarse sand agglomerate	SS 10%	<1	As = 10 ppm (±3) Metallic gray
	10		30					GP	Dark gray fine gravel with sand, trace silt and black fused vesicular agglomerate (medium dense, moist) (fill)	SS 5%	5.8	As = 55 ppm (±5) Metallic gray
					PAI-2 (12.5-13)				Becomes wet	SS	<1	Groundwater encountered at 12 feet at time of drilling Slight hydrocarbon-like odor
										MS	<1	As = 63 ppm (±4) Metallic gray florets
										SS	<1	As = 45 ppm (±3) Metallic gray
	15		30						Grades to black	MS	<1	As = 86 ppm (±4) Metallic gray florets
					PAI-2 (18-18.5)					NS	<1	As = 2,781 ppm (±42)
					PAI-2 (18-18.5 DUP)					MS	3.9	As = 14,694 ppm (±22) As = 487 ppm (±17) Metallic gray blebs
					PAI-2 (19.5-20)							NAPL present (stained liner)
	20		58						With occasional black stained wood fragments	HS	43.6	Rainbow
								ML	Gray sandy silt with occasional gravel (medium stiff, wet)	NS	20.8	As = 56 ppm (±4) As = 62 ppm (±4)
								SM	Gray silty fine sand with occasional gravel (medium dense, wet)	NS	2.3	Moderate hydrocarbon-like odor As = 67 ppm (±4)
										NS	9	As = 19 ppm (±3)
										NS	10.1	As = ND (<8 ppm)
	25				PAI-2 (24-24.5)					NS	10.4	As = 12 ppm (±3)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-2

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	25		55						GP-GM	Gray fine gravel with sand and silt (medium dense, wet)	NS	5.6	As = ND (<9 ppm)
									SM	Gray silty fine to medium sand with occasional gravel (medium dense, wet)	NS	8.3	As = 13 ppm (±3)
											NS	4.2	As = 12 ppm (±3)
						PAI-2 (28-28.5)					NS	7.2	As - 31 ppm (±4)
									SM	Gray silty fine to medium sand with occasional gravel (dense, moist)	NS	14.1	As = 32 ppm (±4)
	30										NS	9.5	As = 47 ppm (±4)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-2 (continued)

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.3
Sheet 2 of 2

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/12/2014	12/12/2014	20	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
28.78	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater		
1270758.79 / 239147.06		Date Measured	Depth to Water (ft)	Elevation (ft)
		12/12/2014	8.5	20.33

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample / Sample Name Testing	FIELD DATA: Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
25	0							See adjacent boring PAI-2 for soil descriptions			XRF Readings "As = X ppm"
	5										
20	10										
15	15			PAI-2B (17.5-18)							As = 5,436 ppm (±105) As = 4,970 ppm (±91) As = 15,455 ppm (±249)
10				PAI-2B (19-19.5)							As = 6,132 ppm (±89) As = 346 ppm (±12) As = 119 ppm (±6)
	20							Temporary pre-pack well screen installed from 14.79 to 19.79 feet below ground surface; grab groundwater sample PAI-2GW collected			

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-2B

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.4
Sheet 1 of 1

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/10/2014	12/10/2014	35	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
30.63	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater: Date Measured	Depth to Water (ft)	Elevation (ft)
1270761.92 / 239097.97				

Notes: Boring PAI-3B drilled approximately 3 feet away to collect groundwater and soil sequential extraction cores.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
30	0		46						AC	2 inches asphalt			XRF Readings "As = X ppm"
									GP	Brown fine gravel with sand and trace silt (medium dense, moist) (fill)	NS	<1	As = ND (<11 ppm)
									SP	Brown fine to medium sand with gravel and trace silt (medium dense, moist) (fill)	SS 5%	<1	As = ND (<8 ppm) Metallic gray
									SM	Dark brown to black silty fine to medium sand with gravel (medium dense, moist) (fill)	NS	<1	As = 18 ppm (±5)
									GM	Black silty fine gravel with sand, black fused vesicular agglomerate with soot, and occasional brick fragments (medium dense, moist) (fill)	NS	<1	As = 57 ppm (±6)
25	5		38			PAI-3 (4.5-5)					SS 5%	<1	As = ND (<14 ppm) Metallic gray
									SM	Black silty fine to medium sand with occasional gravel (medium dense, moist) (fill)	SS 5%	<1	As = 49 ppm (±6) Metallic gray
									GP	With buff and orange stained sand	SS 5%	<1	As = ND (<9 ppm) Metallic gray
										Black with orange staining fine gravel with sand, trace silt and black fused vesicular and nonvesicular agglomerate (medium dense, moist) (fill)	NS	<1	As = ND (<7 ppm)
20	10		36			PAI-3 (9.5-10)					NS	<1	As = ND (<9 ppm)
						PAI-3 (12-12.5)					NS	<1	As = ND (<7 ppm)
						PAI-3 (13-13.5)			GP	Black fine gravel with sand, trace silt and fused vesicular agglomerate (medium dense, moist) (fill)	HS	22	As = 46 ppm (±4) Rainbow Groundwater encountered at 13 feet at time of drilling
										Becomes wet with occasional red fused vesicular agglomerate	HS	11	As = 63 ppm (±4) Rainbow
15	15		24			PAI-3 (15.5-16)					MS	3	As = 68 ppm (±4) Strong hydrocarbon-like odor; NAPL present Metallic gray florets
											NAPL	67	As = 459 ppm (±11)
										With wood fragments	NAPL	23	As = 40 ppm (±4) No recovery from 17 to 20 feet due to rock in sampler shoe
10	20		40										
						PAI-3 (22-22.5)				Grades to dark gray with increasing sand and silt content	NS	22	As = 50 ppm (±4)
											SS	6	As = 22 ppm (±3) Metallic gray
									SM	Dark gray silty sand with gravel (medium dense, wet)	NS	12	As = 11 ppm (±3)
	25								GP				

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-3

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.5
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample / Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
5	25		48						Dark gray fine gravel with sand and trace silt (medium dense, wet)	NS	14	As = ND (<8 ppm)
					PAI-3 (27.5-28)			SP-SM	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	<1	As = 25 ppm (±4)
										NS	2	As = ND (<8 ppm)
								GP	Gray fine gravel with sand and trace silt (medium dense, wet)	NS	2	As = ND (<8 ppm)
0	30		60							NS	<1	As = ND (<8 ppm)
								SP-SM	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	<1	As = ND (<8 ppm)
										NS	<1	As = ND (<9 ppm)
					PAI-3 (33.5-34)			SM	Gray silty fine to medium sand with gravel (medium dense, wet)	NS	<1	As = 13 ppm (±3)
								ML	Gray silt (hard, moist)	NS	7	As = 35 ppm (±5)
	35									NS	5	As = 65 ppm (±5)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-3 (continued)

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.5
Sheet 2 of 2

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/12/2014	12/12/2014	35	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
30.85	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater: Date Measured	Depth to Water (ft)	Elevation (ft)
1270760.15 / 239096.64				

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
30	0							See adjacent boring PAI-3 for soil descriptions			XRF Readings "As = X ppm"
25	5										
20	10										
15	15										
10	20										
	25										

Note: See Figure 2B.1-1.1 for explanation of symbols.

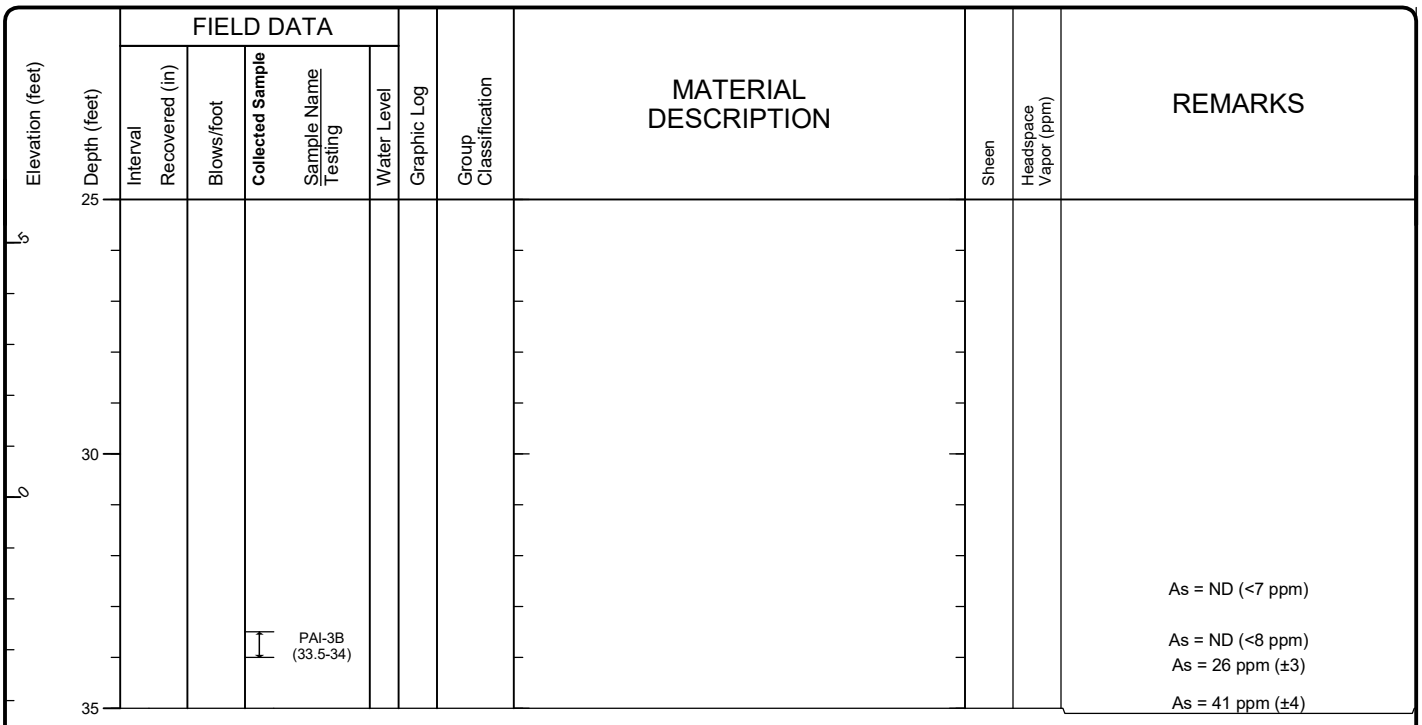
Log of Boring PAI-3B

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.6
Sheet 1 of 2

Seattle: Date:2/15/19 Path:P:\0\0186846\GINT\0186846001.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_STANDARD



Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-3B (continued)

GeoEngineers

Project:	Puget Sound Energy GWPS
Project Location:	Gas Works Park, Seattle, Washington
Project Number:	0186-846-01

Figure 2B.1-1.6
Sheet 2 of 2

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/10/2014	12/10/2014	30	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
30.31	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater: Date Measured	Depth to Water (ft)	Elevation (ft)
1270716.7 / 239117.02				

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
30	0						SP	Gray fine to medium sand with occasional gravel and trace silt (loose, moist) (fill)	NS	<1	XRF Readings "As = X ppm"
		36							SS 5%	<1	As = ND (<9 ppm) Metallic gray
							SP-SM	Dark brown fine to medium sand with silt and occasional gravel (medium dense, moist) (fill)	SS 5%	<1	As = 38 ppm (±6) Metallic gray
							GM	Black silty fine gravel with sand, soot and occasional red bricks (medium dense, moist) (fill)	SS 5%	<1	As = 18 ppm (±5) Metallic gray
25	5	46		PAI-4 (4.5-5)					SS 5%	<1	As = 258 ppm (±22) Metallic gray
									SS 5%	<1	As = 17 ppm (±4) Metallic gray
									SS 5%	<1	As = 13 ppm (±3) Metallic gray
									SS 5%	<1	As = ND (<12 ppm) Metallic gray
								With occasional fine roots			
								With brown to black fused vesicular agglomerate	SS 5%	<1	As = ND (<10 ppm) Metallic gray
20	10	55		PAI-4 (9.5-10)			SP-SM	Black medium to coarse sand with gravel and silt (medium dense, moist) (fill)	SS 5%	1.5	As = 914 ppm (±13) Metallic gray
									SS 5%	5.1	As = 1,525 ppm (±31) Perched groundwater encountered at 11 feet at time of drilling Metallic gray
							ML	Gray silt (soft, moist)	MS	422	As = 378 ppm (±12) Metallic gray florets
							SM	Black silty fine sand with occasional wood fragments (medium dense, moist)	HS 100%	970	As = 190 ppm (±7) Rainbow
				PAI-4 (13-13.5)					MS	729	As = 43 ppm (±3) Metallic gray florets Strong hydrocarbon-like odor
15	15	50									As = 12 ppm (±3) Groundwater encountered at 15 feet at time of drilling
									MS	731	
				PAI-4 (16-16.5)					NAPL	1,002	NAPL present As = 21 ppm (±3) Strong hydrocarbon-like odor
							ML	Gray silt with occasional sand and gravel (soft to medium stiff, wet)	NAPL	293	As = 23 ppm (±3) Rainbow
							SM	Dark gray silty fine to medium sand with gravel (medium dense, wet)	SS 10%	273	As = 26 ppm (±3) Metallic gray
10	20	60							MS	70.5	As = ND (<9 ppm) Metallic gray blebs
								Gravel grades out	SS 5%	19.2	As = 10 ppm (±3) Metallic gray
									SS	8.8	As = 9 ppm (±3) Metallic gray
								Grades to gray with occasional fine gravel	NS	14.3	As = 19 ppm (±3)
							SP-SM	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	20.6	As = 14 ppm (±3)
	25			PAI-4					NS	22.3	As = 16 ppm (±3)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-4

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.7
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample / Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
-5	25		54		(24.5-25)					NS	19.3	As = 11 ppm (±3)
										NS	10	As = 17 ppm (±3)
										NS	8	As = ND (<7 ppm)
					PAI-4 (27.5-28)				With increasing silt content			
								SM	Gray silty fine to medium sand with occasional gravel (dense, moist)	NS	15	As = 9 ppm (±3)
										NS	17	As = 18 ppm (±4)
	30									NS	5	As = 19 ppm (±4)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-4 (continued)

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.7
Sheet 2 of 2

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/8/2014	12/8/2014	15.5	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
34.31	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater: Date Measured	Depth to Water (ft)	Elevation (ft)
1270706.24 / 239150.94				

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs. Refusal at 15.5 feet on concrete.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample / Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						Pavers	1.5 inches red brick pavers			XRF Readings "As = X ppm"
							SP	Brown fine to medium sand with gravel and trace silt (medium dense, moist) (fill)	NS	<1	
							SP-SM	Brown fine to medium sand with gravel and silt (medium dense, moist) (fill)	NS	<1	As = ND (<9 ppm)
		24							NS	<1	As = ND (<9 ppm)
30									NS	<1	As = ND (<8 ppm) Coarse gravel in sampler shoe
	5	36						With occasional orange mottling			
				PAI-5 (6-6.5)				Gravel content increases	SS 5%	<1	As = ND (<11 ppm) Metallic gray
									SS 10%	<1	As = ND (<14 ppm) Metallic gray
				PAI-5 (8-8.5)			SM	Brown to gray silty fine to medium sand with occasion gravel and occasional wood fragments (medium dense, moist) (fill)	SS 5%	<1	As = 26 ppm (±5) Metallic gray
25							SM	Black silty fine sand with black gravel-sized vesicular fused agglomerate, occasional black soot and occasional red brick fragments (medium dense, moist) (fill)	MS	7.2	As = 65 ppm (±7) Metallic gray florets
	10	36							SS	<1	As = 19 ppm (±4) Metallic gray
									MS		As = 30 ppm (±5) Metallic gray florets Moderate hydrocarbon-like odor
								With yellow-orange staining	MS		As = 264 ppm (±10) Metallic gray florets Moderate naphthalene-like odor
							SM	Gray silty fine sand with occasional wood fragments (medium dense, moist) (fill)	MS		As = 344 ppm (±11) Metallic gray florets Moderate naphthalene-like odor
20				PAI-5 (13.5-14)					SS 5%		As = 514 ppm (±13) Metallic gray Slight hydrocarbon-like odor
	15	6		PAI-5 (14.5-15)			AC	Black asphaltic material with a taffy consistency (soft when warm/stiff when cooled, wet) (fill)	NS		Groundwater encountered at 14.5 feet at time of drilling
											As = 467 ppm (±23) Slight hydrocarbon-like odor

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-5

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.8
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	12/9/2014	12/9/2014	10	RNM	ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
29.91	NA	Geoprobe 7730 DT

Easting (X)	Northing (Y)	System Datum	Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
1270674.5	239147.86				

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs. Refusal at 10 feet on concrete. Made second attempt 2 feet away and met refusal at 10 feet again.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						SP	Gray fine to medium sand with occasional gravel and trace silt (loose, moist) (fill)	NS	<1	XRF Readings "As = X ppm"
		30					GP	Gray fine pea gravel with occasional sand and trace silt (loose, moist) (fill)	SS 5%	<1	As = 11 ppm (±3) Metallic gray
							SM	Dark brown silty fine to medium sand with occasional gravel (medium dense, moist) (fill)	NS	<1	As = 15 ppm (±5)
									NS	<1	As = 18 ppm (±6)
25	5	60		PAI-6 (5.5-6)			SM	Grades to dark gray Dark gray to black silty fine sand (medium dense, moist) (fill)	SS 10%	1.5	As = 99 ppm (±7) Metallic gray Hydrocarbon-like odor
									MS	37	As = 766 ppm (±18) Metallic gray florets
								With red brick fragments With occasional wood fragments	SS 10%	2.7	As = 568 ppm (±15) Metallic gray
							SP	Buff to orange fine to medium sand with occasional gravel and trace silt (medium dense, moist) (fill)	NS	<1	As = 1,126 ppm (±22)
							SM	Black silty fine sand with soot (medium dense, moist) (fill)	SS 5%	2.9	As = 7,888 ppm (±157) Metallic gray
20	10			PAI-6 (9-9.5)			CC	Grades to green Concrete (very dense, moist)			

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-6

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.9
Sheet 1 of 1

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/9/2014	12/9/2014	25	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
30.43	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater: Date Measured	Depth to Water (ft)	Elevation (ft)
1270635.61 / 239120.25				

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
30	0						SP	Gray fine to medium sand with occasional gravel and trace silt (loose, moist) (fill)			XRF Readings "As = X ppm"
									NS	<1	As = ND (<10ppm)
		6					GP-GM	Brown fine to coarse gravel with sand and silt (medium dense, moist) (fill)	NS	<1	As = 25 ppm (±4)
25	5	54		PAI-7 (5.5-6)			SM	Gray silty fine to medium sand with gravel and occasional black stained wood fragments (medium dense, wet) (fill)	NS	<1	As = 921 ppm (±19)
							SM	Black silty fine to medium sand with gravel and soot (medium dense, moist) (fill)	NS	<1	As = 385 ppm (±11)
				PAI-7 (8-8.5)					MS	47	Hydrocarbon-like odor As = 227 ppm (±8) Metallic gray florets
									NS	2.6	As = 216 ppm (±8)
20	10	60		PAI-7 (10-10.5)			SM	Gray silty fine sand (medium dense, moist)	NS	<1	As = 70 ppm (±5) Groundwater encountered at 10.2 feet at time of drilling
							ML	Dark gray silt with occasional sand (medium stiff, moist)			
							SM	Dark gray silty fine to medium sand with gravel (medium dense, wet)	NS	<1	As = 237 ppm (±8)
							ML	Dark gray silt (medium stiff, wet)			
							SM	Dark gray silty fine to medium sand with rounded to subrounded gravel (medium dense, wet)	NS	<1	As = 57 ppm (±4)
									MS	12.5	As = 43 ppm (±4) Metallic gray florets
									SS	1.5	As = 17 ppm (±3) Metallic gray
15	15	60		PAI-7 (15-15.5)				Transitional zone to sandy silt	NS	1.4	As = 31 ppm (±3)
									NS	<1	As = 35 ppm (±4)
									NS	<1	As = 21 ppm (±3)
				PAI-7 (18.5-19)					NS	<1	As = ND (<8 ppm)
							ML	Gray sandy silt with rounded to subrounded gravel (very stiff, moist)	NS	<1	As = 47 ppm (±4)
10	20	60							NS	1.7	As = 13 ppm (±3)
							SM	Gray silty fine to medium sand (medium dense, wet)	SS	3.5	As = 20 ppm (±3) Metallic gray
				PAI-7 (22.5-23)			SM	Gray with orange-brown stained silty fine to medium sand with occasional gravel (medium dense, wet)	HS 90%	155	Strong naphthalene-like odor; NAPL present As = ND (<7 ppm) Rainbow
							SM	Gray silty fine to medium sand with occasional gravel (dense, moist)	NAPL	592	As = 18 ppm (±3) Strong naphthalene-like odor; NAPL present
									NS	8.5	As = ND (<8 ppm)
	25								NS	7.1	As = ND (<8 ppm)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-7

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.10
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	12/10/2014	12/10/2014	30	RNM	ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
30.1	NA	Geoprobe 7730 DT

Easting (X) Northing (Y)	System Datum	Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
1270673.66 239165.11				

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						SP	Gray medium sand with trace silt (loose, moist) (fill)			XRF Readings "As = X ppm"
									NS	<1	As = 11 ppm (±3)
		30							NS	<1	As = ND (<8 ppm)
							GP	Gray fine to coarse gravel with sand and trace silt (medium dense, moist) (fill)	NS	<1	As = 11 ppm (±3)
							SM	Gray silty fine to medium sand with occasional gravel (medium dense, moist) (fill)	NS	<1	As = 30 ppm (±4)
25	5	60		PAI-8 (4.5-5)				Becomes black	NS	2	As = 433 ppm (±13)
								Grades to gray			As = 34 ppm (±5)
								Becomes wet	NS	<1	Perched groundwater encountered at 6 feet at time of drilling
								Becomes moist	NS	<1	As = 100 ppm (±6)
				PAI-8 (8.5-9)			SM	Black silty fine to medium sand with gravel, soot and wood fragments (medium dense, moist) (fill)	MS	6	As = 310 ppm (±10) Metallic gray blebs
									HS	14	NAPL blebs present As = 1,123 ppm (±23) Rainbow
20	10	54		PAI-8 (10-10.5)				Grades to dark gray With wood fragments	HS	63	Strong hydrocarbon-like odor As = 344 ppm (±10) Rainbow
							GM	Black with occasional green stained silty fine gravel with silt and soot (medium dense, moist) (fill)	NAPL	27	As = 618 ppm (±15)
									HS	15	As = 114 ppm (±6) As = 64 ppm (±4) Rainbow
							SM	Dark gray silty fine to medium sand with gravel (medium dense, moist)	SS	12	As = 48 ppm (±4) Metallic gray
									HS	39	As = 43 ppm (±4) Rainbow
15	15	48		PAI-8 (14.5-15)				Grades to gray			As = 13 ppm (±3)
								Becomes wet	NS	15	Groundwater encountered at 15 feet at time of drilling
				PAI-8 (16-16.5)					MS	5	As = 26 ppm (±3) Metallic gray florets
							SP-SM	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	8	As = 11 ppm (±3)
									NS	4	As = 44 ppm (±4)
									NS	2	As = 13 ppm (±3)
10	20	60							NS	2	As = 28 ppm (±3)
											As = 24 ppm (±7)
									NS	<1	As = 12 ppm (±3)
				PAI-8 (22.5-23)			SM	Gray silty fine to medium sand (medium dense, wet)	NS	8	As = 16 ppm (±3)
									NS	8	As = 10 ppm (±3)
							SP-SM	Gray fine to medium sand with gravel and silt (medium dense, wet)	NS	14	As = 16 ppm (±3)
	25						SM	Gray silty fine sand (dense, moist)			

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-8

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.11
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample / Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	25		60							NS	3	As = 8 ppm (±3)
									Becomes wet, grades to medium dense	NS	<1	As = 207 ppm (±8)
										NS	3	As = 131 ppm (±6)
					PAI-8 (27.5-28)					NS	3	As = 46 ppm (±4)
								SM	Gray silty fine to medium sand with gravel (dense, moist)	NS	3	As = 27 ppm (±3)
	30									NS	<1	As = ND (<8 ppm)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-8 (continued)

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.11
Sheet 2 of 2

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/11/2014	12/11/2014	25	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
32.5	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater: Date Measured	Depth to Water (ft)	Elevation (ft)
1270679.39 / 239085.91				

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample / Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		45					AC	2 inches asphalt concrete			XRF Readings "As = X ppm"
								GP-GM	Dark brown fine gravel with sand and silt (medium dense, moist) (fill)	NS	<1	As = ND (<13 ppm)
30									Grades to tan/brown	SS	<1	As = ND (<9 ppm) Metallic gray
					PAI-9 (3-3.5)			SM	Black silty sooty fine to medium sand with gravel (medium dense, moist) (fill)	SS	<1	As = 17 ppm (±3) Metallic gray As = 4,245 ppm (±60); As = 2,884 ppm (±46)
										SS	<1	As = 96 ppm (±9) As = 75 ppm (±6)
	5		48					GM	Black silty fine gravel with sand, soot and occasional red brick fragments (medium dense, moist) (fill)	SS	<1	As = 18 ppm (±5) Metallic gray
									With wood fragments	SS	<1	As = 24 ppm (±4) Metallic gray
25									Grades to gray with orange mottling	SS	<1	As = 59 ppm (±6) Metallic gray
										NS	<1	As = ND (<9 ppm)
								SM	Gray with orange mottling silty fine to medium sand with occasional gravel (medium dense, moist) (fill)	NS	<1	As = 11 ppm (±3)
	10		50		PAI-9 (9.5-10)					NS	<1	As = 219 ppm (±8)
										NS	<1	As = 836 ppm (±16)
					PAI-9 (11.5-12)			GP-GM	Dark gray with occasional orange mottling fine gravel with sand and silt (medium dense, moist) (fill)	NS	<1	As = 566 ppm (±12)
20					PAI-9 (12.5-13)				Becomes wet			Groundwater encountered at 12.5 feet at time of drilling
					PAI-9 (12.5-13 DUP)			ML	Gray sandy silt (soft, wet) (fill)	SS	<1	As = 1,483 ppm (±34) Metallic gray
								SM	Black silty sooty fine to medium sand with gravel (medium dense, wet)	SS	<1	As = 207 ppm (±7) Metallic gray Slight hydrocarbon-like odor
	15		50							SS	<1	As = 86 ppm (±5)
										NS	<1	As = 60 ppm (±4)
15								SP-SM	Black sooty fine to medium sand with gravel and silt (medium dense, wet)	MS	<1	As = 196 ppm (±8) Slight hydrocarbon-like odor Metallic gray florets
					PAI-9 (17.5-18)					MS	<1	As = 214 ppm (±8) Metallic gray florets
								SM	Dark gray silty fine to medium sand (medium dense, wet)	SS	<1	As = 236 ppm (±9) Metallic gray
	20		60							SS	<1	As = 115 ppm (±7) Metallic gray
									Grades to black sooty carbon with occasional gravel	NS	<1	As = 124 ppm (±6)
10										NS	<1	As = 68 ppm (±4)
									With gravel	NS	<1	As = 56 ppm (±4)
					PAI-9 (23-23.5)					NS	<1	As = 38 ppm (±4)
									With increasing silt content and density			Sulfur-like odor
	25							ML	Gray silt with sand and occasional gravel (hard, moist)	NS	<1	As = 83 ppm (±5)
										NS	<1	As = 106 ppm (±6)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-9

GeoEngineers

Project: Puget Sound Energy GWPS

Project Location: Gas Works Park, Seattle, Washington

Project Number: 0186-846-01

Figure 2B.1-1.12

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/11/2014	12/11/2014	35	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
28.97	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
1270796.22 / 239139.19		12/11/2014	8.9	20.12

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						SM	Dark brown silty fine to medium sand with occasional gravel and roots (loose, moist) (topsoil)			XRF Readings "As = X ppm"
		36					SM	Black silty sooty fine to medium sand with gravel (medium dense, moist) (fill)			
25								With occasional red brick fragments			
							SP-SM	Brown medium to coarse sand with silt and gravel (medium dense, moist) (fill)			
	5	42						Grades to black			
											As = ND (<11 ppm)
							GP-GM	Brown with orange mottling fine gravel with sand and silt (medium dense, moist) (fill)			As = ND (<12 ppm)
								Grades to black	NS	<1	As = ND (<8 ppm) Hydrocarbon-like odor
20					▼				NS	<1	As = ND (<10 ppm) Groundwater encountered at 9 feet at time of drilling
	10	36		PAI-10 (9.5-10)					MS	21	As = ND (<9 ppm) Metallic gray blebs
									SS	3	As = ND (<11 ppm) Metallic gray
15								Black fused vesicular agglomerate	HS	13	As = 9 ppm (±3) Rainbow
											As = 15 ppm (±3)
	15	36		PAI-10 (14.5-15)					SS	4	As = 29 ppm (±3) Metallic gray
									NS	<1	
											As = 147 ppm (±6)
10							GP	Black fine gravel with sand and trace silt (medium dense, wet) (fill)			As = 82 ppm (±7)
								Black fused vesicular agglomerate	NS	<1	As = 82 ppm (±5)
	20	36		PAI-10 (19.5-20)							As = 192 ppm (±7)
								With orange and red gravel			
									NS	<1	As = 65 ppm (±5)
5							SP-SM	Dark gray fine to medium sand with silt and gravel (medium dense, wet) (fill) With orange and red sand and gravel	NS	<1	As = 168 ppm (±6)
							GP	Black fine gravel with sand and trace silt (medium dense, wet) (fill)			As = 228 ppm (±7)
	25			PAI-10							

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-10

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.13
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample / Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	25		24		(24.5-25)				Fused vesicular agglomerate	MS	<1	As = 224 ppm (±7) Metallic gray blebs
								SP-SM	Dark gray fine to medium sand with gravel and silt (medium dense, wet)			
										NS	3	As = 15 ppm (±3)
								GP	Dark gray fine gravel with sand and trace silt (medium dense, wet)			As = 34 ppm (±4)
	30		60		PAI-10 (29.5-30)			SP-SM	Gray fine to medium sand with silt and occasional gravel (medium dense, wet)	NS	2	As = ND (<10 ppm)
					PAI-10 (31.5-32)							As = 11 ppm (±3)
								ML	Gray sandy silt (medium stiff, wet)			As = 21 ppm (±3)
								SM	Gray silty fine sand (medium dense, wet)			
	35							ML	Gray sandy silt with occasional gravel (hard, moist)			
									Temporary pre-pack well screen installed from 19.09 to 24.09 feet below ground surface; grab groundwater sample PAI-10-GW collected			

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-10 (continued)

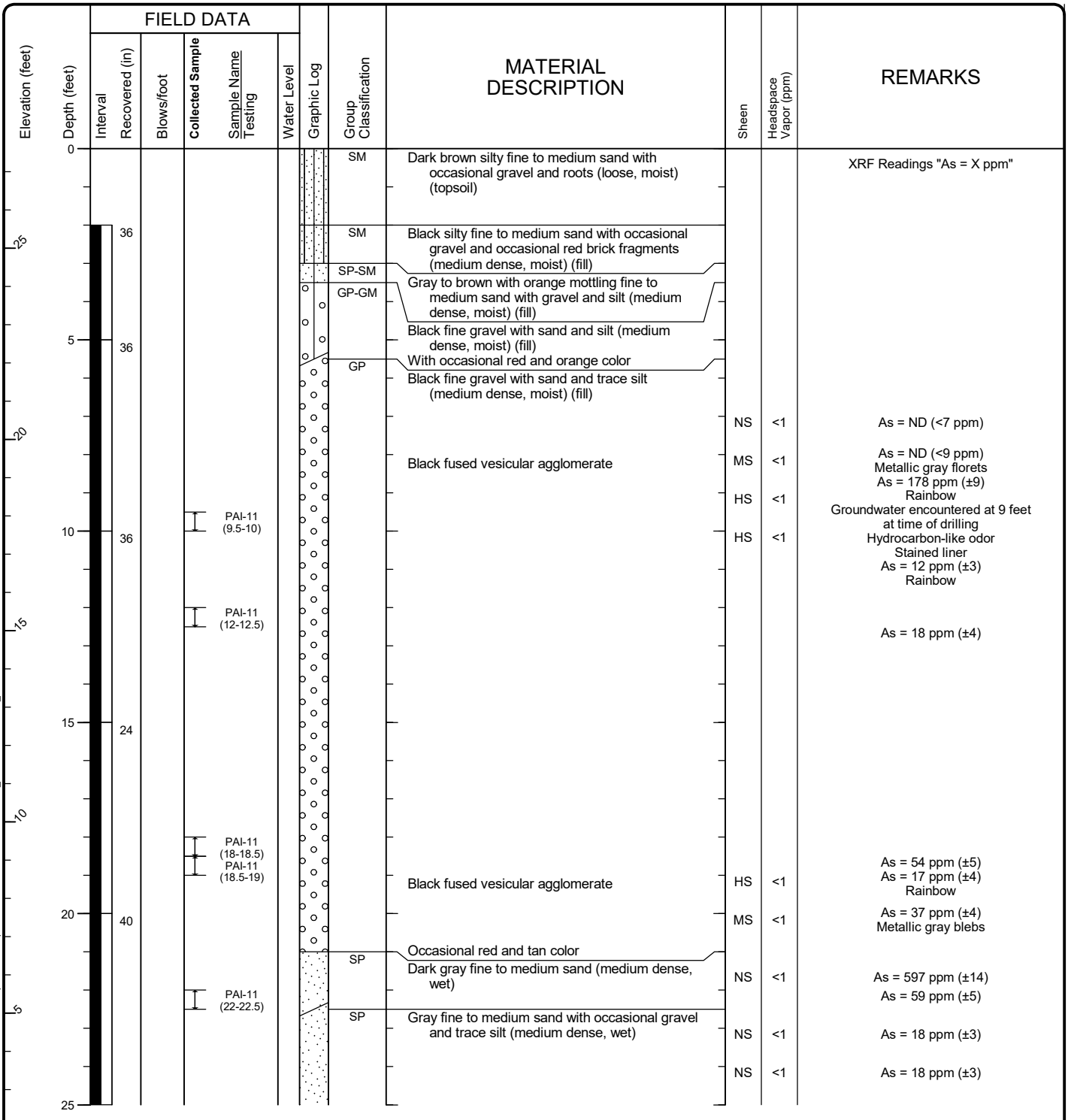
GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.13
Sheet 2 of 2

Drilled: Start 12/11/2014 End 12/11/2014	Total Depth (ft): 30	Logged By: RNM Checked By: ZAS	Driller: Cascade Drilling	Drilling Method: Continuous	
Surface Elevation (ft) Vertical Datum: 27.6		Hammer Data: NA		Drilling Equipment: Geoprobe 7730 DT	
Easting (X): 1270809.27 Northing (Y): 239187.48		System Datum:		Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs. Boring PAI-11B drilled approximately 5 feet away to collect groundwater.



Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-11

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.14
Sheet 1 of 2

Seattle: Date:2/15/19 Path:P:\0\0186846\GINT\0186846GPJ DBTemplate/LibTemplate\GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_STANDARD

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	25		60								NS	<1	As = 18 ppm (±3)
											NS	<1	As = 23 ppm (±3)
									SP-SM	Gray fine to medium sand with silt (medium dense, wet)			As = 81 ppm (±5)
									SM	Gray silty fine to medium sand (medium dense, wet)	NS	<1	As = 64 ppm (±5)
						PAI-11 (28-28.5)							
									SM	Gray silty fine to medium sand with occasional gravel (dense, moist)	NS	<1	As = 25 ppm (±3)
	30										NS	<1	As = 20 ppm (±3)

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-11 (continued)

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.14
Sheet 2 of 2

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/12/2014	12/12/2014	23.09	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
28.43	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum	Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
1270804.95 / 239188.1		12/12/2014	8.3	20.18

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample / Sample Name Testing	FIELD DATA: Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
25	0				▼			See boring PAI-11 for soil descriptions			
	5										
20											
	10										
15											
	15										
10											
	20										

Temporary pre-pack well screen installed from 18.09 to 23.09 feet below ground surface; grab groundwater sample PAI11-GW collected

Note: See Figure 2B.1-1.1 for explanation of symbols.

Log of Boring PAI-11B

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.15

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
12/12/2014	12/12/2014	20	RNM / ZAS	Cascade Drilling	Continuous

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
34.2	NA	Geoprobe 7730 DT

Easting (X) / Northing (Y)	System Datum
1270729.23 / 239137.38	

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
12/12/2014	14.0	20.2

Notes: Hand-dug with posthole digger from 0 to 2 feet bgs.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample / Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						Paver	1.5 inches brick pavers			
							SP-SM	Brown fine to medium sand with silt and occasional gravel (medium dense, moist) (fill)			
30		38					SM	Dark gray silty fine to medium sand with occasional red brick fragments (medium dense, moist) (fill)			As = 12 ppm (±4) As = 45 ppm (±16) As = 14 ppm (±3)
	5	42					SP-SM	Black sooty fine to medium sand with silt and gravel (medium dense, moist) (fill) Buff fine to medium sand lens			As = 26 ppm (±4) As = 35 ppm (±5) As = 14 ppm (±4)
25				PAI-12 (8.5-9)							As = 605 ppm (±14) As = 850 ppm (±20) As = 627 ppm (±13)
	10	45						Buff fine to medium sand lens			As = 370 ppm (±10) As = 765 ppm (±16) As = 52 ppm (±6)
20				PAI-12 (13.5-14)	▼			Black fused vesicular agglomerate			As = 1,155 ppm (±22) As = 1,537 ppm (±25) Hydrocarbon-like odor As = 21,838 ppm (±376) Groundwater encountered at 14 feet at time of drilling
	15	6					GP-GM	Black fine gravel with sand and silt (medium dense, moist) (fill) With occasional mustard-yellow staining Black fused vesicular agglomerate	HS		As = 4,450 ppm (±62) Hydrocarbon-like odor
15											6 inches recovery with no blockage in sampler shoe
	20			PAI-12 (19.5-20)							As = 18,982 ppm (±312)

Temporary pre-pack well screen installed from 13.27 to 18.27 feet below ground surface; grab groundwater sample PAI-12GW collected

Note: See Figure 2B.1-1.1 for explanation of symbols.

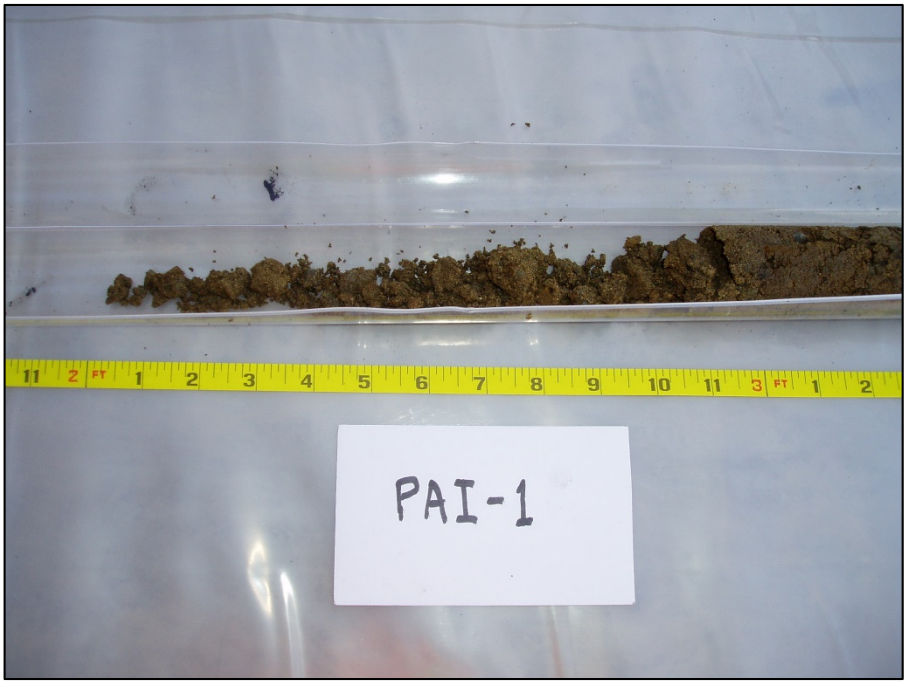
Log of Boring PAI-12

GeoEngineers

Project: Puget Sound Energy GWPS
Project Location: Gas Works Park, Seattle, Washington
Project Number: 0186-846-01

Figure 2B.1-1.16
Sheet 1 of 1

ATTACHMENT 2B-1-2
Soil Boring Core Field Photos

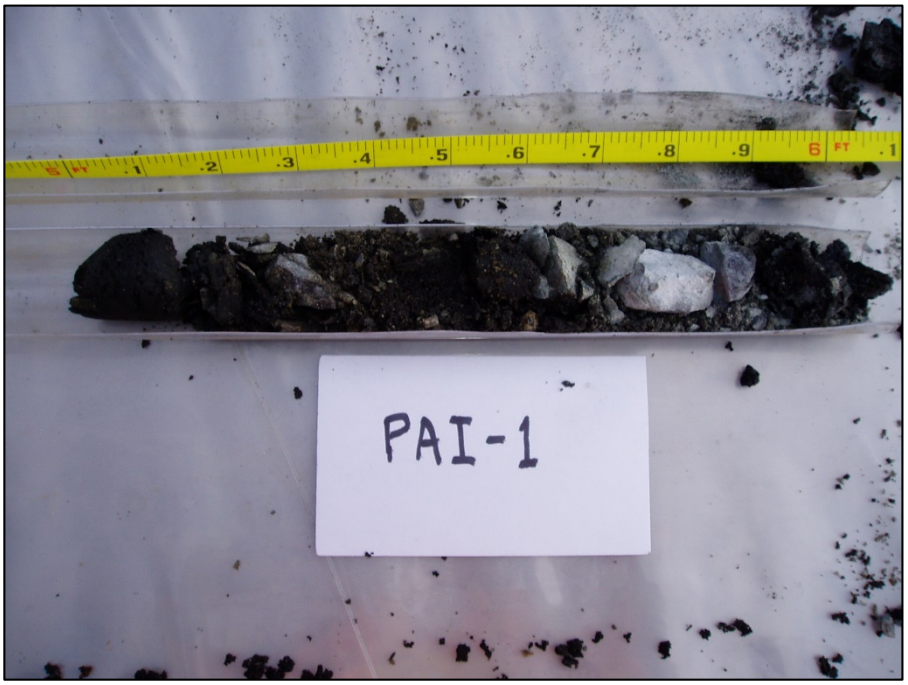


PAI-1 2 to 3 feet

PAI-1 3 to 4 feet

Soil Boring Field Photographs PAI-1	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

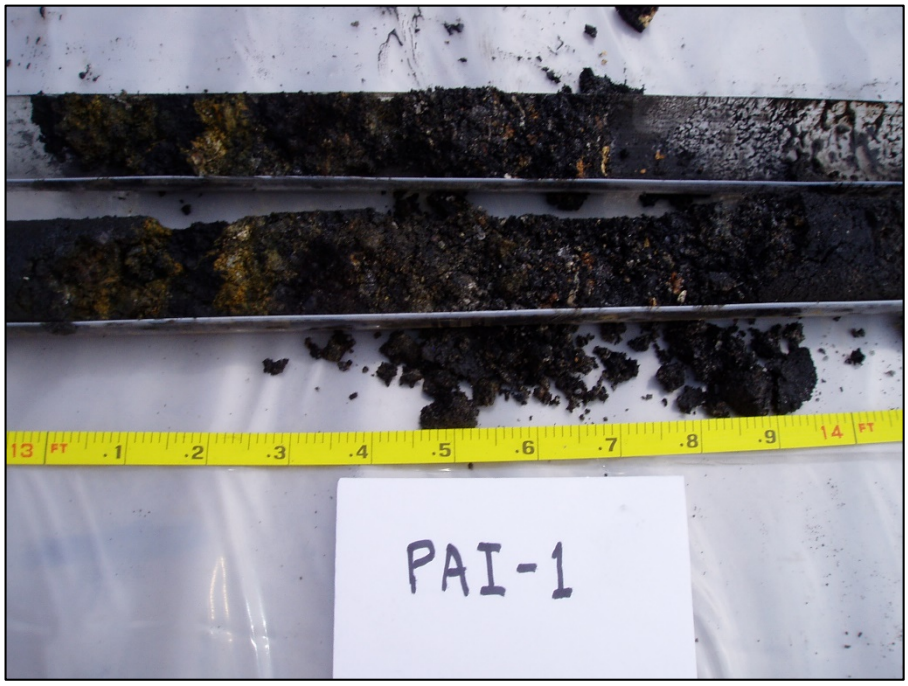
PAI-1 4 to 5 feet



PAI-1 5 to 6 feet

Soil Boring Field Photographs PAI-1	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

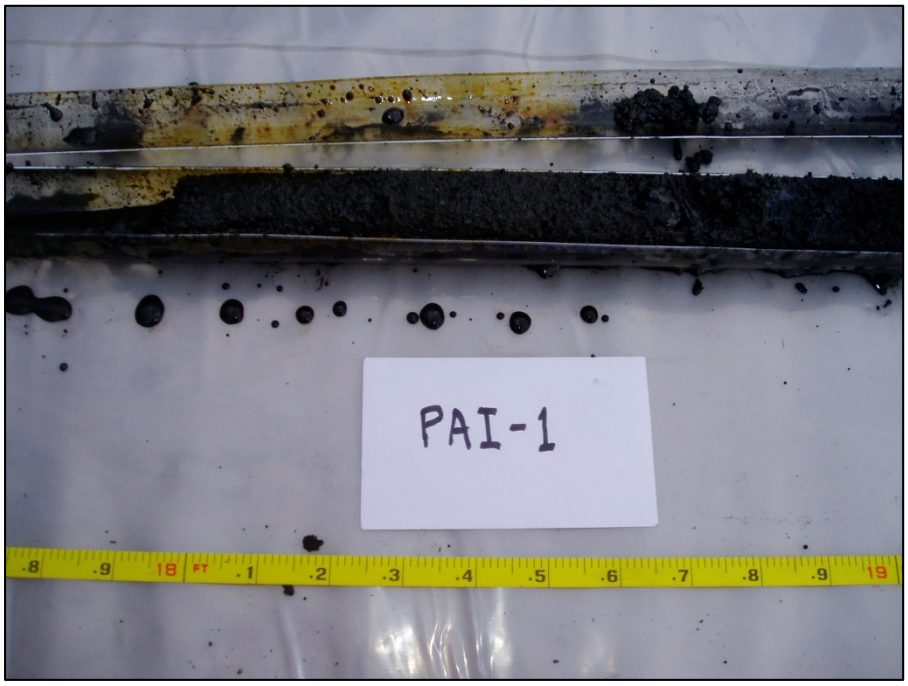
PAI-1 12 to 13 feet



PAI-1 13 to 14 feet

Soil Boring Field Photographs PAI-1	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

PAI-1 14 to 15 feet



PAI-1 18 to 19 feet

Soil Boring Field Photographs PAI-1	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

0186-846-01 Date Exported: 01/18/19

PAI-1 19 to 20 feet

PAI-1 22 to 23 feet

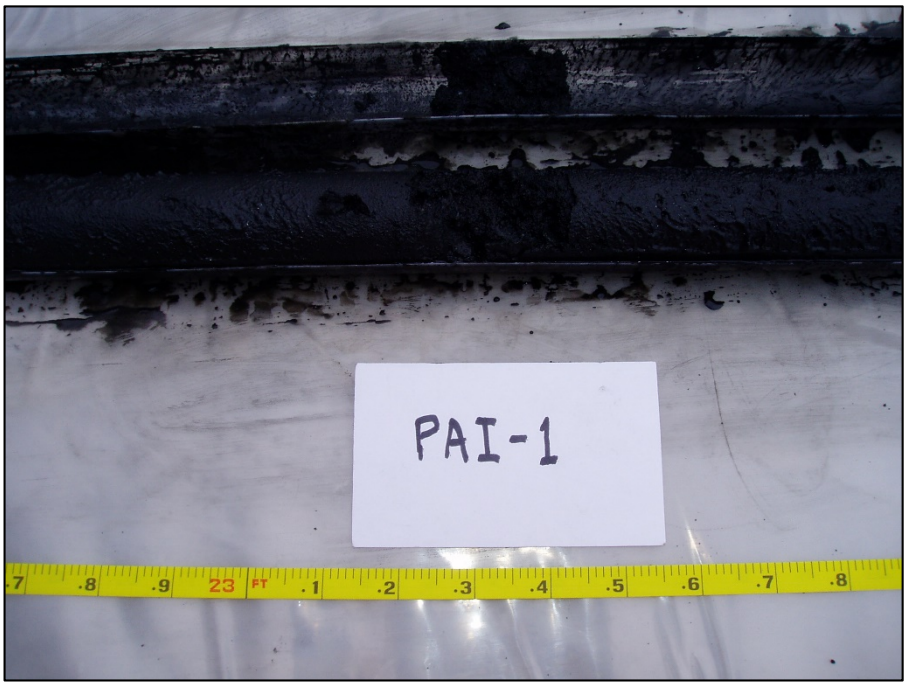
Soil Boring Field Photographs PAI-1

Gas Works Park Site
Seattle, Washington

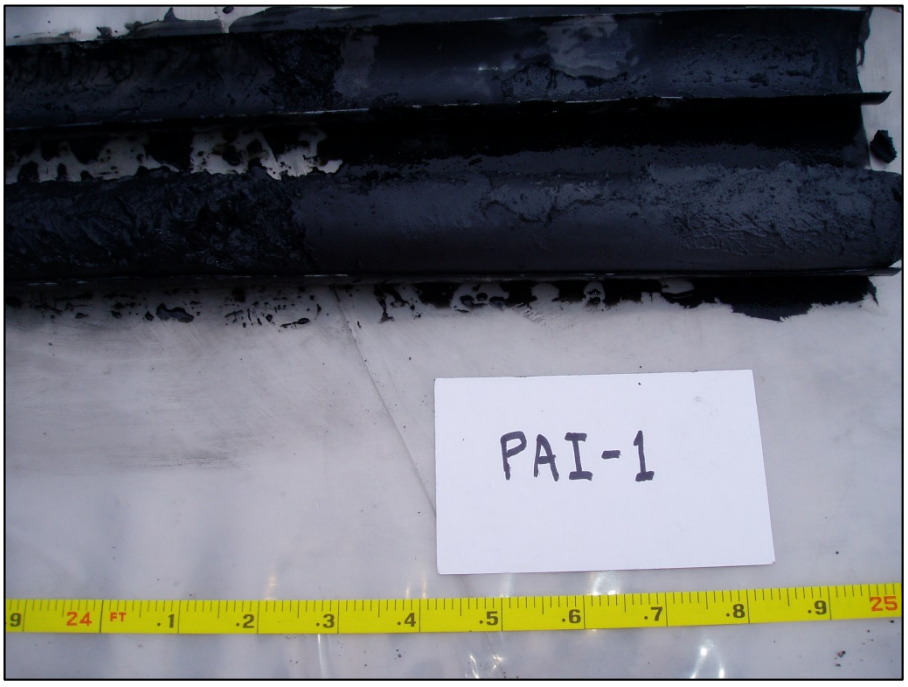
GeoEngineers

Appendix 2B-1-2

0186-846-01 Date Exported: 01/18/19



PAI-1 23 to 24 feet



PAI-1 24 to 25 feet

Soil Boring Field Photographs PAI-1	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

PAI-1 26 feet

PAI-1 27 feet

Soil Boring Field Photographs PAI-1	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

PAI-1 28 feet

PAI-1 29 to 30 feet

Soil Boring Field Photographs PAI-1	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

PAI-2 1 to 2 feet

PAI-2 2 to 3 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

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PAI-2 3 to 4 feet

PAI-2 4 to 5 feet

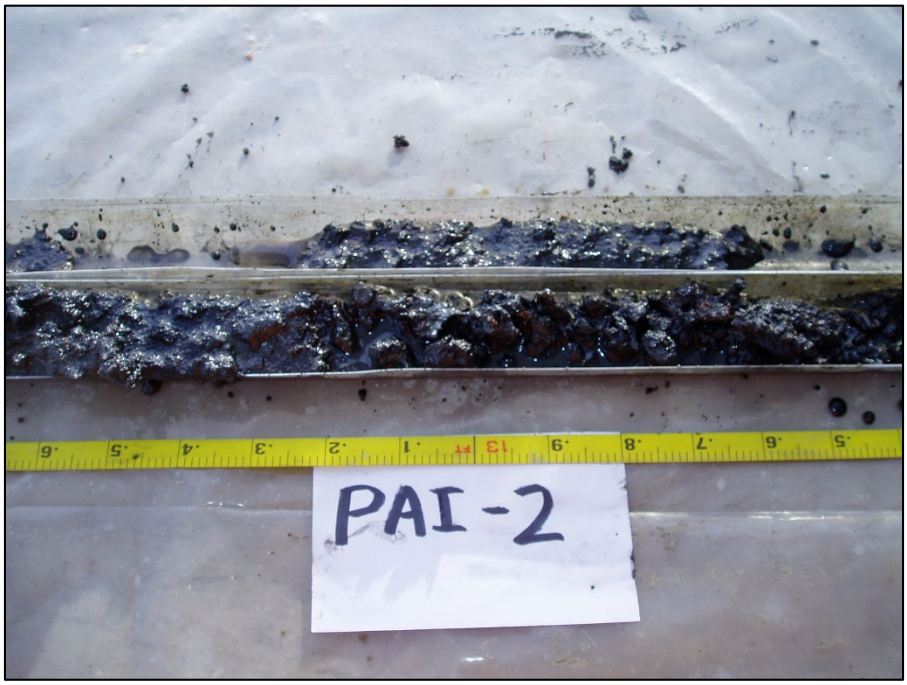
Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

PAI-2 7 to 8 feet

PAI-2 8 to 9 feet

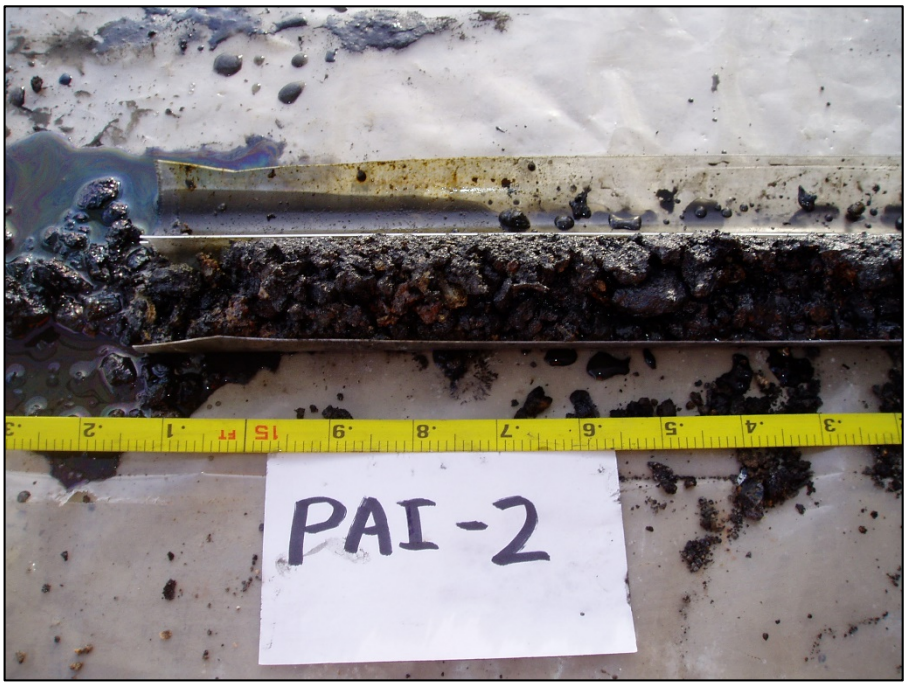
Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

PAI-2 9 to 10 feet

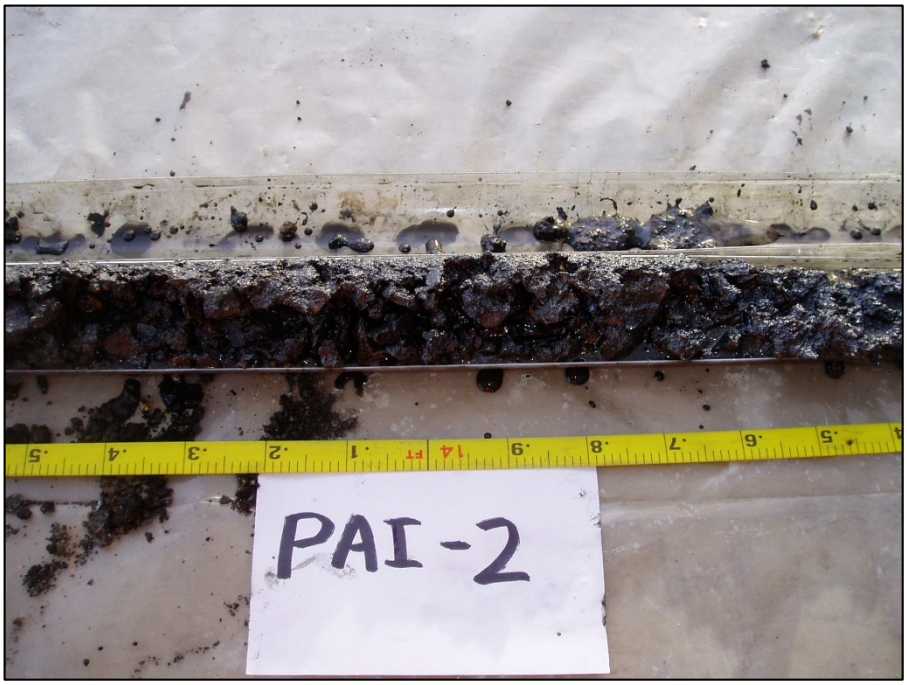


PAI-2 13 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2



PAI-2 14 to 15 feet



PAI-2 14 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
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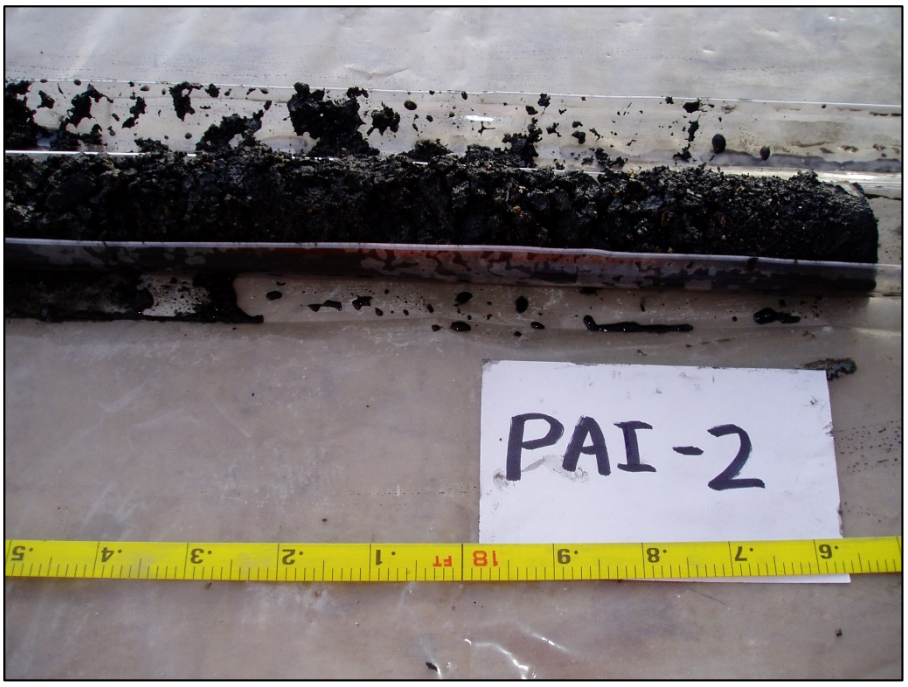
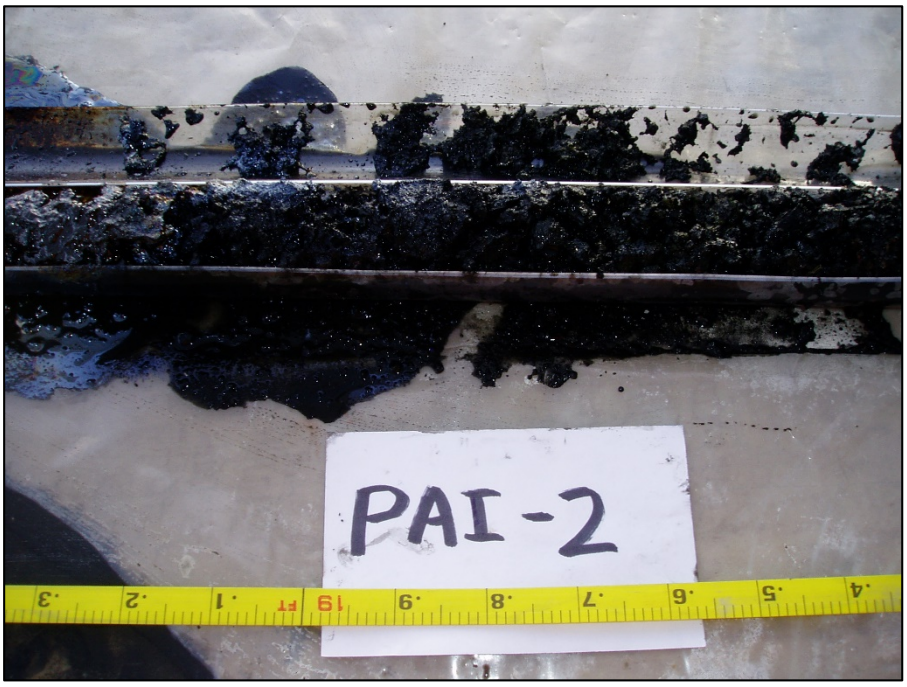


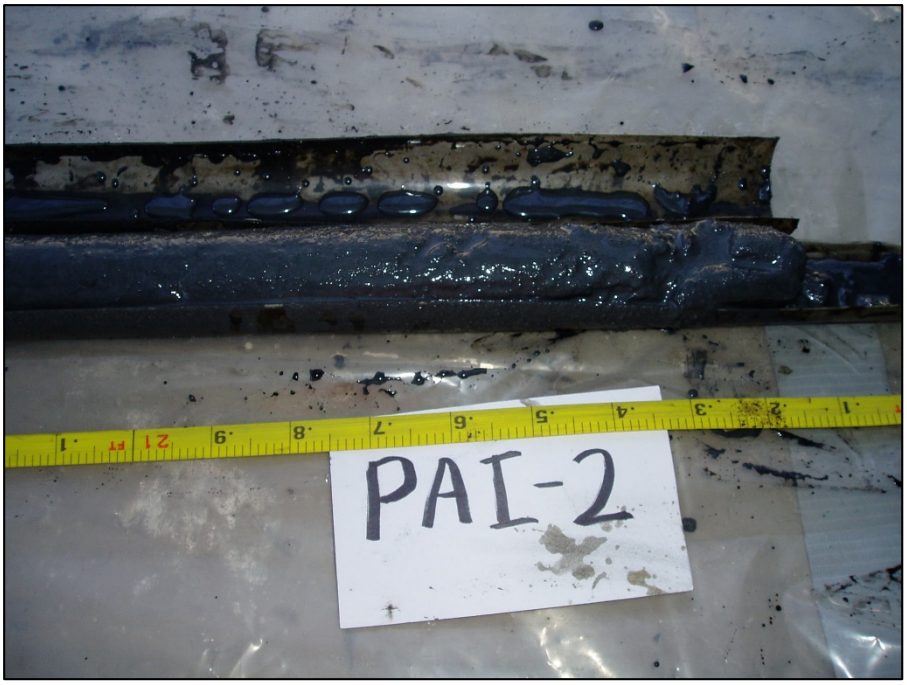
PAI-2 18 feet

PAI-2 19 to 20 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

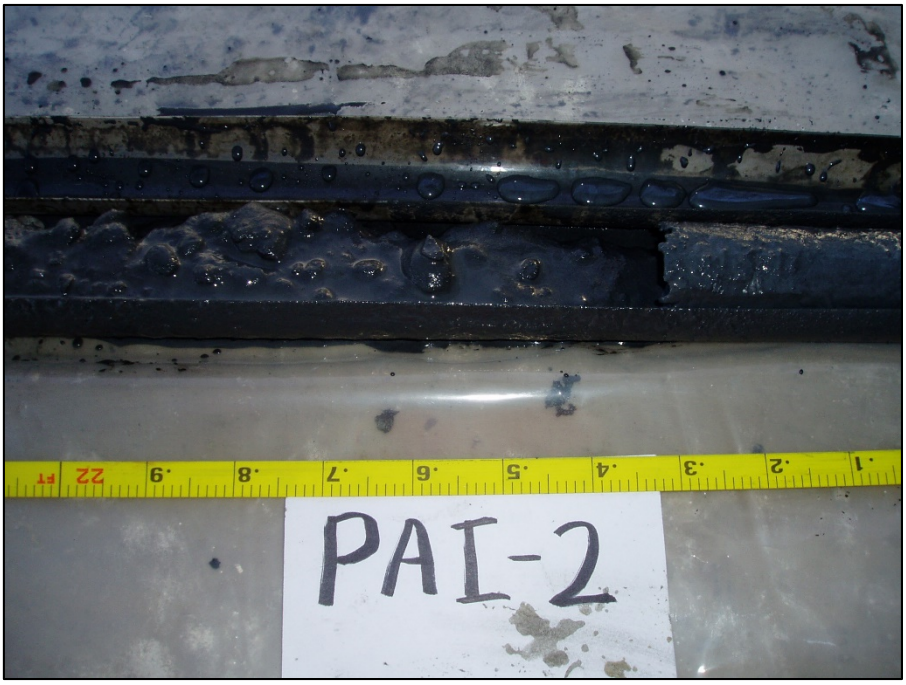


PAI-2 19 feet

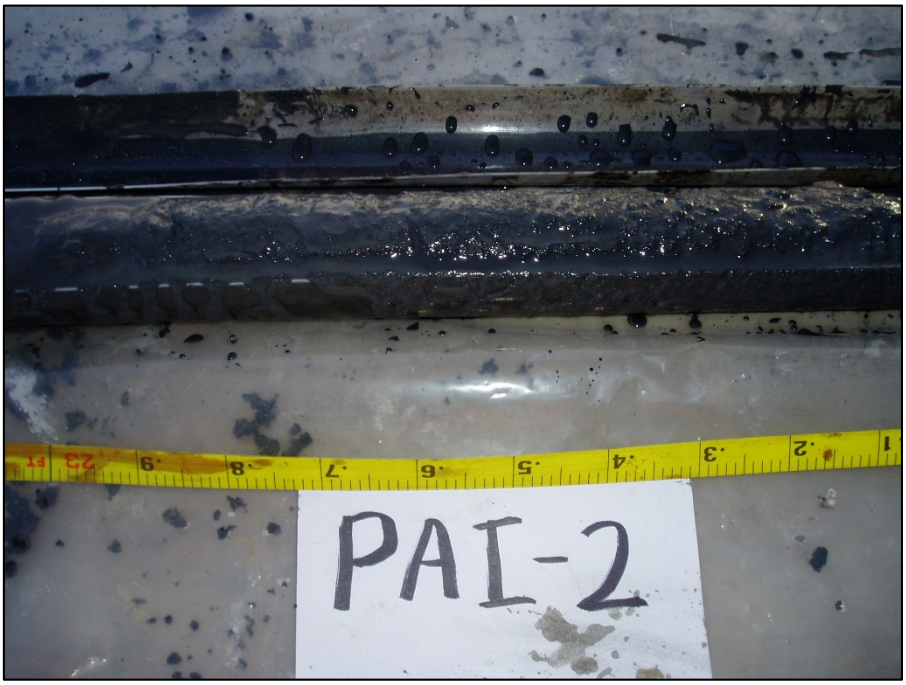


PAI-2 20 to 21 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

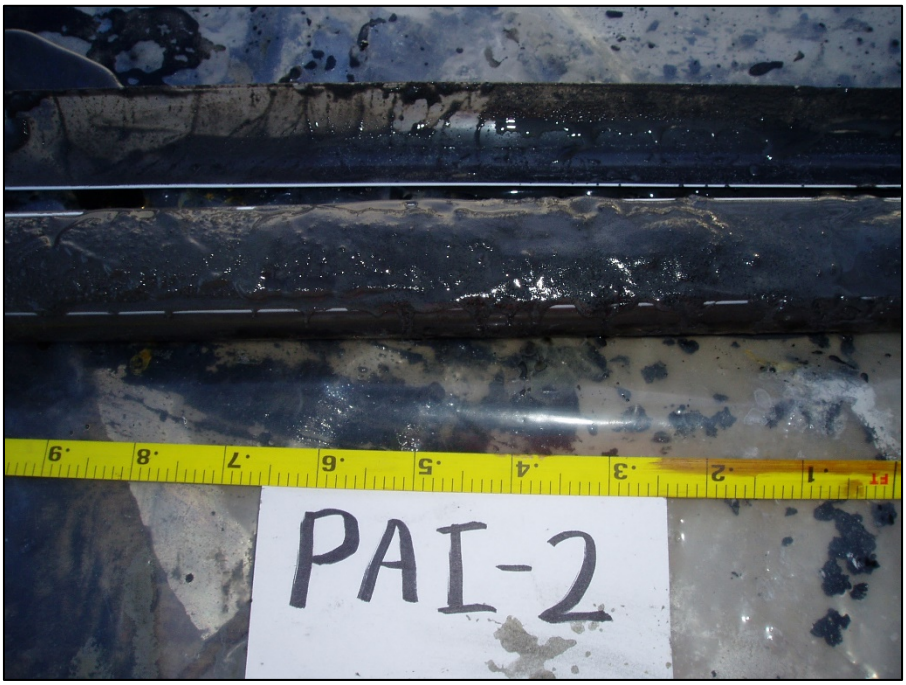


PAI-2 21 to 22 feet



PAI-2 22 to 23 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2



PAI-2 23 to 24 feet

PAI-2 24 to 25 feet

Soil Boring Field Photographs PAI-2

Gas Works Park Site
Seattle, Washington

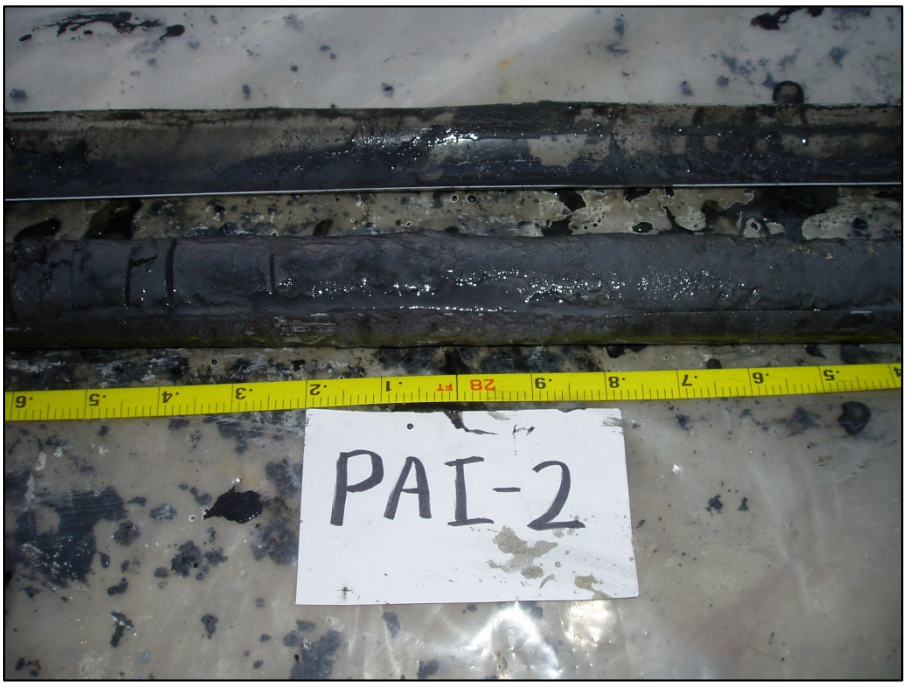
GeoEngineers

Appendix 2B-1-2

PAI-2 26 feet

PAI-2 27 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2



PAI-2 28 feet

PAI-2 29 to 30 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

0186-846-01 Date Exported: 01/18/19

PAI-2 29 feet

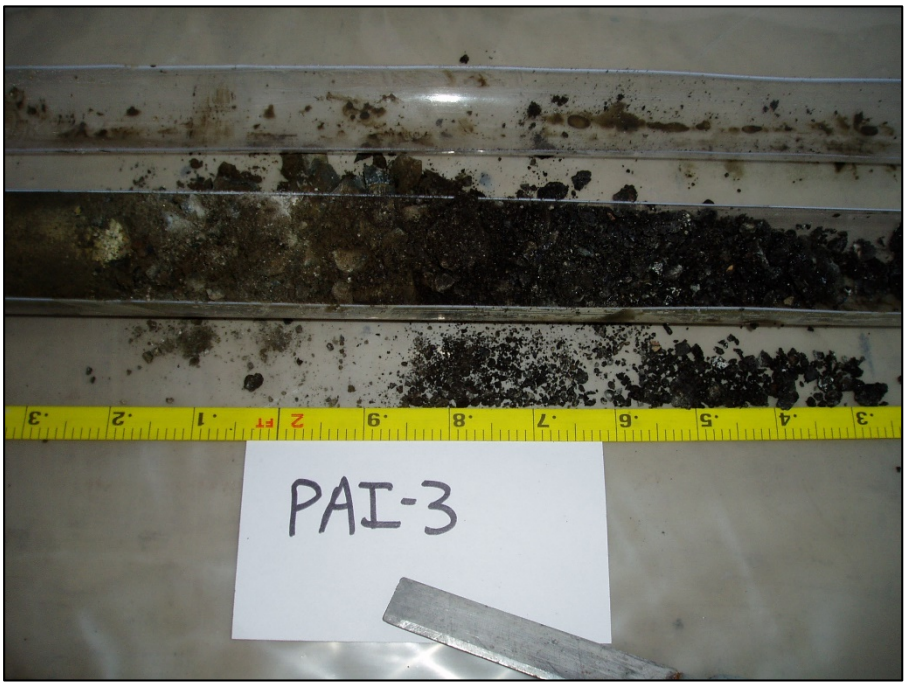
PAI-2 GW 17 to 18 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

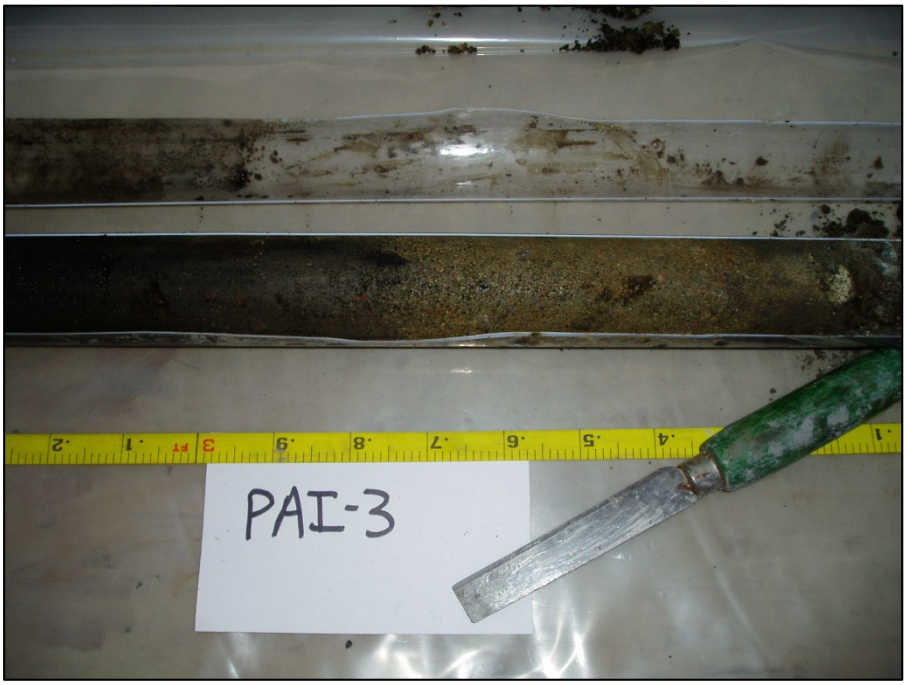
PAI-2 GW 18 to 19 feet

PAI-2 GW 19 to 20 feet

Soil Boring Field Photographs PAI-2	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2



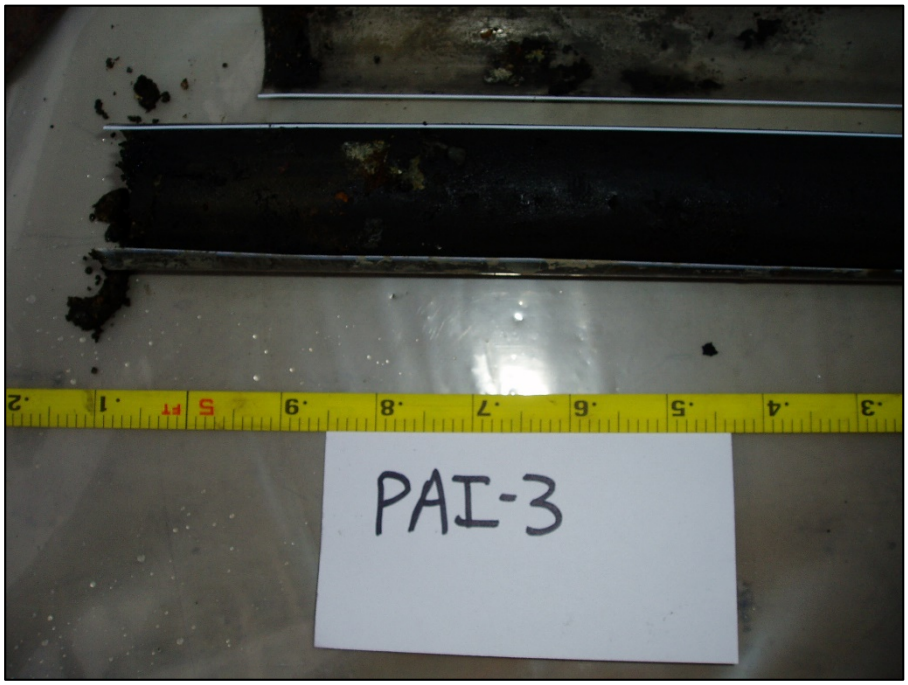
PAI-3 1 to 2 feet



PAI-3 2 to 3 feet

Soil Boring Field Photographs PAI-3	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

PAI-3 3 to 4 feet



PAI-3 4 to 5 feet

Soil Boring Field Photographs PAI-3

Gas Works Park Site
Seattle, Washington

GeoEngineers

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PAI-3 7 to 8 feet

PAI-3 8 to 9 feet

Soil Boring Field Photographs PAI-3	
Gas Works Park Site Seattle, Washington	
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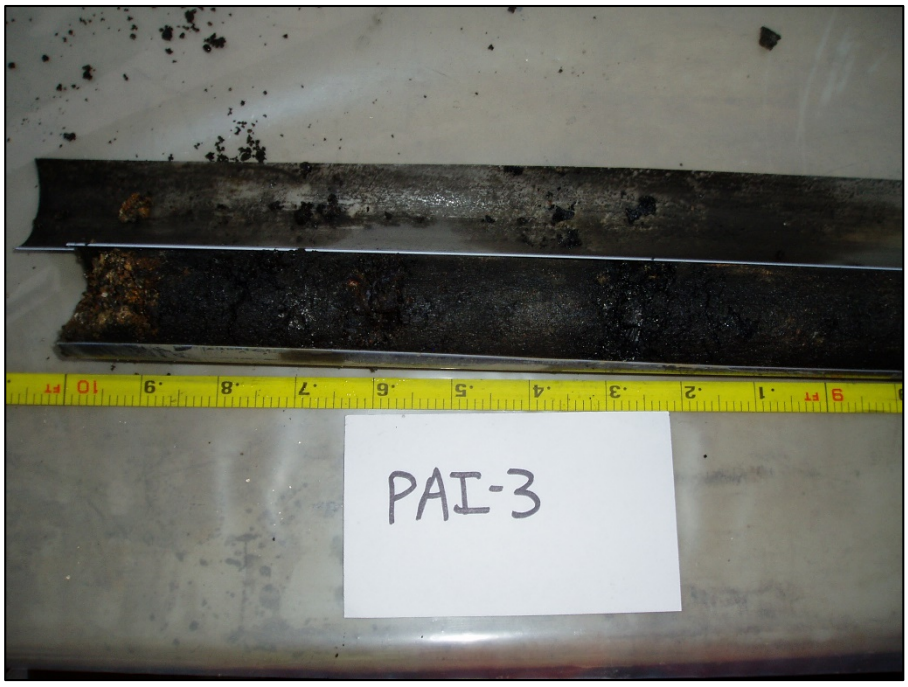


PAI-3 9 to 10 feet

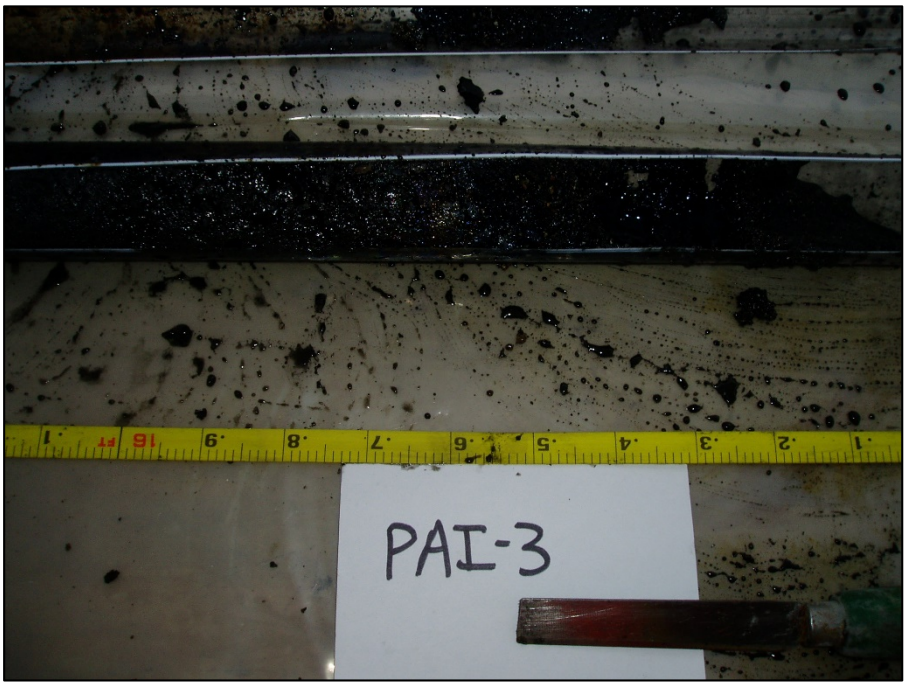
PAI-3 12 to 13 feet

Soil Boring Field Photographs PAI-3	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

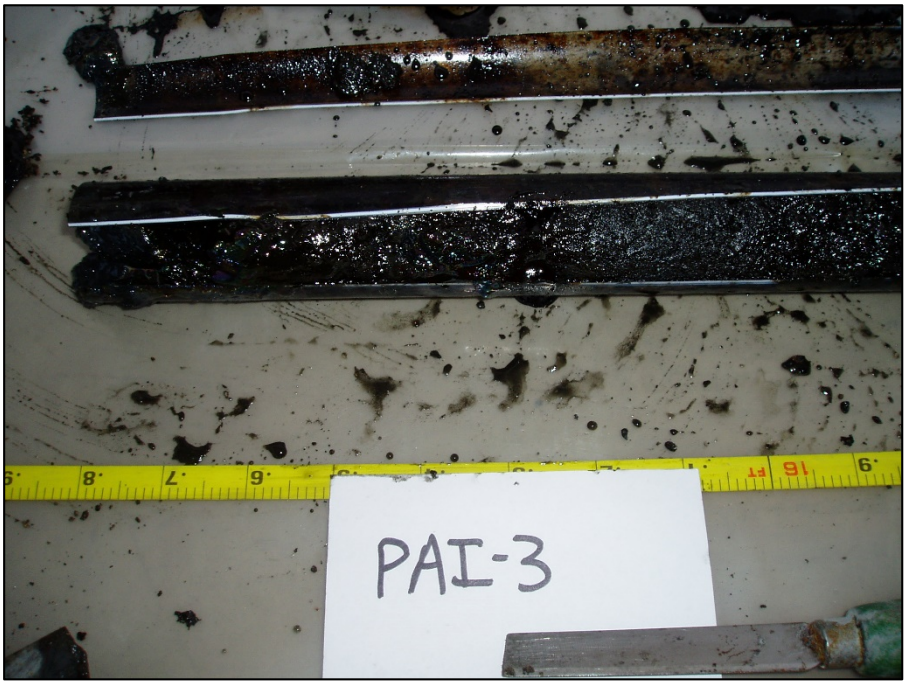
PAI-3 13 to 14 feet

PAI-3 14 to 15 feet

Soil Boring Field Photographs PAI-3	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2



PAI-3 15 to 16 feet



PAI-3 16 to 17 feet

Soil Boring Field Photographs PAI-3	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2

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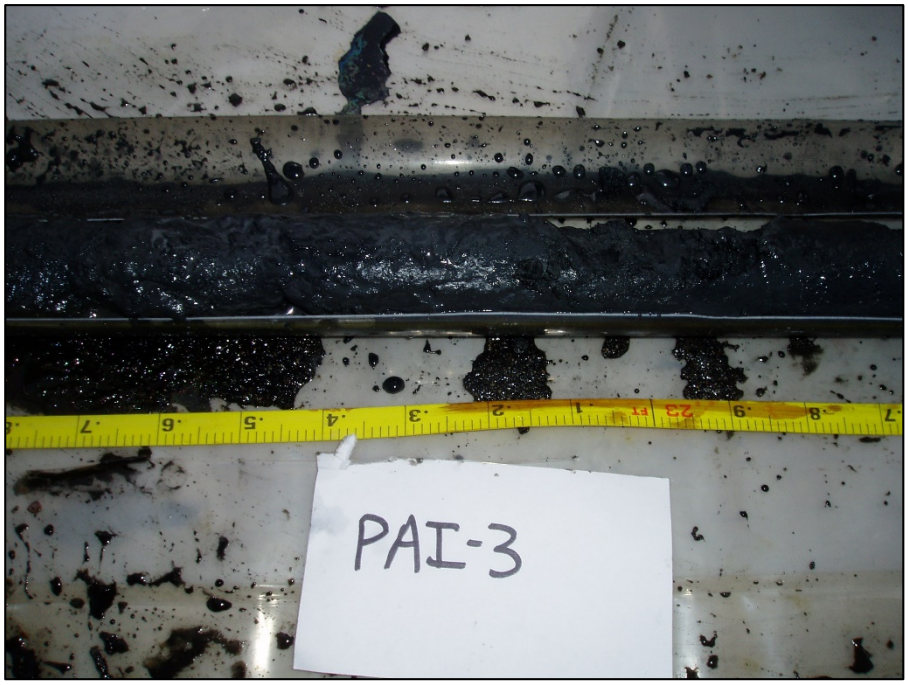
PAI-3 22 feet



PAI-3 23 feet

Soil Boring Field Photographs PAI-3

Gas Works Park Site
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PAI-3 24 feet

PAI-3 25 feet

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PAI-3 26 to 27 feet

PAI-3 27 to 28 feet

Soil Boring Field Photographs PAI-3	
Gas Works Park Site Seattle, Washington	
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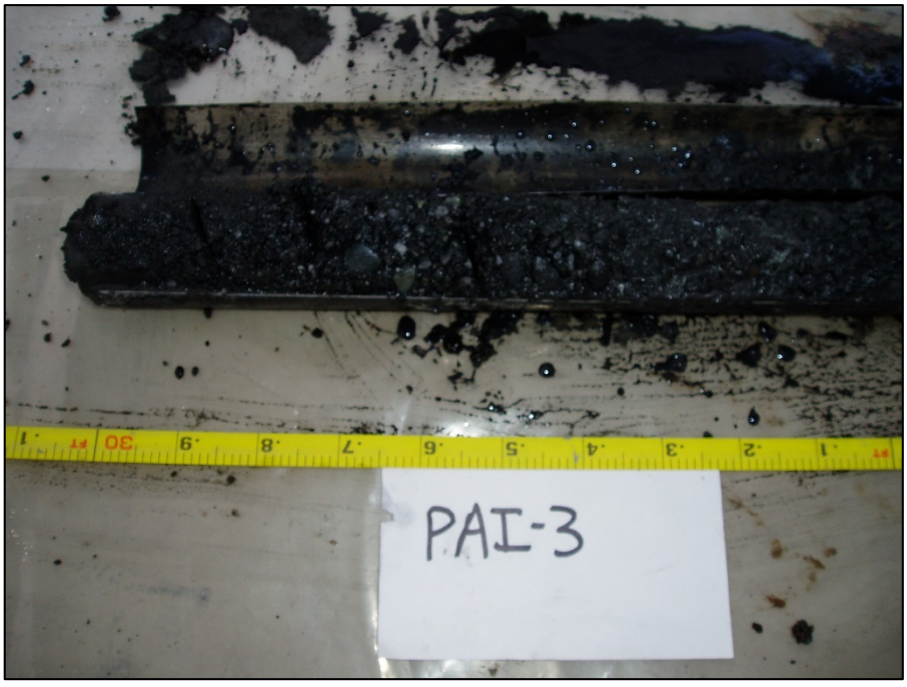
PAI-3 28 to 29 feet



PAI-3 29 to 30 feet

Soil Boring Field Photographs PAI-3

Gas Works Park Site
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PAI-3 30 to 31 feet

PAI-3 31 to 32 feet

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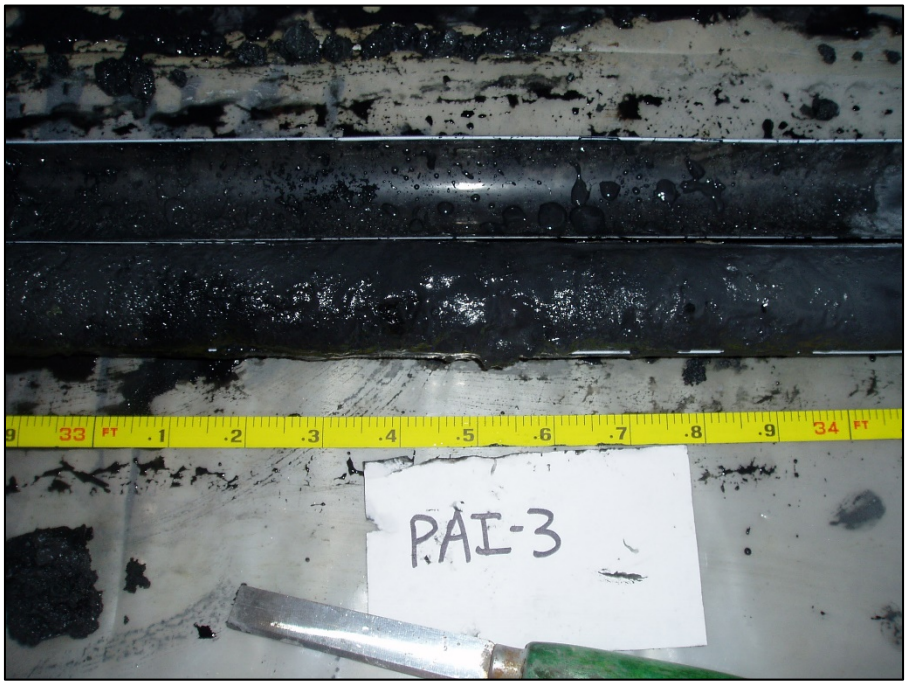
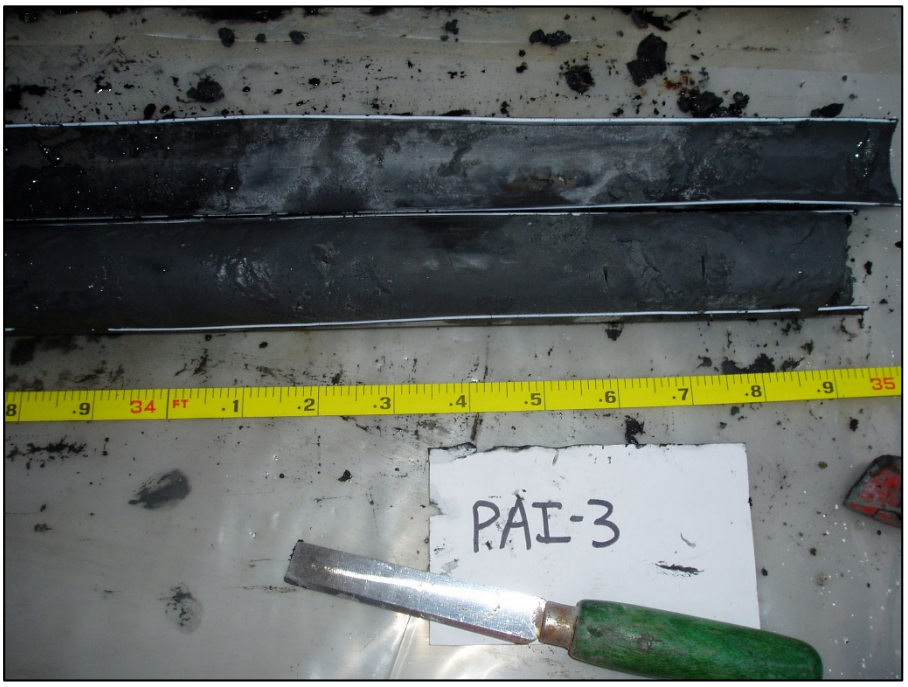
PAI-3 32 to 33 feet

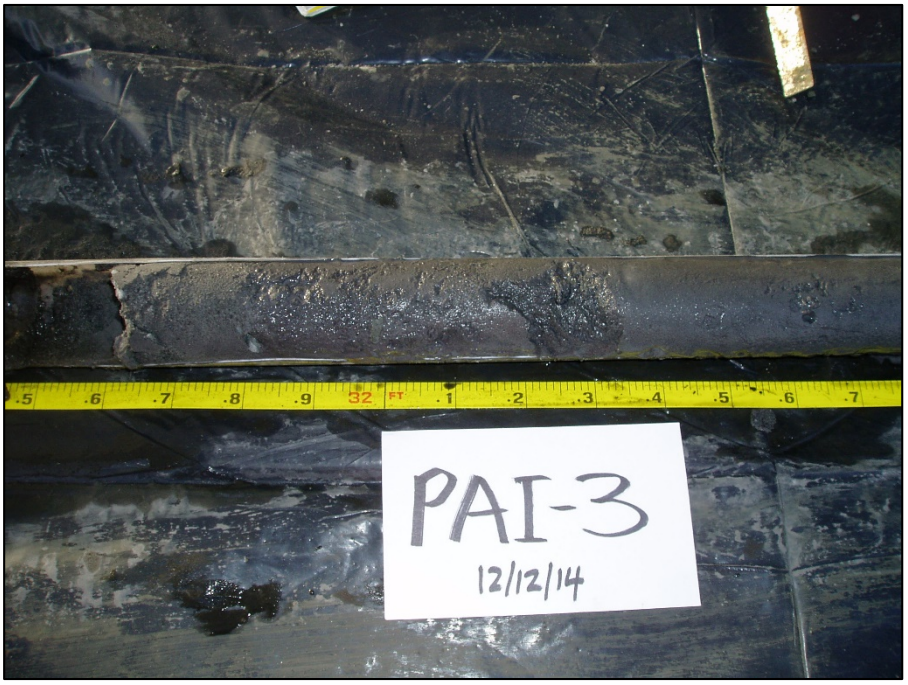


PAI-3 33 to 34 feet

Soil Boring Field Photographs PAI-3	
Gas Works Park Site Seattle, Washington	
GeoEngineers	Appendix 2B-1-2



PAI-3 34 to 35 feet



PAI-3 32 feet

Soil Boring Field Photographs PAI-3	
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PAI-3 33 feet

PAI-3 34 feet

Soil Boring Field Photographs PAI-3	
Gas Works Park Site Seattle, Washington	
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PAI-3 35 feet

Soil Boring Field Photographs PAI-3	
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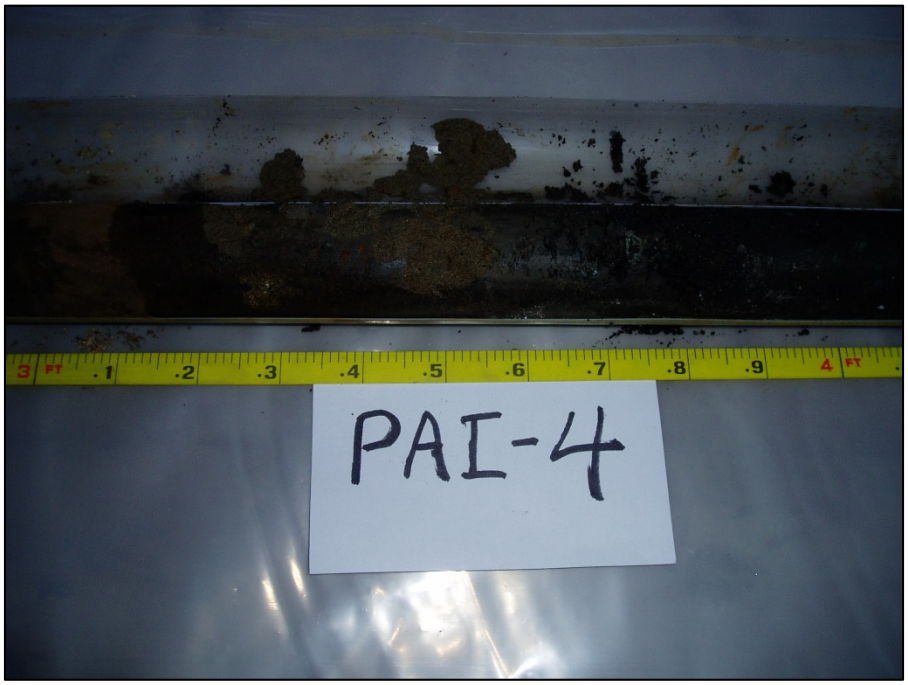
PAI-4 2 to 3 feet



PAI-4 3 to 4 feet

Soil Boring Field Photographs PAI-4	
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PAI-4 4 to 5 feet

PAI-4 6 to 7 feet

Soil Boring Field Photographs PAI-4	
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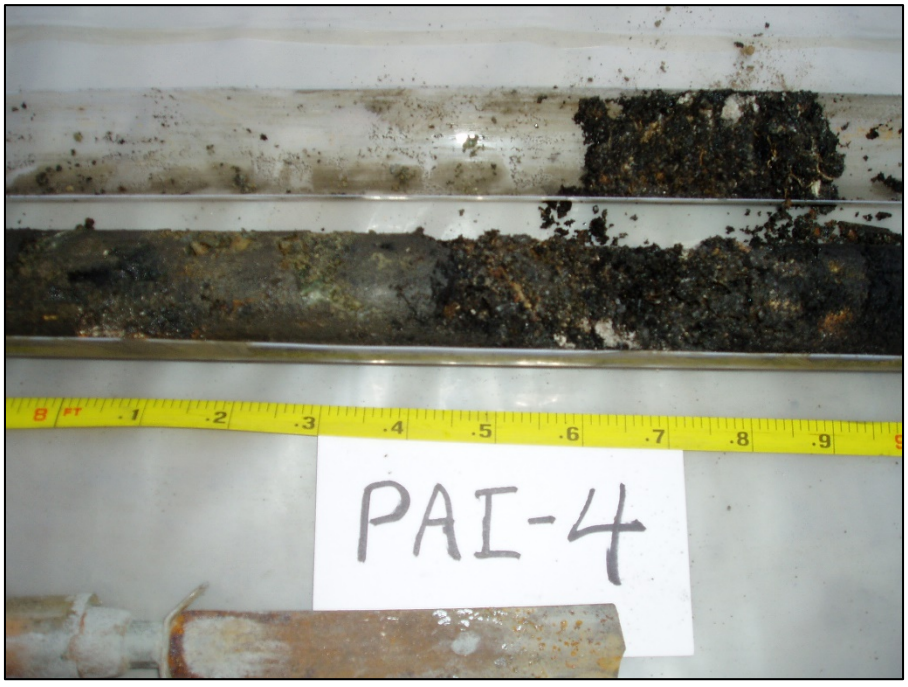
PAI-4 7 to 8 feet



PAI-4 8 to 9 feet

Soil Boring Field Photographs PAI-4	
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PAI-4 9 to 10 feet

PAI-4 10 to 11 feet

Soil Boring Field Photographs PAI-4

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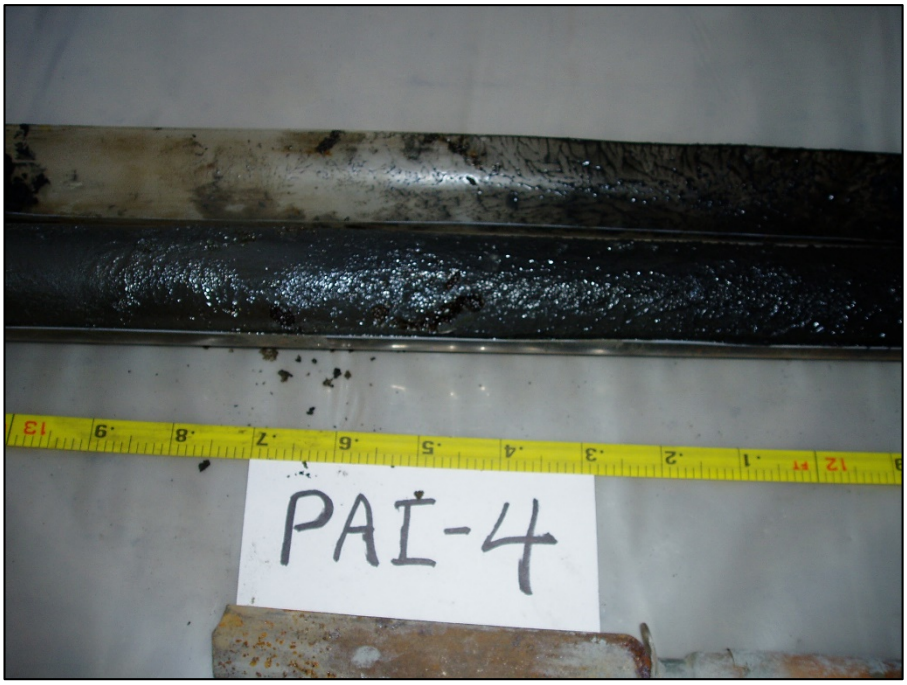
PAI-4 11 to 12 feet



PAI-4 12 to 13 feet

Soil Boring Field Photographs PAI-4	
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PAI-4 13 to 14 feet

PAI-4 14 to 15 feet

Soil Boring Field Photographs PAI-4	
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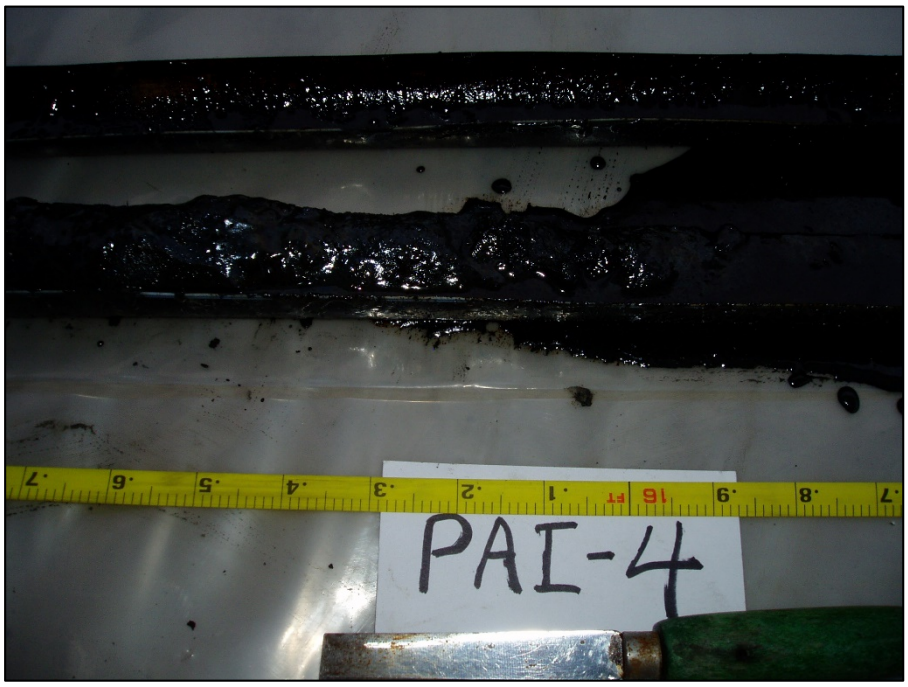

PAI-4 16 feet

PAI-4 17 feet

Soil Boring Field Photographs PAI-4	
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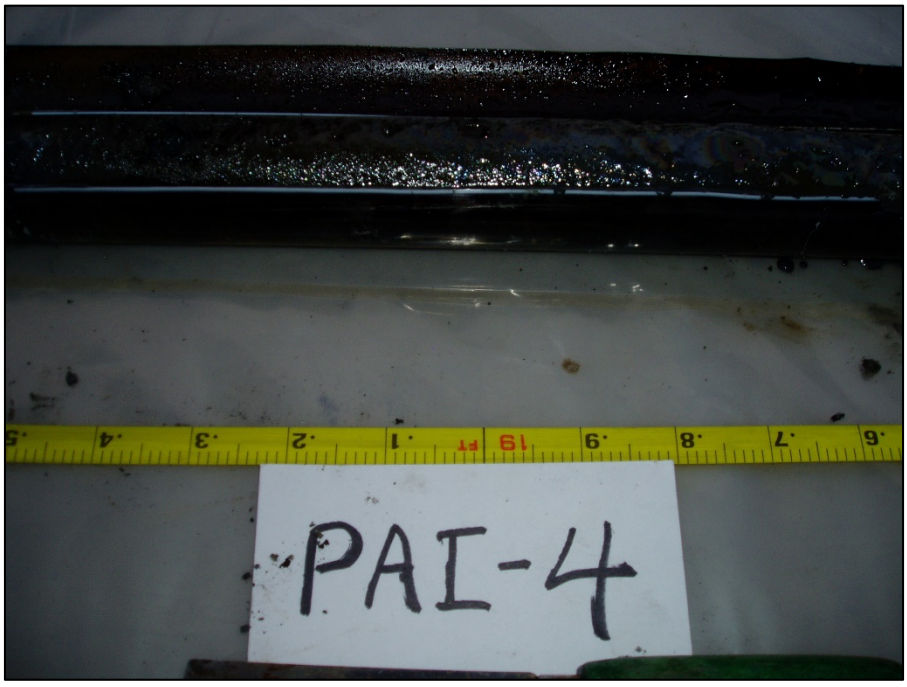
PAI-4 18 feet



PAI-4 19 feet

Soil Boring Field Photographs PAI-4	
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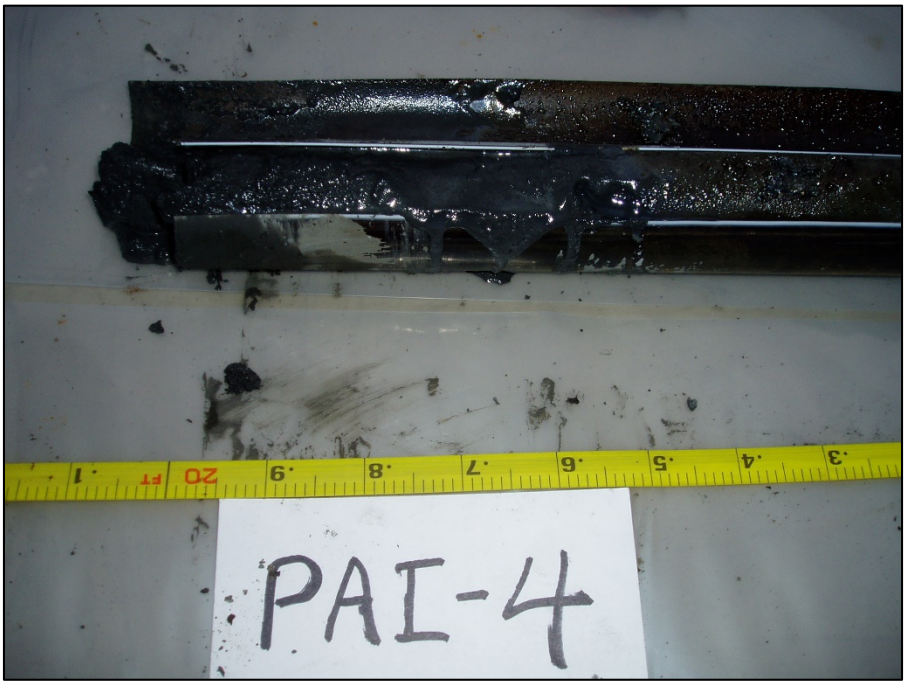
PAI-4 20 to 21 feet



PAI-4 20 feet

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PAI-4 21 to 22 feet

PAI-4 22 to 23 feet

Soil Boring Field Photographs PAI-4	
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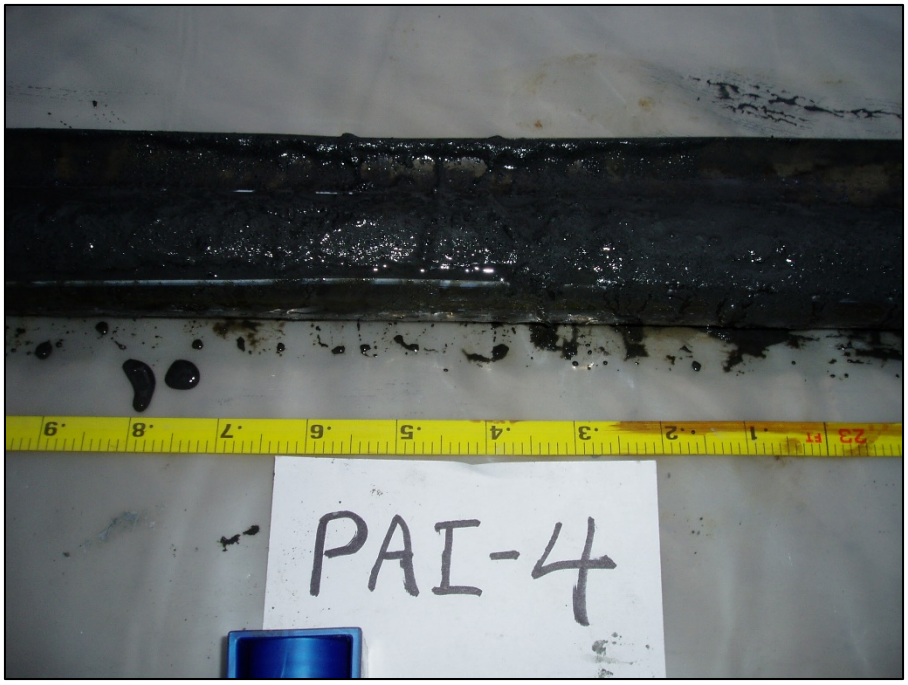

PAI-4 23 to 24 feet

PAI-4 24 to 25 feet

Soil Boring Field Photographs PAI-4

Gas Works Park Site
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PAI-4 25 to 26 feet

PAI-4 26 to 27 feet

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PAI-4 27 to 28 feet

PAI-4 28 to 29 feet

Soil Boring Field Photographs PAI-4	
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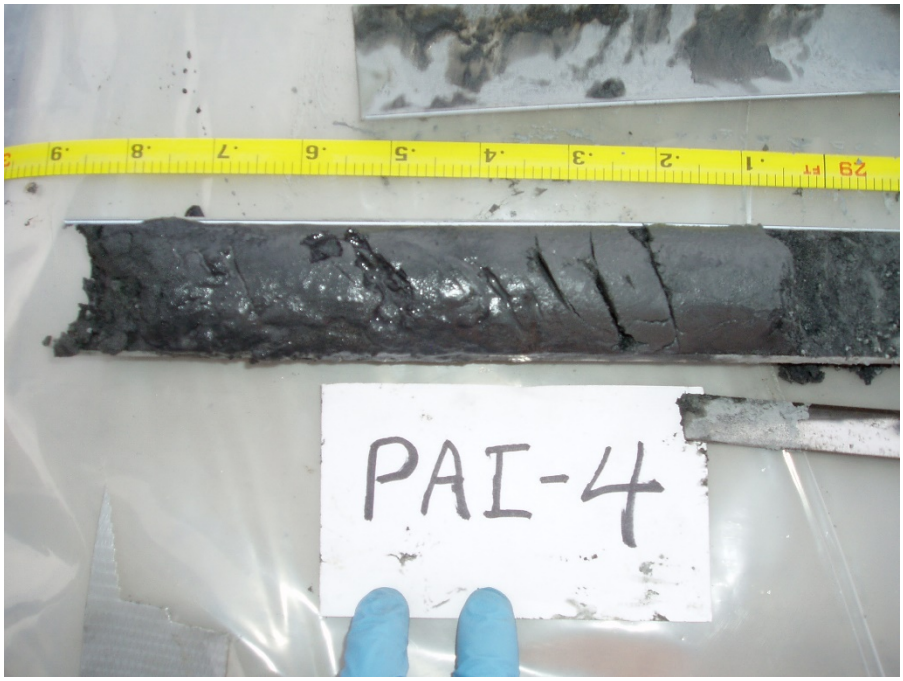

PAI-4 29 to 30 feet

Soil Boring Field Photographs PAI-4

Gas Works Park Site
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PAI-5 2 to 3 feet

PAI-5 3 to 4 feet

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PAI-5 4 feet

PAI-5 7 to 8 feet

Soil Boring Field Photographs PAI-5	
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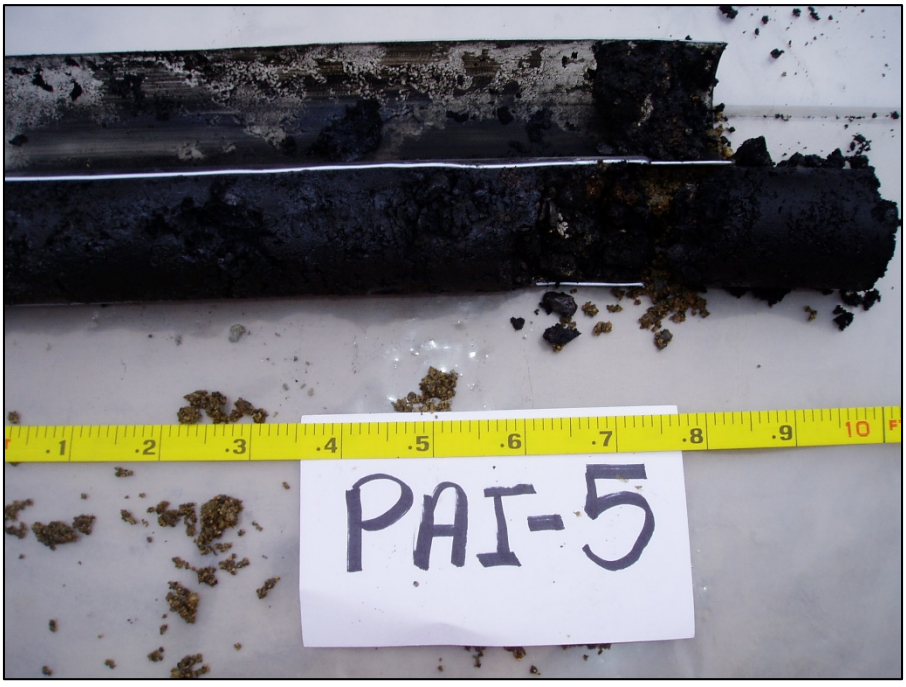
PAI-5 8 to 9 feet



PAI-5 9 to 10 feet

Soil Boring Field Photographs PAI-5	
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PAI-5 11 feet

PAI-5 12 feet

Soil Boring Field Photographs PAI-5

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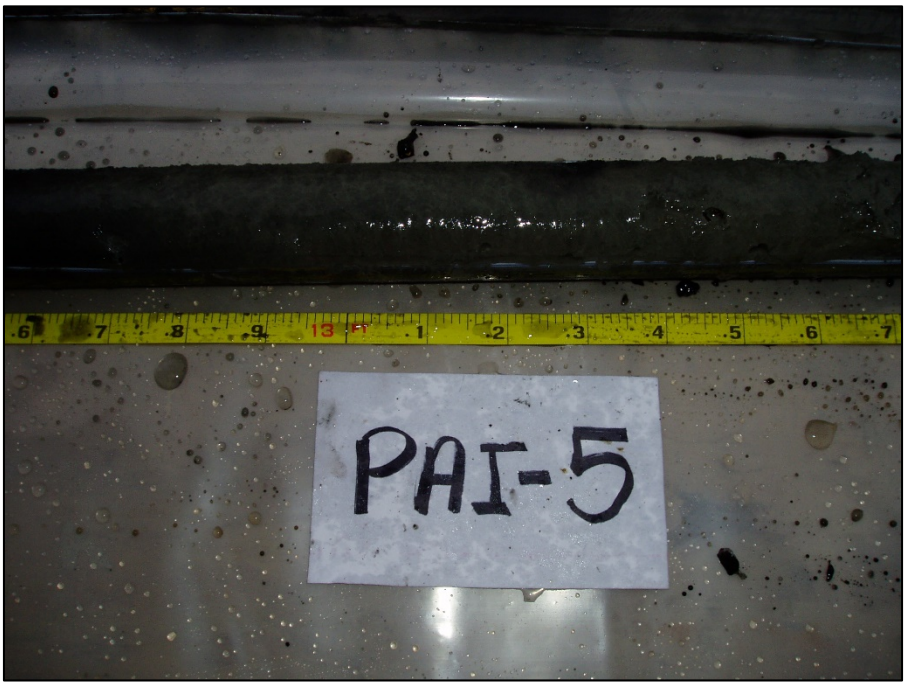

PAI-5 13 feet

PAI-5 14 feet

Soil Boring Field Photographs PAI-5	
Gas Works Park Site Seattle, Washington	
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PAI-5 15 to 15.5 feet

Soil Boring Field Photographs PAI-5	
Gas Works Park Site Seattle, Washington	
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PAI-6 2 to 3 feet

PAI-6 3 to 4 feet

Soil Boring Field Photographs PAI-6	
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PAI-6 4 to 5 feet

PAI-6 5 to 6 feet

Soil Boring Field Photographs PAI-6

Gas Works Park Site
Seattle, Washington

GeoEngineers

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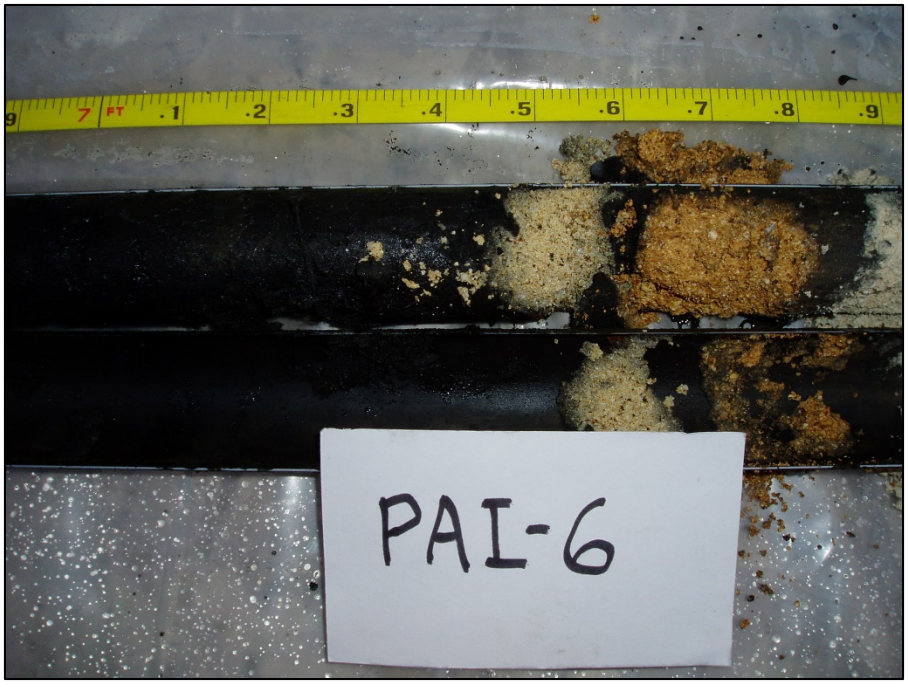
PAI-6 6 to 7 feet



PAI-6 7 to 8 feet

Soil Boring Field Photographs PAI-6

Gas Works Park Site
Seattle, Washington

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PAI-6 8 to 9 feet

PAI-6 9 to 10 feet

Soil Boring Field Photographs PAI-6	
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