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October 7, 2011

Mr. Steve Teel, L.HG.
Washington State Department of Ecology
Toxics Cleanup Program – Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504 - 7775

Subject: *Data Gap Investigation Work Plan and Schedule*
East Bay Redevelopment Site, Olympia, Washington

Dear Mr. Teel:

On behalf of the Port of Olympia, I am enclosing for your review two copies of a work plan for the additional data gap soil sampling and analysis at the Port of Olympia East Bay Redevelopment Site (Site). The primary purpose of these proposed data gap samples is to provide additional data to supplement the Site Boundary Technical Memorandum (PIONEER 2010, Ecology 2010) and assist in defining the Site boundary.

Introduction

The Site is located in Olympia, Washington, on the southeast corner of the Port peninsula adjacent to the East Bay of Budd Inlet. Most of the Site consists of fill dredged from Budd Inlet except for what was added after 1979, which was clean fill from an off-site location. The 1979 shoreline is shown on Figures 1 and 2.

The Port of Olympia originally entered the Site into Washington State Department of Ecology's (Ecology) Voluntary Cleanup Program in 2007, and since has entered into Agreed Order (AO) DE5471 and AO DE7830, which superseded AO DE5471. This Work Plan satisfies the Data Gap Investigation Work Plan and Schedule deliverable following the draft Site Boundary Technical Memorandum deliverable specified in AO DE7830.

Description of Soil Sampling and Analysis

Based on existing data, new sample locations are proposed to further characterize the Site and define the Site boundary (see Table 1). In summary, direct-push soil borings will be advanced in eleven locations, seven of those locations will be sampled for carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and eight of those locations will be sampled for chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans (dioxins/furans). Sample locations for cPAHs and dioxins/furans are shown on Figures 1 and 2, respectively. In addition, a limited excavation will be performed in the southwest corner of the Site in Parcel 3 in attempt to remove the P-1 anomaly and any associated impacted soil. The location of the anomaly is shown on Figure 1.

Field guidelines and descriptions of procedures applicable to this Work Plan are outlined in the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) provided as Attachment 1. The

SAP/QAPP is Appendix D of the Remedial Investigation Work Plan for the East Bay Redevelopment Site (GeoEngineers and PIONEER 2008). Deviations from this SAP/QAPP are described in Table 2. Field activities will be documented using PIONEER field forms provided as Attachment 2.

All samples will be analyzed by an Ecology accredited laboratory. The analytical methods will be United States Environmental Protection Agency (USEPA) Method SW846-8290 for dioxins/furans, USEPA Method SW846-8270 for PAHs, Ecology Method NWTPH-Dx for diesel- and heavy oil-range petroleum hydrocarbons, and USEPA Method SW846-8082 for polychlorinated biphenyls (PCBs). It is anticipated that Pace Analytical Services will perform the dioxins/furans analyses and Anatek Labs, Inc will perform the rest of the analyses (both laboratories are Ecology accredited for the analyses being performed). Current target soil reporting limits for these analyses are presented in Table 3. As shown in Table 3, all target reporting limits are less than soil screening levels for the Site.

Schedule

Following review and approval of this Work Plan by Ecology, PIONEER will implement the investigation activities described herein. A proposed schedule of upcoming work and deliverables is presented in Figure 3.

If you have any questions or require further information, please do not hesitate to contact me at 570-1700 or Alex Smith at 528-8020.

Respectfully,

Troy Bussey Jr., P.E. (WA, CA), L.G. (WA), L.HG. (WA)
Senior Professional Engineer

cc:

Mr. Scott Rose, Washington State Department of Ecology (electronic copy)
Ms. Alex Smith, Port of Olympia (electronic copy)
Mr. Eric Hielema, LOTT Clean Water Alliance (electronic copy)
Mr. Jay Burney, City of Olympia (electronic copy)
Mr. Josh Johnson, Brown and Caldwell (electronic copy)

References

Washington State Department of Ecology (Ecology). 2010. Request for Data Gap Work Plan and Transmittal of Ecology Comments on the *Site Boundary Memorandum for the East Bay Redevelopment Site,* Prepared for the Port of Olympia by Pioneer Technologies Corporation, November 2010; East Bay Redevelopment Site, Olympia, Washington Ecology Facility/Site No. 5785176, Agreed Order DE7830. December 14.

GeoEngineers and PIONEER (Pioneer Technologies Corporation). 2008. Remedial Investigation Work Plan East Bay Redevelopment Port of Olympia, Olympia Washington. October 22.

PIONEER 2009. East Bay: Interim Action Work Plan. May.

PIONEER. 2010. Site Boundary Technical Memorandum for the East Bay Redevelopment Site. November.

Attachments

Figures

Figure 1 – Existing cPAHs Data and Proposed Sampling Locations
Figure 2 – Existing Dioxins/Furans Data and Proposed Sampling Locations
Figure 3 – Schedule as of October 7, 2011 for the East Bay Redevelopment Site

Tables

Table 1 – Proposed Data Gap Soil Sampling Locations
Table 2 – Soil Sampling Deviations from the Sampling and Analysis Plan/Quality Assurance Project Plan
Table 3 – Soil Analysis Target Reporting Limits

Attachments

Attachment 1 – GeoEngineers SAP/QAPP from the Remedial Investigation Work Plan
Attachment 2 – PIONEER Field Forms

TABLES

Table 1. Proposed Data Gap Soil Sampling Locations

Ecology Comment #[1]	Location Description[2]	Type of Data Gap[3]	Proposed Sampling Location	Analytes	Rationale for Sample Depth Selection[4]
1a	North of MW21S (0.5-1.5)	SB	DP46	cPAHs	Three or four soil samples will be collected from this boring. The intent is to collect one sample from each major soil lithology that is encountered (e.g., pre-1982 fill, soil containing fine-grained wood debris, former native sediments) and to bias depth interval selections towards intervals most likely to be impacted. Considerations in interval selection will include (1) lithology, (2) depth(s) of surrounding exceedances, (3) depth(s) of any debris encountered, and (4) desire to collect one sample near 2 feet bgs.
1a	East of MW21S (0.5-1.5)	SB	DP47	cPAHs	Same depths as 1a for DP46.
1b	West of DP37 (2-3.5)	SB	DP48	cPAHs[5]	Same depths as 1a for DP46.
1b	West of DP38 (5-6)	SB	DP49	cPAHs	Same depths as 1a for DP46.
1c	Northeast of MW05 (10-12)	SB	DP50	cPAHs[5]	If the bottom of the 1982 fill is encountered within 15 feet bgs, one soil sample will be collected from soil beneath the 1982 fill.
1d	East of DP33 (3-4, 7-8)	SB	DP51	cPAHs[5]	Same depth as 1c for DP50.
1e	East of MW04 (2-4)	SB	DP52	cPAHs[5]	Same depths as 1a for DP46.
1f	Northeast of MW20 (6-8)	SB	DP46	cPAHs	Same depths as 1a for DP46.
1f	Northwest of MW20 (6-8)	No sample proposed[6]			
2a	North of DP30 (7-7.5)	SB	DP53[(7)]	D/F	Pre-1982 fill was encountered from ground surface to 7 feet bgs in DP30 and neither of the two DP30 samples collected from pre-1982 fill had a D/F exceedance. Similarly there are no D/F exceedances in the pre-1982 fill samples located closest to DP30 (e.g., samples in the southern portion of the LOTT Expansion Site, DP29, MW23S, DP43, DP34, DP38), which is not surprising since DP30 is located a considerable distance from D/F-related AOCs and the historic shorelines where treated wood pilings were likely used. The only DP30 exceedance was a 7-7.5 feet bgs sample of what appeared to be former native sediment mixed with wood debris that was located beneath the pre-1982 fill. As a result, one to two samples will be collected beneath the pre-1982 fill in this boring. One sample will be collected from former native sediment (if encountered) and one sample will be collected adjacent to wood debris (if encountered). If neither former native sediment nor wood debris are encountered beneath the pre-1982 fill, one sample will be collected at roughly the same depth as the DP30 exceedance.
2a	South of DP30 (7-7.5)	SB	DP54[(7)]	D/F	Same depths as 2a for DP53.
2a	West of DP30 (7-7.5)	No sample proposed[6]			
2a	East of DP30 (7-7.5)	RI/FS	DP55 [(7)]	D/F	Same depths as 2a for DP53.
2b	East of DP26 (1-2)	SB	DP52	D/F[5]	Same depths as 1a for DP46.
2c	East of TP02 (2-2.5)	SB	DP51	D/F[5]	Same depth as 1c for DP50.
2d	East of DP42 (1-2, 7-8)	SB	DP56	D/F	Same depths as 1a for DP46.
2e	Northeast of TP03 (3.5-4)	SB	DP50	D/F[5]	Same depth as 1c for DP50.
2f	West of MW24S (6.5-8, 9-10)	SB	DP48	D/F[5]	Same depths as 1a for DP46.
2g	West of TP04 (1.5-2)	No sample proposed[8]			
7	Southwest corner of Parcel 3 (i.e., location of P-1 anomaly)	RI/FS	Not applicable	TPH-D, TPH-HO, PAHs, and PCBs	A limited attempt will be made to remove the P-1 anomaly and any associated impacted soil (e.g., no more than 50 cubic yards total during this limited attempt). Excavated soil and the anomaly will be disposed of at the Weyerhaeuser Regional Landfill in Castle Rock. Four sidewall samples and one bottom sample will be collected following the removal to characterize the surrounding soil conditions.

Notes:
bgs: below ground surface
Dioxins/furans: chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans
PAHs: polycyclic aromatic hydrocarbons
RI/FS: Remedial Investigation / Feasibility Study
TPH-D: total petroleum hydrocarbons in the diesel range
cPAHs: carcinogenic polycyclic aromatic hydrocarbons
DP: direct push
PCBs: polychlorinated biphenyls
SB: site boundary
TPH-HO: total petroleum hydrocarbons in the heavy oil range

[1]Comments dated December 14, 2010 on the Site Boundary Technical Memorandum for the East Bay Redevelopment Site (PIONEER 2010).
[2]The depth of soil screening level exceedance (in feet bgs) for the sample that was referenced in the Ecology comment (e.g., "MW21S") is shown in parenthesis.
[3]Data gaps for the site boundary are differentiated from general RI/FS data gaps. Sampling for these different types of data gaps may be conducted in separate phases.
[4]All borings will be advanced to 15 feet bgs unless otherwise noted.
[5]Samples collected from these locations are being analyzed for both cPAHs and D/F. The depth interval selections will be the same for cPAHs and D/F.
[6]Deeper characterization of potential releases at AOC 1 will be addressed as part of activities at the LOTT Expansion Site.
[7]No sample is proposed northwest of DP30 since the total D/F exceedance in DP30 has already been delineated to concentrations less than the soil screening level in the northwestern direction by BC_DP17. Samples are proposed to the northeast, southwest, and southeast (rather than north, west, south, east).
[8]This screening level exceedance has already been delineated with samples at DP38, which is located west of TP04 (see Figure 2).

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Table 2. Soil Sampling Deviations from the Sampling and Analysis Plan/Quality Assurance Project Plan

SAP/QAPP Section	Deviation	Rationale/Explanation
4.0	Work will be executed by PIONEER rather than GeoEngineers.	The Port of Olympia selected PIONEER to perform this work.
2.0	Samples will not be collected every two feet.	One sample will be taken from each major soil lithology that is encountered. Table 1 describes considerations of intervals that will be sampled.
2.0	Water sheen and headspace vapor screening methods will not be used.	Due to the nature of constituents being investigated in this Work Plan, these tests will not be employed.
2.0	Investigation derived waste will be handled differently.	It is anticipated based on previous sampling events that an insignificant volume of decontamination water will be generated and therefore will be discharged on site. It is anticipated based on previous sampling events that an insignificant volume of unused soil cores will be generated. These soils will be placed on-site or will be added to the excavated soils from the southwest corner or Parcel 3 (which are being disposed of at Weyerhaeuser Regional Landfill in Castle Rock).
5.2	Samples will be collected for a 1-foot interval instead of a four to six inch interval.	Given the lithology and actual core recovery, even with two side-by-side borings, typically it is expected to require a one-foot sample interval or longer in order to obtain the minimum required container volume.
5.2	A different GPS unit will be used.	PIONEER has a different GPS unit (which is more accurate than the unit specified in the SAP/QAPP).
8.0	Sample nomenclature will be revised.	To improve data usability during subsequent data evaluations.
11.1	No field trip blanks will be used.	VOCs are not being investigated in this Work Plan.
Table 4	Different target reporting limits will be used.	Reporting limits for the analytical methods and anticipated laboratories are presented in Table 3.

Notes:
GPS: Global Positioning System
SAP: Sampling and Analysis Plan
QAPP: Quality Assurance Project Plan
VOCs: volatile organic constituents

Table 3. Soil Analysis Target Reporting Limits

Analytes	Analytical Method	Target Reporting Limits (mg/kg)	Soil Screening Level[1] (mg/kg)
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)			
Benzo(a)pyrene	USEPA SW846-8270	0.01	--
Benzo(a)anthracene	USEPA SW846-8270	0.01	--
Benzo(b)fluoranthene	USEPA SW846-8270	0.01	--
Benzo(k)fluoranthene	USEPA SW846-8270	0.01	
Chrysene	USEPA SW846-8270	0.01	--
Dibenz(a,h)anthracene	USEPA SW846-8270	0.01	--
Indeno(1,2,3-cd)pyrene	USEPA SW846-8270	0.01	--
Total cPAHs Nondetected Value[2,3]	0.015		0.095
Polycyclic Aromatic Hydrocarbons (PAHs)			
PAHs	USEPA SW846-8270	0.01	--
Total Petroleum Hydrocarbons (TPHs)			
Diesel-Range	NWTPH-Dx	25	2000
Heavy Oil-Range	NWTPH-Dx	100	2000
Polychlorinated Biphenyls (PCBs)			
Aroclor 1016	USEPA SW846-8082	0.1	--
Aroclor 1221	USEPA SW846-8082	0.1	--
Aroclor 1232	USEPA SW846-8082	0.1	--
Aroclor 1242	USEPA SW846-8082	0.1	--
Aroclor 1248	USEPA SW846-8082	0.1	--
Aroclor 1254	USEPA SW846-8082	0.1	--
Aroclor 1260	USEPA SW846-8082	0.1	--
Total PCBs Nondetected Value[3,4]	0.35		0.5
Dioxins and Furans			
2,3,7,8-TCDD	USEPA SW846-8290	1.0E-06	--
2,3,7,8-TCDF	USEPA SW846-8290	1.0E-06	--
-Penta, Hexa, Hepta	USEPA SW846-8290	5.0E-06	--
-Octa	USEPA SW846-8290	10.0E-06	--
Total Dioxins/Furans Nondetected Value[2,3]	5.7E-06		9.8E-06

Notes:
-- = not applicable
[1]From Table 1 of the Site Boundary Technical Memorandum for the East Bay Redevelopment Site (PIONEER 2010), except for diesel and heavy oil range which are from the East Bay Interim Action Work Plan (PIONEER 2009).
[2]The total cPAHs and total dioxins/furans nondetected values were calculated by multiplying the reporting limit by the toxic equivalency factors as presented in Tables 708-2 and 708-1, respectively, in the MTCA Statute and Regulation Handbook, then adding the values using compound totaling rules described below.
[3]Compound totaling was performed in accordance with Ecology's Concise Explanatory Statement for the Amendments to the Model Toxics Control Act (MTCA) Cleanup Regulation Chapter 173-340 WAC, Publication No. 01-09-043. For congeners that occur at the site (detected in any media), but not detected in that sample, a value of 1/2 the detection limit is assigned. For congeners that do not occur at the site (not detected in any media), a value of zero is assigned. In the case of cPAHs, all congeners have been detected at least once. In the case of PCBs, only one of the seven congeners has been detected. In the case of dioxins/furans, all congeners have been detected at least once.
[4]Even though only one PCB congener has ever been detected at the site, it is possible that they could all be detected, and therefore the total PCBs nondetected value is the total of ½ the reporting limits.

FIGURES

AOC ID	Description of Historic Features
AOC01	Refuse Fire Area
AOC 02	Panel Oiling
AOC 04	Propane Lift Truck Fueling Shed
AOC 09	Oil House
AOC 10	Engine Room
AOC 11	Unidentified Structure
AOC 12	Machine Shop
AOC 13	Blacksmith Shop
AOC 14	Tar Dipping Tank North
AOC 15	Tar Dipping Tank South
AOC 16	Oiled Cooled Transformer on Concrete Pad
AOC 17	Boiler House
AOC 18	Fuel Bin
AOC 19	Flammable Liquids
AOC 20	Hog Fuel Pile on Ground
AOC 21	Oil House
AOC 24	Power House
AOC 25	Unknown Shop
AOC 26	Pipe Shop
AOC 27	Fuel Bin
AOC 28	Transformer Vault
AOC 29	Oil House
AOC 30	Fenced Electrical Enclosure
AOC 31	Jitney Shop
AOC 32	Electronic Shop
AOC 33	Machine Shop
AOC 34	Welding Shop
AOC 35	Engine (Type Unknown)
AOC 36	Engine (Type Unknown)
AOC 37	Repair Shop
AOC 38	Blacksmith Shop
AOC 39	Logway
AOC 40	Glue House
AOC 41	Blacksmith Shop
AOC 42	Machine Shop
AOC 52	Diesel Fuel Release
AOC 53	Sawmill
AOC 54	Planing Mill

N W E S

Legend

Sample No Longer in Place

Proposed Sample Location

- Site Boundary Data Gap

Soil Data (0-2' bgs)

- Soil Concentration <= SL
- SL < Soil Concentration <= RL
- Soil Concentration > RL

Soil Data (2-6' bgs)

- Soil Concentration <= SL
- SL < Soil Concentration <= RL
- Soil Concentration > RL

Soil Data (>= 6' bgs)

- Soil Concentration <= SL
- SL < Soil Concentration <= RL
- Soil Concentration > RL

1979 Shoreline

Areas of Concern (AOC)

Parcel Boundaries

LOTT Expansion Site

Completed/Underway Remedial Actions

- Soil Cap
- Soil Cover
- Soil Removal

Notes:

bgs = below ground surface
cPAHs = carcinogenic polycyclic aromatic hydrocarbons
cPAHs = 0.095 mg/kg
Possible cPAHs RL[1] = 3.4 mg/kg
SL = screening level
RL = remediation level
NLIP = no longer in place
RI/FS = Remedial Investigation/Feasibility Study

1. Based on the Interim Action Reuse Under Pavement Levels for the Direct Contact Pathway in Table C-5 of the Interim Action Work Plan (PIONEER 2009a)

-Data from the LOTT Expansion Site are shown (Brown and Caldwell 2007a, 2007b, 2007c, and 2009a).
-Non-detected values greater than the SL are not shown as exceedances.
-Sample breakout depths are based on sample top.

0 100 200 Feet

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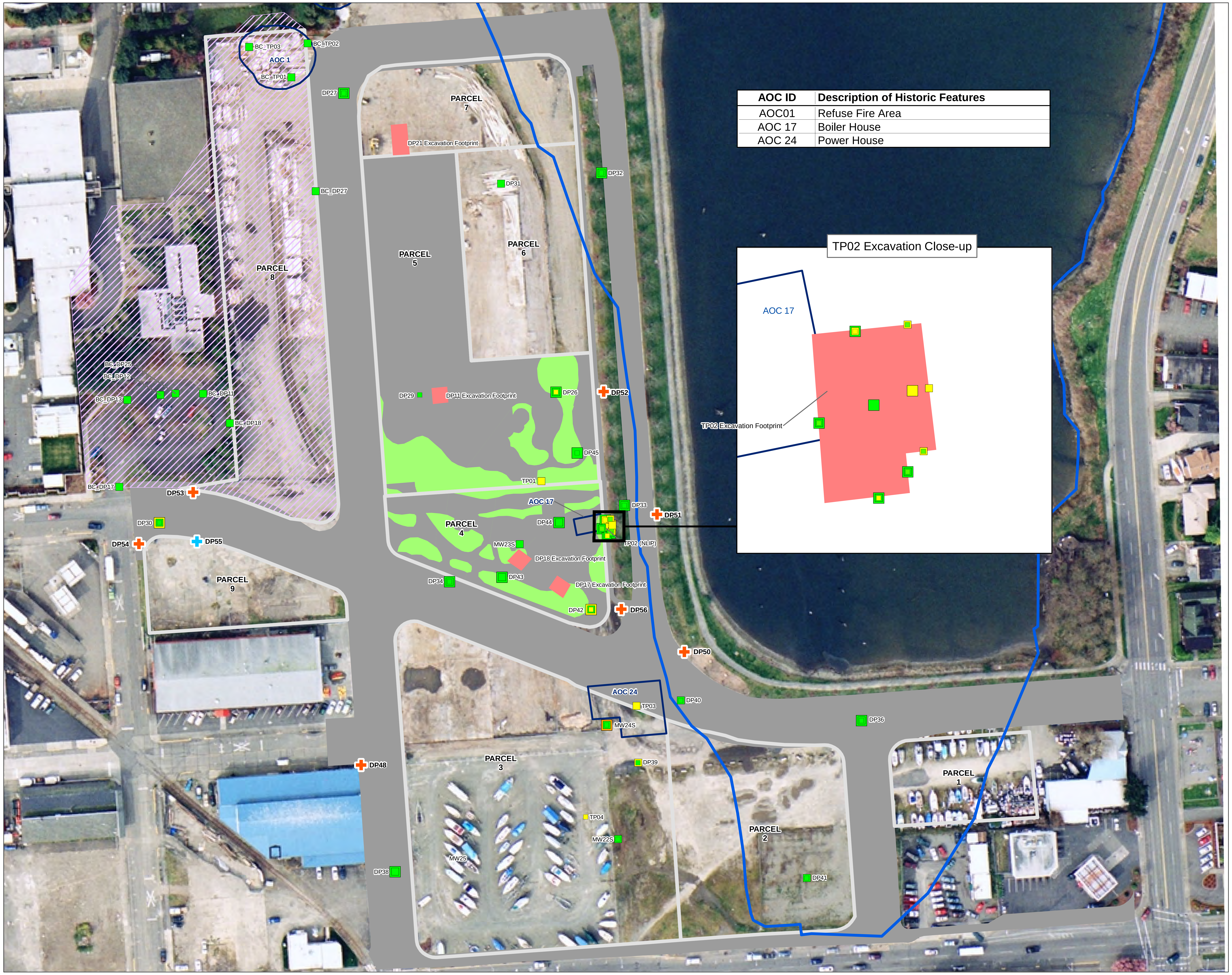
Existing cPAHs Data and Proposed Sampling Locations
Data Gap Work Plan
East Bay Redevelopment Site

DWN:	PROJECT:
MF	
DATE:	FIGURE NO.:
October 2011	1



AOC ID	Description of Historic Features
AOC01	Refuse Fire Area
AOC 17	Boiler House
AOC 24	Power House

N W E S

Legend

Sample No Longer in Place

Proposed Sample Location

- Site Boundary Data Gap Sample
- RI/FS Data Gap Sample

Soil Data (0-2' bgs)

- Soil Concentration <= SL
- SL < Soil Concentration <= RL
- Soil Concentration > RL

Soil Data (2-6' bgs)

- Soil Concentration <= SL
- SL < Soil Concentration <= RL
- Soil Concentration > RL

Soil Data (>= 6' bgs)

- Soil Concentration <= SL
- SL < Soil Concentration <= RL
- Soil Concentration > RL

1979 Shoreline

Areas of Concern (AOC)

Parcel Boundaries

LOTT Expansion Site

Completed/Underway Remedial Actions

- Soil Cap
- Soil Cover
- Soil Removal

Notes:

Total Dioxins/Furans SL = 9.8 ng/kg
Possible Total Dioxins/Furans RL[1] = 510 mg/kg

SL = screening level
RL = remediation level
bgs = below ground surface
NLIP = no longer in place
RI/FS = Remedial Investigation/Feasibility Study

1. Based on the Interim Action Reuse Under Pavement Levels for the Direct Contact Pathway in Table C-5 of the Interim Action Work Plan (PIONEER 2009a)

-Data from the LOTT Expansion Site are shown (Brown and Caldwell 2007a, 2007b, 2007c, and 2009a).
-Sample breakout depths are based on sample top.

0 100 200 Feet

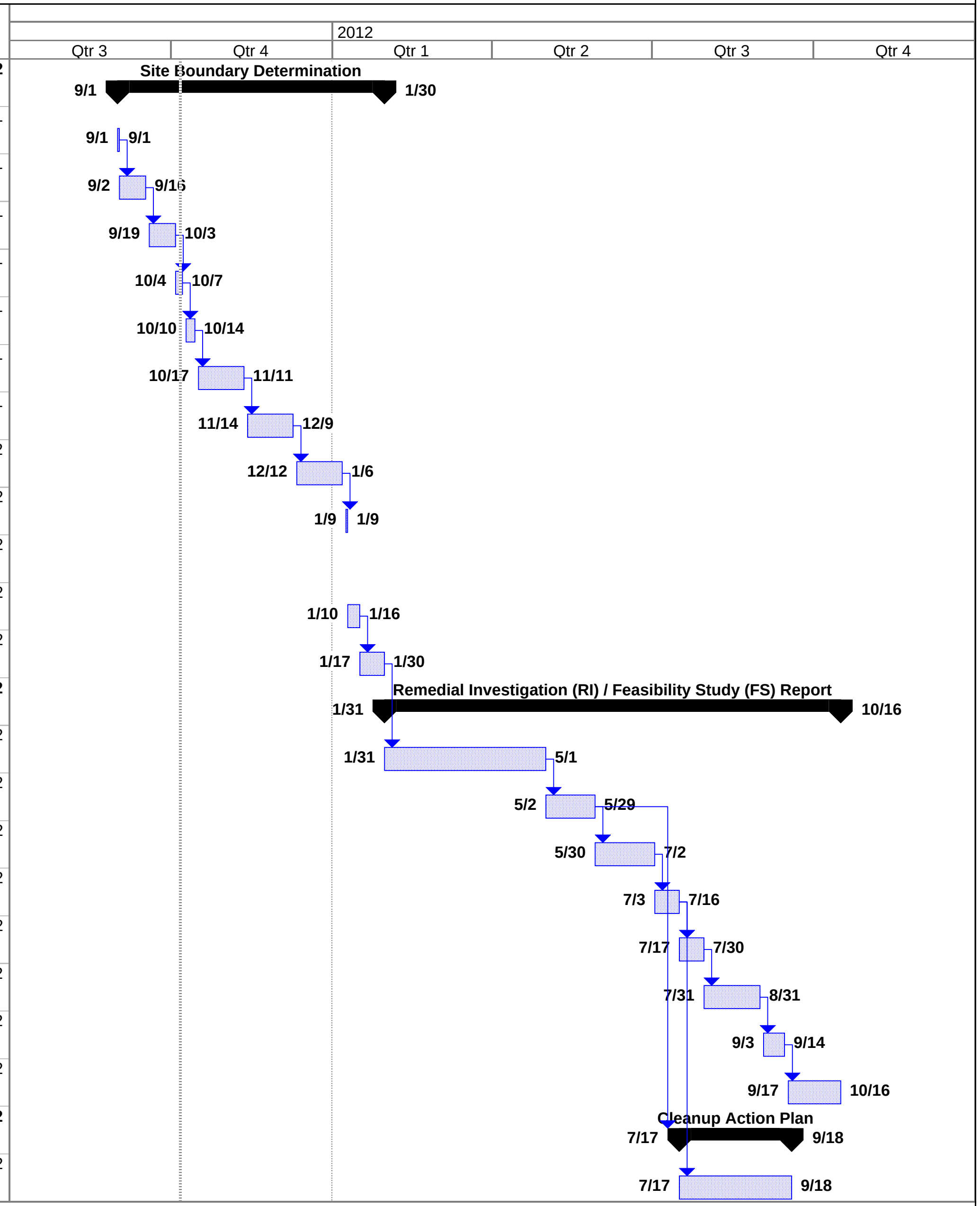
PIONEER TECHNOLOGIES CORPORATION

Existing Dioxins/Furans Data and Proposed Sampling Locations
Data Gap Work Plan
East Bay Redevelopment Site

DWN:	PROJECT:
MF	
DATE:	FIGURE NO.:
October 2011	2

Figure 3. Schedule as of October 7, 2011 for the East Bay Redevelopment Site

ID	Task Name	Duration	Start	Finish
1	**Site Boundary Determination**	**108 days**	**Thu 9/1/11**	**Mon 1/30/12**
2	Meeting on Port's proposed site boundary	1 day	Thu 9/1/11	Thu 9/1/11
3	Port submit a Data Gap Investigation Work Plan and Schedule	11 days	Fri 9/2/11	Fri 9/16/11
4	Ecology review Data Gap Investigation Work Plan and Schedule	11 days	Mon 9/19/11	Mon 10/3/11
5	Port submit final Data Gap Investigation Work Plan and Schedule (if necessary)	4 days	Tue 10/4/11	Fri 10/7/11
6	Ecology approve Data Gap Investigation Work Plan and Schedule	5 days	Mon 10/10/11	Fri 10/14/11
7	Port complete Data Gap Investigation Work Plan field activities	20 days	Mon 10/17/11	Fri 11/11/11
8	Port receive laboratory results	20 days	Mon 11/14/11	Fri 12/9/11
9	Evaluate new data	20 days	Mon 12/12/11	Fri 1/6/12
10	Meeting to discuss results of Data Gap Investigation	1 day	Mon 1/9/12	Mon 1/9/12
11	Additional work and meeting for site boundary (if necessary)	0 days	Mon 1/9/12	Mon 1/9/12
12	Port submit figure to Ecology showing proposed site boundary, once all agree on site boundary	5 days	Tue 1/10/12	Mon 1/16/12
13	Ecology approve proposed site boundary	10 days	Tue 1/17/12	Mon 1/30/12
14	**Remedial Investigation (RI) / Feasibility Study (FS) Report**	**186 days**	**Tue 1/31/12**	**Tue 10/16/12**
15	Port submit draft RI / FS Report	66 days	Tue 1/31/12	Tue 5/1/12
16	Ecology review and comment on draft RI / FS Report	20 days	Wed 5/2/12	Tue 5/29/12
17	Port submit draft final RI / FS Report	24 days	Wed 5/30/12	Mon 7/2/12
18	Ecology approves draft final RI / FS Report for public comment period	10 days	Tue 7/3/12	Mon 7/16/12
19	Ecology prepare for public comment period	10 days	Tue 7/17/12	Mon 7/30/12
20	Public comment period	24 days	Tue 7/31/12	Fri 8/31/12
21	Ecology response to public comments	10 days	Mon 9/3/12	Fri 9/14/12
22	Port prepare final RI/FS Report	22 days	Mon 9/17/12	Tue 10/16/12
23	**Cleanup Action Plan**	**46 days**	**Tue 7/17/12**	**Tue 9/18/12**
24	Port Submit Draft Cleanup Action Plan to Ecology	46 days	Tue 7/17/12	Tue 9/18/12



Note: The Department of Ecology is not bound by the scheduled duration time or the Start and Finish dates for review, response, comment, or approval of documents by Ecology. Ecology will endeavor to finish its review within the timeline indicated in the Schedule. If the review, response, comment or approval of documents by Ecology is longer than the duration time indicated in the Schedule, the Start and Finish dates of subsequent Tasks will be delayed a corresponding number of days.

Task	Milestone	External Tasks
Split	Summary	External Milestone
Progress	Project Summary	Deadline

ATTACHMENT 1

GeoEngineers SAP/QAPP from the Remedial Investigation Work Plan

APPENDIX D

SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN

SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN REMEDIAL INVESTIGATION WORK PLAN EAST BAY REDEVELOPMENT PORT OF OLYMPIA OLYMPIA, WASHINGTON

OCTOBER 22, 2008

FOR
PORT OF OLYMPIA

GEOENGINEERS

Sampling and Analysis Plan and Quality Assurance Project Plan

File No. 0615-034-07

October 22, 2008

Prepared for:

Port of Olympia
915 Washington Street NE
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Attention: Joanne Snarski,

Prepared by:

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SAMPLING AND ANALYSIS PLAN AND
QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION WORK PLAN
EAST BAY REDEVELOPMENT, PORT OF OLYMPIA
OLYMPIA, WASHINGTON
FOR
PORT OF OLYMPIA

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) describe sample collection, handling and analysis procedures associated with the Remedial Investigation Work Plan (RIWP) for the Port of Olympia's (Port) 13-acre East Bay Redevelopment Site (Site). The Site is located in Olympia, Washington, as shown in Figure 1. This SAP must be used in conjunction with the RIWP and the project-specific Health and Safety Plan (HASP).

Detailed descriptions of the field sampling procedures are provided in this document. Site conditions may make it necessary to modify these procedures. Any variations or modifications that become necessary during the investigation will be coordinated with Port personnel, the Washington State Department of Ecology (Ecology) and other involved parties, as appropriate. Variations or modifications implemented during the investigation and the reason for the modification will be documented in field records.

This SAP describes field activities, sampling equipment, sampling locations and procedures that will be used during investigations at the Site. This SAP also includes a QAPP (Section 11), which identifies quality assurance/quality control (QA/QC) procedures that will be implemented during field sampling activities and laboratory analyses.

2.0 PURPOSE AND SCOPE

The purpose of this SAP is to present the detailed procedures that will be used to obtain samples during the supplemental remedial investigation (RI). The objective of this sampling is to provide information to:

- Characterize the nature and extent of contamination at the Site;
- Assess the potential risk to human and ecological receptors; and
- Provide the information that will allow selection of cleanup action alternatives.

Rationale for sample locations and depths and monitoring wells are described in Tables 1 through 3.

Activities to be performed by GeoEngineers during the RI include the following:

1. Update the Project HASP and SAP for use by GeoEngineers' personnel during the RI.
2. Retain public and private utility locating services to identify and locate underground utilities in the exploration areas in coordination with the Port.
3. Retain a concrete coring contractor to core through paved surfaces, as necessary.
4. Monitor the advancement of soil explorations using direct-push and/or hollow-stem auger techniques to depths specific to proposed sample locations. If field screening indicates

contamination is present at the target total depth for a boring, the boring will be advanced until field screening indicates contamination is not present.

  - **a.** Soil borings will be located by measuring from known previously surveyed features (roads, existing monitoring wells, etc) and GPS readings.
  - **b.** Samples of soil will be collected continuously for the total depth of each boring. Samples for potential chemical analyses will be collected approximately every two feet. Soil will be visually classified in the field according to the Unified Soil Classification System. Contacts between soil lithologies and fill episodes, if feasible, will also be described.
  - **c.** Groundwater monitoring wells may be constructed in five borings as described in Table 2.

5. Obtain soil samples as specified in this SAP and the RIWP. Field screening will be performed on each sample using visual, water sheen and headspace vapor screening methods. The field screening results will be used as a general guideline to approximate the vertical extent of petroleum-related contamination in the soil samples. In addition, screening results will be used to aid in the selection of soil samples to be submitted for chemical analysis.

6. Explore the locations and nature of water seeps along the shoreline embankment and collect data to determine if the seeps represent groundwater.

7. Obtain groundwater samples from existing and new monitoring wells for chemical analytical testing using low-flow sampling methodology. Measure depth to water using an electric water level indicator.

  - **a.** Collect water samples from seeps if the seeps represent groundwater.

8. Contain soil cuttings, purge water and decontamination water in steel drums and store the drums in a secure location designated by the Port to await off-site transport and disposal. The drums will be labeled according to standard GeoEngineers' practice.

9. Submit soil and groundwater samples to a subcontracted chemical analytical laboratory for chemical analysis. The chemical constituents for each sample have been determined based on existing data and assumptions of the chemicals of potential concern (COPCs) present. Sample locations, depth intervals, and COPCs are described in Tables 1 through 3. The chemical analysis may include one or more of the following:

  - **a.** Gasoline-, diesel- and motor oil-range petroleum hydrocarbons by Ecology Methods NWTPH-Gx and NWTPH-Dx,
  - **b.** Metals by U.S. Environmental Protection Agency (EPA) Method 6000/7000 series,
  - **c.** Volatile organic compounds (VOCs) by EPA Method 8260B,
  - **d.** Semivolatile organic compounds (SVOCs) including carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by EPA Method 8270 SIM,
  - **e.** Polychlorinated biphenyls (PCBs) by EPA Method 8082, and
  - **f.** Dioxins/furans by EPA Method 1613B or Method 8290.

Tables 4 and 5 summarizes the target analytical reporting limits and analytical methods that will be used for soil and groundwater.

10. Document sample methodology and sample locations using detailed field logs.

11. Use database and geographic information system (GIS) technologies to manage chemical analytical data and sample locations.

3.0 PROJECT SCHEDULE

Field work for the supplemental RI will be conducted in phases. The initial phase of the RI will be completed in Fall 2008 in order to provide data critical to the planning of the infrastructure improvement project. The initial phase includes completing eight explorations located in or near the infrastructure corridor. The initial eight exploration locations include borings DP27, DP30, DP32, DP33, DP34, DP36, DP38, and DP40, which are also highlighted on Table 1. The initial phase will also include locating suspected artesian wells, as described in Appendix B of the RI Workplan. Subsequent phase of field work will be completed after data from the first phase has been evaluated and after decommissioning of the artesian wells.

4.0 ROLES AND RESPONSIBILITIES

This section outlines the individuals directly involved with the RI. Work performed under this SAP will be in cooperation with the Port.

Key personnel for this project are as follows:

Position	Name	Affiliation	Telephone Number
Ecology Project Coordinator	Steve Teel	Washington State Department of Ecology	360-407-6247
Port Project Coordinator	Joanne Snarski	Port of Olympia	360-528-8061
Principal-in-Charge	David Cook	GeoEngineers, Inc.	206-728-2674
Project Manager	Jay Lucas	GeoEngineers, Inc.	206-239-3221

- The **Ecology Project Coordinator** is responsible for providing timely technical review and guidance regarding compliance with the Agreed Order (AO) and is responsible for overseeing implementation of the AO for Ecology.
- The **Port Project Coordinator** is responsible for administering the contract with the consultant and is responsible under the AO for overseeing implementation of the AO for the Port.
- The **Principal-in-Charge** works with the Project Manager and is responsible for project document QA/QC review.
- The **Project Manager** reports directly to the Port Project Coordinator and the Principal-in-Charge. The Project Manager is responsible for coordinating project activities and submitting deliverables to the Port. The Project Manager's duties consist of providing concise technical work statements for project tasks, selecting project team members, determining the degree of subcontractor participation, establishing and adhering to budget and schedule, providing technical oversight and providing review of all work.

5.0 FIELD PROCEDURES

The rationale, depths and chemical program for soil and groundwater samples are presented in Tables 1 through 6 of this SAP and are described in the RIWP. The soil and groundwater samples will be obtained and submitted to a Washington State accredited laboratory for chemical analysis.

Note that Sampling and Testing associated with the RI, as outlined in this SAP, includes a phased approach to facilitate early decisions regarding the infrastructure improvements and associated excavation. The phased explorations and testing approach are highlighted in Table 1 of this SAP.

5.1 UNDERGROUND UTILITY LOCATE

Prior to sampling activities, an underground utility locate will be conducted in the area of the proposed sample locations to identify any subsurface utilities and/or potential underground physical hazards.

5.2 SUBSURFACE SOIL SAMPLING

5.2.1 Sample Collection Method

Subsurface soil sampling will be conducted using a direct-push drilling rig equipped with a core barrel lined with disposable acetate sleeves. Soil samples will be obtained every two feet for potential chemical analytical testing and field screening, as described in Table 1. Samples obtained for chemical analytical testing will consist of approximately four- to six-inches of the soil core. The depth of each sample will be measured from the bottom of the sample interval. The depth to the groundwater table, if present, may also be measured at each sample location, using an electric water level indicator.

Samples to be analyzed for gasoline-range petroleum hydrocarbons and VOC analysis following EPA Method 5035A (Ecology 2004) will be obtained first. Samples obtained for non-volatile analyses will be obtained from the same general intervals as the volatile samples. Planned sample depths are based on results from earlier studies and are outlined in Table 1. Sample containers will be labeled in the field and stored in an iced cooler prior to and during shipment to the chemical analytical laboratory.

Sampling activities will be conducted by a GeoEngineers representative, and soil will be visually classified in the field according to the Unified Soil Classification System (USCS) and American Society for Testing and Materials (ASTM) Standard 2488.

Field personnel will record the sample locations using hand-held Trimble GeoXT global positioning system (GPS) units with sub-meter accuracy during sampling activities. Sub-meter accuracy standards will be used during data collection to record latitude and longitudinal data. A minimum of four satellites will be required for a position dilution of precision (PDOP) value of less than 6. Satellite elevation must be at least 15 degrees above the horizon, with a minimum signal-to-noise ratio (SNR) of 39 bBHz. GPS data collected in the field will be subsequently processed in the office using measurements from the nearest reference station to each collection point.

5.2.2 Sample Locations

Twenty-two new boring locations are planned and shown in Figures 2 and 3. The borings are placed in areas to further evaluate the lateral and/or vertical extent of contamination that has been identified in previous studies. The rationale for sample locations and depth intervals are described in Table 1.

5.2.3 Phase 1: Infrastructure Construction Corridor Sample Locations

Locations of eight borings are within utility corridors associated with the infrastructure improvements. These borings may be completed during an initial phase of exploration to accommodate the construction schedule. These borings are highlighted in Table 1 and Figure 2. Sampling in the infrastructure corridor will provide data to characterize soil that will be removed during excavation activities.

5.3 FIELD SCREENING

Field screening for evidence of possible contamination will be performed on soil samples obtained from the explorations. Field screening results will be recorded on the field logs, and the results will be used as a general guideline to delineate areas of possible contamination. Screening results will be used to aid in the selection of soil samples to be submitted for chemical analysis. The following screening methods will be used: (1) visual screening, (2) water sheen screening and (3) headspace vapor screening. Visual screening and water sheen screening are qualitative methods; therefore, precision, accuracy and detection limits are not quantified for these methods. Headspace vapor screening is a semi-quantitative method; however, precision and accuracy will not be quantified for this method. Instrument accuracy and detection limits are described below. Field screening results are site- and location-specific. The results may vary with temperature, moisture content, soil type and chemical constituent.

5.3.1 Visual Screening

The soil will be observed for unusual color and stains and/or odor indicative of possible contamination.

5.3.2 Water Sheen Screening

A portion of the soil sample will be placed in a pan containing distilled water. The water surface will be observed for signs of sheen. The following sheen classifications will be used:

Classification	Identifier	Description
No Sheen	(NS)	No visible sheen on the water surface
Slight Sheen	(SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly
Moderate Sheen	(MS)	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface
Heavy Sheen	(HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen

5.3.3 Headspace Vapor Screening

Headspace vapor screening will be performed on a portion of the soil sample placed into a resealable plastic bag. Ambient air will be captured in the bag; the bag will be sealed and then shaken gently to expose the soil to the air trapped in the bag. The bag will remain closed for approximately 5 minutes at ambient temperature before the headspace vapors are measured. Vapors present within the sample bag's headspace will be measured by inserting the probe of a photoionization detector (PID) through a small opening in the bag. A PID measures the concentration of organic vapors ionizable by a 10.6 electron volt (eV) lamp in parts per million (ppm) and quantifies organic vapor concentrations in the range between 0.1 ppm and 2,000 ppm (isobutylene equivalent) with an accuracy of 1 ppm between 0 ppm and 100 ppm. The maximum value on the instrument and the ambient air temperature will be recorded on the field log for each sample. The PID will be calibrated to 100 ppm isobutylene.

5.4 GROUNDWATER SAMPLING

5.4.1 Monitoring wells

Groundwater will be sampled from 17 existing and new monitoring wells for chemical analytical testing as shown in Table 3. Monitoring wells will be sampled using low-flow sampling methodologies, as described below.

- Prior to sampling, measure depth to water with an electric water level indicator.
- Purge groundwater from the monitoring wells using dedicated tubing, a peristaltic pump (or equivalent), a flow-through cell and water parameter analyzer (Horiba U-20). Purge monitoring wells using a flow rate between 100 and 500 milliliters per minute (mL/min) that does not create significant drawdown in the well. When field parameters have stabilized or at least three well volumes of water have been purged from the well, disconnect the flow-through cell and sample groundwater directly from down-well tubing, maintaining a low-flow pumping rate. Water quality parameters to be monitored during purging include: conductivity, dissolved oxygen, pH, salinity, total dissolved solids, turbidity, oxidation-reduction potential and temperature.
- Place each groundwater sample directly into a laboratory-prepared sample container, label the container, log the sample on the chain-of-custody and sample collection form, and place the container into a cooler with ice.

5.4.2 Groundwater Seeps

Greylock Consulting identified four seep locations along the shoreline during a low tide on July 16, 2008. These locations, as well as other seep locations that may be identified during site visits, will be evaluated to determine if they represent groundwater rather than surface water, irrigation water or discharge from buried pipes.

The evaluation will be based on several lines of evidence that will include:

- Physical observations of the proximity of the seeps to known utilities that could represent areas where water leaks from stormwater drains or from the fill around buried utilities.
- Explore the soil above the seeps to determine if the soil is saturated above the seepage point, and follow the saturation to its point of origin. This exploration will be conducted with hand digging equipment.
- Measure the temperature, salinity and conductivity of the water discharging from the seeps and compare these values to that representative of groundwater and of marine water. This will help determine if the seeps represent delayed drainage of sea water, rather than groundwater.
- Determine if the seeps originate at a higher elevation that the groundwater table. If a seep originates above the elevation of the groundwater table or high tide elevation that day, it is evidence that the seep does not represent groundwater. The elevation of the groundwater table will be based on water levels measured in the nearest monitoring well during the high tide and the low tide of that day’s tidal cycle.

If water from an area of seepage is identified as groundwater, a representative sample will be collected for chemical testing as identified in Table 3. The sample will be collected by pushing a short PVC pipe into the seep so the water drains from the end of the pipe. Following insertion of the PVC pipe, a sample of the water will be collected after turbidity caused by the initial disturbance has descreased. Conductivity, temperature, and salinity water quality parameters will be measured as described above for the monitoring well samples. Up to four samples representative of groundwater seeps will be collected. The PVC pipe will be decontaminated prior to collection of each sample.

5.5 Field Equipment Calibration Procedures

Field equipment requiring calibration will be calibrated to known standards in accordance with manufacturers' recommended schedules and procedures for each instrument. If field equipment becomes inoperable, it will be replaced with a properly calibrated instrument.

6.0 CHEMICAL ANALYTICAL PROGRAM

All samples will be submitted to a Washington State accredited laboratory. Tables 1 and 3 summarize the chemical analyses for soil and groundwater samples from monitoring wells, respectively. Tables 4 and 5 summarize the target analytical reporting limits.

7.0 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

The following procedures will be used when obtaining soil and/or groundwater samples during the investigation activities.

- Dedicated nitrile gloves will be worn when obtaining each sample, including quality control (QC) samples.
- Soil samples obtained for chemical analysis of gasoline-range petroleum hydrocarbons and VOCs will be obtained using EPA Method 5035A.
- Samples obtained for chemical analysis will be transferred into clean sample containers supplied by the analytical laboratory. Table 6 lists the sample containers to be used.
- Sufficient sample volume will be obtained for the laboratory to complete the method-specific QC analyses on a laboratory-batch basis.
- Sample labels will be completed for each sample following the procedures provided in this section. Immediately after the samples are obtained, they will be stored in a cooler with ice until they are delivered to the analytical laboratory.
- Standard chain-of-custody procedures will be followed for all samples obtained.

7.1 Custody Seals

Custody seals are signed and dated seals that are affixed to the lid of a shipping container (for example, cooler) and are used to indicate if the container has been opened before it reaches the intended recipient. Custody seals will be attached to containers by GeoEngineers personnel before they are transferred to the chemical analytical laboratory.

7.2 Custody Procedures

Chain-of-custody procedures will be used to track the possession of the samples from the time they are obtained in the field through analysis and final disposition. Each time the samples change hands, both the sender and receiver will sign and date the chain-of-custody record form. A chain-of-custody record form will be used to track possession of the samples and to document the analyses requested. The form will be completed at the end of each sampling day prior to transfer of samples off-site and will accompany the samples during transfer to the laboratory.

When the samples are shipped to the laboratory via common carrier, one copy of the chain-of-custody record form will be retained for project files, and the remaining copies will be enclosed in a plastic bag and secured to the inside of the cooler prior to shipment.

Upon receipt of the samples at the laboratory, the custody seals will be broken, the chain-of-custody form will be signed as received by the laboratory, and the conditions of the samples will be recorded on the form. The original chain-of-custody form will remain with the laboratory, and copies will be returned to the relinquishing party.

8.0 DOCUMENTATION OF FIELD ACTIVITIES

Daily field activities, including observations and field procedures, will be recorded on appropriate forms. The original field forms will be maintained in GeoEngineers' office files. Copies of the completed forms will be maintained in a sequentially numbered field file for reference during field activities. Photographic documentation of field activities will be performed as appropriate.

8.1 SAMPLE DESIGNATION

Each sample obtained during field activities will be identified by a unique sample designation. The sample designation will be included on the sample label. For soil samples, the designation also will be included with the corresponding sample information on the appropriate field log. For groundwater sampling from monitoring wells, the corresponding sample information will be recorded on the monitoring well sampling field sheet. The following sample designation system will be used for this project.

All samples will be assigned a unique identification code based on a consistent sample designation scheme. The sample designation scheme is designed to suit the needs of the field staff, data management and data users. All samples will consist of three components separated by a dash. These components are station code, date and sample interval. The sample designation scheme is as follows:

Station Code	Date	Sample Interval
SSnn	YYMMDD	XXX
MWnn	YYMMDD	W

The three components are described below.

8.1.1 Station Code

The station code component is a four-character code that uniquely identifies each sampling station. The station code component has two parts: a two-letter station designation ("SS" or "MW") followed by a sequential two-digit number component "nn." The two-letter "SS" designation will be determined by how the soil sample was obtained (for example, drilling method, grab) as described below. The sequential "nn" component will begin at 26 (that is, 26, 27, 28) to accommodate samples previously obtained at the Site during previous studies. For groundwater samples, the "MWnn" designation will correspond to the monitoring well number (for example, MW25S).

The station designations are:

- DP – Direct-Push
- SB – Soil Boring using Hollow-Stem Auger (HSA) Drilling Techniques
- TP – Test Pit
- GB – Grab Sample

8.1.2 Date

The date component is a six-character code that presents the date that the sample was obtained in the following format: year, month, day (YYMMDD).

8.1.3 Sample Interval

The sample interval component corresponds to sample depth for soil samples, and is a three-character code that identifies each sampling interval. Soil sample depth determinations will be made to the nearest 0.5 foot, with the depth determination representing *either* the sample collection point (for VOC) *or* the beginning of the sampling interval (that is, 050 will represent the 5- to 5.5-foot interval). For groundwater, a "W" will be used for the sample interval component.

8.1.3.1 Field Quality Control (QC) Samples

Field QC samples will be identified by adding characters to the end of the sample interval field. The following characters are associated with the following field QC sample types:

- TB – VOC trip blank
- DUP – duplicate sample

8.1.4 Examples

Examples of complete sample numbers with descriptions are as follows:

- DP30-080825-020 — A field sample collected at station DP30 on August 25, 2008, from 2 to 2.5 feet bgs.
- MW04-080825-W — A groundwater sample collected at monitoring well MW04 on August 25, 2008.

Under the sample designation method described above, the identifier will be unique (that is, no two samples will have the same identifier) and informative (that is, location, date and sample interval). This designation scheme will facilitate overall data management and submittal into Ecology's Environmental Information Management (EIM) database.

8.2 SAMPLE LABELING

Sample information will be printed legibly onto the sample labels in indelible ink. Field identification will be sufficient to enable cross-reference with the project logbook.

To minimize handling of sample containers, labels will be completed before sample collection to the extent possible. The label will be filled out completely in the field and attached firmly to the sample container. The sample label will provide the following information:

- GeoEngineers' job number
- Sample designation
- Date of sample collection (month/day/year)
- Time of sample collection (hours: minutes)
- Chemical analyses to be conducted

- Sample preservation, if applicable
- Initials of sampler

8.3 Field Logbooks and Data Forms

Field logbooks (or daily logs) and data forms are necessary to document daily activities and observations. Documentation will be sufficient to enable participants to reconstruct events that occurred during the project accurately and objectively at a later time. All entries will be written in ink, dated and signed daily. No pages will be removed from logbooks for any reason. If corrections are necessary, these corrections will be made by drawing a single line through the original entry (so that the original entry is legible) and writing the corrected entry alongside. The correction will be initialed and dated. Corrected errors may require a footnote explaining the correction.

8.4 Photographs

Documentation of a photograph is crucial to its validity as a representation of an existing situation. The following information will be noted in the field logbook or data forms concerning photographs:

- Date, time and location where photograph was taken
- Photographer
- Description of photograph taken
- Sequential number of the photograph and the film roll number, or sequence in the digital log
- Compass direction

9.0 DECONTAMINATION PROCEDURES

The objectives of decontamination procedures are to minimize the potential for cross-contamination between individual samples, to prevent contamination from leaving the sampling site by way of equipment or personnel and to prevent exposure of field personnel to contaminated materials. This section discusses general decontamination procedures.

9.1 Personnel

Personnel decontamination procedures depend on the level of protection specified for a given activity. The HASP identifies the appropriate level of protection for each type of fieldwork involved in this project, as well as appropriate decontamination procedures.

9.2 Sampling Equipment

Decontamination procedures are designed to remove trace-level contaminants from sampling equipment to prevent cross-contamination of samples. Non-dedicated sampling or measurement equipment, including stainless steel sampling tools, soil sampling equipment and water level measurement instruments, will be decontaminated prior to and after each sampling attempt or measurement by washing with a nonphosphate detergent solution (for example, LiquiNox® and distilled water) and rinsing with distilled water.

10.0 INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) generated from the subsurface investigations will be contained in 55-gallon steel drums and temporarily stored in a secured location as designated by the Port. The IDW is anticipated to consist of soil cuttings, decontamination water, monitoring well development and purge water. The IDW will be separated by media (that is, soil and water) and labeled appropriately. Chemical analytical results from soil and groundwater sample analyses may be used to profile IDW for disposal at an appropriate off-site disposal facility. Solid waste from sampling activities (used gloves, tubing, etc.) will be contained in plastic trash bags and disposed as solid waste.

11.0 QUALITY ASSURANCE PROJECT PLAN

11.1 QUALITY ASSURANCE OBJECTIVES

The general quality assurance (QA) objectives for this project are to develop and implement procedures for obtaining and evaluating data of a specified quality that can be used to assess site conditions and risks. Field QA procedures to be followed include completing all appropriate sample documentation. Measurement data should have an appropriate degree of accuracy and reproducibility; samples obtained should be representative of actual field conditions, and samples should be obtained and analyzed using proper chain-of-custody procedures.

11.2 FIELD QA/QC PROCEDURES

Field QA/QC procedures to be followed include completing all appropriate sample documentation and preservation. One trip blank will be placed in each sample shipping container (for example, cooler) and analyzed for VOCs.

11.2.1 Trip Blanks

The analytical results of field trip blanks will be reviewed to evaluate the possibility for contamination resulting from the laboratory-prepared sample containers or the sample transport containers. Trip blanks will be analyzed at a frequency of one for each shipment of samples containing field samples for chemical analysis of VOCs. The trip blanks will be labeled with a "TB" sample identifier as described earlier in the "Sample Designation" section (Section 8.1) and delivered to the laboratory with the normal shipment of samples.

11.2.2 Sample Preservation and Containers

Samples will be kept in a cooler with ice before and during transport to the laboratory. The sampling extraction and analysis dates will be reviewed to confirm that extraction and analyses were completed within the recommended holding times, as specified by EPA protocol. Appropriate laboratory-assigned data qualifiers will be noted if holding times are exceeded or containers do not contain the appropriate sample preservation. Table 6 summarizes sample preservation and containers.

11.3 LABORATORY QA/QC PROCEDURES

The data quality objectives will be met in the laboratory by using established instrument calibration and sample handling procedures, analysis according to standard analytical methods and analysis of quality control samples. Laboratory quality control will consist of analysis of surrogate spikes, method blanks, duplicates, matrix spikes and matrix spike duplicates and reporting of all data including holding times.

11.3.1 Equipment Calibration Procedures and Frequency

All instruments and equipment used by the laboratory will be operated, calibrated and maintained according to manufacturer's guidelines and recommendations. Operation, calibration and maintenance will be performed by personnel who have been properly trained in these procedures. A routine schedule and record of instrument calibration and maintenance will be kept on file at the laboratory.

11.3.2 Analytical Procedures

Samples will be analyzed according to analytical methods listed in Tables 1, 3, 4 and 5. EPA standard analytical methods are specified in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846* (through update III), dated December 1996. Washington analytical methods for petroleum hydrocarbons are specified in the Model Toxics Control Act (MTCA) regulations, as outlined in Washington Administrative Code (WAC) 173-340.

11.3.3 Laboratory QA/QC Samples

Laboratory QC samples will be analyzed at a frequency of 5 percent (1 in 20) on a laboratory batch basis. Laboratory QC samples will consist of duplicates, method blanks, matrix spikes and matrix spike duplicates. In addition, each organic analysis will include addition of surrogate compounds to the sample for surrogate spike analysis.

11.3.4 Laboratory Deliverables

The following information will be provided in the laboratory reports submitted for this project:

- Transmittal letter, including information about the receipt of samples, the testing methodology performed, any deviations from the required procedures, any problems encountered in the analysis of the samples, any problems meeting the method holding times or laboratory control limits, and any corrective actions taken by the laboratory relative to the quality of the data contained in the report.
- Sample analytical results, including sampling date, date of sample extraction or preparation, date of sample analysis, dilution factors and test method identification; soil sample results in milligrams per kilogram (mg/kg), micrograms per kilogram (µg/kg) or nanograms per kilogram (ng/kg); and detection limits for undetected analytes. Results will be reported for all field samples, including field duplicates and blanks submitted for analysis.
- Method blank results, including reporting limits for undetected analytes.
- Surrogate recovery results and corresponding control limits for samples and method blanks (organic analyses only).
- Matrix spike/matrix spike duplicate and/or blank spike/blank spike duplicate spike concentrations, percent recoveries, relative percent differences and corresponding control limits.
- Laboratory duplicate results for inorganic analyses, including relative percent differences and corresponding control limits.
- Sample chain-of-custody documentation.

The raw analytical data, including calibration curves, instrument calibration data, data calculation work sheets and other laboratory support data for samples from this project, will be compiled and kept on file at the laboratory's office for reference.

11.4 REVIEW OF FIELD AND LABORATORY QA/QC DATA

The sample data, field and laboratory QA/QC results will be evaluated for acceptability with respect to the RI data quality objectives (DQOs). Each group of samples will be compared with the DQOs and evaluated using data validation guidelines contained in the following documents: *Guidance Document for the Assessment of RCRA Environmental Data Quality*, draft dated 1988 and *National Functional Guidelines for Organic Data Review*, draft 1999. To accomplish data evaluation, the criteria listed in the following subsections will be assessed.

11.5 PRECISION, ACCURACY AND COMPLETENESS

11.5.1 Precision

Precision is a measure of data variability. Variability can be attributed to sampling activities and/or chemical analysis. Relative percent difference (RPD) is used to assess the precision of the sampling and analytical method and is calculated as follows.

RPD = 100[(Xs - Xd)/(Xs + Xd)]/2

where

RPD	=	relative percent difference
Xs	=	sample analytical result
Xd	=	duplicate sample analytical result

11.5.2 Accuracy

Accuracy is a measure of the error between chemical analytical results and the true sample concentrations. Accuracy is a measure of the bias in a system and will be expressed as the percent recovery of spiked samples. The accuracy will be presented as percent recovery and will be calculated as follows.

PR = 100(Xss - Xs)/T

where

PR	=	percent recovery
Xss	=	spike sample analytical result
Xs	=	sample analytical result
T	=	known spike concentration

11.5.3 Completeness

Completeness is evaluated to assess whether a sufficient amount of valid data is obtained. Completeness is described as the ratio of acceptable measurements to the total planned measurements. Completeness is calculated as follows.

C = (Number of samples having acceptable data)/
(total number of samples analyzed) x 100%

where

C	=	completeness

11.6 REPORTING, DOCUMENTATION, DATA REDUCTION AND CORRECTIVE ACTION

Upon receipt of each laboratory data package, data will be evaluated against the criteria outlined in the previous sections. Any deviation from the established criteria will be noted and the data will be qualified, as appropriate. A review and discussion of analytical data QA/QC will be submitted in a report to be attached to the RI report. Data validation procedures for all samples will include checking the following, when appropriate.

1. Holding times
2. Detection limits
3. Field equipment rinseate blanks
4. Laboratory blanks
5. Laboratory matrix spikes
6. Laboratory matrix spike duplicates
7. Laboratory blank spikes
8. Laboratory blank spike duplicates
9. Surrogate recoveries

If significant quality assurance problems are encountered, appropriate corrective action as determined by GeoEngineers' project manager and/or the chemical analytical laboratory will be implemented as appropriate. All corrective action will be defensible, and the corrected data will be qualified.

Spatial information collected during the field event will be analyzed and displayed using ArcGIS 9.1 and EQUIS 3 to manage the chemical analytical data.

12.0 REFERENCES

Ecology (Washington State Department of Ecology). June 2004. *Collecting and Preparing Soil Samples for VOC Analysis – Implementation Memorandum #5*. Publication 04-09-087.

Ecology. April 2003. *Guidance for Site Checks and Site Assessments for Underground Storage Tanks*. Publication 90-53.

Ecology. February 2001. *Model Toxics Control Act, Chapter 173-340*, Washington State Department of Ecology Toxics Cleanup Program, Olympia, Washington.

TABLE 1
PROPOSED NEW BORING AND MONITORING WELL RATIONALE
EAST BAY REDEVELOPMENT
PORT OF OLYMPIA

Ecology Comment	Response to Ecology Comments/Sampling Rationale	Exploration: Boring (DP) Well (MW)	Sampling Depth Interval (ft bgs)[1]	Soil Analyses: NWTPH-Dx	NWTPH-G	BTEX	Total Metals (As, Cd, Pb)[2]	D/F	PAHs	PCBs	TOC[3]	Planned Utilities - Maximum Depth (feet)	Anticipated Soil Type / Lithologic Unit
1. Additional characterization is needed to define the extent of soil contamination at the site. The aerial and vertical extent of soil contamination needs to be further defined in the vicinity of DP02 and DP04 (including westward beneath Jefferson Street and on adjacent offsite parcels if necessary) and north of DP18.	TPH-D, TPH-MO, arsenic, and cadmium in the 2-6 feet interval were the only COPC exceedances at DP04. These COPCs have been delineated laterally in this interval to the northeast and south with MW08 and DP03, respectively. A new soil boring will be advanced northwest of DP04 to complete the lateral delineation of COPC screening level exceedances in the 2-6 feet interval. Soil samples will also be obtained from beneath existing railroad tracks to be removed during infrastructure construction activities. The railroad tracks are currently embedded in the asphaltic pavement along Jefferson Street and we expect that the section beneath the pavement will consist of railroad ties supporting the rail and ballast material (typically 3 feet of crushed rock) supporting the ties. Soil samples will be collected at the soil/ballast interface. We will analyze soil collected beneath the ballast material for cPAHs (using EPA Method 8270C), TPH, and metals to assess potential residual soil contamination associated with the ties.	DP37	0-2										
			2-6	x [a]	X	X	x		x	X			light sand fill
			6-10	X	X	X	x			X			dark sand fill
	TPH-MO in the 2-6 feet interval was the only significant COPC exceedance at DP02. This COPC has been delineated laterally in this interval to the north and southeast with DP03 and DP16, respectively. A new soil boring will be advanced southwest of DP02 to complete the lateral delineation of the TPH-MO screening level exceedance in the 2-6 feet interval. A sample from 10 to 14 feet from the monitoring well boring for MW25S will be tested for TPH-MO to evaluate the vertical extent of this COPC identified in previous samples from DP02. Proposed shallow screen interval for MW25S addresses Ecology Comment #9 for detected TPH in soil at DP02 and DP04. Soil samples from below the railroad tracks will also be collected and analyzed from DP38 and analyzed for PAHs. PAHs will be tested in sample from 10 to 14 foot depth interval in the boring for MW25S to evaluate the vertical extent of this COPC identified previously at DP02 and DP16. One sample from DP38 will be tested for dioxins/furans to evaluate soil within the infrastructure corridor.	DP38	1-3				x		x				
			4-6	x	X	X	x	x	x		x		light sand fill
			6-10	X	X	X	x	x	x		x	9	Silt or dark sand fill
		MW25S	0-2										
			2-6										
			6-10	x	X	X	X		X				Silt or dark sand fill
			10-14	x	X	X	X		x				Silt or dark sand fill
	TPH-MO in the 10-14 feet interval was the only significant potential COPC exceedance at DP18. This COPC has been delineated latreally in the vadose zone and saturated zone with MW03, MW16, and DP17 but has not been delineated laterally north of DP18. Soil samples from the boring for MW23S will provide this information. Proposed screen interval for MW23S addresses Ecology Comment #9 for detected TPH in soil at DP18. TPH-MO will be tested in MW-23S at the 6 to 10 and 10 to 14 foot intervals to evaluate the vertical extent of TPH-MO identified previously at DP18.	MW23S	0-2										
			2-6										
			6-10	x [a]	X	X	X		X				light sand fill
			10-14	x	X	X	X		X				light sand fill
2. Additional characterization is needed to define the extent of soil contamination at the site. The vertical extent of contamination needs to be defined in the vicinity of DP06 and DP08.	TPH-G in the 2-6 feet interval was the only significant potential COPC exceedance at DP06 and needs to be defined at depth and to the south. TPH-D and TPH-MO in the 2-6 feet interval were the only significant potential COPC exceedances at DP08. TPH-D and TPH-MO exceedance was identified in the 2-6 feet interval in DP-13. The vertical extent of gasoline, diesel and oil contaminated soil has been delineated with DP24, DP15, DP14, MW-5, MW-8 and MW-10. MW24S, along with the other proposed and existing wells, will be used to evaluate the leaching to groundwater pathway via empirical demonstration per WAC 173-340-747(9) an (10)(c). Proposed shallow screen interval for MW24S addresses Ecology Comment #9 for detected TPH in soil at DP06, DP08, DP24, and DP13.	MW24S	4-6	X	X	X	X		X				
			6-10	X	X	X	X		X				
	Evaluate lateral extent of TPH-D and MO identified previously at DP08 and DP13. Evaluate lateral extent of gasoline exceedance at DP08 and DP13.	DP39	0-2	X	X	X	X		X				
			2-6	x [a]	X	X	X		X				dark sand fill
	Lateral and vertical extent of dioxins/furans by TP03. Evaluate thickness of pre-1891 fill. Collect data to support management of soil that will be excavated as part of the infrastructure improvements. DP40 will also help evaluate the extent of diesel and oil contamination previously observed in DP13 and DP08 at 2-6 feet.	DP40	0-2	x	X	X	x	x	x				light sand fill
			2-4	x	X	X	x	x	x		x		light sand fill
			4-6	x	X	X	x	x	x		x	3.5	dark sand fill
3. Additional characterization is needed to define the extent of soil contamination at the site. The aerial extent of contamination has not been defined in the vicinity of MW19.	TPH-G in the 2-6 feet interval was the only potential COPC exceedance at MW19. Two soil borings (DP28 and the boring for MW21s) will be located near MW19 to evaluate the aerial extent of the screening level exceedance of TPH-G at MW19 in the 2-6 feet interval. The proposed screen interval (2 to 7 feet bgs) for MW21S addresses Ecology Comment #9 for detected TPH in soil at MW19. Moreover, a soil boring advanced to the west of MW19 in response to Ecology Comment #7 (i.e. DP27) will also be sampled for TPH-G in the 2-6 feet interval to provide lateral delineation to the west. To address Ecology comment 7, if evidence of burned wood or ash is observed in boring DP28, which is located on the northern edge of parcel 1 near the former Refuse Fire Area, a sample of this material will be analyzed for dioxins and furans.	DP28	0-2	X	X	X	X						
			2-6	X	x	X	X						light sand fill
		MW21S	0-2										
			2-6		x [a]								light sand fill

TABLE 1
PROPOSED NEW BORING AND MONITORING WELL RATIONALE
EAST BAY REDEVELOPMENT
PORT OF OLYMPIA

Ecology Comment	Response to Ecology Comments/Sampling Rationale	Exploration: Boring (DP) Well (MW)	Sampling Depth Interval (ft bgs)[1]	Soil Analyses: NWTPH-Dx	NWTPH-G	BTEX	Total Metals (As, Cd, Pb)[2]	D/F	PAHs	PCBs	TOC[3]	Planned Utilities - Maximum Depth (feet)	Anticipated Soil Type / Lithologic Unit
4. Additional characterization is needed to define the extent of soil contamination at the site. Area of Concern (AOC) #16 (pad mounted transformer) needs to be evaluated. Soil samples should be collected from this area for petroleum hydrocarbons and PCBs. The location of well MW04 does not appear to be close enough to this AOC to be adequate.	One new boring will be advanced and sampled within AOC 16 as recommended by Ecology. The targeted depth for the soil sample collected from this boring is the elevation of the former transformer pad located in AOC 16. The sample from this boring will be analyzed for PCBs and mineral oil range petroleum hydrocarbons (NWTPH-Dx).	DP35	0-2										
			2-6	x						x			gravel fill
5. Parcel 1 needs to be assessed. AOCs #43 through 48 and #50 have not been adequately assessed. Also, the northern portion of Parcel 1 needs to be assessed.	The first sentence of this comment does not apply because the East Bay Redevelopment Project Area only includes the northwest portion of Parcel 1. A new boring (DP36) located in the right-of-way of Olympia avenue adjacent to the northwest portion of Parcel 1will address Ecology's concern regarding the northern portion of Parcel 1. However, the primary purpose of this boring is to evaluate soil conditions to assist in planning of future infrastructure improvements in this area and evaluate residual concentrations of COPCs in an area where historical sources were not located.	DP36	1-3					x					gravel fill
			2-6	x	x	X	x	X					silt
			6-10					X				9	silt
6. Additional characterization of dioxins/furans is needed. As shown in the report, concentration of dioxins/furans that exceed the MTCA Method B Soil Cleanup Level of 11 nanograms per kilogram (ng/kg) or parts per trillion (ppt), expressed as a Total Toxicity Equivalency Factor (TEF), were observed at all four locations tested for this constituent. The reported TEF values from these locations range from 57.9 to 645 ng/kg. Because the highest concentration (TP02) is near the east property line and near an adjacent public walking path and grassy area, additional samples for dioxins/furans should be collected in this adjacent area. Also, an analysis of wind direction should be performed to help predict locations that may show higher dioxin concentrations.	New boring DP33 will provide vertical profile of dioxins/furans concentrations near TP2. Selection of sample locations based on prediction of wind direction is not necessary because the proposed dioxins/furans sample locations (as outlined in this table) provide spatial coverage across the site.	DP33	0-2				x	x	x				gravel fill
			2-4				x	x	x		x		gravel fill
			4-6				x	x	x				light sand fill
			6-8					x				9	light sand fill
7. Additional characterization of dioxins/furans is needed. Parcel 7 is located adjacent to the Refuse Fire Area (Area of Concern #1), which is a potential source of dioxins/furans contamination. Additional soil samples for dioxins/furans analyses should be performed in Parcel 7. These samples will provide additional dioxins/furans data for the site and may help to determine whether AOC #1 was a source.	Additional samples which address Ecology's comment 7 will be collected and tested for dioxins/furans from a boring advanced near AOC 1 (DP27) and a boring advanced at the northern edge of Parcel 7 (DP28). In addition, DP27 will be sampled for TPH-G to address gasoline contamination identified in soil at MW-19 (see response to Ecology Comment #3). Samples from boring DP27 will also be analyzed for PAHs to evaluate the lateral and vertical extent of cPAHs identified in soil samples from MW-20, near the Refuse Fire Area. Note that Parcel 8, which is adjacent to the northwest portion of the Site, is being addressed by LOTT Alliance through Ecology's Voluntary Cleanup Program.	DP27	0-2				x	x	x				light sand fill
			2-4		x	X	x	x	x		x		light sand fill
			4-6				x	x	x		x		silt
			6-8				x	x				3	silt

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EAST BAY REDEVELOPMENT
PORT OF OLYMPIA

Ecology Comment	Response to Ecology Comments/Sampling Rationale	Exploration: Boring (DP) Well (MW)	Sampling Depth Interval (ft bgs)[1]	Soil Analyses: NWTPH-Dx	NWTPH-G	BTEX	Total Metals (As, Cd, Pb)[2]	D/F	PAHs	PCBs	TOC[3]	Planned Utilities - Maximum Depth (feet)	Anticipated Soil Type / Lithologic Unit
8. Additional characterization of dioxins/furans is needed. Section 4.3.1 states that "dioxin testing appears to indicate that the historical working surface (depth of about 2 feet below existing grade) is impacted." Please provide more detail on what is meant by "historical working surface" and how it is distinguished. According to the Supplemental Site Use History report, the boiler house (AOC #17) operated circa 1932 and the power house (AOC #22-24) operated from at least 1941 through 1958. Was 2.0 feet below current grade the historical grade for these facilities? If so, what evidence is there for this? Dioxin samples were collected at the 2.0 foot depth at AOC #17, at the 3.5 depth at AOC #22-24, and at the 1.5 and 2.0 foot depths at the two randomly selected locations. It is recommended that additional samples be collected at AOC #17 so that a concentration verses depth profile can be determined.	The "historical working surface" is the sometimes woody and compacted historical grade where industrial buildings were located and operations were conducted on the property prior to later filling and grading. Based on our review of historical information the working surface is located about 1 to 4 feet below existing grade, however it can be difficult to identify in borings due to similarity in lithology of fill in this depth interval. Because of Ecology's questioning of the historical working surface and difficulty in determining its exact location in borings, a more appropriate rationale for the location of explorations where vertical profiles for dioxins/furans testing is as follows:1) complete a profile (DP33) adjacent to previous sample with high dioxins concentrations (TP02) and 2) complete a profile that represents temporal fill sequences.	See DP 33 (Comment 6) and borings and "Additional Explorations" rationale below.											
9. Additional characterization of groundwater contamination, flow direction, and gradient is needed. Groundwater monitoring wells MW-1 through MW-11 and MW-14 were installed with their screened interval submerged below the water table. Wells that monitor for light non-aqueous phase liquids (LNAPL, such as petroleum hydrocarbons) should be completed so that their screen straddles the water table. Therefore, to accurately evaluate whether groundwater is contaminated from LNAPL constituents, it will be necessary to install additional groundwater monitoring wells with screens that extend above the water table at selected locations where the existing monitoring wells are not adequate. Please present your proposed new well locations to us for review and approval.	Given the general lack of dissolved-phase petroleum constituent detections in the groundwater samples collected from existing MWs (as well as the relatively low TPH soil concentrations detected in soil samples collected from areas with suspected hydrocarbon contamination), it is unlikely that the typical placement of the screened intervals straddling the water table would result in measurable LNAPL thicknesses or even a screening level TPH exceedance at any MW at this site. Nonetheless, five shallow MWs (MW21S through MW25S) with screens straddling the water table are proposed to address this comment. MW21S and MW24S are discussed in the responses to Ecology Comments #2 and #3, respectively. Proposed MW22S will be used to evaluate LNAPL thicknesses and petroleum constituent concentrations near MW06. MW23S and MW25S are discussed in the response to Ecology Comment #1. This Ecology comment is further addressed by in the Groundwater Monitoring Plan. Based on recent comments from Ecology (9/22/08 Ecology comment letter and subsequent discussion), because artesian wells at the Site may be influencing shallow groundwater, an attempt will be made to locate and decommission or otherwise mitigate leakage from the artesian wells. If the artesian wells are found and decommissioned, water levels and the need for shallow monitoring wells will be reevaluated.	MW22S	No analysis of soil samples unless field observations indicate the presence of contamination. Anticipated screened interval is 1-6 feet bgs.										
Additional Explorations													
Additional explorations to evaluate the nature and extent of contamination, including dioxins/furans. These explorations will provide data related to: a) regional area background concentrations of dioxins/furans and metals not related to a site release, b) management of soil that will be excavated as part of the infrastructure improvements, and c) evaluation of COPC distribution in different fill types and spatial coverage related to general extent of COPCs.	Evaluate extent of lead and PAHs at DP11.	DP29	0-2						x				light sand fill
			2-6				x						silt or gravel
			6-10				x						silt or gravel
			10-14						x				silt or gravel
	Evaluate dioxins/furans in fill (1891 to 1908 time interval), evaluate dioxins/furans in soil within the infrastructure corridor, and provide additional sampling data for parcel 9.	DP30	0-2				x	x					light sand fill
			2-4				x	x	x				light sand fill or silt
			6-8				x	x (if silt)				9	light sand fill or silt

TABLE 1
PROPOSED NEW BORING AND MONITORING WELL RATIONALE
EAST BAY REDEVELOPMENT
PORT OF OLYMPIA

Ecology Comment	Response to Ecology Comments/Sampling Rationale	Exploration: Boring (DP) Well (MW)	Sampling Depth Interval (ft bgs)[1]	Soil Analyses: NWTPH-Dx	NWTPH-G	BTEX	Total Metals (As, Cd, Pb)[2]	D/F	PAHs	PCBs	TOC[3]	Planned Utilities - Maximum Depth (feet)	Anticipated Soil Type / Lithologic Unit
	Locations DP31 and DP41 are selected to obtain dioxins/furans data from soil not associated with any AOC source. This data will be used to evaluate dioxins/furans concentrations related to regional dioxin sources and regional background levels as it is possible that detected concentrations of dioxins/furans and metals in soil samples collected to date are attributable to an area or regional background rather than a site release. DP31 is located on parcel 6 in an area where no historical sources (AOCs) were located and the underlying fill is from the 1948 to 1975 time period. DP41 is located on parcel 2 in an area where no historical sources (AOCs) were located and the underlying fill is from the post 1975 time period.	DP31	0-2					x					light sand fill
			2-6	x			x	x					light sand fill
		DP41	0-2					x					gravel fill
			2-6				x	x					silt
	Evaluate dioxins/furans in post-1975 fill within the infrastructure corridor. These data will assist with evaluating background conditions as well as inform waste characterization and disposal associated with the excavated infrastructure corridor soils.	DP32	0-2					x			x		gravel fill
			2-6				x	x	x		x		gravel fill
			6-9					x				9	gravel fill
	Evaluate dioxins/furans in fill (1891 to 1908 time interval) near infrastructure corridor and on Parcel 4.	DP34	0-2					x					light sand fill
			2-6	X	X	X	x	x	x		x		light sand fill
			8-10	X	X	X	x	x	x			10	light sand fill or gravel
	These borings are located on Parcel 4 and the locations were selected to gather information to support soil characterization during construction activities associated with the Children's Hands on Museum.	DP26	0-2				X	x	X				light sand fill
			2-6					x	X				silt or light sand fill
			6-10				X	X					
		DP42	0-2				X	x					gravel fill
			2-6				X	x					light sand fill
			6-10				X	X					

Notes:

Blank boxes (no X) indicate that soil samples will be collected from the specified depth intervals and held for potential analyses by the analytical laboratory

Shaded cells indicate explorations and samples that will be collected in first phase of investigation

[1] Samples will be collected approximately every 2 feet in soil borings for field screening and potential chemical analyses. Discrete soil samples will be obtained from within the depth intervals shown in this column (rather than composite samples.) The depth ranges represent the intervals that a sample will be analyzed for the COPCs identified in the Soil Analyses columns. Additional samples may be analyzed if field observations indicate the presence of contamination.

[2] The metals listed; arsenic, cadmium and lead, represent metals that had concentrations exceeding screening levels in one or more locations. Some soil samples collected from the infrastructure corridor may also be analyzed for "RCRA 8" metals to provide data needed by soil disposal facilities. The RCRA metals include arsenic, barium, cadmium, chromium, lead, mercury, selenium & silver.

[3]TOC= total organic carbon. TOC and other physical soil properties such as grain size may also be analyzed at various locations for the possibility of establishing site specific Method B cleanup levels.

[a] Also analyze for EPH.
[b] Also analyze for total organic carbon
x = sample collected for analytical testing. Red X = additional analytical testing requested by Ecology in it's September 22, 2008 comment letter.
As = Arsenic, Cd = Cadmium, Pb = Lead
PCBs = Polychlorinated biphenyls
HCID = Hydrocarbon Identification test (NWTPH-HCID)
NWTPH-Dx = Diesel-range and motor oil-range total petroleum hydrocarbons
TPH-MO = motor oil-range petroleum hydrocarbons
D/F = Dioxins and furans
NWTPH-G = Gasoline-range total petroleum hydrocarbons

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TABLE 2
PROPOSED NEW MONITORING WELL RATIONALE
EAST BAY REDEVELOPMENT
PORT OF OLYMPIA

				Existing Well Data[2]		
Well I.D.	**Purpose**	**Installation Method/Well Diameter**	**Proposed Well Screen Interval (BGS-feet)[1]**	**Nearest Existing well**	**Highest DTW**	**Lowest DTW**
MW21s	MW21S addresses Ecology Comment #9 for detected TPH in soil at MW19.	Direct push/1-inch	2 to 7	MW19	3.47	3.78
MW22s	MW22S will be used to evaluate LNAPL thicknesses and petroleum constituent concentrations near MW06.	Direct push/1-inch	1 to 6	MW6	0.84	1.14
MW23s	MW23S addresses Ecology Comment #9 for detected TPH in soil at DP18.	Direct push/1-inch	4 to 9	MW16	5.41	6.35
MW24s	MW24S addresses Ecology Comment #9 for detected TPH in soil at DP06, DP08, DP24, and DP13.	Direct push/1-inch	2.5 to 7.5	MW10	3.48	3.8
MW25s	MW25S addresses Ecology Comment #9 for detected TPH in soil at DP02 and DP04	Direct push/1-inch	2 to 7	MW7 and MW8	5.0 & 2.55	5 & 2.62

Notes:

Based on recent comments from Ecology, because artesian wells at the Site may be influencing groundwater levels, an attempt will be made to locate and decommission the artesian wells. If the artesian wells are found and decommissioned, the need for shallow monitoring wells will be reevaluated.

[1]Across water table with one foot of screen above predicted high water table elevation and four feet of screen below this elevation, subject to approval by Ecology and issuance of well construction variance.

[2] Based on depth to water measurements collected August 2007 and July 2008 during low and high tides.

bgs=below ground surface

DTW = depth to water in feet as measured from top of well casing. Top of well casings for referenced wells is approximately at ground surface.

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TABLE 3
PROPOSED GROUNDWATER MONITORING AND CHEMICAL ANALYTICAL TESTING PLAN
EAST BAY REDEVELOPMENT
PORT OF OLYMPIA

Well No.(3,4,5)	Associated Historic Source Area/Concern and Contaminant of Potential Concern (COPC)	Past Groundwater Monitoring and Sampling Events												Proposed Future Groundwater Monitoring									
		Last Sampling Events			Chemical Analytical Testing Completed									Physical Parameter Monitoring		Chemical Analytical Testing Proposed							
		Jan-07	Jun-07	Aug-07	TPH-Gasoline	TPH-Diesel	TPH-Oil	VOCs	Total PP Metals	SVOCs (and PAHs) (6)	PCBs(7)	Dioxins/Furans(8)	Previous Exceedance of Screening Level (MTCA A or B)	Depth to Water	Conductivity, pH, ORP, Turbidity, DO, Salinity, Fe^{2+} (using a Horiba U-10 flow through cell)	TPH-Gasoline	TPH-Diesel	TPH-Oil	VOCs (BETX and HVOCs)	Total RCRA Metals	PAHs(6)	PCBs(7)	Dioxins/Furans(8)
MW01	Oil House (TPH)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
MW02	Machine Shops (TPH, metals, PAHs, VOCs)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x (1)	x	--	--
MW03	Tar Dipping Tank (TPH, PAHs)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
MW04	Near former Transformers (PCBs)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	**arsenic**	x	x	x	x	x	x	x (1)	x	x	--
MW05 (2)	Power House Area (TPH, metals, VOCs, D/F)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	x	x
MW06	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	See MW22s (if MW22s is not installed, MW06 wil be sampled for parameters planned for MW22s)							
MW07	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
MW08	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
MW09	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
MW10	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	See MW24s (if MW24s is not installed, MW10 wil be sampled for parameters planned for MW24s)							
MW11	None: downgradient from offsite gasoline station	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
MW12 (2)	Power House Area (TPH, metals, VOCs)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
MW13	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	**arsenic, diesel**	x	x	x	x	x	x	x (1)	x	--	--
MW14	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)	N	N	N	N	N	N	N	N	N	N	N	N/A	x	x	x	x	x	x	x	x	--	--
MW15 (2)	None	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
MW16 (2)	Boiler House Area (TPH, PAHs)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	x (tested Aug-08)
MW17	Shops (TPH, PAHs, Metals, VOCs)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	**arsenic**	x	x	x	x	x	x	x (1)	x	--	--
MW18 (2)	None: downgradient well near Marine View Drive	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
MW19	Panel Oiling (TPH, PAHs)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	See MW21s (if MW21s is not installed, MW19 wil be sampled for parameters planned for MW21s)							
MW20	Refuse Fire Area (TPH, metals, PAHs, D/F)	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	none	x	x	x	x	x	x	x	x	--	--
Proposed Wells and/or Sampling Locations																							
MW21s (paired with MW19)9	Panel Oiling (TPH, PAHs)													x	x	x	x	x	x	x	x	--	--
MW22s (paired with MW06)9	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)													x	x	x	x	x	x	x	x	--	--
MW23s (paired with MW16)9	Boiler House Area (TPH, PAHs)													x	x	x	x	x	--	--	--	--	--
MW24s (paired with MW10)9	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)													x	x	x	x	x	x	x	x	--	--
MW25s (no pairing)	Near Fuel and Oil Areas (TPH, metals, PAHs, VOCs)													x	x	x	x	x	x	x	x	--	--
Seep 1 10	Groundwater/surface water interface													NA	x	x	x	x	x	x	x	--	--
Seep 2 10	Groundwater/surface water interface													NA	x	x	x	x	x	x	x	--	--
Seep 3 10	Groundwater/surface water interface													NA	x	x	x	x	x	x	x	--	--
Seep 4 10	Groundwater/surface water interface													NA	x	x	x	x	x	x	x	--	--

Notes:

[1]Dissolved metals to be tested in addition to total metals at locations where metals exceedances have been measured. Also test these samples for aluminum and iron (Al and Fe^{3+}) to represent suspended clay particles. Results to potentially be used for evaluating sorption of COPCs.

[2]MW05, MW12, MW16 and MW18 are downgradient wells between the subject property and East Bay. These wells will be considered for potential future compliance wells.

[3]MW04, 05, 06, 07, 08, 10 were sampled and tested July 13, 2007 for diesel-range hydrocarbons only.

[4]MW01 through MW10 were installed in January 2007. MW11 through MW20 were installed in July and August 2007.

[5]MW14 was not sampled in 2007 because other monitoring wells surrounding MW14 were sampled and tested.

[6]Note on SVOCs. The only SVOC exceedances were cPAHs, therefore only cPAHs will be analyzed, rather than the full SVOC list.

[7]Note on PCBs. PCBs have not been detected in any of the groundwater samples obtained from MW01 through MW20 at the site; nor have they been detected above soil screening levels. Therefore PCBs will only be tested at locations where low level detections of PCBs were detected in soil on Parcel 3 and near the former transformer location (MW04).

[8]Note on Dioxins/Furans. Dioxin/Furans were not detected in a groundwater sample obtained and tested from MW16 in August 2008. Dioxin sampling and testing approach is based on obtaining samples from potential source area wells that are also downgradient compliance wells (MW05 and MW16). If dioxins/furans are detected in groundwater at MW05 or MW16, then additional testing will be conducted at the other compliance wells (MW04, MW11, MW12

[9]This well will not be installed if water levels drop sufficiently after the artesian wells are decommissioned if the existing paired monitoring well screen is not totally submerged.

[10]Water from this seep area will only be sampled if it is determined to represent groundwater (see Section 5.4.2 of Sample and Analysis Plan)

x = sample collected for analytical testing

Y = Yes; N = No; NA = not applicable; "--" = Not tested

TPH-Gasoline by Ecology Method NWTPH-Gx

TPH-Diesel and Oil by Ecology Method NWTPH-Dx

VOCs (volatile organic compounds) by EPA Method 8260B

RCRA Metals (As, Ba, Cd, Cr, Pb, Ag, Se, Hg) by EPA Methods 6000/7000

PAHs (polycyclic aromatic hydrocarbons) by EPA Method 8270sim

PCBs (polychlorinated biphenyls) by EPA Method 8082

Dioxins/Furans by EPA Method 1613B

ORP = Oxidation Reduction Potential

DO = Dissolved Oxygen

Fe = Iron

Al = Aluminum

COPCs = contaminants of potential concern

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TABLE 4
SOIL ANALYTICAL TARGET REPORTING LIMITS
EAST BAY REDEVELOPMENT
PORT OF OLYMPIA

Analytes	Units	Analytical Laboratory Criteria[1]	
		Target Reporting Limits	**Analytical Method**
Total Petroleum Hydrocarbons			
Gasoline-Range	mg/kg	5.0E+00	NW-TPH-Gx
Diesel-Range	mg/kg	5.0E+00	NW-TPH-Dx
Oil-Range (including Mineral O	mg/kg	1.0E+01	NW-TPH-Dx
Metals			
Arsenic	mg/kg	5.0E+00	6010B ICP
Cadmium	mg/kg	2.0E-01	6010B ICP
Lead	mg/kg	2.0E+00	6010B ICP
Volatile Organic Compounds[2]			
BTEX	mg/kg	1.0E-03	EPA 8260B
Semivolatile Organic Compounds[2]			
SVOCs	mg/kg	6.7E-02	EPA 8270
4-Chloro-3-methylphenol	mg/kg	3.3E-01	EPA 8270
Polycyclic Aromatic Hydrocarbons[2]			
PAHs	mg/kg	5.0E-03	EPA 8270D SIM
Polychlorinated Biphenyls[2]			
Total PCBs	mg/kg	4.0E-03	8082 Low Level
Dioxins and Furans			
2,3,7,8-TCDD	mg/kg	5.0E-07	1613/8290
2,3,7,8-TCDF	mg/kg	5.0E-07	1613/8290
-Penta, Hexa, Hepta	mg/kg	2.0E-06	1613/8290
-Octa	mg/kg	5.0E-06	1613/8290

Notes:

[1] These limits represent target reporting limits typically achievable by analytical laboratories. However, there may be instances where these levels cannot be achieved due to sample specific interferences.

[2] Reporting limits for VOCs, SVOCs, PAHs, and PCBs are indicated for the group of compounds. Specific compounds are listed separately if they have a different reporting limit.

mg/kg = milligrams per kilogram
SVOCs = Semivolatile Organic Compounds
TCDD = Tetrachlorinated Dibenzo-p-dioxins
TCDF = Tetrachlorinated Dibenzofurans
PCBs =Polychlorinated Biphenyls
BTEX = benzene, toluene, ethylbenzene, and xylenes
PAHs = Polycyclic Aromatic Hydrocarbons

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TABLE 5
GROUNDWATER ANALYTICAL TARGET REPORTING LIMITS
EAST BAY REDEVELOPMENT
PORT OF OLYMPIA

Analytes	Units	Analytical Laboratory Criteria[1] Target Reporting Limits	Analytical Method
Petroleum Hydrocarbons			
Gasoline-Range	mg/L	0.03	NWTPH-G
Diesel-Range	mg/L	0.25	NW-TPH-Dx
Oil-Range	mg/L	0.50	NW-TPH-Dx
Si/Acid Cleaned TPH-D	mg/L	0.25	NW-TPH-Dx
Si/Acid Cleaned TPH-O	mg/L	0.50	NW-TPH-Dx
Metals *(Total or Dissolved)*			
Arsenic	mg/L	0.0002	EPA 6020/200.8 ICP-MS
Barium	mg/L	0.01	EPA 6020/200.8 ICP-MS
Cadmium	mg/L	0.0002	EPA 6020/200.8 ICP-MS
Chromium	mg/L	0.0005	EPA 6020/200.8 ICP-MS
Lead	mg/L	0.001	EPA 6020/200.8 ICP-MS
Mercury	mg/L	0.00002	EPA 7470 GFAA & CVAA
Selenium	mg/L	0.1	EPA 6020/200.8 ICP-MS
Silver	mg/L	0.02	EPA 6020/200.8 ICP-MS
Volatile Organic Compounds[2]			
VOCs	µg/L	1.0	EPA 8260B (5 mL purge)
Methylene Chloride	µg/L	2.0	EPA 8260B (5 mL purge)
Acetone	µg/L	5.0	EPA 8260B (5 mL purge)
2-Butanone	µg/L	5.0	EPA 8260B (5 mL purge)
Vinyl Acetate	µg/L	5.0	EPA 8260B (5 mL purge)
4-Methyl-2-Pentanone	µg/L	5.0	EPA 8260B (5 mL purge)
2-Hexanone	µg/L	5.0	EPA 8260B (5 mL purge)
Tetrachloroethene	µg/L	0.2	EPA 8260B (20 mL purge)
1,1,2-Trichlorotrifluoroethane	µg/L	2.0	EPA 8260B (5 mL purge)
Acrolein	µg/L	50	EPA 8260B (5 mL purge)
1,2-Dibromo-3-Chloropropane	µg/L	5.0	EPA 8260B (5 mL purge)
1,2,3-Trichloropropane	µg/L	2.0	EPA 8260B (5 mL purge)
trans-1,4-Dichloro-2-Butene	µg/L	5.0	EPA 8260B (5 mL purge)
Hexachlorobutadiene	µg/L	5.0	EPA 8260B (5 mL purge)
1,2,4-Trichlorobenzene	µg/L	5.0	EPA 8260B (5 mL purge)
Naphthalene	µg/L	5.0	EPA 8260B (5 mL purge)
1,2,3-Trichlorobenzene	µg/L	5.0	EPA 8260B (5 mL purge)
Semivolatile Organic Compounds[2]			
SVOCs	µg/L	1.0	EPA 8270D
Benzyl Alcohol	µg/L	5.0	EPA 8270D
N-Nitroso-Di-N-Propylamine	µg/L	5.0	EPA 8270D
Hexachloroethane	µg/L	2.0	EPA 8270D
2-Nitrophenol	µg/L	5.0	EPA 8270D
Benzoic Acid	µg/L	10	EPA 8270D
bis(2-Chloroethoxy) Methane	µg/L	1.0	EPA 8270D
2,4-Dichlorophenol	µg/L	5.0	EPA 8270D
1,2,4-Trichlorobenzene	µg/L	1.0	EPA 8270D
Naphthalene	µg/L	1.0	EPA 8270D
4-Chloroaniline	µg/L	5.0	EPA 8270D
4-Chloro-3-methylphenol	µg/L	5.0	EPA 8270D
Hexachlorocyclopentadiene	µg/L	5.0	EPA 8270D
2,4,6-Trichlorophenol	µg/L	5.0	EPA 8270D
2,4,5-Trichlorophenol	µg/L	5.0	EPA 8270D
2-Nitroaniline	µg/L	5.0	EPA 8270D
3-Nitroaniline	µg/L	5.0	EPA 8270D
2,4-Dinitrophenol	µg/L	10	EPA 8270D
4-Nitrophenol	µg/L	5.0	EPA 8270D
2,6-Dinitrotoluene	µg/L	5.0	EPA 8270D
2,4-Dinitrotoluene	µg/L	5.0	EPA 8270D
4-Nitroaniline	µg/L	5.0	EPA 8270D
Pentachlorophenol	µg/L	5.0	EPA 8270D
3,3'-Dichlorobenzidine	µg/L	5.0	EPA 8270D
Polycyclic Aromatic Hydrocarbons[2]			
PAHs	µg/L	0.01	8270M GC/MS Low Level
Polychlorinated Biphenyls			
Total PCBs	µg/L	0.01	EPA 8082 Low Level
Dioxins and Furans			
2,3,7,8-TCDD	µg/L	0.000005	EPA 1613/8290
-Penta, Hexa, Hepta	µg/L	0.000025	EPA 1613/8290
-Octa	µg/L	0.00005	EPA 1613/8290

Notes:

[1] These limits represent target reporting limits typically achievable by analytical laboratories. However, there may be instances where these levels cannot be achieved due to sample specific interferences.

[2] Reporting limits for VOCs, SVOCs, PAHs, and PCBs are indicated for the group of compounds. Specific compounds are listed separately if they have a different reporting limit.

mg/L = milligrams per liter
µg/L = micrograms per liter
TCDD = Tetrachlorinated Dibenzo-p-dioxins
TPH-O = Oil-range Petroleum Hydrocarbons
TPH-D = Diesel-range Petroleum Hydrocarbons
SVOC = Semivolatile Organic Compound
VOCs = volatile organic compounds
PCB = Polychlorinated Biphenyls
PAHs = polycyclic aromatic hydrocarbons

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TABLE 6
SAMPLE CONTAINERS
EAST BAY REDEVELOPMENT
PORT OF OLYMPIA

Analysis	Method	Soils				Waters			
		Minimum Sample Size	**Sample Containers**	**Sample Preservation**	**Holding Times**	**Minimum Sample Size**	**Sample Containers**	**Sample Preservation**	**Holding Times**
Diesel Range Hydrocarbons	NWTPH-Dx	100 g	8 or 16 oz amber glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 40 days from extraction to analysis	1 L	1 liter amber glass with Teflon-lined lid	Cool 4 C, HCl to pH < 2	14 days to extraction 40 days from extraction to analysis
Gas Range Hydrocarbons	NWTPH-G	100 g	4 or 8 oz glass wide mouth with Teflon-lined lid	Cool 4°C	14 days	120 mL	3 - 40 mL VOA Vials	HCl - pH<2	14 days preserved 7 days unpreserved
VOC	SW-846 8260B	100 g	4 or 8 oz glass wide mouth with Teflon-lined lid	Cool 4°C	14 days	120 mL	3 - 40 mL VOA Vials	HCl - pH<2	14 days preserved 7 days unpreserved
Metals (including Mercury)	SW-846 6010/6020 SW-846 7470/7471	100 g	4 or 8 oz glass wide mouth with Teflon-lined lid	Cool 4°C	180 days/ 28 days for Mercury	500 mL	1 L poly bottle	HNO_3 - pH<2 (Dissolved metals preserved after filtration)	180 days (28 days for Mercury)
SVOCs (PAHs)	SW-846 8270C	100 g	4 or 8 oz glass wide mouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 40 days from extraction to analysis	1 L	1 liter amber glass with Teflon-lined lid	Cool 4°C	7 days to extraction 40 days from extraction to analysis
PCB	SW-846 8082	100 g	4 or 8 oz glass wide mouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 40 days from extraction to analysis	1 L	1 liter amber glass with Teflon-lined lid	Cool 4°C	7 days to extraction 40 days from extraction to analysis
PCDD/PCDF	SW-846 8290	100 g	4 or 8 oz glass wide mouth with Teflon-lined lid	Cool 4°C	30 days to extraction, 40 days from extraction to analysis	1 L	1 liter amber glass with Teflon-lined lid	Cool 4°C	30 days to extraction 40 days from extraction to analysis

Note:
Holding Times are based on elapsed time from date of collection
VOC = Volatile Organic Compounds
SVOC = Semivolatile Organic Compound
PCDD = Polychlorinated Dibenzo-p-dioxins
PCDF = Polychlorinated Dibenzofurans
PCB =Polychlorinated Biphenyls
HCl = Hydrochloric Acid
HNO_3 = Nitric Acid
oz = ounce
mL = milliliter
L = liter
g = gram

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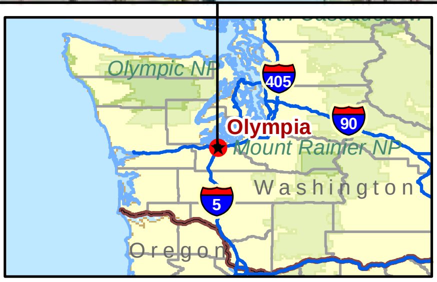

N
W E
S

2,000 0 2,000

Feet

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

Data Sources: Interstates, state routes, and roads from TIGER 2000. County boundaries, cities, and waterbodies from Department of Ecology. U.S. topographic map from National Geographic Society.

Lambert Conformal Conic, Washington State Plane North, North American Datum 1983

Vicinity Map

East Bay Redevelopment Project Area
Olympia, Washington

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Figure 1

Office: TAC Path: P:\0\0615034\02\GIS\061503407_SAP_FIG1_VICINITYMAP.mxd CDB:TCK Map Revised: October 21, 2008

Office:TAC Path: P:\0\0615034\GIS\061503407_SAP_FIG2_EXPLOR_LOC.mxd CDB:TCK Map Revised: October 21, 2008

Proposed Direct-Push Boring Location

Phase 1 Explorations

Test Pit (GeoEngineers, Inc. - Oct. 2007)

Direct-Push Boring (GeoEngineers, Inc. - Sept. 2006, Jan. & July 2007)

Direct-Push Boring (Brown and Caldwell - Nov. 2006, Jan. & Feb. 2007)

Approximate Infastructure Improvement Corridor

East Bay Redevelopment Proposed Short Plat Parcel Boundaries

East Bay Redevelopment Project Area

Direct-Push Boring (Northwest Testing Company, Oct. 2006)

Cone Penotrometer Test (Landau - May 2007)

Boring (Landau - May 2007)

N W E S

150 0 150

Feet

Site Plan and Exploration Locations

East Bay Redevelopment Project Area
Olympia, Washington

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Figure 2

Reference: Aerial photograph (dated April 2008) and Approximate Infastructure Improvement Corridor from Skillings Connolly.
Short plat parcel boundaries are based on information provided by the Port of Olympia.
Notes: 1. The locations of all features shown are approximate.
2. This drawing is for infomation purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Office:TAC Path: P:\0\0615034\GIS\061503407_SAP_FIG3_MW_LOCS.mxd CDB:TCK Map Revised: October 21, 2008

Proposed Monitoring Well Location

Monitoring Well (GeoEngineers, Inc. - Jan. & July 2007)

Monitoring Well (Delta Environmental - June 2003)

Approximate Infastructure Improvement Corridor

East Bay Redevelopment Proposed Short Plat Parcel Boundaries

East Bay Redevelopment Project Area

N W E S

150 0 150

Feet

Reference: Aerial photograph (dated April 2008) from Skillings Connolly. Short plat parcel boundaries are based on information provided by the Port of Olympia.

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

Site Plan and Monitoring Well Locations

East Bay Redevelopment Project Area
Olympia, Washington

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Figure 3

ATTACHMENT 2

PIONEER Field Forms

PIONEER TECHNOLOGIES CORPORATION (PTC)
FIELD CHECKLIST

Project/Task Name: ______________________ Site Location: ______________________

Requested By / Date: ______________________ Work Deadline: ______________________

SERVICES REQUESTED | **COMPLETED**

	COMPLETED
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO
______________________	☐ YES ☐ NO

ADDITIONAL STANDARD INSTRUCTIONS

ADDITIONAL STANDARD INSTRUCTIONS	COMPLETED		COMPLETED
☐ Review Docs: ______________	☐ YES ☐ NO	☐ Health & Safety Meeting	☐ YES ☐ NO
☐ Agency NOI / Utility Locate / Concrete Coring	☐ YES ☐ NO	☐ Call PM from Site	☐ YES ☐ NO
☐ Coordinate Access: ______________	☐ YES ☐ NO	☐ Draw Site Map ______________	☐ YES ☐ NO
☐ Coordinate Sub / Equip: ______________	☐ YES ☐ NO	☐ Cuttings / Purge Water Characterization & Disposal	
☐ Purchase / Rent Equip: ______________	☐ YES ☐ NO	☐ Potential HW ______________	☐ YES ☐ NO
☐ Client/Agency Coordination: ______________	☐ YES ☐ NO	☐ Non-Haz ______________	☐ YES ☐ NO
☐ Calibrate Equipment: ______________	☐ YES ☐ NO	☐ Background ______________	☐ YES ☐ NO

____

____

SAMPLING REQUIREMENTS

☐ Field Testing: ____

☐ Lab Testing: ______________________ Laboratory: ______________

☐ Lab Testing: ______________________ Laboratory: ______________

☐ Lab Testing: ______________________ Laboratory: ______________

FIELD SUPPLIES NEEDED

☐ Site Map ☐ Camera ☐ Survey Equip / GPS ☐ Vehicle

☐ Std Field Equip (keys, forms, SAP, HASP, PPE, decon, tools)

☐ Drilling Equip (PID, references, knife, baggies, tape)

☐ Soil Equip (SS bowls, spoon/shovel, hand auger, pick, sieves)

☐ GWM (pump, tubing, gen., compres., bailers, rope/string, PDB)

☐ Pump / Slug Test Equip (GWM Equip, slug, stopwatch)

☐ Water Level Indicator / Interface Probe

☐ Water Quality Meter __________ ☐ Field Test Kits__________

☐ Sample Kit / Cooler / COC / Ice __________

☐ IDW: ☐ Drums __________ ☐ 5-gal buckets __________

☐ Other:______________________________

☐ Other:______________________________

PIONEER TECHNOLOGIES CORPORATION (PTC)
DAILY FIELD REPORT

Date:______________ Site Location: ______________________________ Site Arrival Time: ___________ Site Departure Time :___________

WEATHER	Clear Sun	Overcast	Drizzle	Rain	Snow
TEMPERATURE	To 32	32-50	50-70	70-85	85 Up
WIND	Calm	Med.	Strong	Severe	

PEOPLE PRESENT ON-SITE

NAME	ASSOCIATION	TIME ON-SITE AND OFF-SITE

NOTES ON WORK COMPLETED

SIGNATURE:____ DATE:__________________

PIONEER TECHNOLOGIES CORPORATION (PTC)
BORING LOG FORM

GENERAL INFORMATION

Boring/MW ID ______	Drilling Co. ______
Project/Site Name ______	Lisc. Driller ______
Field Professional ______	Drilling Method ______
Start Date/Time ______	Drill Rig ______
Stop Date/Time ______	Drill Bit ______

LOCATION SKETCH

North Arrow

SAMPLE COLLECTION

	Sample Depth (ft)		Sampling	SPT Blows	%	Contacts		Containerized		PID	Sent
Time	From	To	Method	per 6 in.	Recov.	or GW?	Localized Soil/Rock Description	From	To	(ppm)	to Lab?
				/ /							
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GENERALIZED DESCRIPTION OF SOIL/ROCK ENCOUNTERED IN BORING

Depth of Boring		USCS/	
From	To	Rock Ty	Generalized Soil or Rock Description

Typical soil desc: USCS Color, sand grain size, SECONDARY modifier, PRIMARY grain size, tertiary constituents, (stiffness/density), (moisture), detail, [geologic interpretatior

Typical rock desc: Rock Type Color, grain description, ROCK TYPE, (strength), (state of weathering), (moisture), detail and bedding, [geologic formation

OTHER RELEVANT INFORMATION

Casing Info (e.g., type, diameter, depths, casing reduction):

Groundwater Encountered (e.g., time, depth, quantity, casing position):

Misc. (e.g., drilling rate, drill cuttings, rig decon, etc.):