FINAL

Remedial Design Investigation Work Plan
Willamette Cove Upland Facility
Portland, Oregon

Prepared for:
Port of Portland

July 5, 2022
1056-18

APEX

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REGISTERED PROFESSIONAL
OREGON
STEVE D. MISNER
G1749
GEOLOGIST

Expires 06-01-2023

Steve Misner, R.G.
Senior Associate

Herb Clough, P.E.
Principal Engineer

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Abbreviations/Acronyms

BaP Eq	Benzo(a)pyrene Toxicity Equivalent
bgs	Below Ground Surface
BNSF	Burlington Northern Santa Fe
CDC	Centers for Disease Control and Prevention
CL	Cleanup Level
COC	Chemical of Concern
COI	Chemical of Interest
COPC	Chemical of Potential Concern
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
CSM	Conceptual Site Model
cy	Cubic Yards
DEQ	Oregon Department of Environmental Quality
ECSI	Environmental Cleanup Site Information
EPA	U.S. Environmental Protection Agency
Facility	Willamette Cove Upland Facility
FS	Feasibility Study
HPAHs	High Molecular Weight Polycyclic Aromatic Hydrocarbons
JSCS	Joint Source Control Strategy
LPAH	Lower Molecular Weight Polycyclic Aromatic Hydrocarbons
LWG	Lower Willamette Group
McCormick & Baxter	McCormick & Baxter Creosoting Company Superfund Site
MHW	Mean High Water
MLW	Mean Low Water
MOU	Memorandum of Understanding
NAPL	Non-Aqueous Phase Liquid
NAVD88	North American Vertical Datum 88
ng/kg	Nanograms per kilogram
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
ODFW	Oregon Department of Fish and Wildlife
OLWL	Ordinary Low Water Line
OS	Open Space
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PDC	Portland Development Commission
PDI	Pre-Design Investigation
PHSS	Portland Harbor Superfund Site

Port	Port of Portland
PRG	Preliminary Remediation Goal
PTW	Principal Threat Waste
RAL	Remedial Action Level
RBC	Risk-Based Concentration
RDI	Remedial Design Investigation
RERA	Residual Ecological Risk Assessment
RHHRA	Residual Human Health Risk Assessment
RI	Remedial Investigation
ROD	Record of Decision
sf	Square Feet
SLV	Screening Level Value
SVOCs	Semi-Volatile Organic Compounds
TOB	Top of Bank
TPH	Total Petroleum Hydrocarbons
UPRR	Union Pacific Railroad
VCP	Voluntary Cleanup Program
VOCs	Volatile Organic Compound

1.0 Introduction

This Remedial-Design Investigation (RDI) Work Plan was prepared for the Willamette Cove Upland Facility (the Facility). The Work Plan was prepared as part of a Voluntary Cleanup Program (VCP) Agreement EC-NWR-00-26 between the Port of Portland (Port), Metro, and the Oregon Department of Environmental Quality (DEQ). The Facility is defined in the DEQ Environmental Cleanup Site Information (ECSI) database as ECSI No. 2066.

This Work Plan summarizes existing data and Facility characteristics, identifies data gaps, and describes the investigation approach and field sampling activities to be completed. For the purpose of the RDI, the Site consists of that portion of the upland Facility landward of the top of the riverbank. Investigation and cleanup of the riverbank, beach, and in-water contamination are being conducted separately under the Portland Harbor Superfund Site (PHSS) in-water actions, overseen by the U.S. Environmental Protection Agency (EPA).

1.1 Purpose and Objectives

The purpose of the RDI is to gather sufficient information to design the remedial action for the Facility. The specific objectives of the RDI include the following:

- Define the lateral and vertical extent of soil hot spots designated for excavation and off-site disposal;
- Define the lateral and vertical extent of soil posing excess risk to human and ecological receptors that will be excavated and consolidated in an on-site capped cell or disposed of off-site;
- Define the lateral and vertical extent of soil with excess ecological receptor risk that will remain in place following excavation of soil described above; and
- Generate data to support residual risk assessment.

1.2 Regulatory Framework

Since 1988, a succession of site-specific investigations and removal actions have been implemented at the Facility. The Facility is defined within the DEQ ECSI database as No. 2066. In November 2000, the Port and Metro entered into a voluntary agreement (ECVC-NWR-00-26) with DEQ to perform a remedial investigation / feasibility study (RI/FS) and implement any needed source control measures to prevent releases to Portland Harbor. In December 2000, the EPA identified the Portland Harbor area of the lower Willamette River as a Superfund Site (ID No. ORSFN1002155) and placed it on the National Priorities List (NPL) due to concerns of contamination in Willamette River sediments and potential risks to human health and the environment from consuming fish. The EPA selected a final action for the Portland Harbor in the January 2017 Record of Decision (ROD).

In 2001, the EPA entered into a Memorandum of Understanding (MOU) with the DEQ, six federally recognized Native American Tribes (tribes), the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of the Interior, and the Oregon Department of Fish and Wildlife (ODFW). Under this MOU, the DEQ is the lead agency for addressing sources of contamination in the upland portions of the Superfund Site (i.e., source control) and the EPA is the support agency.

Willamette Cove is located within the Portland Harbor and subject to the EPA ROD. DEQ is the lead agency for assessment and cleanup of upland facilities that could pose a source of sediment contamination to the harbor, and correspondingly the Willamette Cove was identified by DEQ for upland assessment. Prior to 2000, environmental assessments were conducted at Willamette Cove related to property transfers.

The Port and Metro conducted the RI of the Facility between April 2001 and September 2002. The RI combined historical information (prior to 2001) and results of the investigation to develop a conceptual site model and a list of contaminants of interest. Multiple subsequent investigations were conducted between 2002 and 2017 to further investigate areas identified in the RI and resolve data gaps. A Feasibility Study (FS) and Source Control Evaluation was conducted in 2019 (Apex, 2019). The DEQ selected a final remedial action for the upland facility in the March 2021 ROD (DEQ, 2021). The remedial action objectives defined in the ROD include the following:

- Prevent exposure of human receptors (recreational/park user, transient trespasser, construction worker) to soil containing contaminants of concern (COCs) at concentrations exceeding individual and cumulative acceptable risk levels;
- Prevent exposure of ecological receptors (mammals, birds, invertebrates, plants) to soil containing COCs at concentrations exceeding individual and cumulative acceptable risk levels;
- Remove or treat soil hot spots of contamination to the extent feasible and practicable; and
- Prevent further migration of contaminated upland soil to the river, to the extent practicable.

1.3 Work Plan Organization

This document is organized in the following manner:

- Section 2 provides a description of the Site, previous investigations, and interim actions.
- Section 3 presents the current CSM addressing geology, nature/extent of contamination, and contaminants of concern.
- Section 4 summarizes the selected upland remedy.
- Section 5 discusses data gaps for the Site.
- Section 6 presents the plan for evaluating chemical characteristics of the Site soil.

- Section 7 presents the proposed schedule and reporting deliverables.
- Section 8 lists the references cited in this Work Plan.

Supporting information are provided in tables, figures, and appendices. Historical data are provided in Appendix A and B. Appendix C is the Sampling and Analysis Plan (SAP). Health and safety documents are provided in Appendix D.

2.0 Site Description and History

2.1 Site Description

The Facility is located along the northeast bank of the Willamette River in the St. Johns area of Portland, Oregon. Figure 1 shows the location of the Facility. The Facility is situated between River Miles 6 and 7 on the Willamette River and is mostly in Section 12 of Township 1 North, Range 1 West, Willamette Meridian. The Facility has been owned by Metro since 1996. Figure 2 provides a current plan of the Facility, Site, and the surrounding area. For purposes of describing the Facility, it has been divided into West, Central, and East Parcels as shown on Figure 2.

2.1.1 Extent of Upland Facility

The upland portion of the Facility is approximately 3,000 feet long and varies from 110 to 700 feet in width. The cove is set in up to 800 feet from the main river channel; it was created primarily as a result of the placement of the embankment leading up to the Burlington Northern Santa Fe (BNSF) railroad bridge. The Facility as defined in the VCP Agreement covers approximately 24 acres of upland area that is inland from the ordinary low water line (OLWL). However, the scope of work for the VCP Agreement limits the work to inland from the mean high water (MHW) line (defined as 13.3 feet, North American vertical datum 88 [NAVD88] datum) to the property line with the Union Pacific Railroad (UPRR). DEQ, and the EPA have agreed that the riverbank at the Facility (defined as the area from the waterline to the top of bank [TOB]) will be addressed as part of in-water activity. Although the FS included the upper portion of the riverbank, the RDI work does not include any portion of the Facility below the TOB. The Site covers an area of approximately 18.63 acres, divided as follows: West Parcel 4.28 acres; Central Parcel 7.76 acres; and East Parcel 6.59 acres.

2.1.2 Access

The Site is accessible by vehicle from North Edgewater Street. A locked gate is present at the north end of North Edgewater Street one block south of its intersection with North Willamette Boulevard. A gravel roadway is present on the Central and East Parcels, but vehicle access is limited by concrete blocks/rubble at the North Edgewater Street entrance. Access to the area by foot or from the river is possible. Access to the Site will be coordinated with Metro.

Some areas of the Site are covered with dense brush and trees. Access to specific sampling points may require focused clearing of vegetation.

2.1.3 Structures and Improvements

There are no structures on the Site. Indications of previous structures include a large concrete slab foundation and a paved roadway in the eastern portion of the Site and several smaller concrete structures or foundations.

2.1.4 Topography

The Site is situated on a terrace created by historical filling. Overall, the topography of this terrace is flat, with an elevation ranging between 30 and 45 feet (all elevations in the report refer to NAVD88 unless otherwise noted). The southern portion of the West Parcel is slightly higher, at elevation 50 to 55 feet. Berms and hummocks are occasionally present. Uneven terrain, primarily in the West Parcel, may limit vehicle access. Use of tracked vehicles and/or hand sampling may be required in some areas.

Adjacent to the Site, the riverbank is generally a steep slope down to the river. The BNSF railroad embankment along the southeast perimeter of the cove rises steeply approximately 50 feet above the cove. North of the Site, across the UPRR tracks, is a naturally formed 120- to 150-foot-high bluff. This bluff rises at approximately 5H:4V adjacent to the East and Central Parcels. Near the West Parcel, the slope is approximately 10H:3V.

2.1.5 Vegetation

A development planning document (Alta Planning and Design, 2010) summarizes results from a natural resource assessment of the Facility completed in 1999. Native species found on Site include: Oregon white oak (Quercus garryana) madrone (*Arbutus meziesii*), bigleaf maple (*Acer macrophyllum*) and black cottonwood (*Populus trichocarpa*). Any planned clearing of vegetation to access sampling locations will minimize impacts to native vegetation.

2.1.6 Surrounding Properties

The Site is bordered on the northeast by the UPRR tracks. Farther to the northeast is a vegetated bluff. A residential area is present on top of the bluff and farther inland. Bordering the northwest side of the Site is a vacated portion of North Richmond Avenue with industrial property beyond. To the southeast is an embankment for the BNSF railroad bridge over the Willamette River. On the opposite side of this embankment is the former McCormick & Baxter Creosoting Company, a federal Superfund Site. Toward the river, the Site is bordered by the riverbank and the surface water of the cove and Willamette River.

2.1.7 Cultural Resources

A cultural resource survey of the Facility was conducted in 2003 (Archaeological Investigations Northwest, Inc., 2003) with the conclusion that there are no significant archaeological or historical resources identified. However, it is possible that significant resources may be encountered if future activity were to disturb the original floodplain surface and underlying native soils north and east of the 1910 shoreline. In addition, during part of the 2016 excavation activities, an archaeologist was on site to observe the debris encountered in one area of the Central Parcel. The conclusion of the archaeologist was that the brick and other debris encountered should not be recorded as an archaeological site.

2.2 Previous Environmental Work

2.2.1 Soil Sampling and Removal Actions

Numerous investigations, assessments, and environmental actions have been performed at the Facility since 1988, summarized as follows:

- Due diligence assessments, 1988 to 1995;
- Remedial investigation (Hart Crowser, 2003), 2001 to 2002;
- Upland soil removal for metals on the eastern portion of the Central Parcel (Ash Creek/NF, 2008), June 2008.
- Riverbank soil sampling (BBL/Ash Creek/NF, 2006a; Ash Creek/NF, 2008; Ash Creek, 2011), 2005 to 2010;[1]
- Inner cove and wharf road beach sampling (Ash Creek, 2005; Ash Creek/NF, 2010), 2004 and 2007;
- Wharf road area sampling (Ash Creek, 2012b), 2012;
- Upland dioxin/furan and metals sampling (Apex, 2014a; Apex, 2014b; Apex, 2014c; Apex, 2015a; Apex, 2016), 2014 to 2016;
- Hot spot removal action (Apex, 2015b, Apex, 2016), 2015 to 2016; and
- West Parcel soil sampling (Apex, 2017), 2016 to 2017.

Sample locations are shown on figures in Appendix A. Historical soil data are presented in Appendix B.

[1] Although the riverbank is not within the Site, data from the riverbank were included with Site data in identifying contaminants to include the RDI analyses.

2.2.2 2019 Feasibility Study

A feasibility study (FS) and source control evaluation (SCE) was prepared (Apex, 2019) to evaluate remedial options and recommend a remedial alternative to address unacceptable baseline risk at the Facility. For upland receptors, direct contact exposure pathways for ecological and human (park user and transient trespasser) are complete. From a source control evaluation standpoint, complete migration pathways were determined to be erosion of riverbank soil and groundwater to surface water. COCs identified in the FS included metals, PAHs, PCBs, and dioxins/furans for soil. Source control COCs also included TPH. Dioxins/furans are the primary risk driver at the Facility.

Remedial action alternatives were developed to address upland soils, and each alternative was evaluated using balancing factors. The DEQ used the FS to prepare the ROD presenting the selected Site remedy. Section 4.0 describes the selected remedy in more detail.

3.0 Conceptual Site Model

This section summarizes the conceptual site model (CSM) including site geology, nature and extent of contamination, and development of Site chemicals of interest (COIs).

3.1 Geology

The geology beneath the Facility consists of fill and the presence of alluvial and Columbia River basalt (CRB) materials. Early maps of the area indicate the current upland portion of the facility consisted of a strip of lowland adjacent to the current UPRR railroad tracks. Based on historical maps and photographs, fill was placed on this lowland and outward into the Willamette River prior to and concurrent with development. The thickness of the fill across the Facility likely varies from about 20 to 30 feet; however, in places, it could be up to 60 feet (such as in a former log pond on the West Parcel filled in the early 1970s). During recent geotechnical explorations at the Site conducted as part of the Pre-Design Investigation (GSI Water Solutions, Inc. [GSI], 2021), fill materials were encountered between 21.0 and 30.5 feet below ground surface (bgs) in four upland soil borings. Alluvium underlying the fill unit consists of Missoula Flood Deposits (MFD) and recent alluvium defined as downstream sands and gravels, cove elastic silts, and cove sands. MFD are typically fine-grained and coarse-grained units. Encountered thickness of the alluvium in the GSI upland borings ranged from 40 feet to greater than 75 feet (extended to the termination depths of the borings). The Troutdale Formation was encountered at a boring located on the West Parcel at a depth of approximately 75 feet bgs (GSI, 2021). The Troutdale formation consists of a very dense conglomerate with a silty matrix. CRB underlies the alluvium and Troutdale deposits. Offshore, the CRB was encountered at relatively shallow depths, but was not identified in any upland borings.

3.2 Existing Conditions and Site Use

The Facility is currently vacant, covered with invasive and native vegetation, and it provides habitat for opportunistic use by wildlife. The site is not managed for any human use and is posted to prohibit trespassing. However, trespassers do come on the site (e.g., homeless persons and joggers/walkers).

The Facility is currently zoned as an open space (OS) zone with "g" (River General) and "q" (River Water Quality) greenway overlay zones (City of Portland, 2018). The open space zone is intended to preserve and enhance public and private open, natural, and improved park and recreational areas. Greenway regulations are also intended to protect, conserve, enhance, and maintain the natural, scenic, historical, economic, and recreational qualities of lands along Portland's rivers. Specifically, the "g" overlay is intended to allow public use and enjoyment of the waterfront and for enhancement of the river's scenic and natural qualities. The "q" overlay is designed to protect the functional values of water quality resources by limiting or mitigating the impact of development in the 50- to 200-foot setback from the top of bank. Other nearby zoning includes commercial (EG2), residential (R2 and R5), open space (OS), and industrial (IH and IG2).

The Facility is included in a citywide inventory that identified scenic resources (City of Portland, 2012). The Facility is identified as a scenic viewpoint. The zoning map shows a multi-use trail through the Facility (City of Portland, 2004). However, this trail is only proposed as part of the regional trail plan adopted by Metro (Alta Planning and Design, 2010).

3.3 Nature and Extent of Contamination

This section summarizes the nature and extent of contamination on the Site based on the existing data. Figures 3 and 4 from the FS summarize the locations of potential cleanup areas and hot spot areas based on upland soil exposure pathways. The various areas shown on the figures were determined by defining each locus of sampling points where soil data exceeded a preliminary remediation goal (PRG) corresponding to an unacceptable baseline risk pathway or a hot spot level.

3.3.1 RDI Contaminants of Concern and Risk Levels

The PRGs were developed in the FS and will be adopted as the cleanup levels for the RDI and subsequent remedial action. Tables 1 and 2 present the COCs, PRGs, and hot spot levels for the Site.

3.3.2 Lateral Extent

The current understanding of the lateral extent of COCs in soil is presented on Figures 3 and 4. The lateral extent of COCs will be refined based on the RDI sampling program described in Section 6.

3.3.2.1 West Parcel

Unacceptable ecological risk is present resulting primarily from dioxins/furans TEQ and mercury. For human health, unacceptable risk results from dioxins/furans TEQ. These maximum risk levels are driven by the ISM sample results which represents the entire parcel. Therefore, pending further sampling, the lateral extent on the West Parcel is not defined.

3.3.2.2 Central Parcel

Unacceptable ecological risk on the Central Parcel is present resulting primarily from mercury, dioxin/furan TEQ, copper, and lead throughout much of the Central Parcel. Scattered ecological hot spots for dibenzofuran, HPAHs, and other metals are present. Unacceptable human health risk is present primarily from dioxin/furan TEQ with additional contribution from BaP Eq, arsenic, and lead. The west end of the Central Parcel has human health PRG exceedances throughout and a small area of BaP Eq hot spot. The east end of the Central Parcel exceeds the PRG for dioxin/furan TEQ throughout with metal PRG exceedances interspersed.

3.3.2.3 East Parcel

Unacceptable risk on the East Parcel is present resulting primarily from dioxin/furan TEQ for both ecological and human health receptors with additional contribution from several metals for ecological receptors. These exceedances are primarily in the ISM sample. Therefore, pending further sampling, the lateral extent on the East Parcel is not defined.

3.3.3 Vertical Extent

The conceptual site model developed for the RI identified that sources of COCs are related to historical industrial activities and primary COCs are relatively immobile. Therefore, COC concentrations are expected to be highest at the ground surface and reduce rapidly with depth. A possible exception to this is the West Parcel where the log pond was filled in the 1970s, after the historical industrial activities on that parcel. The majority of sampling to date has been surface soil sampling, but the limited sampling at depth supports that maximum concentrations are generally at the surface. Sampling before and during the 2015 removal action on the Central Parcel demonstrated that concentrations exceeding hot spot levels were present only within the top 0.5 to 1 foot of soil in most cases. In one small area associated with buried debris, hot spot concentrations were found to depths of at least 5 feet.

The existing soil data were evaluated to estimate the depth of soil impacts above PRGs and hot spot levels. The evaluation considered the change in concentration with depth based on the existing data, the conceptual site model for COC releases and contaminant transport, and the results of depth discrete sampling conducted for dioxins on the Central Parcel. Table 3 presents the results of that evaluation. In summary, the data suggest that the minimum sampling depth should be 1 foot on the West Parcel, up to 3 feet on the Central

Parcel (outside the small debris area), and 1.2 feet on the East Parcel. The presence of more recent filling on the West Parcel increases the uncertainty in the estimate for the West Parcel.

4.0 Selected Upland Remedy

The selected remedy is an excavation focused effort consisting of the following key elements:

- Excavation and off-site disposal of all soil exceeding hot spot levels for human health;
- Excavation and off-site disposal of soil exceeding non-dioxin/furan hot spot levels for ecological health;
- Consolidation and on-site capping of a) soil posing an excess risk to humans but below hot spot levels; and b) soil with higher risk levels relative to plants and animals, including hot spots.
- Following off-site disposal and on-site consolidation and capping, residual soil contamination posing a lower-level risk to plants and animals would be covered in-place.

The remedy includes a contingency to dispose of soil off-site rather than placing in an on-site consolidation cell (at Metro's discretion). To the extent the final remedy includes engineering controls, the remedy will also include institutional controls and long-term monitoring and maintenance.

5.0 Data Gaps

Based on evaluation of the existing data set and removal action efforts, it is recognized that a number of data gaps currently exist for the Facility. These data gaps require resolution to both refine the Conceptual Site Model and/or support the remedial design process. The intent of the RDI is to provide data necessary to resolve the data gaps. Current data gaps include the following:

- COC concentrations in soil beneath the concrete pad on the East Parcel;
- Lateral delineation of COCs exceeding hot spot levels and or PRGs; and
- Vertical delineation of COCs exceeding hot spot levels and or PRGs

6.0 Chemical Characterization of Soil

The goal of soil characterization is to define the extent and depth of soil with concentrations of COCs exceeding PRGs and hot spot levels to inform future remedial actions. Specific sampling locations and methodologies were developed to meet these goals and address the data gaps identified in Section 5.

6.1 Preparatory Activities

Preparatory activities for soil characterization efforts include coordinating property access with Metro personnel, clearing proposed sample locations of underground utility conflicts, and preparing health and safety documents. These activities are discussed in more detail in the SAP (Appendix C).

6.2 Sampling Approach

The overall approach for RDI sampling will be to collect 30-point ISM samples from three depth ranges (0 – 1, 1 – 2, and 2 – 3 feet bgs) within each decision unit (DU). The targeted ISM DU areas range from approximately 0.39 to 0.54 acres. Table C-1 in Appendix C identifies the individual DU sizes. The results of the ISM samples will be evaluated against human health and ecological PRGs/hot spot concentrations to inform remedial action decisions, development of the remedial design, and estimation of residual risk. Historical data will also be evaluated in relation to the RDI data to identify inconsistencies (considering sample types such as discrete versus composite or ISM and previous removal actions). The comparison of historical and RDI data will occur throughout the RDI data collection process to assure that potential data gaps are identified and addressed during the RDI.

The CSM developed for the site indicates that higher concentrations of COCs are expected at the ground surface and concentrations will decrease with depth. This model is supported by the historical sampling. At locations where vertical sampling has been conducted, concentrations typically decrease with depth.

6.3 Sampling Plan

A detailed discussion of the sampling design and methods, protocols for sample collection, and quality assurance are provided in the SAP (Appendix C).

6.3.1 ISM Sampling

Figures 5, 6, and 7 show the proposed design of DUs with ecological risk, human health risk, and previous excavation area overlays, respectively. The Site was divided into 39 DUs of an approximate half-acre size (DU sizes range from 0.39 to 0.54 acres with an average of 0.46 acres). In general, the DUs are configured to correspond to historical operational areas and Facility features such as the Facility boundaries on the west, north and east and the top of bank on the riverward boundary. The top of bank is defined as the point where the slope of the land surface changes from toward the river to towards the uplands and is defined on the figures as “Top of Bank Plus Areas of Potentially Erodible Soil”. There are two small depressions on the top of bank in the Central Parcel that are included in the DUs that would otherwise be excluded from sampling based on the “top of bank” definition.

ISM probabilistic-based sampling design involves random selection of sampling locations (EPA, 2002a). To meet the requirements of a random sampling element, a systematic random sampling design was used. Each DU will be sampled using a 30-point systematic random sampling design where increment locations are evenly spaced on a uniform grid to the extent feasible in the field (HDOH, 2021). Following the Hawaii Department of Health Technical Guidance Manual (HDOH, 2021), increment locations will be located at a random offset of this grid and collected from the same location in each cell. The target increment spacing for 30-increments across 0.5-acres is approximately 27 feet. The calculated increment spacing averages 26 feet with a minimum spacing of 23.6 feet and maximum spacing of 28 feet. Figures in Appendix C show the planned sample grid for ISM samples in each DU.

ISM samples will be collected from depth intervals of 0 – 1, 1 – 2, and 2 – 3 feet bgs. Access to the target sample depth will be accomplished primarily by mechanical excavation of sample test pits. In restricted access areas, hand or vacuum excavation may be used. ISM increments from each depth interval will be collected using a hand-held power drill. Based on field testing on May 6, 2022, the sample collection method will be a hand sampling device consisting of a metal plate equipped with a vertical tube guide and bucket: a one-inch diameter drill will be advanced through the tube to retrieve a one-foot long sample. A mini excavator will be used to excavate to the subsequent depth intervals and the process repeated. Hand or vacuum excavation may be used in areas of limited access.

Field replicates will be collected from each depth interval for 20 percent of the DUs. Two field replicates plus the primary incremental sample will be collected from locations DU-5 (West Parcel), DU-11 (Central Parcel), DU-13 (Central Parcel), DU-16 (Central Parcel), DU-18 (Central Parcel), DU-22 (Central Parcel) DU-37 (East Parcel), and DU-38 (East Parcel) at each depth interval. Field replicates will be collected from separate locations within the same ISM cell as described in the SAP in Appendix C.

6.3.2 Soil Berm ISM Sampling (DU-41)

Two soil berms approximately four-feet high by 20-feet wide are present on the East Parcel that parallel the south side of the road that separates the Facility from the UPRR tracks. The western berm is approximately 310 feet long (460 cubic yards) and the eastern berm is approximately 80 feet long (120 cubic yards). The total volume of the berms is approximately 580 cubic yards and will be included in DU-41. Consistent with other DUs, ISM samples will be collected from depth intervals of 0-1, 1-2, and 2-3 feet bgs.

Based on LiDAR topographic data, there are other minor irregularities in the Facility. However, none appear to be significant enough to warrant designation of a separate DU.

6.3.3 Concrete Slab Composite Sampling

The concrete slab on the East Parcel will be divided in half with the halves designated as DU-39 and DU-40. Five-point composite samples will be collected from each DU at the depth intervals of 0 – 1, 1 – 2, and 2 - 3 feet bgs. The sample locations will be determined using the systematic random sampling design, similar to the other DUs but with wider spacing of increments. The composite samples will be processed using ISM methodologies described above and in Appendix C. No replicate samples are planned for the concrete slab area.

Samples from the concrete slab area will be collected using concrete coring, mechanical equipment or hand tools, and hand coring devices. Equal masses will be collected from each sample location.

6.3.4 Inadvertent Archaeological or Historical Resource Discovery

The RDI exploration depths (0 to 3 feet) are anticipated to be entirely within fill material, which likely varies from 20 to 30 feet thick, so it is unlikely that archaeological or historical resources will be encountered. However, in the unlikely event of an inadvertent discovery of any of the following (with the exception of the brick and other debris described in Section 2.1.7), work within 100 feet of the area will be stopped and the protocols described in Appendix C, Section 5.2.4 will be followed.

6.4 Analytical Testing Program

ISM samples (primary and replicates from all target depths) will be analyzed for the following:

- Metals (antimony, arsenic, chromium, copper, lead, mercury, nickel, selenium, and zinc) by United States Environmental Protection Agency (EPA) method 6020B;
- Dioxins/furans by EPA method 1613B;
- Polycyclic aromatic hydrocarbons (PAHs) by EPA method 8270E-SIM;
- Dibenzofuran by EPA method 8270E-SIM; and
- Polychlorinated biphenyls (PCB) Aroclors by EPA method 8082A.

Analytical methods will be performed by Apex Laboratories of Tigard, Oregon (Apex Lab, OR01039) or a laboratory subcontracted by Apex Lab. Apex Lab will process all ISM samples prior to submitting to a subcontract laboratory. The SAP in Appendix C includes a detailed discussion of the analytical testing plan and is summarized in Tables C-2 and C-3.

7.0 Schedule and Reporting

7.1 Schedule

The anticipated schedule is shown below.

Proposed Activity	Anticipated Schedule
Submit Draft RDI Work Plan	February 2022
Submit Final RDI Work Plan	July 2022

Conduct field work	July-September 2022
Submit Draft RDI Evaluation Report	November 2022
Submit Final RDI Evaluation Report	January 2023

7.2 Reporting

The results of chemical characterization of the Facility will be presented in a RDI Evaluation Report in general accordance with the following outline.

1. Introduction
2. Background
    a. Previous Investigations, Remedial Actions
    b. Historical Data
3. Activities Completed
    a. Pre-field Activities
    b. Boundary Survey
    c. Soil Sampling and Analysis
4. Deviation from Work Plan
5. Chemical Characterization of Upland Facility
    a. Upland Soil Sampling Results
        i. Tabular and Graphical Representation of Data
        ii. Analytical Results Narrative
6. Upland Soil Source Control Evaluation
7. Exposure Pathway Evaluation
8. Conclusion
9. Appendices
    a. Soil Sampling Field Documentation and Exploration Logs
    b. Analytical Laboratory Sample Analysis Report/Quality Assurance Review
    c. Photographs

8.0 References

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Table 1
Upland Soil Cleanup Levels and Oregon High Concentration Hot Spot Values – Ecological Receptors
Willamette Cove Upland Facility
Portland, Oregon

Chemical of Concern	Ecological PRGs/Hot Spot Levels			
	Sample Type			
	Discrete/Composite		ISM	
	PRG	Hot Spot Level	PRG	Hot Spot Level
	Concentration in mg/kg			
Antimony	2.7	27	2.7	27
Arsenic	18	180	18	180
Chromium	76	76	39	39
Copper	70	700	70	700
Lead	79	330	33	330
Mercury	0.23	0.23	0.073	0.15
Nickel	47	200	23	200
Selenium	0.71	5.2	0.52	5.2
Zinc	180	1,200	120	1,200
Total HPAH	5.6	56	5.6	56
Total LPAH	29	290	29	290
Dibenzofuran	0.01	0.1	0.01	0.1
Total PCBs	0.098	0.98	0.098	0.98
Dioxin/Furan TEQ	6.10E-06	6.10E-05	6.10E-06	6.10E-05

Notes:

1. RBC = Risk Based Concentration
2. PRG = Preliminary Remediation Goal adopted as cleanup level for remediation
3. ISM = Incremental Sampling Methodology
4. mg/kg = milligrams per kilogram
5. HPAH = high molecular weight polycyclic aromatic hydrocarbons
6. LPAH = low molecular weight polycyclic aromatic hydrocarbons
7. PCBs = polychlorinated biphenyls
8. Dioxin/Furan TEQ = 2,3,7,8-TCDD toxicity equivalent

Table 2
Upland Soil Cleanup Levels and Oregon High Concentration Hot Spot Values – Human Health
Willamette Cove Upland Facility
Portland, Oregon

Chemical of Concern	Human Health PRGs			
	Sample Type			
	Discrete/Composite		ISM	
	PRG	Hot Spot Level	PRG	Hot Spot Level
	Concentration in mg/kg			
Antimony	24.3	243	24.3	243
Arsenic	8.8	140	4.4	140
Copper	11,000	110,000	11,000	110,000
Lead	400	4,000	400	4,000
BaP Eq	0.55	55	0.55	55
Total PCBs	0.74	40	0.74	40
Dioxin/Furan TEQ	1.50E-05	1.50E-03	1.50E-05	1.50E-03

Notes:

1. RBC = Risk Based Concentration
2. PRG = Preliminary Remediation Goal adopted as cleanup level for remediation
3. ISM = Incremental Sampling Methodology
4. mg/kg = milligrams per kilogram
5. BaP Eq = benzo(a)pyrene equivalent
6. PCBs = polychlorinated biphenyls
7. Dioxin/Furan TEQ = 2,3,7,8-TCDD toxicity equivalent

Table 3
Estimated Depth of Chemicals of Concern Impacts in Upland Soil
Willamette Cove Upland Facility
Portland, Oregon

Chemical of Concern	Estimated Depth to Achieve Concentration Below Ecological Hot Spot (ft)			Estimated Depth to Achieve Concentration Below Human Health Hot Spot (ft)			Estimated Depth to Achieve Concentration Below Ecological CUL (ft)			Estimated Depth to Achieve Concentration Below Human Health CUL (ft)		
	West Parcel	Central Parcel[1]	East Parcel[2]	West Parcel	Central Parcel[1]	East Parcel[2]	West Parcel	Central Parcel[1]	East Parcel[2]	West Parcel	Central Parcel[1]	East Parcel[2]
Antimony	--	--	--	--	--	--	--	0.9	0.9	--	--	--
Arsenic	--	--	--	--	--	--	--	1	--	--	1.5	--
Copper	--	0.8	--	--	--	--	0.5	1	--	--	--	--
Lead	--	2	--	--	--	--	2*	2	0.9	--	2	--
Mercury	>0.5	>2	--	--	--	--	>0.5	>2	--	--	--	--
Nickel	--	--	--	--	--	--	--	0.7	1	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	0	--	--	--	--	--	2	1.2	--	--	--
Dibenzofuran	--	0.5	--	--	--	--	--	1.5	--	--	--	--
BaP Eq	--	--	--	--	0.5	--	--	--	--	--	1.2	--
Total HPAH	--	0.5	--	--	--	--	--	1.2	--	--	--	--
Total LPAH	--	--	--	--	--	--	--	0.5	--	--	--	--
Total PCBs	--	--	--	--	--	--	0.5	--	--	--	--	--
Dioxin/Furan TEQ	0.5	1	0.5	0.5	1	--	>0.5	1.8	>0.5	0.5	1.5	>0.5
Minimum Sample Depth	>0.5	>2	0.5	0.5	1	0	1	>2	1.2	0.5	1.5	>0.5

Notes:

1. Excludes small debris area in 2015 removal action area.
2. Excludes samples at edge of slab/boundary with Central Parcel
3. ft = Feet
4. CUL = Cleanup level
5. BaP Eq = Benzo(a)pyrene equivalent
6. HPAH = High molecular weight polycyclic aromatic hydrocarbons
7. LPAH = Low molecular weight polycyclic aromatic hydrocarbons
8. PCBs = Polychlorinated biphenyls
9. Dioxin/Furan TEQ = 2,3,7,8-TCDD Toxicity equivalent
10. > = Greater than

* Based on a single sample that exceeds CUL by factor of 1.2.

Note: Base map prepared from USGS 7.5-minute quadrangles of Linnton and Portland, OR, dated 2020 as provided by USGS.gov.

0 2,000 4,000
Approximate Scale in Feet

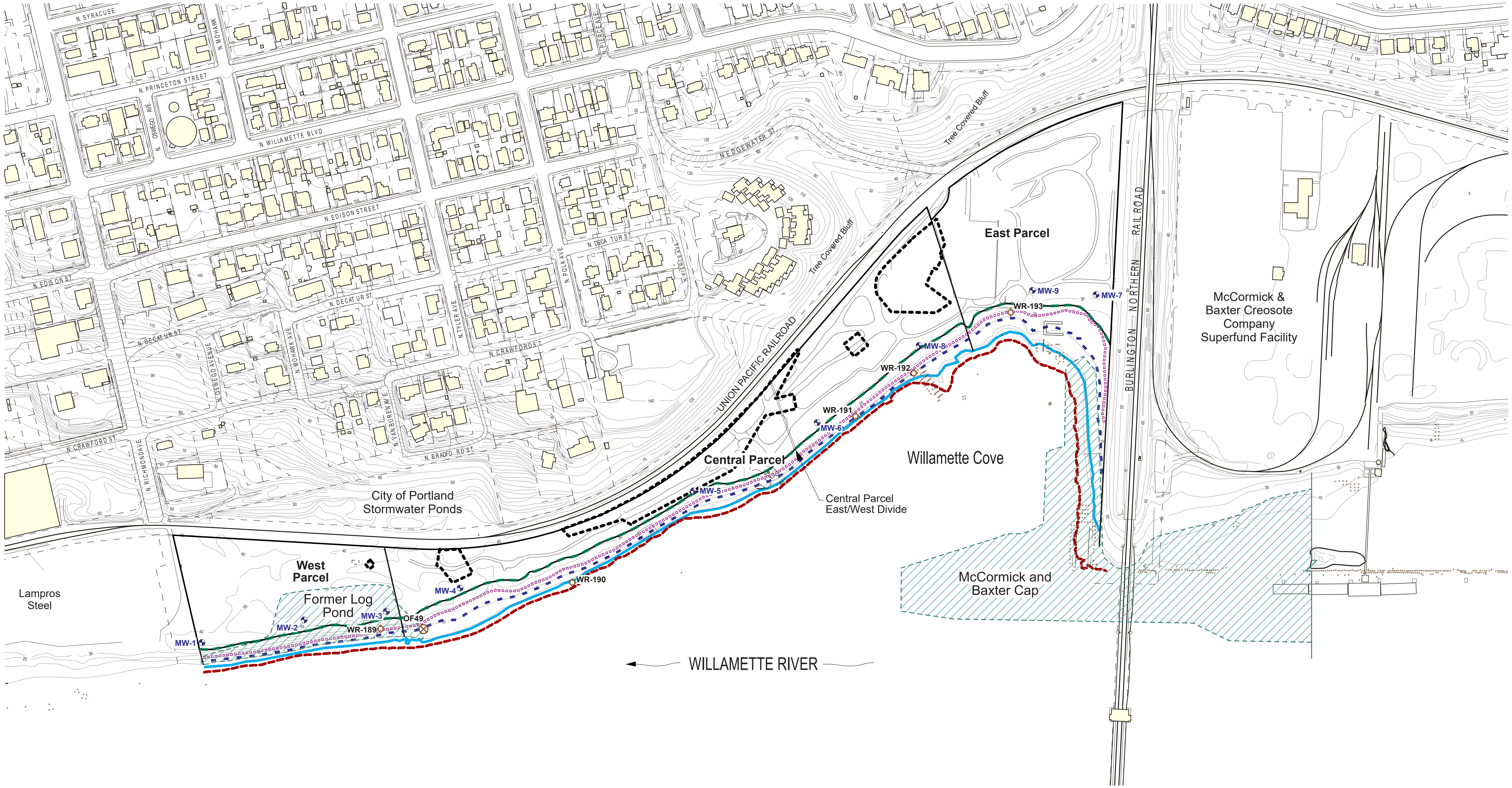
N

Facility Location Map

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: SM
		July 2022		Figure 1

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\320001056-18 01 (Facility Location).des



Legend:

- MW-1 Monitoring Well Location
- OF49 City of Portland Outfall
- WR-189 Potential Historical Outfall (Inactive)
- 2008 and 2015 Removal Action Areas
- Upper Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)
- -2 Columbia River Datum (3.2NAVD88)

0 300 600

Approximate Scale in Feet

Source: Base map prepared from an electronic file provided by Hart Crowser.

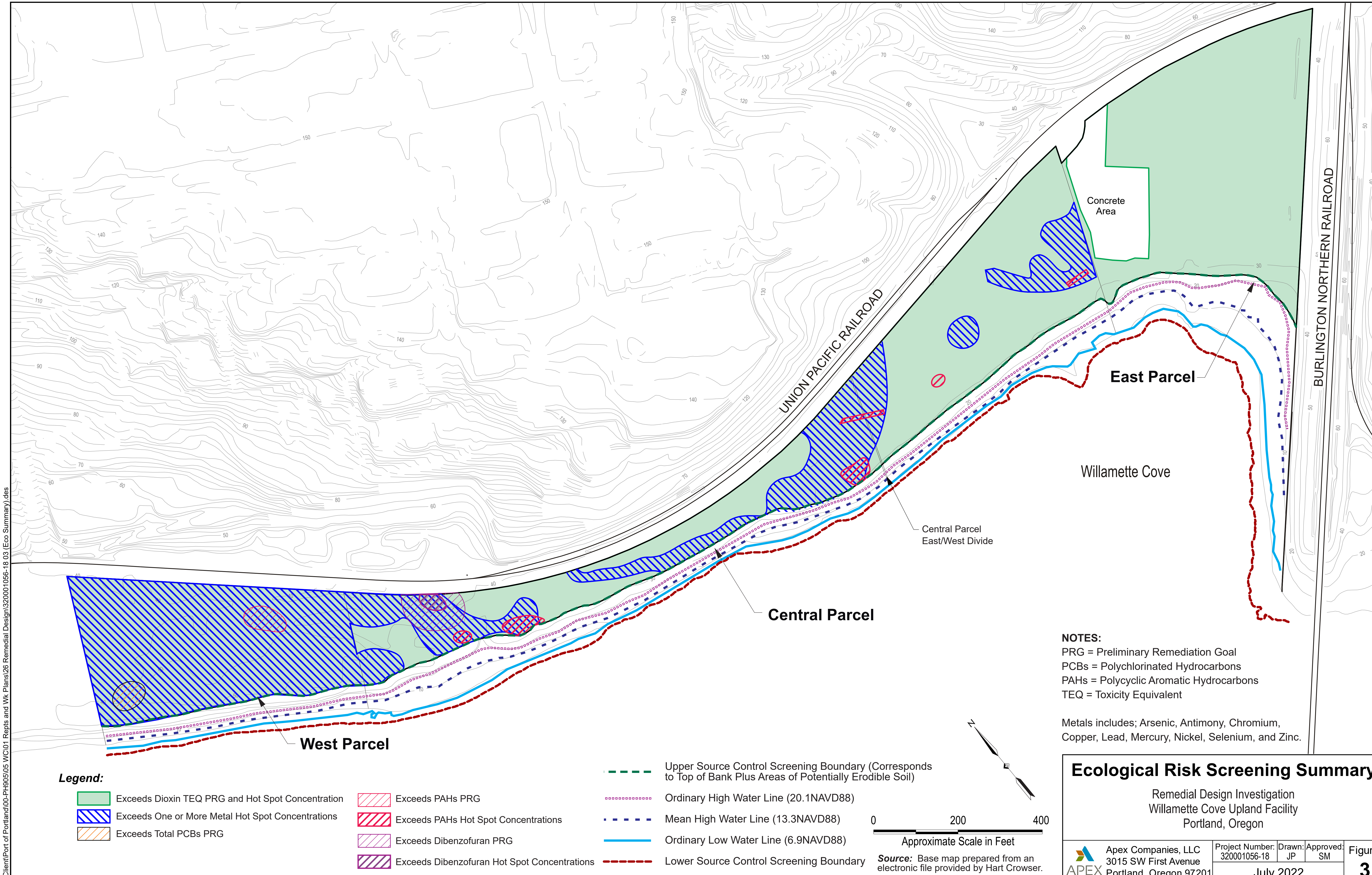
N

Facility Plan

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number:	Drawn:	Approved:	Figure
320001056-18	JP	SM	2
July 2022			



NOTES:
PRG = Preliminary Remediation Goal
PCBs = Polychlorinated Hydrocarbons
PAHs = Polycyclic Aromatic Hydrocarbons
TEQ = Toxicity Equivalent

Metals includes; Arsenic, Antimony, Chromium, Copper, Lead, Mercury, Nickel, Selenium, and Zinc.

Ecological Risk Screening Summary

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number:	Drawn:	Approved:	Figure
320001056-18	JP	SM	3
July 2022			

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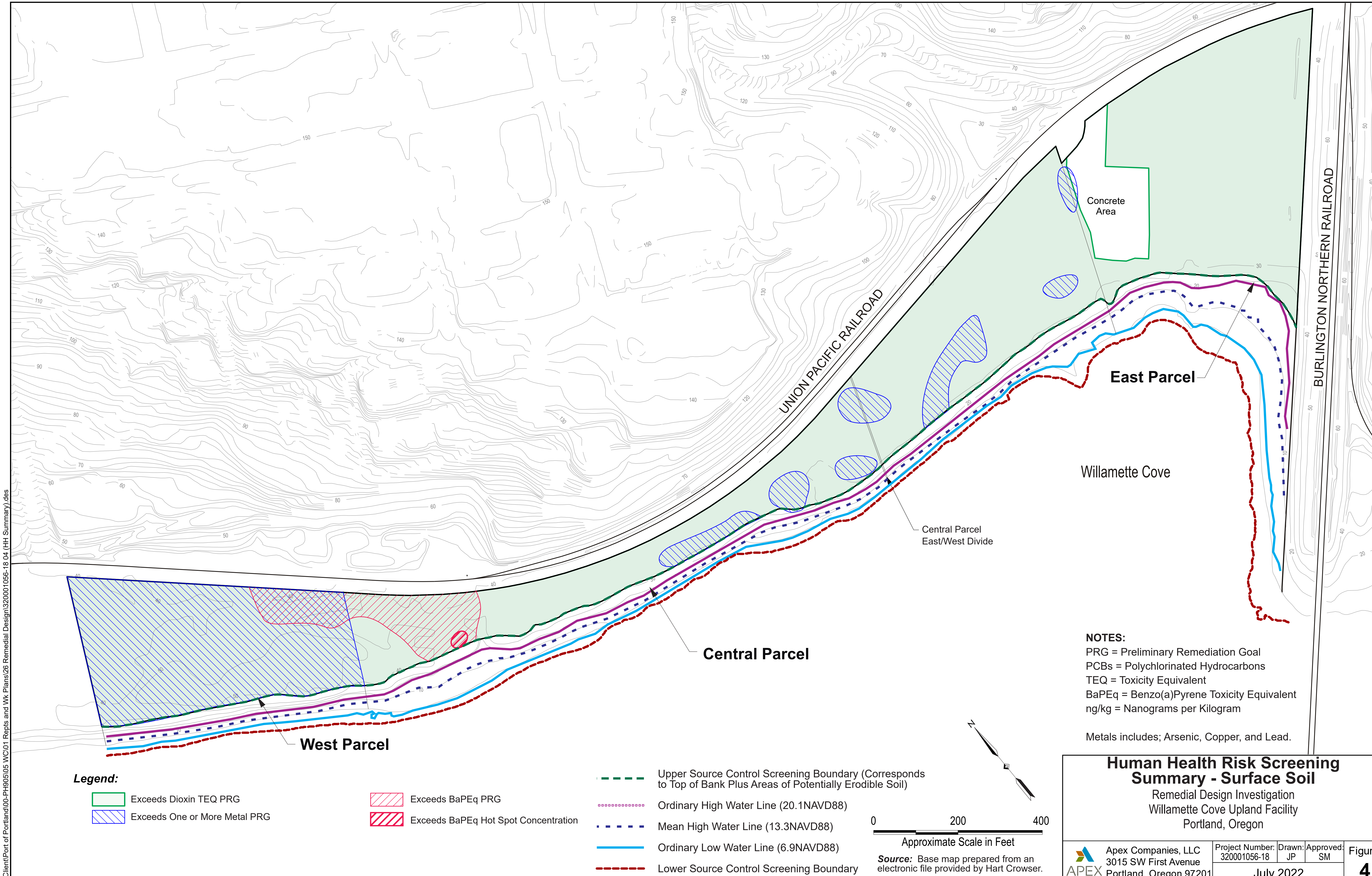

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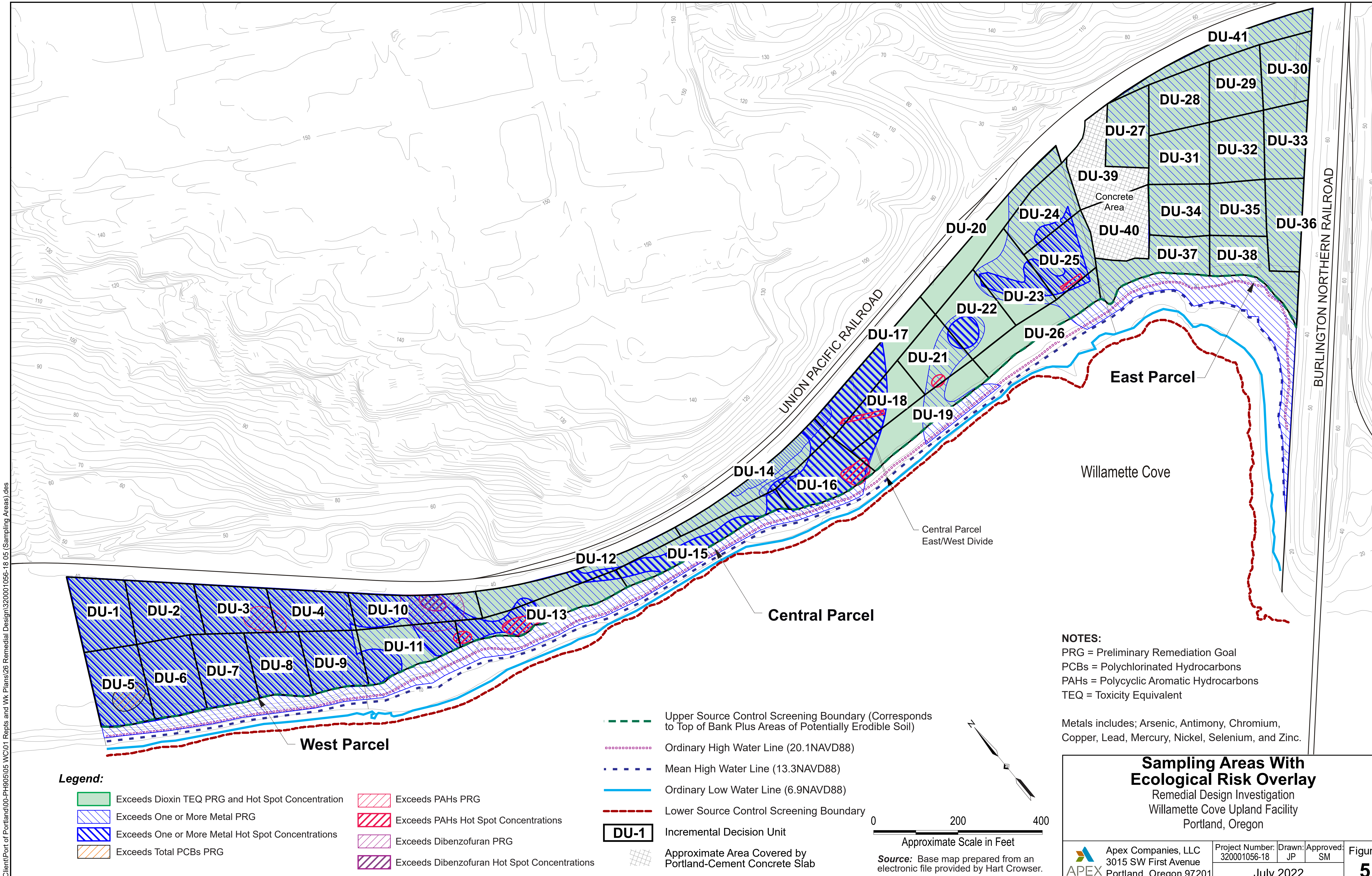

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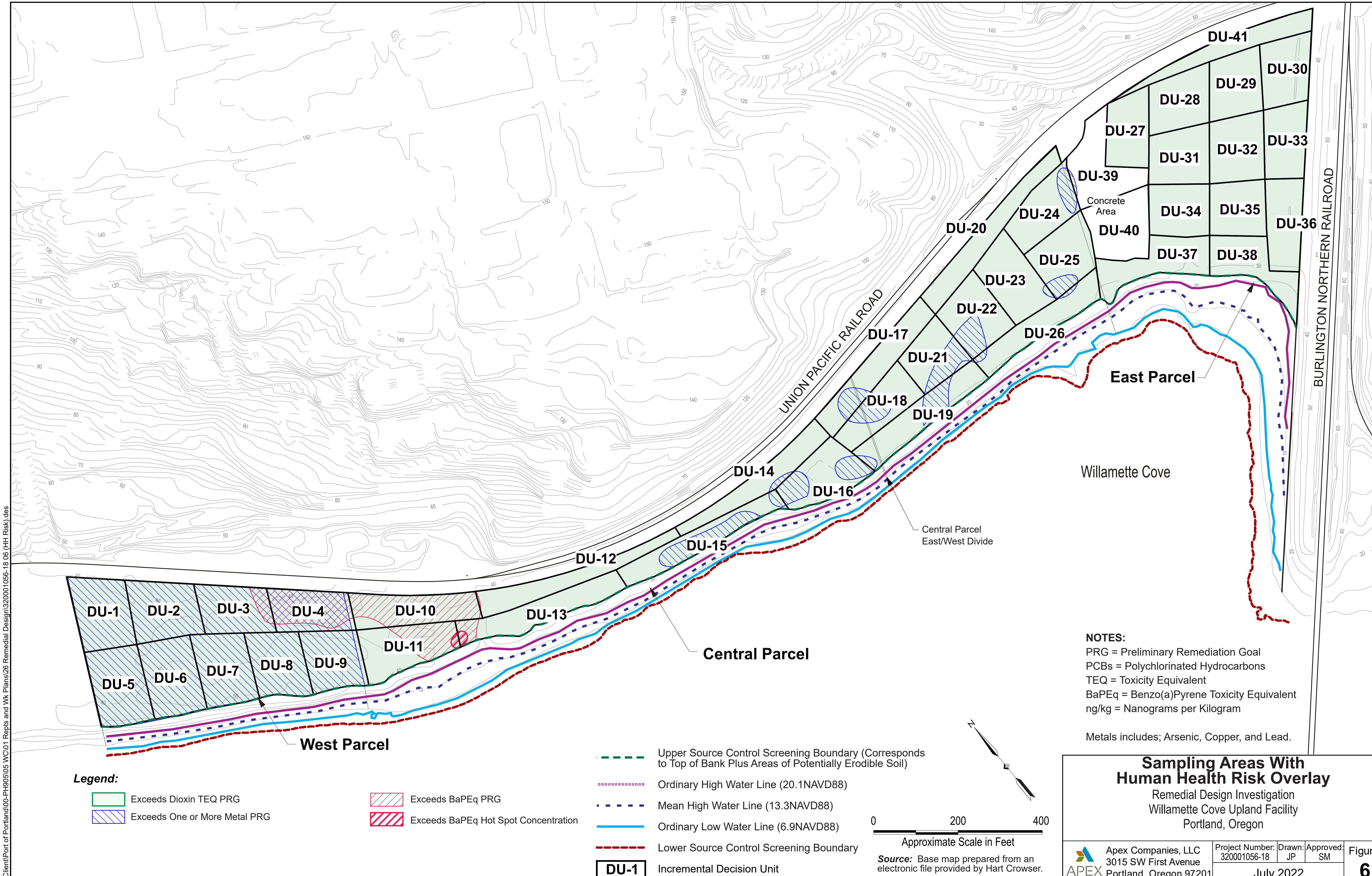

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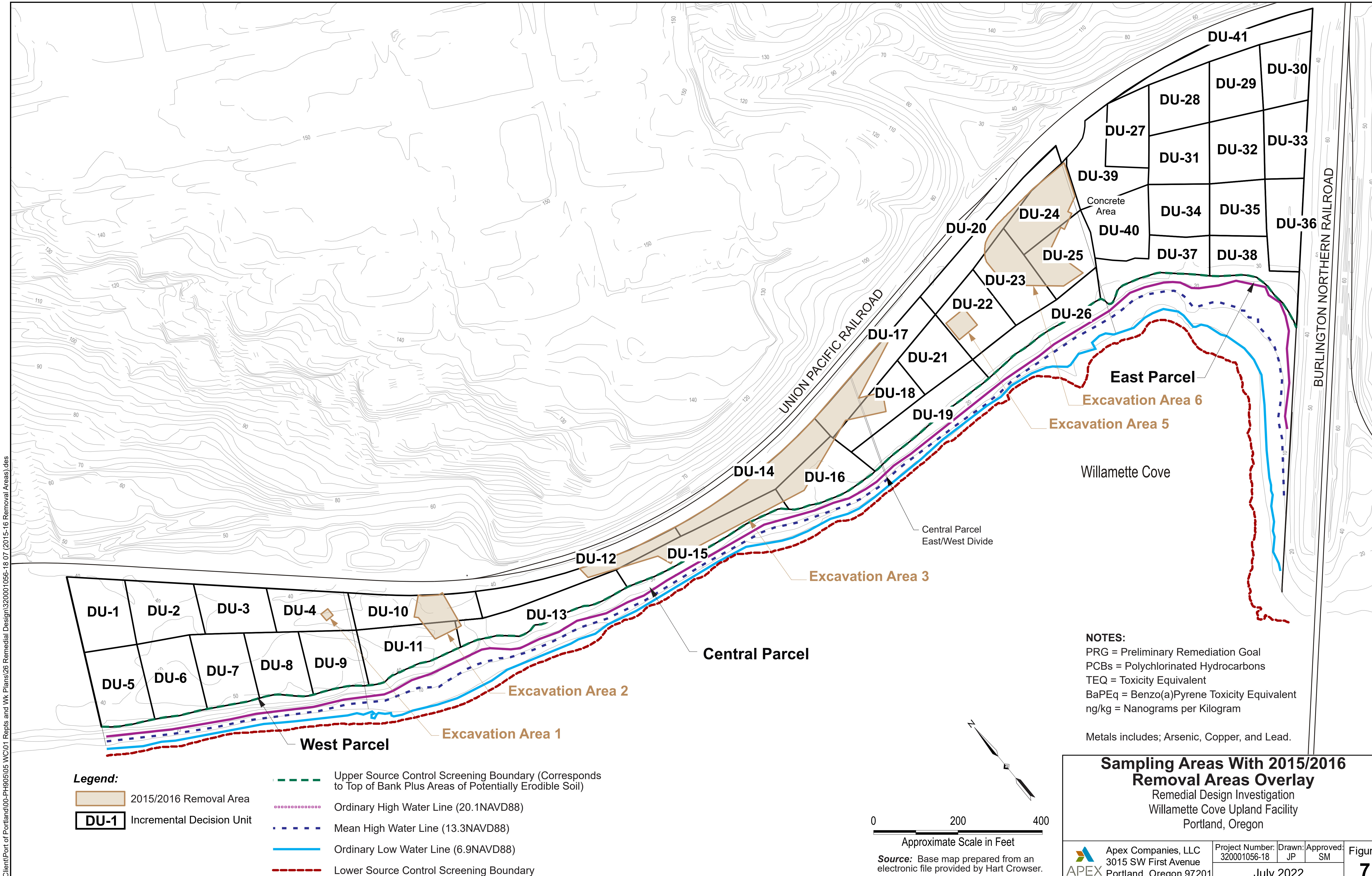

Sampling Areas With 2015/2016 Removal Areas Overlay
Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: SM	Figure 7
	July 2022			

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Appendix A

Historical Soil Sample Locations

Appendix A Figures (Figures from Appendix C of the *Revised Feasibility Study and Source Control Evaluation, Apex, 2019*)

UNION PACIFIC RAILROAD

BNSF RAILWAY

Legend:

- Discrete Sample Location
- Sample Locations Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 200 400

Approximate Scale in Feet

N

Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

Discrete Soil Sample Locations

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-1

Legend:

- Discrete Sample Location
- Sample Locations Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 60 120
Approximate Scale in Feet

N

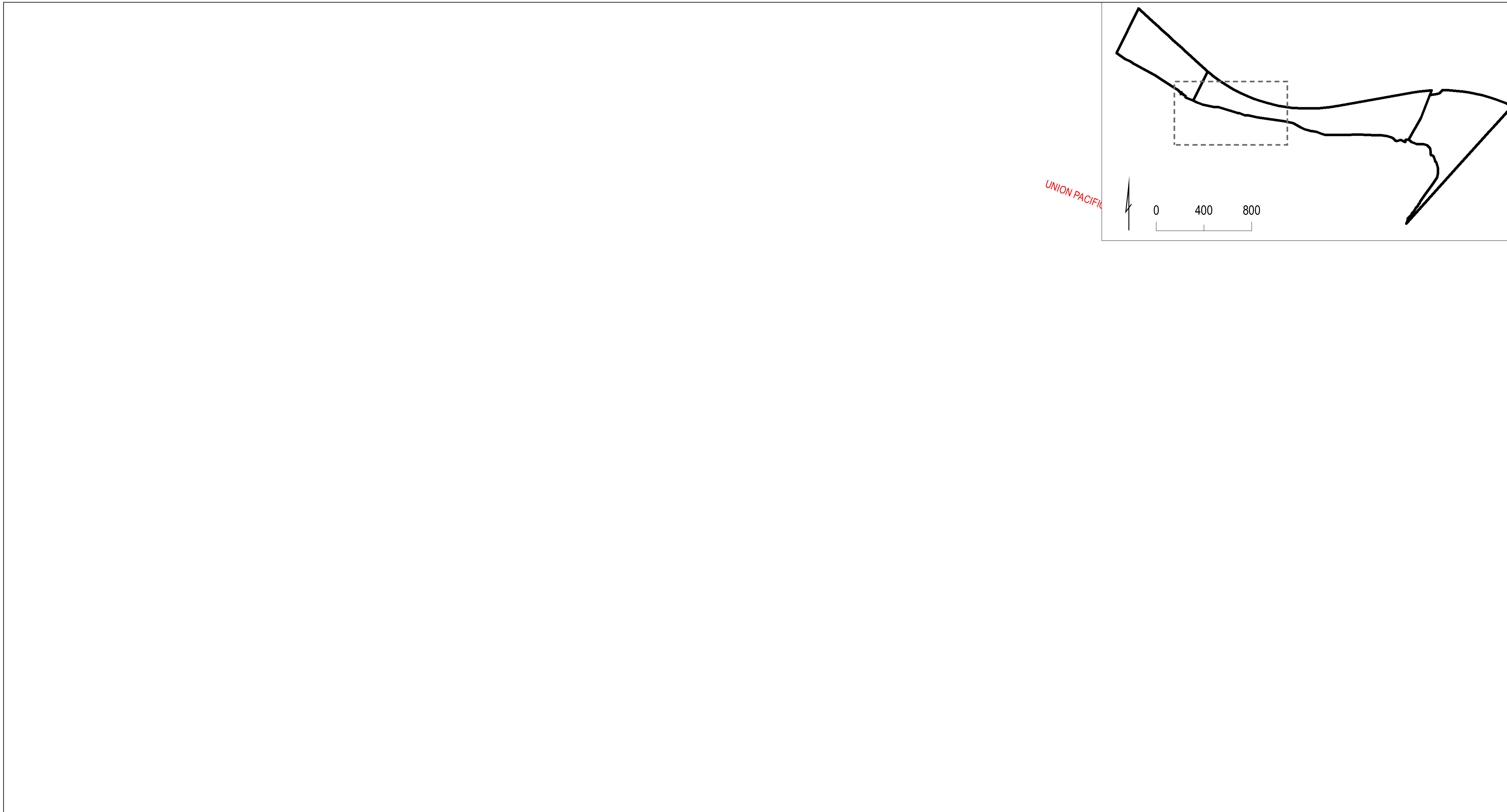
Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

Discrete Soil Sample Locations - 1 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-1a



Legend:

- Discrete Sample Location
- Sample Locations Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 60 120 N

Approximate Scale in Feet

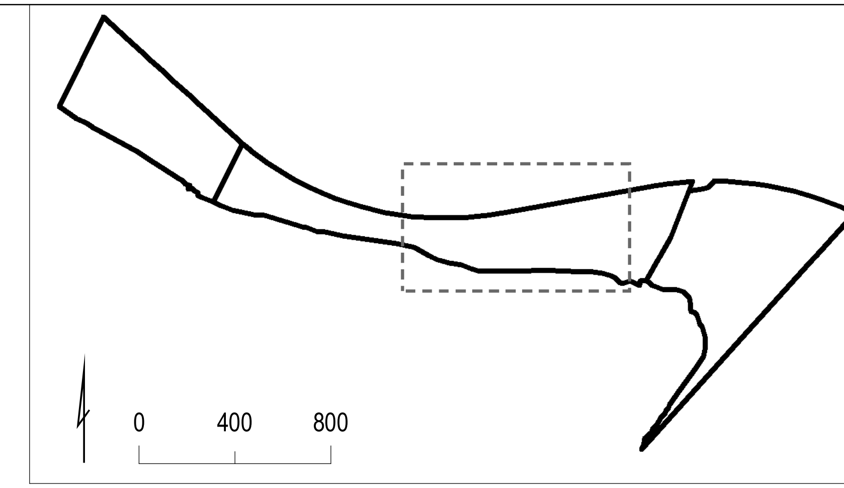
Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

Discrete Soil Sample Locations - 2 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-1b



UNION PACIFIC RAILROAD

Legend:

- Discrete Sample Location
- Sample Locations Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 60 120
Approximate Scale in Feet

N

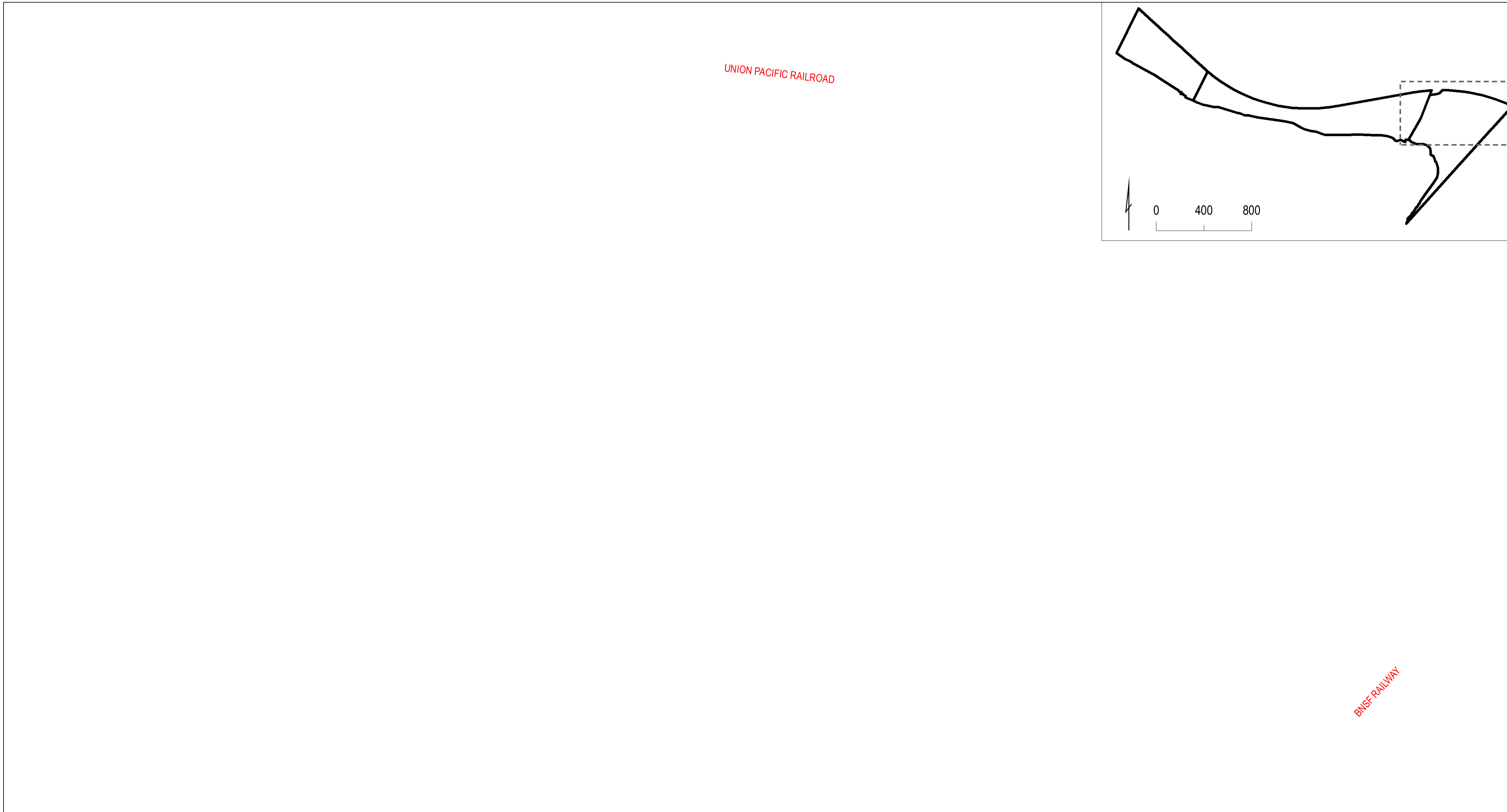
Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

Discrete Soil Sample Locations - 3 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-1c



Legend:

- Discrete Sample Location
- Sample Locations Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 60 120
Approximate Scale in Feet

N

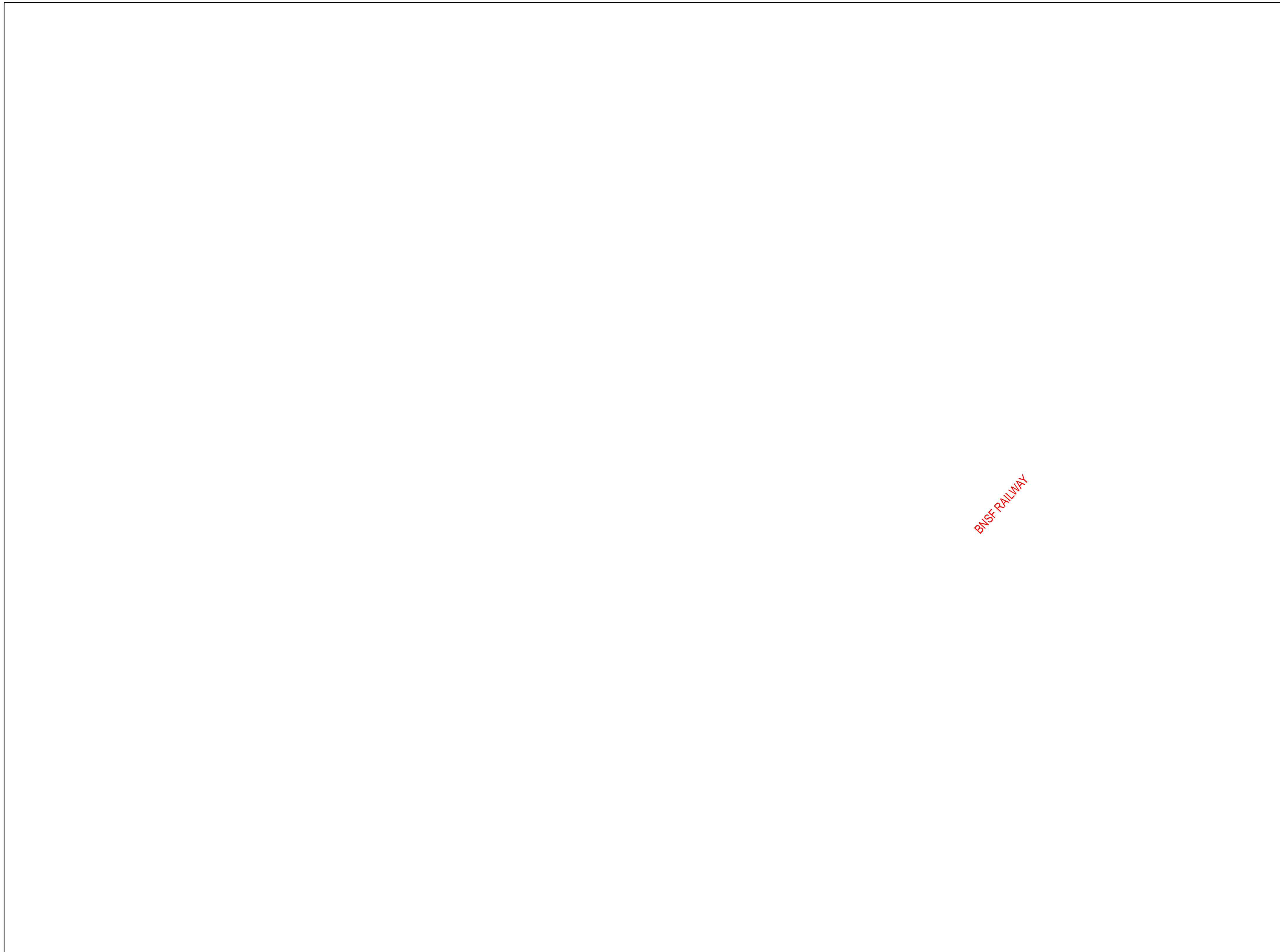
Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

Discrete Soil Sample Locations - 4 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-1d



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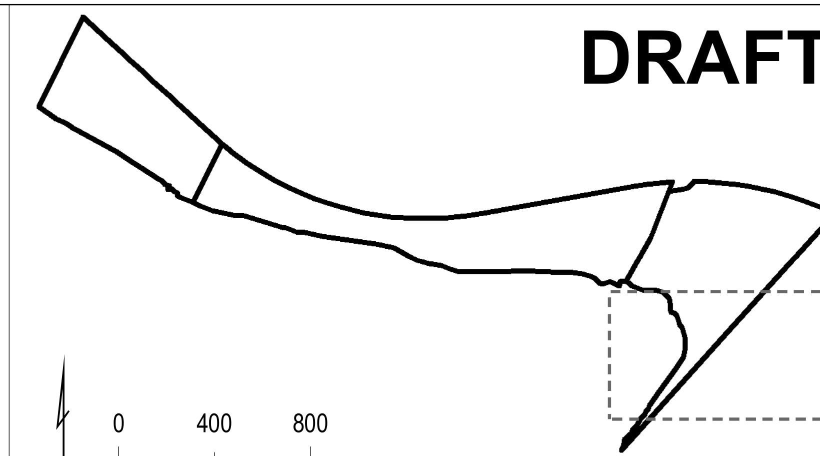


Legend:

- Discrete Sample Location
- Sample Locations Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

0 60 120
Approximate Scale in Feet

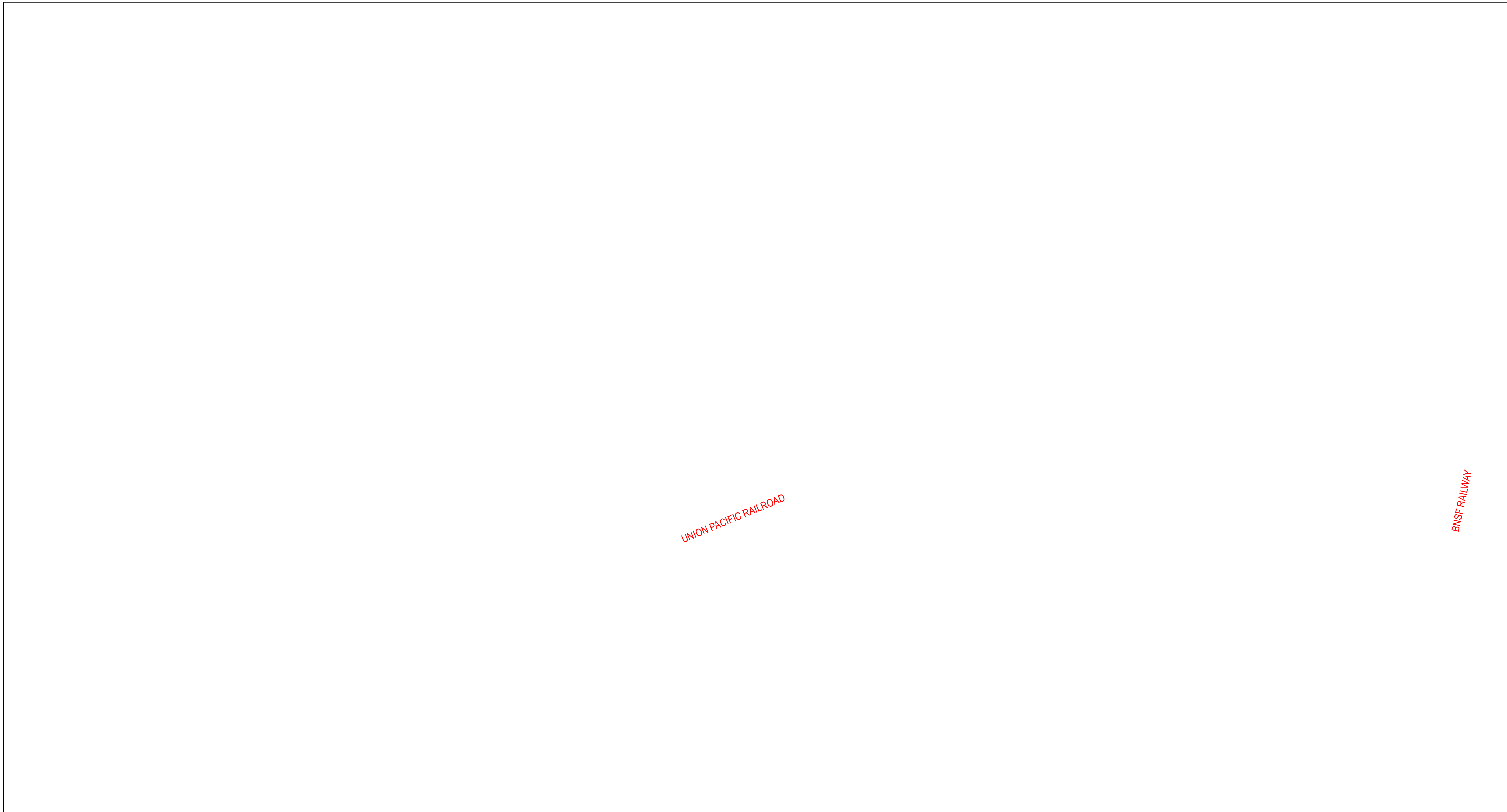
N

Discrete Soil Sample Locations - 5 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-1e



Legend:

- Composite Sample Location
- Center of Entire or Significant Portion of Sample Location Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 200 400
Approximate Scale in Feet

N

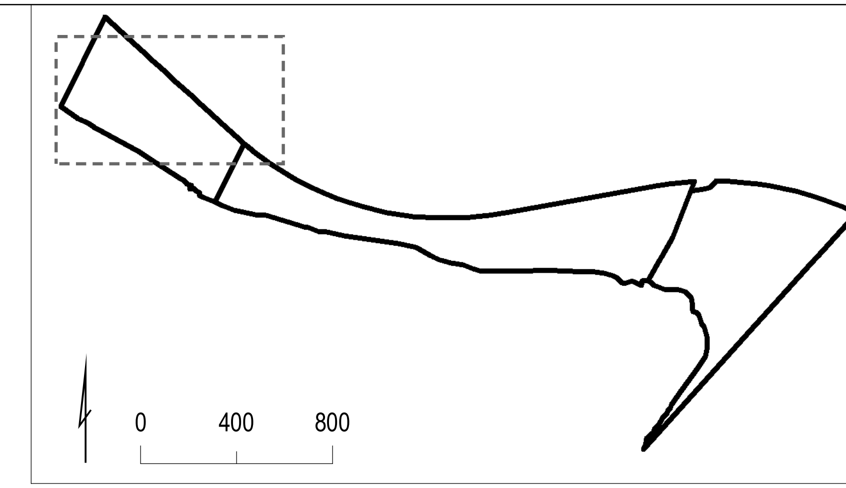
Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

Composite Soil Sample Locations

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-2



Legend:

- Composite Sample Location
- Center of Entire or Significant Portion of Sample Location Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

0 60 120
Approximate Scale in Feet

N

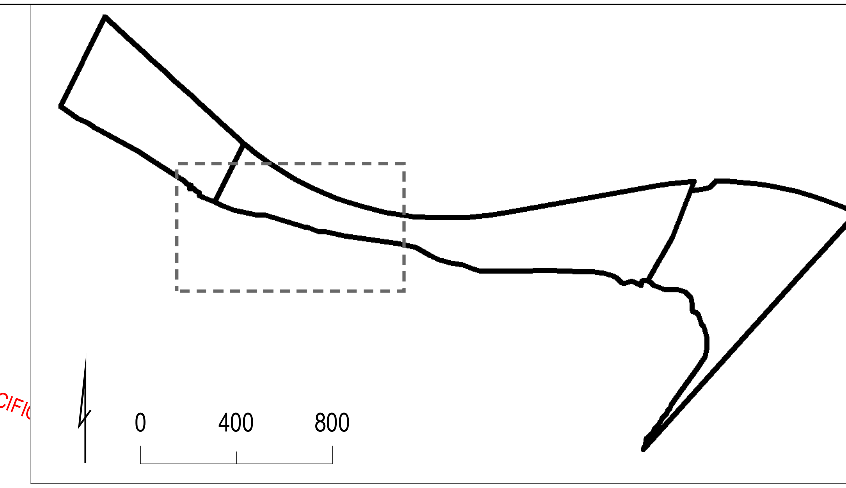
Composite Soil Sample Locations - 1 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number 1056-10
March 2019

Figure C-2a



UNION PACIFIC

Legend:

- Composite Sample Location
- Center of Entire or Significant Portion of Sample Location Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 60 120
Approximate Scale in Feet
N

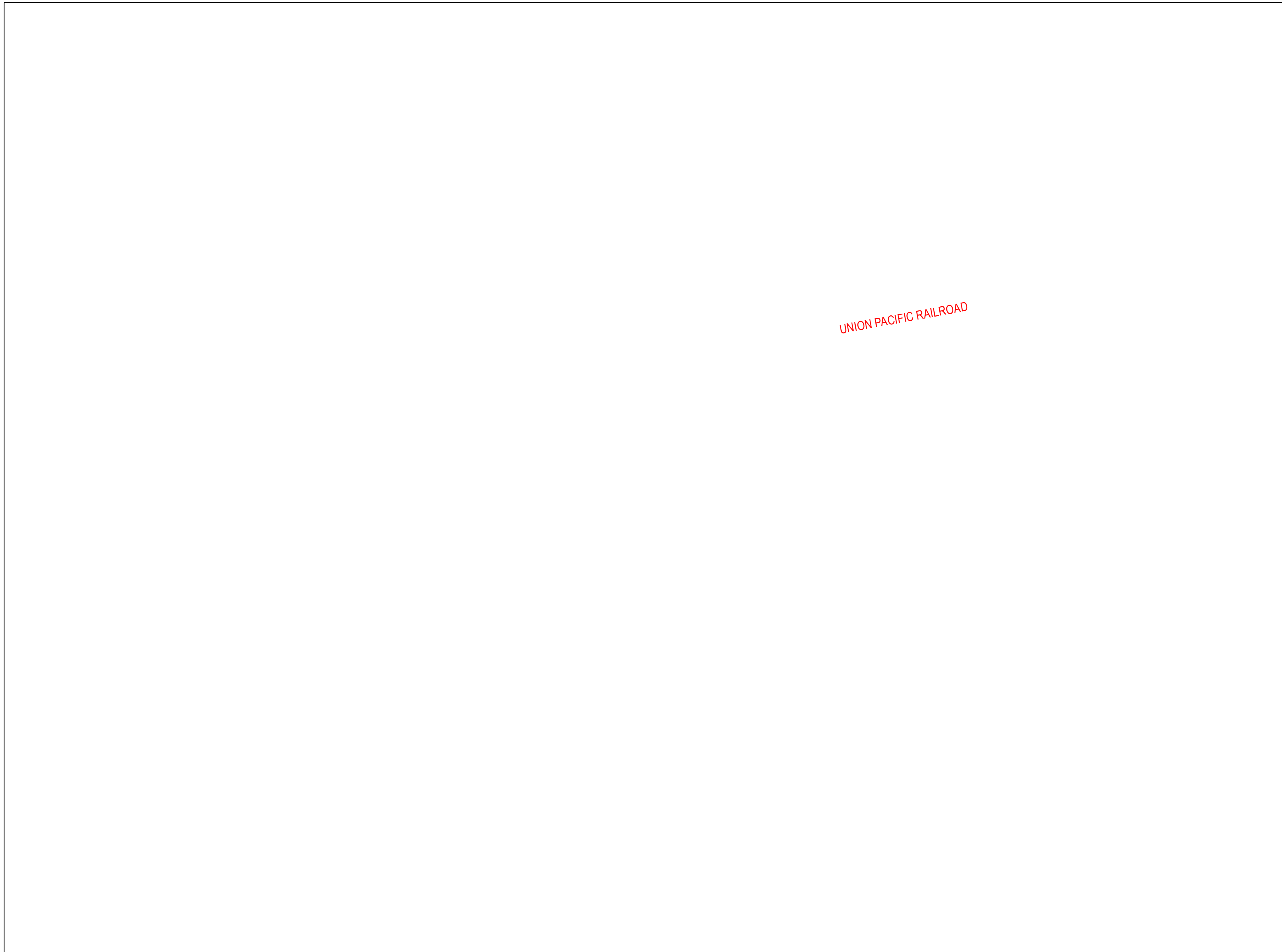
Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

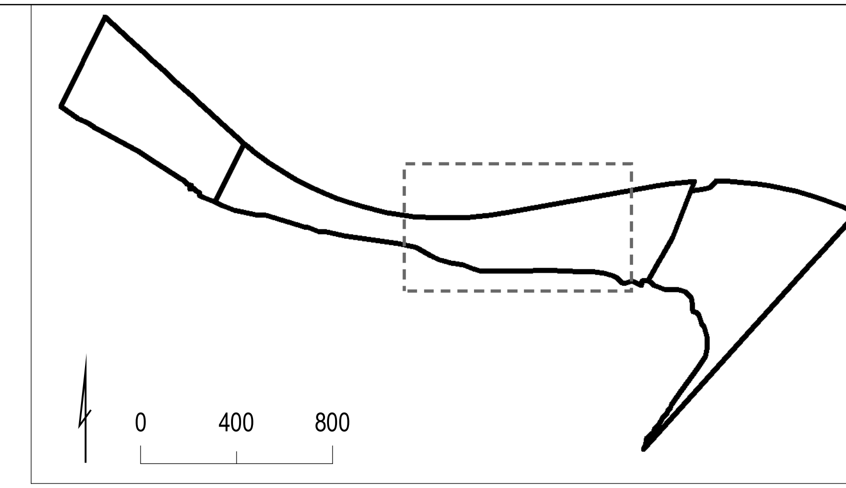
Composite Soil Sample Locations - 2 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-2b





Legend:

- Composite Sample Location
- Center of Entire or Significant Portion of Sample Location Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 60 120
Approximate Scale in Feet

N

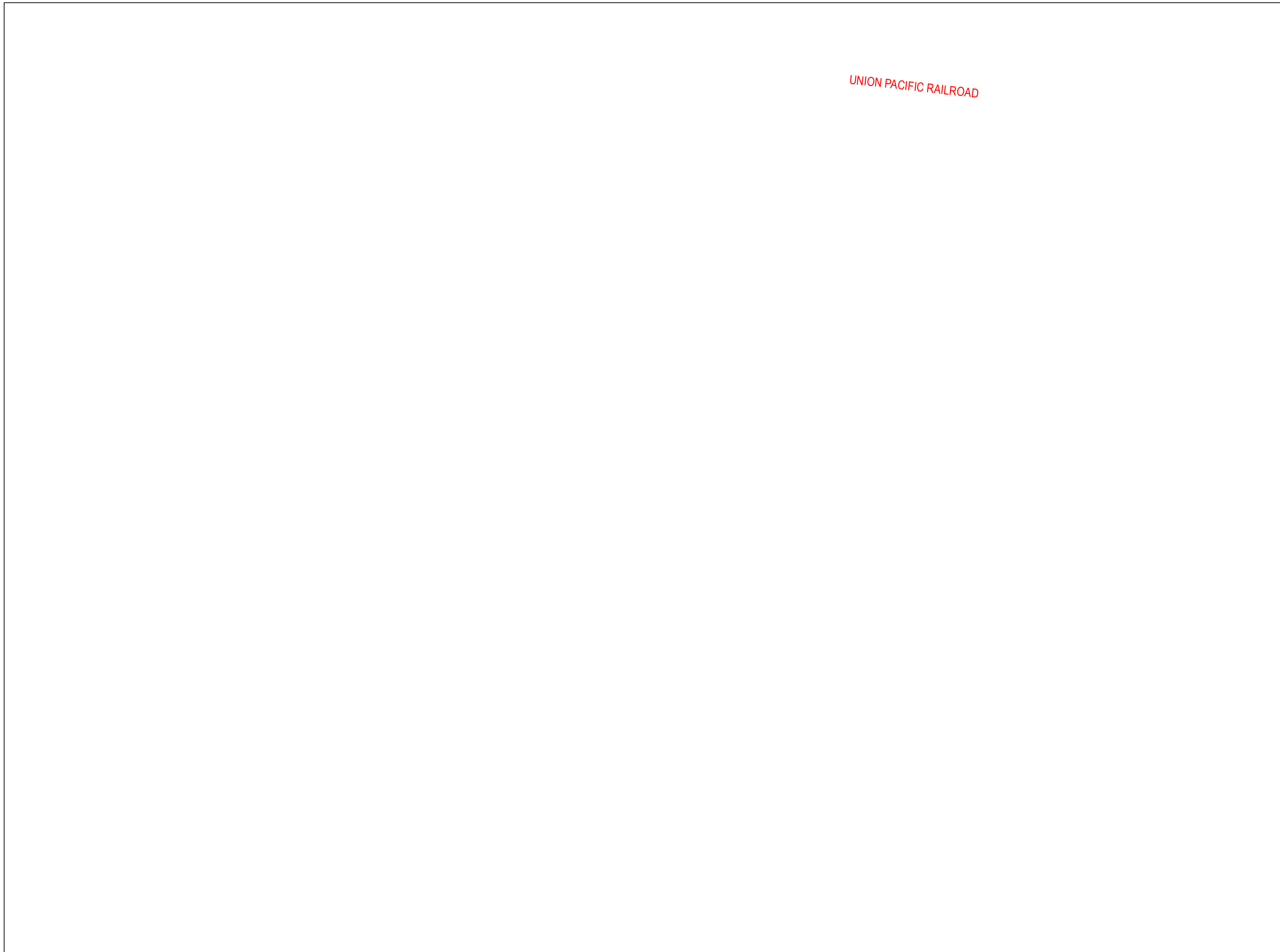
Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

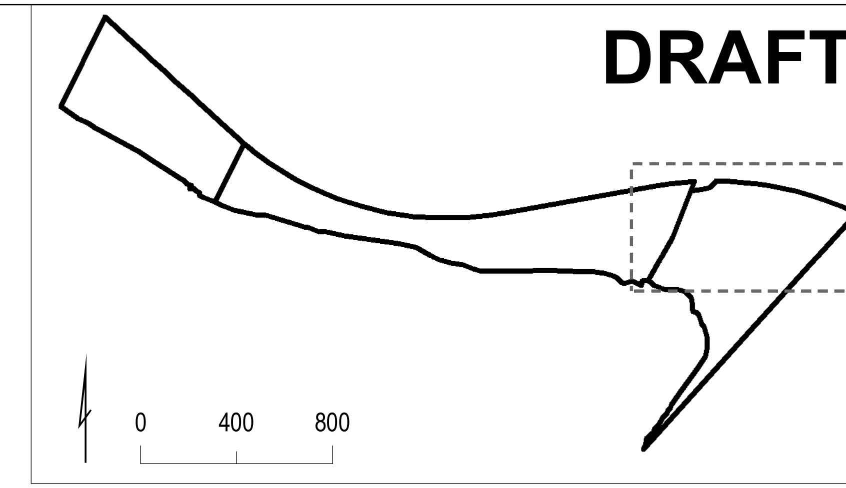
Composite Soil Sample Locations - 3 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number 1056-10
March 2019
Figure C-2c





Legend:

- Composite Sample Location
- Center of Entire or Significant Portion of Sample Location Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 60 120
Approximate Scale in Feet
N

Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

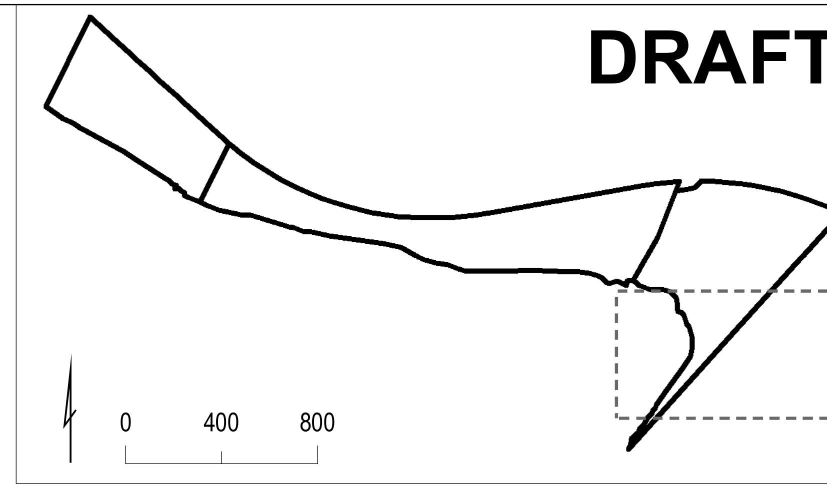
Composite Soil Sample Locations - 4 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-2d

DRAFT



Legend:

- Composite Sample Location
- Center of Entire or Significant Portion of Sample Location Removed During 2008/2015 Soil Removal Actions
- Parcel Boundary
- Removal Action Area
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

0 60 120
Approximate Scale in Feet
N

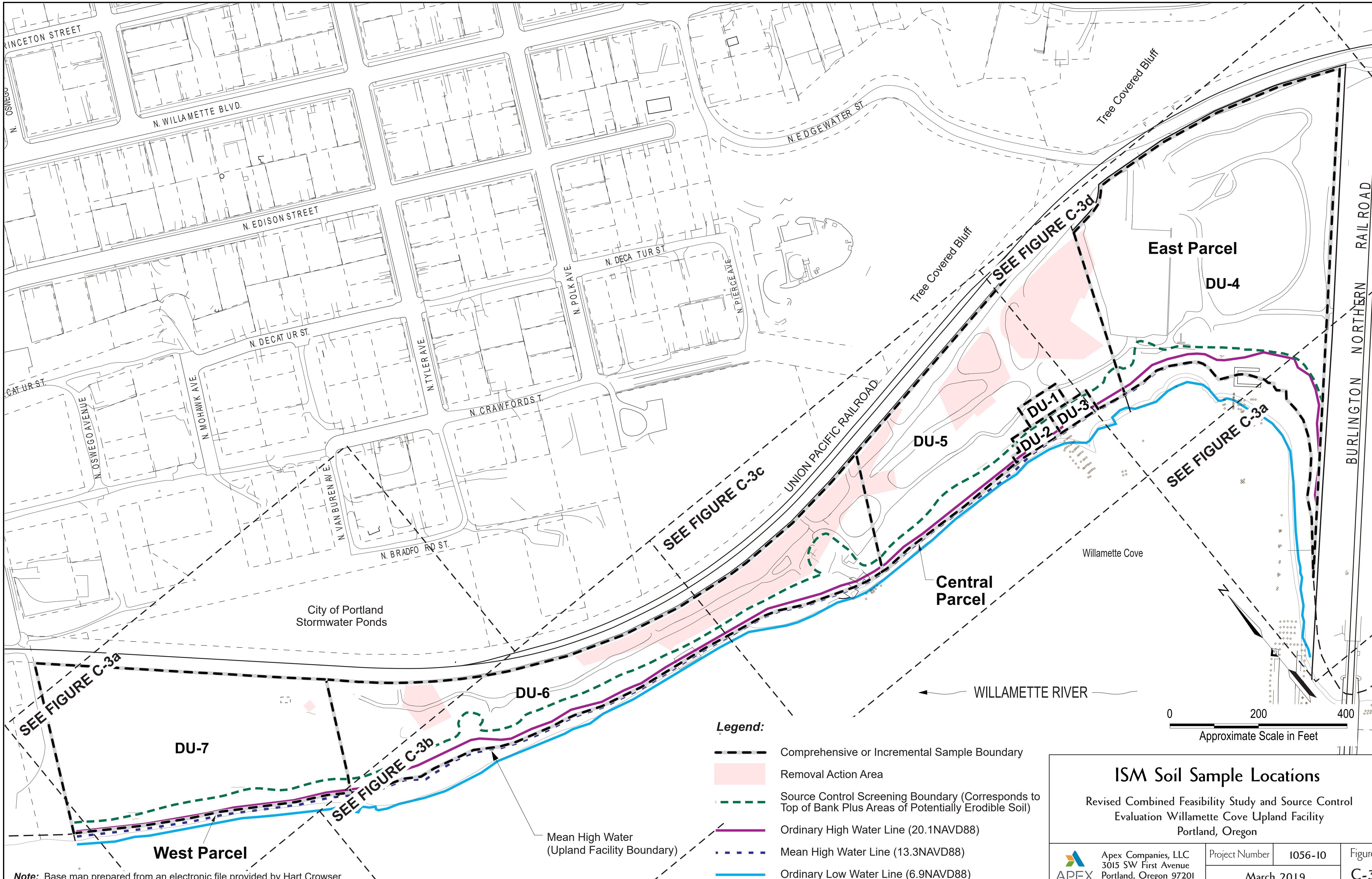
Basemap prepared using spatial data from Metro (2010-2017), Apex, Formation Environmental, and Hart Crowser. Coordinate System: NAD83 HARN StatePlane Oregon North FIPS 3601 (Intl Feet).

Composite Soil Sample Locations - 5 of 5

Revised Feasibility Study and Source Control Evaluation
Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number 1056-10
March 2019
Figure C-2e



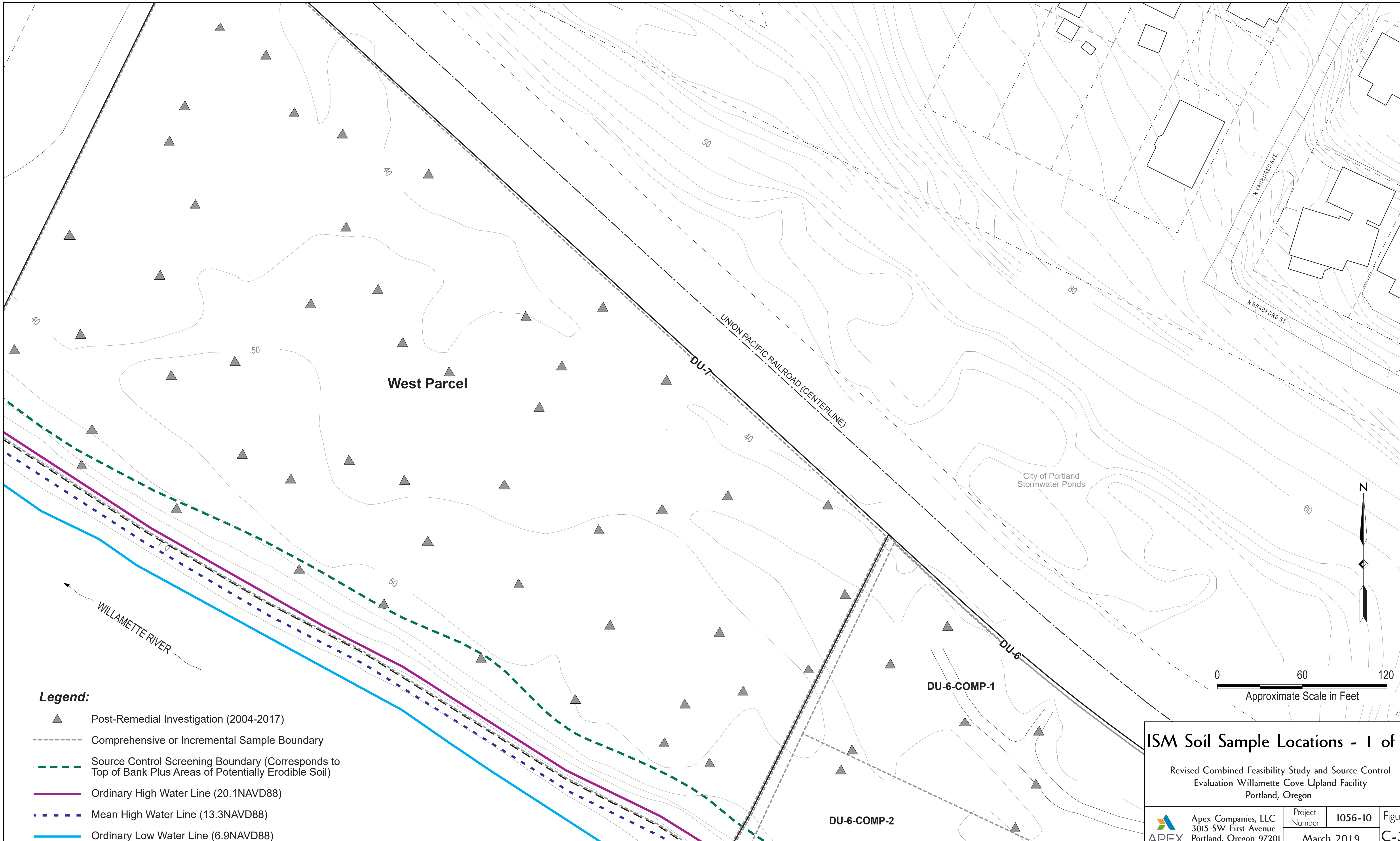
Note: Base map prepared from an electronic file provided by Hart Crowser.

ISM Soil Sample Locations

Revised Combined Feasibility Study and Source Control Evaluation Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

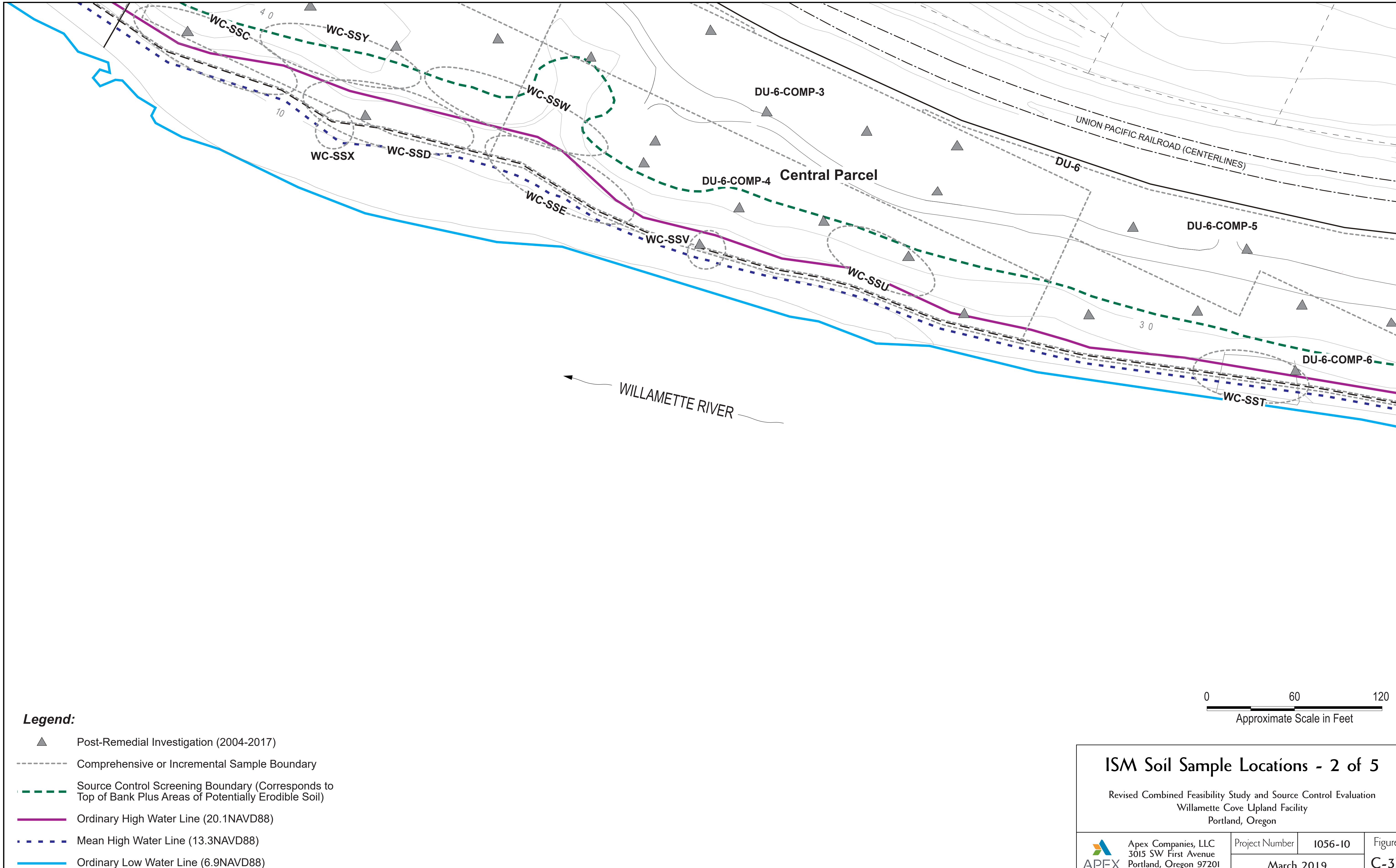
Project Number	1056-10	Figure
March 2019		C-3



ISM Soil Sample Locations - 1 of 5

Revised Combined Feasibility Study and Source Control Evaluation Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1056-10	Figure
	March 2019		C-3a

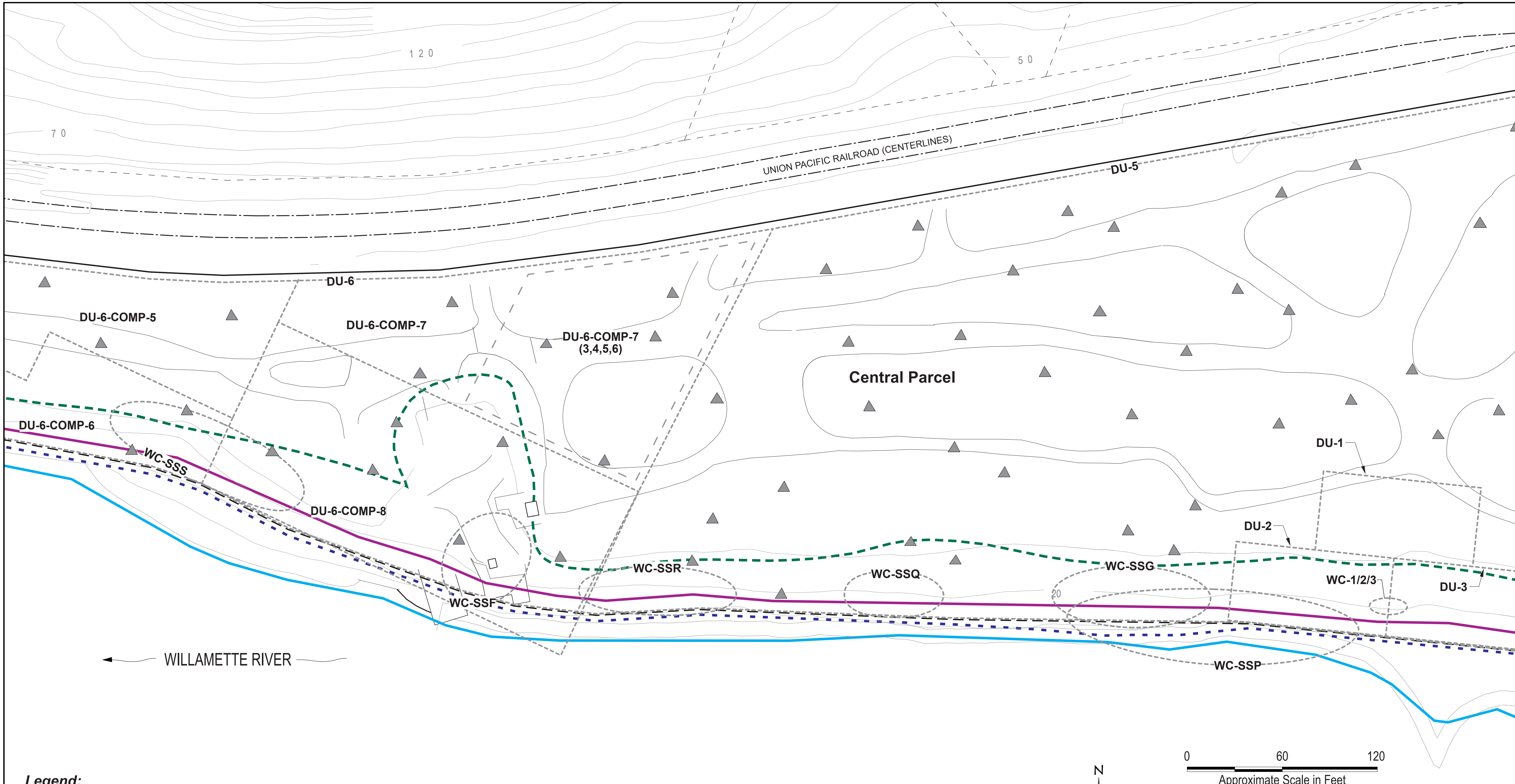


ISM Soil Sample Locations - 2 of 5

Revised Combined Feasibility Study and Source Control Evaluation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-3b



Legend:

- Post-Remedial Investigation (2004-2017)
- Comprehensive or Incremental Sample Boundary
- Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
- Ordinary High Water Line (20.1NAVD88)
- Mean High Water Line (13.3NAVD88)
- Ordinary Low Water Line (6.9NAVD88)

ISM Soil Sample Locations - 3 of 5

Revised Combined Feasibility Study and Source Control Evaluation
Willamette Cove Upland Facility
Portland, Oregon

APEX
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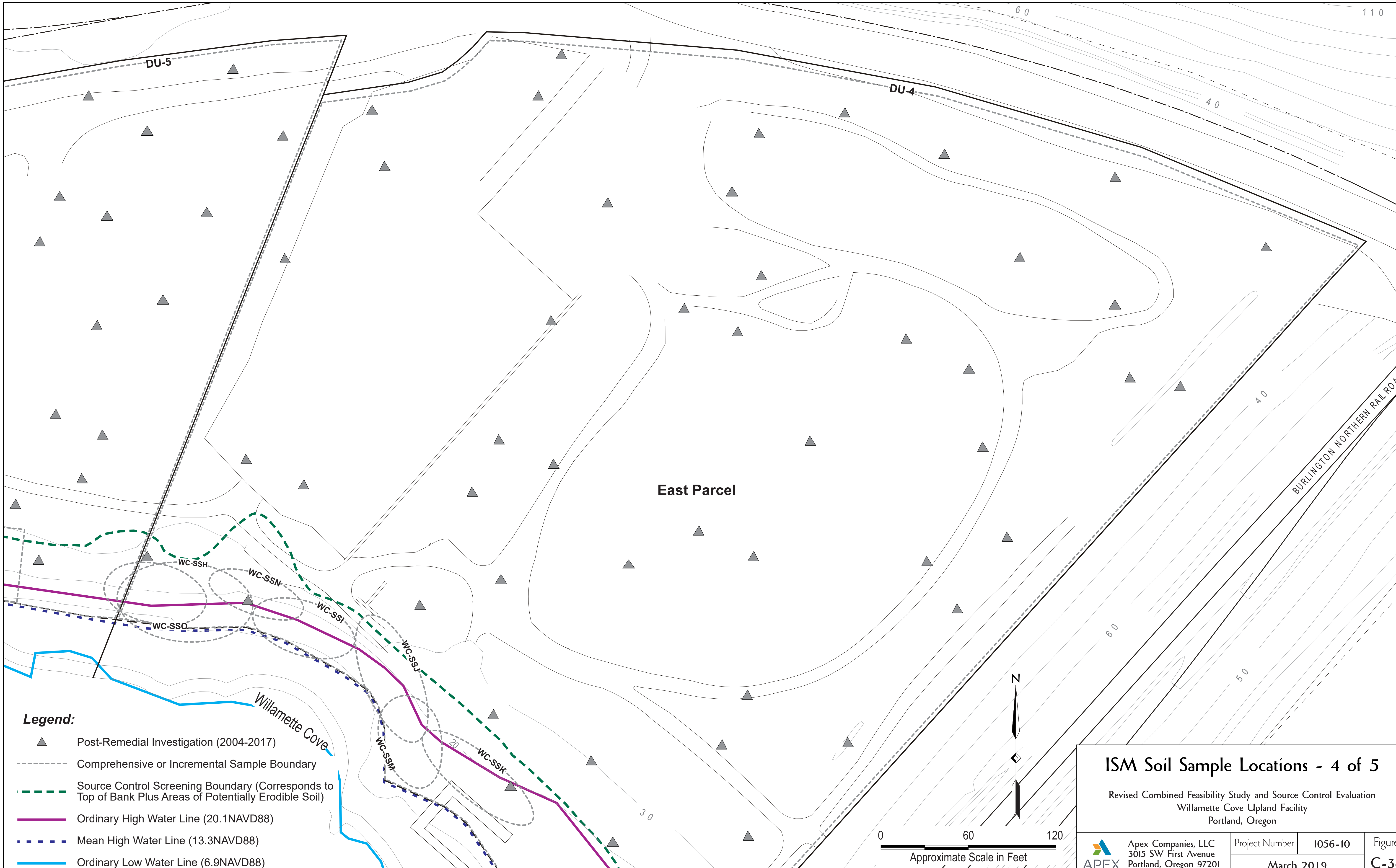
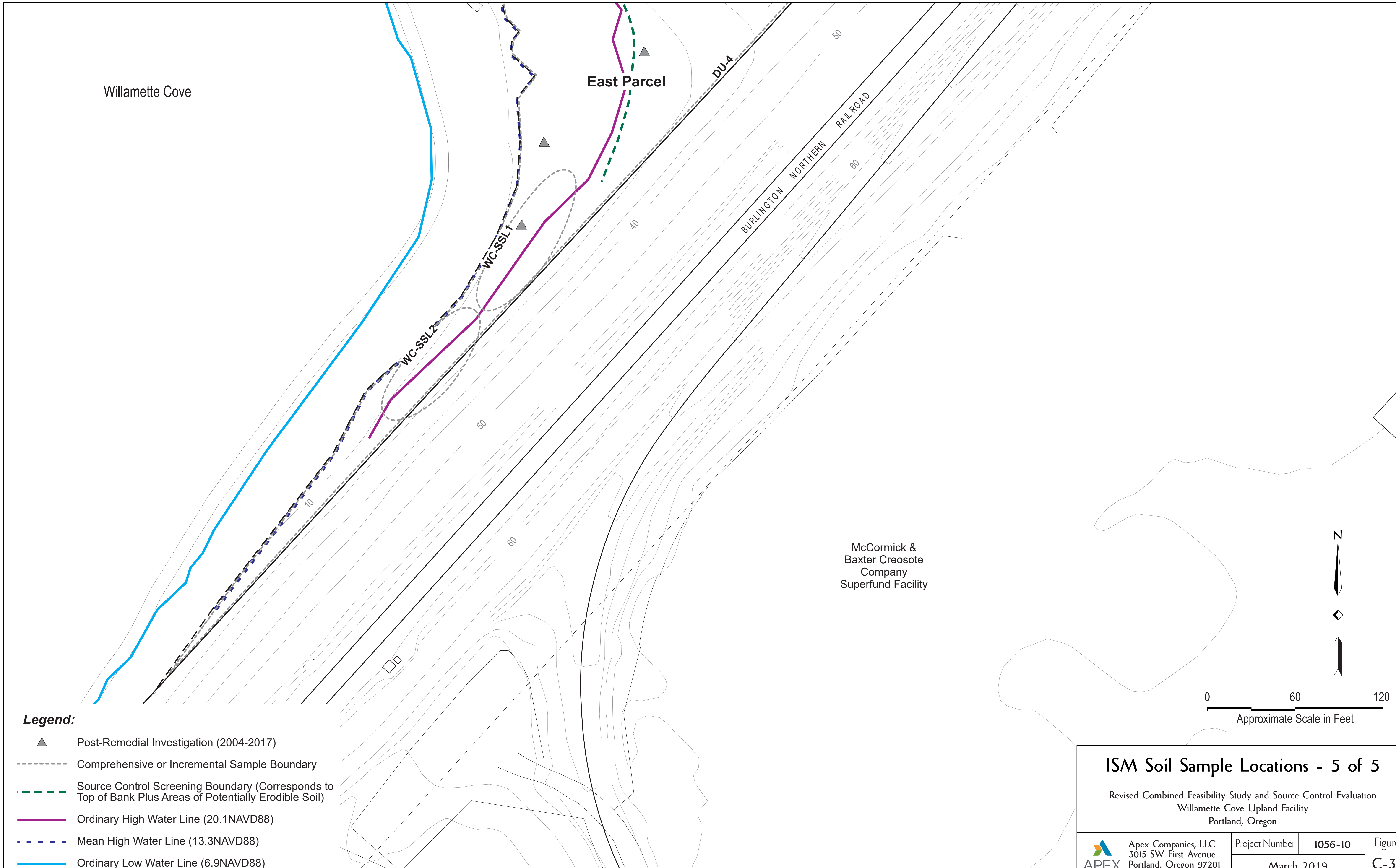
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-3c



DU-5
DU-4
East Parcel
WC-SSH
WC-SSN
WC-SSI
WC-SSO
WC-SSJ
WC-SSM
WC-SSK
Willamette Cove
BURLINGTON NORTHERN RAILROAD
N
0
60
120
Approximate Scale in Feet
Legend:
Post-Remedial Investigation (2004-2017)
Comprehensive or Incremental Sample Boundary
Source Control Screening Boundary (Corresponds to Top of Bank Plus Areas of Potentially Erodible Soil)
Ordinary High Water Line (20.1NAVD88)
Mean High Water Line (13.3NAVD88)
Ordinary Low Water Line (6.9NAVD88)
ISM Soil Sample Locations - 4 of 5
Revised Combined Feasibility Study and Source Control Evaluation
Willamette Cove Upland Facility
Portland, Oregon
APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201
Project Number
1056-10
March 2019
Figure
C-3d



ISM Soil Sample Locations - 5 of 5

Revised Combined Feasibility Study and Source Control Evaluation
Willamette Cove Upland Facility
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-10	Figure
March 2019		C-3e

Appendix B

Historical Soil Sample Analytical Results

Table B-1
Historical Soil Sample Analytical Results - PCB Aroclors
Willamette Cove Upland Facility
Portland, Oregon

	PCB Aroclors (mg/kg)																
	Central Parcel																
Sample ID	HA-6/S-1	TP-22/S-1	TP-29/S-1	TP-7	WC-1/2/3	WC-SSF	WC-SSG	WC-SSH-D	WC-SSH-E	WC-SSH-F	WC-SSP (Comp)-1	WC-SSQ(Composite)	WC-SSR(Composite)	WC-SSS(Composite)	WC-SST(Comp)-1	WC-SSU(Composite)	WC-SSV-1-1
Minimum Depth (feet bgs)	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	5/18/2001	4/17/2001	4/18/2001	10/19/1995	10/1/2010	12/21/2005	12/21/2005	12/27/2007	12/27/2007	12/27/2007	10/4/2010	10/1/2010	10/1/2010	10/1/2010	10/4/2010	10/1/2010	10/4/2010
Sample Type	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Composite	Discrete	Discrete	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Discrete
Aroclor 1016	0.067 U	0.067 U	0.067 U	0.1 U	0.0054 U	0.0391 U	0.0581 U	0.01 U	0.01 U	0.01 U	0.0044 U	0.0042 U	0.0043 U	0.0043 U	0.0047 U	0.0043 U	0.0049 U
Aroclor 1221	0.134 U	0.134 U	0.134 U	0.3 U	0.0027 U	0.0787 U	0.117 U	0.02 U	0.02 U	0.02 U	0.0088 U	0.0084 U	0.0086 U	0.0086 U	0.0094 U	0.0086 U	0.0097 U
Aroclor 1232	0.067 U	0.067 U	0.1 U	0.1 U	0.0037 U	0.0391 U	0.0581 U	0.01 U	0.01 U	0.015 U	0.0088 U	0.0084 U	0.0086 U	0.0086 U	0.0094 U	0.0086 U	0.0097 U
Aroclor 1242	0.067 U	0.067 U	0.067 U	0.1 U	0.005 U	0.0391 U	0.0581 U	0.01 U	0.01 U	0.031 U	0.0066 U	0.0063 U	0.0065 U	0.0064 U	0.007 U	0.0064 U	0.0073 U
Aroclor 1248	0.067 U	0.067 U	0.067 U	0.1 U	0.0047 U	0.0391 U	0.0581 U	0.01 U	0.01 U	0.01 U	0.0066 U	0.0063 U	0.0065 U	0.0064 U	0.007 U	0.0064 U	0.0073 U
Aroclor 1254	0.134 U	0.067 U	0.1 U	0.1 U	0.0029 U	0.0391 U	0.0581 U	0.01 U	0.01 U	0.01 U	0.0055 U	0.0052 U	0.0054 U	0.0054 U	0.0058 U	0.0054 U	0.0061 U
Aroclor 1260	0.134 U	0.067 U	0.1 U	0.1 U	0.0058 U	0.0391 U	0.0581 U	0.21	0.01 U	0.13	0.0099 U	0.0094 U	0.0097 U	0.0097 U	0.0105 U	0.0096 U	0.0109 U
Aroclor 1262	--	--	--	--	0.0034 U	--	--	0.01 U	0.01 U	0.01 U	0.0044 U	0.0042 U	0.0043 U	0.0043 U	0.0047 U	0.0043 U	0.0049 U
Aroclor 1268	--	--	--	--	0.0016 U	--	--	0.01 U	0.01 U	0.01 U	0.0044 U	0.0042 U	0.0043 U	0.0043 U	0.0047 U	0.0043 U	0.0049 U
Total PCBs (as reported in FS)	0.134 U	0.134 U	0.134 U	0.3 U	0.0058 U	0.0787 U	0.117 U	0.21	0.02 U	0.13	0.0099 U	0.0094 U	0.0097 U	0.0097 U	0.0105 U	0.0096 U	0.0109 U
Total PCBs (ND = 1/2 DL)	0.134 U	0.134 U	0.134 U	0.3 U	0.0058 U	0.0787 U	0.117 U	0.26	0.02 U	0.19	0.0099 U	0.0094 U	0.0097 U	0.0097 U	0.0105 U	0.0096 U	0.0109 U

Please see notes at the end of table.

Table B-1
Historical Soil Sample Analytical Results - PCB Aroclors
Willamette Cove Upland Facility
Portland, Oregon

	PCB Aroclors (mg/kg)																	
	Central Parcel				East Parcel													
Sample ID	WC-SSW(Composite)	WC-SSX(Composite)	WC-SSY(Composite)	Wharf Beach -1	Beach Cove-1	Beach Cove-2	HA-1	TP-37/S-1	TP-38/S-2	TP-39/S-2	Trench 1/2	Trench 3	Trench 3/4	Trench 4A	Trench 4B	WC-SSH	WC-SSH-1
Minimum Depth (feet bgs)	0	0	0	1	12	12	0	0	1.5	1.5	8	8	8	8	8	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	1.5	18	18	6	0.5	2	2	8	8	8	8	8	0.5	0.5
Sample Date	10/4/2010	10/4/2010	10/4/2010	9/27/2010	9/27/2010	9/27/2010	12/12/1988	4/16/2001	4/16/2001	4/16/2001	9/28/2010	9/28/2010	9/29/2010	9/29/2010	9/29/2010	12/21/2005	12/21/2005
Sample Type	Composite	Composite	Composite	Discrete	Discrete	Discrete	Composite	Discrete	Discrete	Discrete	Composite	Discrete	Composite	Discrete	Discrete	Composite	Discrete
Aroclor 1016	0.0043 U	0.004 U	0.0055 U	0.0057 U	0.0892 U	0.111 U	--	0.067 U	0.067 U	0.067 U	0.0628 U	0.0048 U	0.0723 U	0.0048 U	0.0049 U	0.0787 U	0.193 UJ
Aroclor 1221	0.0085 U	0.0081 U	0.011 U	0.0113 U	0.178 U	0.222 U	1 U	0.134 U	0.134 U	0.134 U	0.126 U	0.0024 U	0.145 U	0.0024 U	0.0024 U	0.158 U	0.388 UJ
Aroclor 1232	0.0085 U	0.0081 U	0.011 U	0.0113 U	0.178 U	0.222 U	1 U	0.067 U	0.067 U	0.067 U	0.126 U	0.0033 U	0.145 U	0.0034 U	0.0034 U	0.0787 U	0.193 UJ
Aroclor 1242	0.0064 U	0.0061 U	0.0082 U	0.0085 U	0.134 U	0.167 U	1 U	0.067 U	0.067 U	0.067 U	0.0942 U	0.0044 U	0.108 U	0.0045 U	0.0045 U	0.0787 U	0.193 UJ
Aroclor 1248	0.0064 U	0.0061 U	0.0082 U	0.0085 U	0.134 U	0.167 U	0.9 U	0.067 U	0.067 U	0.067 U	0.0942 U	0.0042 U	0.108 U	0.0043 U	0.0043 U	0.0787 U	0.193 UJ
Aroclor 1254	0.0053 U	0.005 U	0.0068 U	0.0071 U	0.112 U	0.139 U	0.8 U	0.067 U	0.067 U	0.067 U	0.0785 U	0.0026 U	7.94	0.363	207	0.0787 U	0.193 UJ
Aroclor 1260	0.0096 U	0.0091 U	0.0123 U	0.0127 U	0.201 U	0.25 U	0.7 U	0.067 U	0.067 U	0.067 U	0.141 U	0.0052 U	0.163 U	0.0052 U	0.0052 U	0.748	1.2 J
Aroclor 1262	0.0043 U	0.004 U	0.0055 U	0.0057 U	0.0892 U	0.111 U	--	--	--	--	0.0628 U	0.003 U	0.0723 U	0.003 U	0.003 U	--	--
Aroclor 1268	0.0043 U	0.004 U	0.0055 U	0.0057 U	0.0892 U	0.111 U	--	--	--	--	0.0628 U	0.0014 U	0.0723 U	0.0014 U	0.0014 U	--	--
Total PCBs (as reported in FS)	0.0096 U	0.0091 U	0.0123 U	0	0	0	0	0.134 U	0.134 U	0.134 U	0.141 U	0.0052 U	7.94	0.363	207	0.748	1.20 J
Total PCBs (ND = 1/2 DL)	0.0096 U	0.0091 U	0.0123 U	0.0127 U	0.201 U	0.25 U	1 U	0.134 U	0.134 U	0.134 U	0.141 U	0.0052 U	8.38	0.378	207	1.02	1.88 J

Please see notes at the end of table.

Table B-1
Historical Soil Sample Analytical Results - PCB Aroclors
Willamette Cove Upland Facility
Portland, Oregon

	PCB Aroclors (mg/kg)																
	East Parcel															West Parcel	
Sample ID	WC-SSH-2	WC-SSH-3	WC-SSH-4	WC-SSH-A	WC-SSH-B	WC-SSH-C	WC-SSH-G	WC-SSH-H	WC-SSH-SHS1	WC-SSH-SHS2	WC-SSI	WC-SSJ	WC-SSK	WC-SSL-1 Composite	WC-SSL-2 Composite	SE/E-12-A	SE/E-13-A
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	2.5	2.5	0	0	0	0	0	5	5
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	3	3	0.5	0.5	0.5	0.5	0.5	10	10
Sample Date	12/21/2005	12/21/2005	12/21/2005	12/27/2007	12/27/2007	12/27/2007	12/27/2007	12/27/2007	4/21/2008	4/21/2008	12/21/2005	12/21/2005	12/21/2005	9/28/2010	9/30/2010	12/9/1988	12/9/1988
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Composite
Aroclor 1016	0.0393 UJ	0.403 UJ	0.0374 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0391 U	0.0391 U	0.0419 U	0.0058 U	0.0059 U	1 U	1 U
Aroclor 1221	0.0792 UJ	0.811 UJ	0.0752 UJ	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0787 U	0.0787 U	0.0843 U	0.0029 U	0.0029 U	1 U	1 U
Aroclor 1232	0.0393 UJ	0.403 UJ	0.0374 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0391 U	0.0391 U	0.0419 U	0.0041 U	0.0041 U	1 U	1 U
Aroclor 1242	0.0393 UJ	0.403 UJ	0.0374 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0391 U	0.0391 U	0.0419 U	0.0054 U	0.0054 U	1 U	1 U
Aroclor 1248	0.0393 UJ	0.403 UJ	0.0374 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	0.0391 U	0.0391 U	0.0419 U	0.0052 U	0.0052 U	1 U	1 U
Aroclor 1254	0.0393 UJ	0.403 UJ	0.0374 UJ	0.01 U	0.01 U	0.017	0.012 U	0.01 U	0.01 U	0.028 P	0.0391 U	0.0391 U	0.0419 U	0.0031 U	0.0031 U	1 U	1 U
Aroclor 1260	0.261 J	1.85 J	0.0374 UJ	0.01 U	0.01 U	0.029	0.022	0.01 U	0.01 U	0.075	0.0391 U	0.0391 U	0.0419 U	0.0063 U	0.0063 U	--	1 U
Aroclor 1262	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	--	--	--	0.0037 U	0.0037 U	--	--
Aroclor 1268	--	--	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0099 U	--	--	--	0.0017 U	0.0017 U	--	--
Total PCBs (as reported in FS)	0.261 J	1.85 J	0.0752 U	0.02 U	0.02 U	0.046	0.022	0.02 U	0.02 U	0.10 P	0.0787 U	0.0787 U	0.0843 U	0.0063 U	0.0063 U	0	0
Total PCBs (ND = 1/2 DL)	0.399 J	3.26 J	0.0752 UJ	0.02 U	0.02 U	0.086	0.068	0.02 U	0.02 U	0.14 J	0.0787 U	0.0787 U	0.0843 U	0.0063 U	0.0063 U	1 U	1 U

Please see notes at the end of table.

Table B-1
Historical Soil Sample Analytical Results - PCB Aroclors
Willamette Cove Upland Facility
Portland, Oregon

	PCB Aroclors (mg/kg)			
	West Parcel			
Sample ID	TP-18/S-4	TP-3	WC-SSA	WC-SSB
Minimum Depth (feet bgs)	5.5	0	0	0
Maximum Depth (feet bgs)	6	3.8	0.5	0.5
Sample Date	7/31/2001	10/20/1995	12/21/2005	12/21/2005
Sample Type	Discrete	Discrete	Discrete	Discrete
Aroclor 1016	--	0.1 U	0.0514 U	0.049 U
Aroclor 1221	0.134 U	0.1 U	0.103 U	0.0985 U
Aroclor 1232	0.067 U	0.1 U	0.0514 U	0.049 U
Aroclor 1242	0.067 U	0.1 U	0.0514 U	0.049 U
Aroclor 1248	0.067 U	0.1 U	0.0514 U	0.049 U
Aroclor 1254	0.067 U	0.1 U	0.0514 U	0.049 U
Aroclor 1260	0.067 U	0.1 U	0.111	0.049 U
Aroclor 1262	--	--	--	--
Aroclor 1268	--	--	--	--
Total PCBs (as reported in FS)	0	0.1 U	0.111	0.0985 U
Total PCBs (ND = 1/2 DL)	0.134 U	0.1 U	0.291	0.0985 U

Notes:
1. mg/kg = Milligrams per kilogram.
2. PCBs = Polychlorinated biphenyls.
3. ND = Not detected.
4. DL = Detection or reporting limit.
5. -- = Value not available or PCB Aroclor was not analyzed.
6. bgs = Below ground surface.
7. U = Analyte was not detected.
8. J = Result is estimated.
9. P = GC or HPLC confirmation criteria exceeded. Analyte could not be confirmed and is tentatively identified.
10. UJ = The analyte was analyzed for but was not detected. However, the detection limit may be inaccurate or imprecise.
11. Shading = Sample locations removed during the 2008/2015 soil removal actions.

Table B-2
Historical Soil Sample Analytical Results - PCB Congeners
Willamette Cove Upland Facility
Portland, Oregon

	PCB Congeners (ng/g)											
	West Parcel											
Sample ID	DP-2 (10-30)		DP-2 (40-45)		DP-4 (10-30)		DP-4 (40-42)		DP-5 (10-30)		DP-5 (40-45)	
Minimum Depth (feet bgs)	10		40		10		40		10		40	
Maximum Depth (feet bgs)	30		45		30		45		30		45	
Sample Date	12/19/2016		12/19/2016		12/21/2016		12/21/2016		1/14/2017		1/14/2017	
Sample Type	Composite		Composite		Composite		Composite		Composite		Composite	
2-MonoCB-(1)	0.0153		0.557		1.13		0.0188		0.674		0.0338	
3-MonoCB-(2)	0.0018	U	0.0387		0.059		0.0091		0.0446		0.0032	
4-MonoCB-(3)	0.0092		0.144		0.509		0.0197		0.241		0.0134	
22'-DiCB-(4)	0.08		5.97		0.577		0.104		0.295		0.442	
2,3-DiCB-(5)	0.071	U	0.064	U	0.074	U	0.096	U	0.074	U	0.074	U
2,3'-DiCB-(6)	0.232		0.052	U	0.14	U	0.225		0.14	U	0.059	U
2,4-DiCB-(7)	0.075		0.058	U	0.066	U	0.086	U	0.066	U	0.066	U
2,4'-DiCB-(8)	0.834		0.149		0.427		0.754		0.427		0.16	
2,5-DiCB-(9)	0.074		0.052	U	0.059	U	0.077	U	0.059	U	0.059	U
2,6-DiCB-(10)	0.068	U	0.047	U	0.056	U	0.069	U	0.056	U	0.047	U
3,3'-DiCB-(11)	0.058	U	0.048	U	0.056	U	0.051	U	0.058		0.076	U
DiCB-(12)+(13)	0.063	U	0.363		0.061	U	0.056	U	0.1		0.083	U
3,5-DiCB-(14)	0.057	U	0.047	U	0.055	U	0.05	U	0.057		0.075	U
4,4'-DiCB-(15)	0.1	U	2.49		0.28		0.2	U	0.21		0.25	
22'3-TriCB-(16)	0.288		6.5		0.444		0.396		0.195		0.551	
22'4-TriCB-(17)	0.28		6.36		0.69		0.409		0.741		0.575	
TriCB-(18)+(30)	0.743		10.9		0.994		0.873		0.762		1.03	
22'6-TriCB-(19)	0.0597		1.7		0.211		0.0952		0.24		0.143	
TriCB-(20) + (28)	0.942		12.8		2.25		1.98		3		1.28	
TriCB-(21)+(33)	0.459		7.05		1.4		0.576		2.26		0.663	
234'-TriCB-(22)	0.313		4.34		0.408		0.459		0.189		0.41	
235-TriCB-(23)	0.0053	U	0.013		0.0079	U	0.0082	U	0.0058		0.0045	U
236-TriCB-(24)	0.0062	U	0.012	U	0.012	U	0.0096	U	0.0093		0.015	U
23'4-TriCB-(25)	0.0673		1.15		0.731		0.106		2.01		0.157	
TriCB-(26)+(29)	0.127		2.2		0.454		0.221		1.08		0.258	
23'6-TriCB-(27)	0.0301		0.727		0.305		0.0508		0.825		0.064	
24'5-TriCB-(31)	0.887		9.68		1.38		1.37		1.51		0.978	
24'6-TriCB-(32)	0.19		3.15		3.16		0.292		7.52		0.311	
23'5'-TriCB-(34)	0.0051	U	0.102		0.0152		0.0191		0.0116		0.0094	
33'4-TriCB-(35)	0.0066		0.104		0.0148		0.0246		0.0288		0.0085	
33'5-TriCB-(36)	0.0038	U	0.0092	U	0.0056	U	0.0059	U	0.0041		0.0032	U
344'-TriCB-(37)	0.184		2.41		0.259		0.492		0.142		0.21	
345-TriCB-(38)	0.0043	U	0.01	U	0.022	U	0.0067	U	0.073		0.0037	U
34'5-TriCB-(39)	0.0082		0.067		0.0703		0.022		0.133		0.0062	
TetraCB-(40)+(41)+(71)	0.916		4.27		3.53		1.76		5.92		0.505	
22'34'-TetraCB-(42)	0.458		2.73		0.949		0.944		0.982		0.248	
22'35-TetraCB-(43)	0.0849		0.389		0.134		0.15		0.125		0.0388	
TetraCB-(44)+(47)+(65)	1.75		9.66		47.2		3.54		118		1.5	
TetraCB-(45)+(51)	0.324		1.97		27.9		0.563		72.3		0.463	

Please see notes at the end of table.

Table B-2
Historical Soil Sample Analytical Results - PCB Congeners
Willamette Cove Upland Facility
Portland, Oregon

	PCB Congeners (ng/g)					
	West Parcel					
Sample ID	DP-2 (10-30)	DP-2 (40-45)	DP-4 (10-30)	DP-4 (40-42)	DP-5 (10-30)	DP-5 (40-45)
Minimum Depth (feet bgs)	10	40	10	40	10	40
Maximum Depth (feet bgs)	30	45	30	45	30	45
Sample Date	12/19/2016	12/19/2016	12/21/2016	12/21/2016	1/14/2017	1/14/2017
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite
22'36'-TetraCB-(46)	0.114	0.638	0.683	0.181	1.5	0.0697
22'45-TetraCB-(48)	0.391	1.99	0.301	0.712	0.155	0.164
TetraCB-(49)+TetraCB-(69)	1.01	8.44	22.7	2.27	64.3	1.39
TetraCB-(50)+(53)	0.252	1.4	13.6	0.446	34.2	0.389
22'55'-TetraCB-(52)	1.91	11.8	11.1	4.52	26.6	1.49
22'66'-TetraCB-(54)	0.0072 U	0.0313	4.06	0.0094	10.2	0.0501
233'4-TetraCB-(55)	0.0078	0.0182	0.0035 U	0.0062 U	0.0059	0.003 U
233'4'-Tetra CB(56)	0.726	3.25	0.811	1.57	0.358	0.261
233'5-TetraCB-(57)	0.0042	0.0296	0.0139	0.0094	0.0411	0.0068
233'5'-TetraCB-(58)	0.0026 U	0.006 U	0.0032 U	0.0057 U	0.0054	0.0027 U
TetraCB-(59)+(62)+(75)	0.117	0.787	1.64	0.276	4.91	0.076
2344'-TetraCB -(60)	0.355	0.478	0.124	0.564	0.0741	0.0396
TetraCB-(61)+(70)+(74)+(76)	2.77	11.7	4.32	6.69	3.33	0.956
234'5-TetraCB-(63)	0.0575	0.274	0.235	0.144	0.302	0.0207
234'6-TetraCB-(64)	0.795	3.4	1.25	1.61	1.55	0.315
23'44'-TetraCB-(66)	1.24	6.1	1.99	3.1	1.4	0.495
23'45-TetraCB-(67)	0.0403	0.228	0.252	0.102	0.811	0.0233
23'45'-TetraCB-(68)	0.0061	0.297	0.647	0.0281	1.33	0.0232
23'55'-TetraCB-(72)	0.0099	0.341	0.198	0.0524	0.342	0.0272
23'5'6-TetraCB-(73)	0.0025 U	0.014	0.694	0.0044	1.82	0.0124
33'44'-TetraCB-(77)	0.105	0.493	0.0912	0.297	0.0542	0.0422
33'45-TetraCB-(78)	0.0022 U	0.0052 U	0.0028 U	0.0049 U	0.0272	0.0024 U
33'45'-TetraCB(79)	0.0138	0.17	0.0911	0.0502	0.125	0.0148
33'55'-TetraCB-(80)	0.0022 U	0.005 U	0.0027 U	0.0047 U	0.0045	0.0023 U
344'5-TetraCB-(81)	0.0045	0.0077 U	0.0042 U	0.0073 U	0.0069	0.0035 U
22'33'4-PentaCB-(82)	0.363	0.697	0.264	0.0646	0.264	0.248
PentaCB-(83)+(99)	0.965	18.3	6.26	3.17	7.16	1.59
22'33'6-PentaCB-(84)	1.63	1.71	1.66	0.206	1.66	0.555
PentaCB-(85)+(116)+(117)	0.304	1.17	1.49	0.951	2.98	0.0734
PentaCB-(86)(87)(97)(109)(119)(125)	1.19	8.33	4.5	4.03	6.27	0.693
PentaCB-(88)+(91)	0.301	2.73	11.8	0.833	32.9	0.432
22'346'-PentaCB-(89)	0.032	0.0789	0.0201	0.0073 U	0.0201	0.035
PentaCB-(90)+(101)+(113)	1.62	34.7	12.9	6.06	16.9	3.03
22'355'-PentaCB-(92)	3.23	1.11	5.06	1.02	5.06	0.301
PentaCB-(93)+(98)+(100)+(102)	0.0966	0.783	10.9	0.253	38	0.223
22'356'-PentaCB-(94)	1.38	0.0301	2.92	0.0165	2.92	0.0121
22'35'6-PentaCB-(95)	7.65	4.41	9.01	2.01	9.01	1.43
22'366'-PentaCB-(96)	1.62	0.0425	4.02	0.0298	4.02	0.0203
22'45'6-PentaCB-(103)	2.3	0.0583	8.06	0.212	8.06	0.015

Please see notes at the end of table.

Table B-2
Historical Soil Sample Analytical Results - PCB Congeners
Willamette Cove Upland Facility
Portland, Oregon

	PCB Congeners (ng/g)					
	West Parcel					
Sample ID	DP-2 (10-30)	DP-2 (40-45)	DP-4 (10-30)	DP-4 (40-42)	DP-5 (10-30)	DP-5 (40-45)
Minimum Depth (feet bgs)	10	40	10	40	10	40
Maximum Depth (feet bgs)	30	45	30	45	30	45
Sample Date	12/19/2016	12/19/2016	12/21/2016	12/21/2016	1/14/2017	1/14/2017
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite
22'466'-PentaCB-(104)	0.917	0.0034 U	3.79	0.0074	3.79	0.00081 U
233'44'-PentaCB-(105)	0.909	2.04	0.784	0.195	0.784	0.633
233'45-PentaCB-(106)	0.0017 U	0.014 U	0.0035 U	0.0035 U	0.0034	0.003 U
233'4'5-PentaCB-(107)	0.096	1.48	0.572	0.393	0.5	0.129
PentaCB-(108)+(124)	0.0506	0.182	0.101	0.166	0.0747	0.0123
PentaCB-(110)+(115)	2.12	18.1	7.53	7	7.06	1.53
233'55'-PentaCB-(111)	0.0019 U	0.142	0.0901	0.006	0.158	0.016
233'56-PentaCB-(112)	0.0019 U	0.0083 U	0.0036 U	0.0038 U	0.0054	0.002 U
2344'5-PentaCB-(114)	0.038	0.188	0.0868	0.108	0.114	0.0182
23'44'5-PentaCB-(118)	1.39	8.95	4.06	5.18	2.85	0.638
23'455'-PentaCB-(120)	0.0048	0.461	0.113	0.0222	0.168	0.0446
23'45'6-PentaCB-(121)	0.0019 U	0.083	0.272	0.0039 U	1.02	0.0162
233'4'5'-PentaCB-(122)	0.0328	0.0525	0.0185	0.0032 U	0.0185	0.018
23'44'5'-PentaCB-(123)	0.0283	0.021 U	0.0201	0.0449	0.0126	0.0044 U
33'44'5-PentaCB-(126)	0.0053	0.033 U	0.0069 U	0.015 U	0.013	0.004 U
33'455'-PentaCB-(127)	0.0015 U	0.012 U	0.0032 U	0.0031 U	0.0031	0.0027 U
HexaCB-(128)+(166)	0.31	5.7	1.18	1.17	1.51	0.471
HexaCB-(129)+(138)+(163)	2.05	78.2	13.3	8.8	19.4	6.32
22'33'45'-HexaCB-(130)	0.693	0.5	0.847	0.34	0.847	0.122
22'33'46-HexaCB-(131)	0.0899	0.107	0.087	0.027	0.087	0.022 U
22'33'46'-HexaCB-(132)	4.72	3.19	5.26	2.23	5.26	0.744
22'33'55'-HexaCB-(133)	0.941	0.107	1.98	0.341	1.98	0.0313
HexaCB-(134)+(143)	0.0858	3.13	0.584	0.357	0.727	0.217
HexaCB-(135)+(151)	0.726	60.3	8.34	3.06	12.3	4.63
22'33'66'-HexaCB-(136)	3.32	1.08	5.99	1.25	5.99	0.263
22'344'5-HexaCB-(137)	0.279	0.31	0.332	0.041	0.332	0.0839
HexaCB-(139)+(140)	0.0384	2.15	0.329	0.13	0.645	0.177
22'3455'-HexaCB-(141)	1.85	1.44	2.19	1.17	6.41	0.334
22'3456-HexaCB-(142)	0.0087 U	0.011 U	0.018 U	0.01 U	0.018 U	0.0069
22'345'6-HexaCB-(144)	0.467	0.352	0.541	0.269	0.541	0.093
22'3466'-HexaCB-(145)	0.013 U	0.012 U	0.0096 U	0.015 U	0.0096 U	0.0099 U
22'34'55'-HexaCB-(146)	3.91	1.23	6.41	2.86	6.41	0.303
HexaCB-(147)+(149)	1.59	94.6	19.1	6.74	33.4	7.95
22'34'56'-HexaCB-(148)	0.449	0.014 U	1.21	0.114	1.21	0.012 U
22'34'66'-HexaCB-(150)	0.783	0.012	2.82	0.081	2.82	0.0097 U
22'3566'-HexaCB-(152)	0.438	0.0099 U	0.952	0.013 U	0.952	0.0084 U
HexaCB-(153)+(168)	1.58	97.8	14.1	6.78	23.9	8.4
22'44'56'-HexaCB-(154)	1.39	0.087	3.54	0.601	3.54	0.021
22'44'66'-HexaCB-(155)	0.142	0.0044 U	0.465	0.0056 U	0.465	0.0037 U

Please see notes at the end of table.

Table B-2
Historical Soil Sample Analytical Results - PCB Congeners
Willamette Cove Upland Facility
Portland, Oregon

	PCB Congeners (ng/g)					
	West Parcel					
Sample ID	DP-2 (10-30)	DP-2 (40-45)	DP-4 (10-30)	DP-4 (40-42)	DP-5 (10-30)	DP-5 (40-45)
Minimum Depth (feet bgs)	10	40	10	40	10	40
Maximum Depth (feet bgs)	30	45	30	45	30	45
Sample Date	12/19/2016	12/19/2016	12/21/2016	12/21/2016	1/14/2017	1/14/2017
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite
HexaCB-(156)+(157)	0.182	2.97	0.733	0.718	0.879	0.229
233'44'6-HexaCB-(158)	0.679	0.712	1.03	0.322	1.03	0.158
233'455'-HexaCB-(159)	0.114	0.0652	0.24	0.0951	0.24	0.0166
233'456-HexaCB-(160)	0.0066 U	0.0082 U	0.014 U	0.0077 U	0.014 U	0.0036 U
233'45'6-HexaCB-(161)	0.0056 U	0.0069 U	0.012 U	0.0065 U	0.012 U	0.0031 U
233'4'55'-HexaCB-(162)	0.0205	0.0213	0.0233	0.0063	0.0233	0.0045 U
233'4'5'6-HexaCB-(164)	0.825	0.53	1.07	0.411	1.07	0.127
233'55'6-HexaCB-(165)	0.232	0.0085 U	0.559	0.0217	0.559	0.0038 U
23'44'55'-HexaCB-(167)	0.244	0.235	0.377	0.0864	0.377	0.0718
33'44'55'-HexaCB-(169)	0.0035 U	0.0069 U	0.0069 U	0.0028 U	0.0069 U	0.0028 U
22'33'44'5-HeptaCB-(170)	3.69	1.82	10.7	2.43	10.7	0.542
HeptaCB-(171)+(173)	0.151	6.92	0.961	0.47	2.7	0.625
22'33'455'-HeptaCB-(172)	0.513	0.257	1.46	0.369	1.46	0.0786
22'33'456'-HeptaCB-(174)	3.09	1.68	6.92	2.7	6.92	0.514
22'33'45'6-HeptaCB-(175)	0.128	0.0664	0.305	0.0916	0.305	0.0219
22'33'466'-HeptaCB-(176)	0.432	0.216	1.03	0.326	1.03	0.0637
22'33'45'6'-HeptaCB-(177)	2.16	0.873	5.03	1.72	5.03	0.274
22'33'55'6-HeptaCB-(178)	1.1	0.337	2.55	0.74	2.55	0.102
22'33'566'-HeptaCB-(179)	1.71	0.693	3.39	1.31	3.39	0.204
HeptaCB-(180)+(193)	7.64	3.53	21.7	5.72	21.7	1.13
22'344'56-HeptaCB-(181)	0.0198	0.0132	0.0582	0.0049 U	0.0582	0.0532
22'344'56'-HeptaCB-(182)	0.0436	0.0097 U	0.107	0.0332	0.107	0.009 U
22'344'5'6-HeptaCB-(183)	1.81	0.926	5.18	1.3	5.18	0.263
22'344'66'-HeptaCB-(184)	0.0048 U	0.0065 U	0.0118	0.0059 U	0.0118	0.006 U
22'3455'6-HeptaCB-(185)	0.221	0.133	0.375	0.197	0.375	0.068
22'34566'-HeptaCB-(186)	0.0053 U	0.0072 U	0.0028 U	0.0065 U	0.0028 U	0.0067 U
22'34'55'6-HeptaCB-(187)	6.15	2.6	15.2	5.18	15.2	0.768
22'34'566'-HeptaCB-(188)	0.156	0.0046 U	0.476	0.0212	0.476	0.0043 U
233'44'55'-HeptaCB-(189)	0.14	0.0651	0.482	0.0762	0.482	0.0204
233'44'56-HeptaCB-(190)	0.592	0.284	1.98	0.405	1.98	0.0934
233'44'5'6-HeptaCB-(191)	0.104	0.0561	0.349	0.0742	0.349	0.0181
233'455'6-HeptaCB-(192)	0.0041 U	0.0045 U	0.0056 U	0.0035 U	0.0056 U	0.0035 U
22'33'44'55'-OctaCB-(194)	1.96	0.71	6.9	1.39	6.9	0.261
22'33'44'56-OctaCB-(195)	0.787	0.289	2.98	0.535	2.98	0.115
22'33'44'56'-OctaCB-(196)	0.964	0.398	3.42	0.655	3.42	0.132
22'33'44'66'OctaCB-(197)	0.0745	0.0297	0.271	0.0509	0.271	0.0092
OctaCB-(198)+(199)	1.84	0.937	6.11	1.56	6.11	0.359
22'33'4566'-OctaCB-(200)	0.215	0.116	0.662	0.151	0.662	0.0462
22'33'45'66'-OctaCB-(201)	0.257	0.12	0.768	0.16	0.768	0.0391

Please see notes at the end of table.

Table B-2
Historical Soil Sample Analytical Results - PCB Congeners
Willamette Cove Upland Facility
Portland, Oregon

	PCB Congeners (ng/g)					
	West Parcel					
Sample ID	DP-2 (10-30)	DP-2 (40-45)	DP-4 (10-30)	DP-4 (40-42)	DP-5 (10-30)	DP-5 (40-45)
Minimum Depth (feet bgs)	10	40	10	40	10	40
Maximum Depth (feet bgs)	30	45	30	45	30	45
Sample Date	12/19/2016	12/19/2016	12/21/2016	12/21/2016	1/14/2017	1/14/2017
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite
22'33'55'66'-OctaCB-(202)	0.396	0.191	1.16	0.311	1.16	0.067
22'344'55'6-OctaCB-(203)	1.29	0.596	4.49	0.904	4.49	0.204
22'344'566'-OctaCB-(204)	0.0041 U	0.0038 U	0.002 U	0.0061 U	0.002 U	0.0047 U
233'44'55'6-OctaCB-(205)	0.122	0.0433	0.436	0.0807	0.436	0.0204
22'33'44'55'6-NonaCB-(206)	0.577	0.557	1.97	0.367	1.97	0.598
22'33'44'566'-NonaCB-(207)	0.0647	0.0632	0.219	0.037 U	0.219	0.0401
22'33'455'66'-NonaCB-(208)	0.117	0.209	0.394	0.0624	0.394	0.133
DecaCB-(209)	0.249	1.02	0.563	0.0267	0.563	1.02
Total PCBs (as reported in FS)	46.1	1070	361	133	764	97.4
Total PCBs (ND = 1/2 DL)	115	637	459	138	769	66.9

Notes:
1. ng/g = Nanograms per gram.
2. PCBs = Polychlorinated biphenyls.
3. ND = Not detected.
4. DL = Detection or reporting limit.
5. -- = Value not available or PCB Aroclor was not analyzed.
6. bgs = Below ground surface.
7. U = Analyte was not detected.

Table B-3
Historical Soil Sample Analytical Results - Butyltins
Willamette Cove Upland Facility
Portland, Oregon

	Butyltins (mg/kg)					
	Central Parcel		East Parcel			
Sample ID	Wharf Beach -1		Beach Cove-1		Beach Cove-2	
Minimum Depth (feet bgs)	1		12		12	
Maximum Depth (feet bgs)	1.5		18		18	
Sample Date	9/27/2010		9/27/2010		9/27/2010	
Sample Type	Discrete		Discrete		Discrete	
Butyltin	0.039	U	0.056	U	0.055	U
Dibutyltin	0.056	U	0.04	U	0.039	U
Tributyltin	0.037	U	0.038	U	0.037	U

Notes:
1. mg/kg = Milligrams per kilogram.
2. bgs = Below ground surface.
3. U = Analyte was not detected.

Table B-4
Historical Soil Sample Analytical Results - Dioxins/Furans
Willamette Cove Upland Facility
Portland, Oregon

	Dioxins/Furans (mg/kg)												
	Central Parcel												
Sample ID	Area-2-10a	Area-2-10b	Area-2-10c	Area-3-3a	Area-3-3b	Area-3-3c	Area-6-9a	Area-6-9b	Area-6-9c	DU-1	DU-2	DU-3	DU-5
Minimum Depth (feet bgs)	0	0.5	1	0	0.5	1	0	0.5	1	0	0	0	0
Maximum Depth (feet bgs)	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	0.5	0.5	0.5
Sample Date	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	8/9/2012	8/8/2012	8/13/2012	1/13/2014
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	ISM	ISM	ISM	ISM
1,2,3,4,6,7,8-HpCDD	0.0000762	0.0000109	0.000085	0.000134	0.000048	0.0000485	0.0000563	0.00000449	0.00000457	0.00316 E	0.00255 E	0.00153 E	0.00296 E
1,2,3,4,6,7,8-HpCDF	0.0000235	0.00000375	0.0000268	0.0000569	0.000021	0.0000119	0.00000665	0.0000011 J	0.00000023 U	0.000387	0.000449	0.000235	0.000273 P
1,2,3,4,7,8,9-HpCDF	0.000000462 J	0.000000211 U	0.000000211 U	0.000000876 J	0.000000322 J	0.000000225 J	0.000000361 J	0.000000211 U	0.000000211 U	0.0000232	0.0000738	0.0000212	0.0000157
1,2,3,4,7,8-HxCDD	0.00000266	0.000000523 J	0.00000302	0.00000438	0.00000149 J	0.00000237 J	0.00000152 J	0.000000231 U	0.000000231 U	0.000053	0.0000439	0.0000203	0.0000373
1,2,3,4,7,8-HxCDF	0.000000627 J	0.000000154 U	0.000000629 J	0.00000116 J	0.000000452 J	0.000000312 J	0.00000079 J	0.000000154 U	0.000000154 U	0.0000468	0.000255	0.0000513	0.0000294
1,2,3,6,7,8-HxCDD	0.0000464	0.00000605	0.0000555	0.0000888	0.0000283	0.0000364	0.0000113	0.0000015 J	0.00000204 J	0.000659	0.000282	0.000118	0.000358
1,2,3,6,7,8-HxCDF	0.000000711 J	0.000000195 U	0.000000746 J	0.00000129 J	0.000000479 J	0.000000404 J	0.000000837 J	0.000000195 U	0.000000195 U	0.0000424	0.00028	0.0000819	0.0000283 P
1,2,3,7,8,9-HxCDD	0.0000298	0.000004	0.0000334	0.0000526	0.0000181	0.0000238	0.0000071	0.000000901 J	0.00000126 J	0.000333	0.000123	0.0000642	0.000133
1,2,3,7,8,9-HxCDF	1.95E-08 U	0.000000195 U	0.000000195 U	0.000000195 U	0.000000195 U	0.000000195 U	0.000000195 U	0.000000195 U	0.000000195 U	0.000000408 U	0.000000835 U	0.000000494 U	0.00000221
1,2,3,7,8-PeCDD	0.00000799	0.00000101 J	0.00000961	0.0000115	0.00000393	0.00000769	0.00000382	0.000000253 J	0.000000394 J	0.0000674	0.0000848	0.0000215	0.0000414
1,2,3,7,8-PeCDF	0.000000254 U	0.000000254 U	0.000000254 U	0.000000333 J	0.000000254 U	0.000000254 U	0.000000398 J	0.000000254 U	0.000000254 U	0.0000183	0.0000456	0.0000156	0.00000854
2,3,4,6,7,8-HxCDF	0.000000821 J	8.05E-08 U	0.000000905 J	0.00000175 J	0.000000695 J	0.000000463 J	0.00000193 J	0.000000407 J	8.05E-08 U	0.0000742	0.000652	0.000214	0.0000512
2,3,4,7,8-PeCDF	0.000000211 U	0.000000211 U	0.000000211 U	0.000000629 J	0.00000034 J	0.000000211 U	0.000000282 J	0.000000211 U	0.000000211 U	0.0000724	0.00159 E	0.00051	0.0000168
2,3,7,8-TCDD	7.78E-08 U	7.78E-08 U	7.78E-08 U	7.78E-08 U	7.78E-08 U	7.78E-08 U	7.78E-08 U	7.78E-08 U	7.78E-08 U	0.0000063	0.00000645	0.00000258	0.00000292
2,3,7,8-TCDF	0.000000204 J	2.89E-08 U	6.82E-08 J	0.00000039 J	2.89E-08 U	0.000000137 J	0.000000401 J	0.000000108 J	2.89E-08 U	0.0000134	0.0000373	0.0000162	0.00000591
OCDD	0.000109	0.0000215	0.0000948	0.000115	0.0000582	0.0000305	0.000362	0.0000232	0.000166	0.0183 E	0.0188 E	0.01 E	0.0189 E
OCDF	0.0000106	0.00000402	0.0000118	0.0000226	0.00000895	0.00000437 J	0.00000912	0.00000118 J	0.00000047 U	0.000331	0.00031	0.000366	0.000452
Total HpCDD	0.000179	0.0000265	0.000201	0.000303	0.000111	0.000105	0.000131	0.0000111	0.0000111	0.000915 P	0.00892 P	0.00297 P	0.000973
Total HpCDF	0.0000399	0.00000609	0.0000437	0.0000926	0.0000355	0.0000181	0.0000167	0.0000011	0.00000036	0.00692	0.00462	0.00274	0.00607
Total HxCDD	0.000322	0.0000424	0.000377	0.00058	0.000195	0.000257	0.000077	0.00000891	0.0000128	0.000798	0.00114	0.000689	0.000874
Total HxCDF	0.0000137	0.00000103	0.0000143	0.0000298	0.0000115	0.00000754	0.0000264	0.00000462	0.000000341 U	0.00434	0.0023	0.000831	0.00199
Total PeCDD	0.0000533	0.00000701	0.0000613	0.0000779	0.0000265	0.0000543	0.0000294	0.00000135	0.00000242	0.000964 P	0.022 P	0.0068 P	0.001
Total PeCDF	0.00000432	0.000000177 U	0.00000313	0.000017	0.00000481	0.00000328	0.0000326	0.0000084	5.17E-08 U	0.000574	0.00115	0.000215	0.000297
Total TCDD	0.00000727	0.000000186	0.00000403	0.0000076	0.000000672	0.00000685	0.00000626	0.000000206 U	0.000000259 U	0.000102	0.000244	0.0000735	0.0000473
Total TCDF	0.00000313	0.000000207 U	0.000000831	0.00000948	0.00000224	0.00000218	0.0000126	0.00000279	5.95E-08 U	0.000455 P	0.00498 P	0.00149 P	0.000507
Dioxin/Furan TEQ (as reported in FS)	1.72E-05	2.22E-06	2.02E-05	2.87E-05	9.70E-06	1.47E-05	7.06E-06	6.50E-07	8.20E-07	2.59E-04	7.73E-04	2.55E-04	1.52E-04
Dioxin/Furan TEQ (ND = 1/2 DL)	1.72E-05	2.33E-06	2.03E-05	2.87E-05	9.75E-06	1.48E-05	7.10E-06	7.22E-07	9.40E-07	2.59E-04	7.73E-04	2.55E-04	1.52E-04

Please see notes at the end of table.

Table B-4
Historical Soil Sample Analytical Results - Dioxins/Furans
Willamette Cove Upland Facility
Portland, Oregon

	Dioxins/Furans (mg/kg)												
	Central Parcel												
Sample ID	DU-6	DU-6-COMP-1	DU-6-COMP-2	DU-6-COMP-3	DU-6-COMP-4	DU-6-COMP-5	DU-6-COMP-5-1	DU-6-COMP-5-2	DU-6-COMP-5-3	DU-6-COMP-5-3a	DU-6-COMP-5-3b	DU-6-COMP-5-3c	DU-6-COMP-5-4
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0.5	1	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1.5	0.5
Sample Date	1/13/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	2/20/2015	2/20/2015	2/20/2015	4/8/2014
Sample Type	ISM	Composite	Composite	Composite	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
1,2,3,4,6,7,8-HpCDD	0.0162 E	0.000309	0.000282	0.00125 E	0.000358	0.18	0.00731	0.0135	0.0241	0.00332	0.0000425	0.0000606	0.234
1,2,3,4,6,7,8-HpCDF	0.00504 E	0.0000803	0.0000702	0.000402	0.000069	0.0562	0.00228	0.00374	0.00795	0.000764	0.0000155	0.0000133	0.0819
1,2,3,4,7,8,9-HpCDF	0.0000736	0.00000307	0.00000212	0.00000652	0.00000385	0.000672	0.0000284	0.0000447	0.0000896	0.00000834	0.000000211 U	0.000000211 U	0.0011
1,2,3,4,7,8-HxCDD	0.000547	0.0000041	0.00000533	0.0000348	0.00000616	0.00483	0.000253	0.000435	0.000666	0.0000797	0.00000175 J	0.00000222 J	0.00872
1,2,3,4,7,8-HxCDF	0.0000849	0.00000304	0.00000333	0.00000896	0.0000041	0.000898	0.0000373	0.0000558	0.000107	0.0000113	0.000000293 J	0.000000244 J	0.0012
1,2,3,6,7,8-HxCDD	0.013 E	0.0000656	0.000102	0.000724	0.000114	0.145	0.00471	0.00843	0.0146	0.00204	0.0000302	0.0000355	0.198
1,2,3,6,7,8-HxCDF	0.000119	0.0000021	0.0000023	0.00000993	0.00000376	0.00122	0.0000494	0.0000825	0.000136	0.0000119	0.000000319 J	0.000000327 J	0.00154
1,2,3,7,8,9-HxCDD	0.00694 E	0.0000375	0.0000604	0.000451	0.0000643	0.0813	0.00307	0.00553	0.00925	0.00117	0.0000172	0.0000227	0.118
1,2,3,7,8,9-HxCDF	0.0000134	0.000000733 J	0.000000418 J	0.00000179	0.000000688 J	0.000162	0.00000484 J	0.00000799 J	0.0000156 J	0.00000174 J	0.000000195 U	0.000000195 U	0.000218
1,2,3,7,8-PeCDD	0.00181 E	0.00000885	0.0000161	0.000108	0.0000135	0.0193	0.000768	0.00127	0.00191	0.000194	0.00000414	0.000005	0.0264
1,2,3,7,8-PeCDF	0.0000131	0.00000105 J	0.00000121	0.00000295	0.0000014	0.000124 J	0.00000776 J	0.0000111 J	0.0000187 J	0.00000226 J	0.000000254 U	0.000000254 U	0.000185
2,3,4,6,7,8-HxCDF	0.000133	0.00000303	0.00000285	0.0000128	0.00000659	0.00135	0.0000648	0.0000997	0.000159	0.0000154	8.05E-08 U	0.000000356 J	0.00188
2,3,4,7,8-PeCDF	0.0000198	0.000000947 J	0.00000135	0.00000598	0.00000403	0.000241	0.00000991 J	0.0000163 J	0.0000504	0.00000351	0.000000211 U	0.000000211 U	0.000293
2,3,7,8-TCDD	0.0000562	0.000000716	0.000000947	0.00000501	0.000000693	0.000772	0.00004	0.0000597	0.0000769	0.00000668	7.78E-08 U	7.78E-08 U	0.00118
2,3,7,8-TCDF	0.00000303	0.000000859	0.000000737	0.000003	0.00000233	0.0000225 J	0.00000246 J	0.000000083 U	0.00000459 J	0.00000177	2.89E-08 U	2.89E-08 U	0.0000303
OCDD	0.00801 E	0.00176	0.00117	0.00213	0.00187	0.0456	0.00357	0.0048	0.00851	0.00168	0.0000346	0.0000301	0.0632
OCDF	0.00229 E	0.000217	0.0000931	0.000264	0.00025	0.0189	0.000717	0.00122	0.00269	0.000303	0.00000606	0.00000495 J	0.0273
Total HpCDD	0.0027 P	0.0000732	0.0000606	0.000231	0.000111	0.0265	0.00118	0.00179	0.00324	0.00836	0.0000957	0.000128	0.0343
Total HpCDF	0.0338	0.000599	0.00055	0.00258	0.000681	0.362	0.0158	0.0267	0.05	0.00121	0.0000242	0.0000203	0.494
Total HxCDD	0.00888 P	0.000251	0.000168	0.000712	0.00026	0.0916	0.00366	0.0058	0.0127	0.0131	0.000187	0.00023	0.13
Total HxCDF	0.0748	0.000425	0.000675	0.00464	0.000622	0.843	0.0321	0.0525	0.0962	0.000335	0.00000649	0.00000616	1.27
Total PeCDD	0.000437 P	0.0000294	0.0000233	0.000107	0.000101	0.00394	0.00028	0.000374	0.000524	0.00126	0.0000283	0.0000322	0.00656
Total PeCDF	0.00996	0.0000578	0.0000966	0.000631	0.0000827	0.118	0.0047	0.00748	0.0121	0.0000763	0.000000615	0	0.164
Total TCDD	0.000768	0.0000101	0.000013	0.0000696	0.0000197	0.00956	0.000476	0.000655	0.000992	0.0000977	0.00000139	0.00000211	0.0143
Total TCDF	0.000106 P	0.0000158	0.0000118	0.0000545	0.0000551	0.000887	0.000053	0.0000751	0.000141	0.0000279	0.000000182 U	0.000000194 U	0.00146
Dioxin/Furan TEQ (as reported in FS)	4.17E-03	2.61E-05	3.91E-05	2.57E-04	4.06E-05	4.60E-02	1.73E-03	2.97E-03	4.82E-03	5.77E-04	9.71E-06	1.19E-05	6.38E-02
Dioxin/Furan TEQ (ND = 1/2 DL)	4.17E-03	2.61E-05	3.91E-05	2.57E-04	4.06E-05	4.60E-02	1.73E-03	2.97E-03	4.82E-03	5.77E-04	9.80E-06	1.20E-05	6.38E-02

Please see notes at the end of table.

Table B-4
Historical Soil Sample Analytical Results - Dioxins/Furans
Willamette Cove Upland Facility
Portland, Oregon

	Dioxins/Furans (mg/kg)												
	Central Parcel												
Sample ID	DU-6-COMP-5-5	DU-6-COMP-5-6	DU-6-COMP-5-6a	DU-6-COMP-5-6b	DU-6-COMP-5-6c	DU-6-COMP-5-6d	DU-6-COMP-5-6e	DU-6-COMP-5-6f	DU-6-COMP-6	DU-6-COMP-6-1	DU-6-COMP-6-2	DU-6-COMP-6-3	DU-6-COMP-6-4
Minimum Depth (feet bgs)	0	0	0	0.5	1	1.5	2	2.5	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	1	1.5	2	2.5	3	0.5	0.5	0.5	0.5	0.5
Sample Date	4/8/2014	4/8/2014	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Discrete	Discrete	Discrete	Discrete
1,2,3,4,6,7,8-HpCDD	0.00586	2.54	3.85	1.82	0.443	0.506	0.65	1.8	0.0242	0.00184	0.00107	0.0124	0.0502
1,2,3,4,6,7,8-HpCDF	0.0018	0.454	0.558	0.352	0.372	0.113	0.142	0.208	0.00771	0.000569	0.000331	0.00443	0.0181
1,2,3,4,7,8,9-HpCDF	0.0000277	0.00684	0.011	0.00661	0.00249	0.00138	0.00195	0.00541	0.0000841 J	0.0000125 J	0.00000769 J	0.0000509	0.000177
1,2,3,4,7,8-HxCDD	0.000195	0.0896	0.117	0.0661	0.015	0.0148	0.0177	0.0562	0.000559	0.0000622	0.0000374	0.000403	0.00133
1,2,3,4,7,8-HxCDF	0.0000404	0.00915	0.0118	0.00649	0.00289	0.00201	0.00226	0.00564	0.000131 J	0.0000367	0.0000109 J	0.0000654	0.000222
1,2,3,6,7,8-HxCDD	0.00356	1.69	2.63	1.36	0.316	0.435	0.449	1.28	0.0184	0.00101	0.000529	0.00877	0.0325
1,2,3,6,7,8-HxCDF	0.0000469	0.0121	0.0162	0.00981	0.0031	0.00264	0.00313	0.011	0.000145 J	0.0000305	0.0000122 J	0.0000861	0.000239
1,2,3,7,8,9-HxCDD	0.0025	0.949	1.59	0.808	0.205	0.248	0.269	0.834	0.0106	0.000635	0.000345	0.00538	0.0206
1,2,3,7,8,9-HxCDF	0.00000972 J	0.00126 J	0.00163 J	0.00155 J	0.000634 J	0.000461	0.000438	0.00124	0.0000213 J	0.0000027 J	0.00000253 J	0.0000155 J	0.0000187 J
1,2,3,7,8-PeCDD	0.000663	0.218	0.36	0.162	0.0459	0.0707	0.0564	0.171	0.00203	0.000152	0.000083	0.00127	0.00357
1,2,3,7,8-PeCDF	0.00000938 J	0.00161 J	0.00255	0.00136 J	0.000375	0.000484	0.000382	0.0012	0.0000195 J	0.0000194 J	0.00000325 J	0.0000153 J	0.0000357
2,3,4,6,7,8-HxCDF	0.0000591	0.0131	0.0194	0.0113	0.00358	0.00312	0.00361	0.012	0.000162 J	0.0000287	0.0000173 J	0.000107	0.000292
2,3,4,7,8-PeCDF	0.0000159 J	0.00328	0.00328	0.00214 J	0.000653	0.000884	0.000718	0.00201	0.0000262 J	0.0000214 J	0.000013 J	0.0000265	0.0000567
2,3,7,8-TCDD	0.0000419	0.0104	0.016	0.00765	0.0019	0.00348	0.00183	0.00528	0.0000808	0.00000996	0.000000051 U	0.0000599	0.000157
2,3,7,8-TCDF	0.00000427 J	0.000237	0.000601	0.00048	0.0000667	0.000172	0.0000643	0.000157	0.00000828 J	0.0000108	0.0000027 J	0.00000434 J	0.00000846
OCDD	0.00534	0.629	1.38	0.608	0.123	0.14	0.189	0.439	0.00939	0.00319	0.00194	0.0047	0.0171
OCDF	0.000661	0.139	0.188	0.12	0.139	0.0367	0.0493	0.0618	0.0028	0.000292	0.000179	0.00155	0.00744
Total HpCDD	0.0011	0.226	8.54	4.17	1.13	1.33	1.61	4.41	0.00334	0.000454	0.000275	0.002	0.00707
Total HpCDF	0.0123	6.3	0.863	0.555	0.579	0.175	0.223	0.325	0.0525	0.00364	0.0021	0.0268	0.107
Total HxCDD	0.00297	0.728	16.5	8.92	2.19	2.82	2.82	8.6	0.0126	0.000962	0.000574	0.00713	0.0297
Total HxCDF	0.025	11.7	0.306	0.178	0.0949	0.0609	0.0635	0.17	0.115	0.00674	0.00355	0.0585	0.213
Total PeCDD	0.00037	0.041	2.28	1.09	0.304	0.473	0.323	0.974	0.000685	0.000315	0.000267	0.000546	0.00108
Total PeCDF	0.00425	1.35	0.0679	0.0371	0.0103	0.0147	0.0104	0.0348	0.0134	0.00126	0.000504	0.00818	0.0229
Total TCDD	0.000521	0.128	0.203	0.113	0.0276	0.058	0.0259	0.0622	0.00119	0.000289	0.000054	0.000782	0.00199
Total TCDF	0.000122	0.00668	0.0167	0.011	0.00235	0.00464	0.00209	0.00504	0.000165	0.000156	0.000108	0.00016	0.000271
Dioxin/Furan TEQ (as reported in FS)	1.43E-03	5.36E-01	8.60E-01	4.19E-01	1.11E-01	7.65E-02	6.09E-02	1.82E-01	5.45E-03	3.76E-04	1.98E-04	2.99E-03	9.96E-03
Dioxin/Furan TEQ (ND = 1/2 DL)	1.43E-03	5.36E-01	8.60E-01	4.19E-01	1.11E-01	1.51E-01	1.41E-01	4.17E-01	5.45E-03	3.76E-04	1.97E-04	2.99E-03	9.96E-03

Please see notes at the end of table.

Table B-4
Historical Soil Sample Analytical Results - Dioxins/Furans
Willamette Cove Upland Facility
Portland, Oregon

	Dioxins/Furans (mg/kg)												
	Central Parcel												
Sample ID	DU-6-COMP-6-5	DU-6-COMP-6-6	DU-6-COMP-7	J-6-COMP-7-3/7-4/7-5/7	DU-6-COMP-8	RA3-B1	RA3-B10	RA3-B11	RA3-B12	RA3-B13	RA3-B14	RA3-B15	RA3-B16
Minimum Depth (feet bgs)	0	0	0	0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1
Sample Date	4/8/2014	4/8/2014	4/9/2014	4/9/2014	4/9/2014	10/19/2015	10/19/2015	10/19/2015	10/21/2015	10/28/2015	10/28/2015	12/22/2015	12/22/2015
Sample Type	Discrete	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
1,2,3,4,6,7,8-HpCDD	0.0366	0.0603	0.011	0.00891	0.00301	0.000127	0.000505	0.000059	0.0055	0.000349	0.000214	0.00000131 J	0.0000342
1,2,3,4,6,7,8-HpCDF	0.00743	0.0161	0.00358	0.00271	0.000751	0.0000425	0.000188	0.0000309	0.00165	0.0000797	0.0000605	0.000000213 U	0.00000951
1,2,3,4,7,8,9-HpCDF	0.000109	0.000172	0.0000515	0.0000418	0.0000257	0.0000121 U	0.0000121 U	0.0000122 U	0.0000191	0.00000341	0.00000328	6.31E-08 U	0.000000349 U
1,2,3,4,7,8-HxCDD	0.00101	0.00176	0.000339	0.000276	0.0000741	0.0000503	0.0000196	0.0000122 U	0.000187	0.00000717	0.00000262	0.000000418 U	0.000001
1,2,3,4,7,8-HxCDF	0.000123	0.000224	0.0000625	0.0000498	0.0000233	0.00000338 J	0.0000104	0.0000122 U	0.0000249	0.00000248	0.00000221	5.36E-08 U	0.000000798
1,2,3,6,7,8-HxCDD	0.0334	0.0418	0.00716	0.00483	0.00126	0.0000121 U	0.000281	0.0000369	0.00338	0.0000834	0.0000359	0.000000397 U	0.0000136
1,2,3,6,7,8-HxCDF	0.000177	0.00026	0.0000822	0.0000608	0.0000263	0.00000315 J	0.00000918	0.0000122 U	0.0000307	0.00000242	0.00000214	5.17E-08 U	0.000000731
1,2,3,7,8,9-HxCDD	0.016	0.0273	0.0038	0.00314	0.000736	0.0000264	0.000192	0.0000246	0.0021	0.0000553	0.0000219	0.000000453 U	0.00000826
1,2,3,7,8,9-HxCDF	0.000015 J	0.0000315	0.0000147	0.00000416 J	0.00000376	0.00000151 J	0.0000121 U	0.0000122 U	0.00000812	0.000000913	0.000000801	7.79E-08 U	0.000000295 U
1,2,3,7,8-PeCDD	0.00284	0.00528	0.0011	0.000807	0.000196	0.0000121 U	0.0000448	0.0000122 U	0.000512	0.0000142	0.00000619	0.000000173 U	0.00000158
1,2,3,7,8-PeCDF	0.0000192 J	0.00004	0.0000118	0.00000972	0.00000596	0.0000121 U	0.00000497	0.0000122 U	0.00000517	0.000000657	0.000000564	0.00000013 U	0.000000655 U
2,3,4,6,7,8-HxCDF	0.000206	0.000325	0.000097	0.0000776	0.0000381	0.00000546 J	0.00000996	0.00000246	0.0000391	0.00000382	0.00000412	5.95E-08 U	0.00000131
2,3,4,7,8-PeCDF	0.00003	0.0000497	0.0000195	0.000017	0.0000092	0.0000114 J	0.0000159	0.00000592	0.0000147	0.00000137	0.00000243	0.000000122 U	0.00000203
2,3,7,8-TCDD	0.0000874	0.000187	0.0000549	0.0000412	0.0000111	0.00000242 U	0.00000241 U	0.00000244 U	0.0000225	0.000000988	0.000000455	0.000000104 U	0.000000318 U
2,3,7,8-TCDF	0.00000514	0.0000092	0.00000489	0.00000365	0.00000449	0.00000242 U	0.00000369	0.00000244 U	0.00000166	0.000000426	0.000000524	9.22E-08 U	0.000000565 U
OCDD	0.0133	0.0186	0.0163	0.0141	0.0171	0.000492	0.000365	0.0000589	0.00218	0.00227	0.00158	0.0000125	0.000223
OCDF	0.00268	0.00594	0.00148	0.00126	0.000811	0.0000351	0.000073	0.0000244 U	0.000622	0.0000995	0.000235	0.000000409 J	0.0000132
Total HpCDD	0.00369	0.00748	0.00185	0.00155	0.000683	0.000282	0.00107	0.000128	0.00978	0.000675	0.000398	0.00000305	0.0000673
Total HpCDF	0.0769	0.13	0.02	0.0186	0.00547	0.0000777	0.000301	0.0000518	0.0026	0.000207	0.000212	0.000000234	0.0000188
Total HxCDD	0.012	0.0262	0.00544	0.00452	0.00185	0.000265	0.00219	0.000255	0.0211	0.00058	0.000238	0.000000772	0.0000913
Total HxCDF	0.162	0.28	0.039	0.0327	0.00795	0.0000741	0.000158	0.0000332	0.000696	0.0000778	0.0000752	0.000000324	0.0000162
Total PeCDD	0.000791	0.00142	0.000486	0.000414	0.000311	0.0000459	0.000501	0.0000217	0.00313	0.0000905	0.0000394	0.000000173 U	0.00000931
Total PeCDF	0.0157	0.0326	0.00613	0.00477	0.00123	0.000121	0.000158	0.0000483	0.000222	0.0000368	0.0000672	0.000000184	0.0000143
Total TCDD	0.00108	0.00273	0.000632	0.000462	0.000143	0.0000059	0.000113	0	0.000284	0.0000148	0.0000059	0.000000199	0.00000187
Total TCDF	0.000205	0.000369	0.000157	0.000125	0.000151	0.000037	0.0000497	0.00000746	0.0000554	0.0000115	0.0000196	9.22E-08 U	0.00000311
Dioxin/Furan TEQ (as reported in FS)	8.48E-03	1.34E-02	2.47E-03	1.82E-03	4.70E-04	1.43E-05	1.09E-04	9.09E-06	1.19E-03	3.62E-05	1.77E-05	1.70E-08	5.27E-06
Dioxin/Furan TEQ (ND = 1/2 DL)	8.48E-03	1.34E-02	2.47E-03	1.82E-03	4.70E-04	2.25E-05	1.11E-04	1.92E-05	1.19E-03	3.62E-05	1.77E-05	2.57E-07	5.48E-06

Please see notes at the end of table.

Table B-4
Historical Soil Sample Analytical Results - Dioxins/Furans
Willamette Cove Upland Facility
Portland, Oregon

	Dioxins/Furans (mg/kg)												
	Central Parcel												
Sample ID	RA3-B2	RA3-B3	RA3-B4	RA3-B5	RA3-B6	RA3-B7	RA3-B8	RA3-B9	RA3-D-B1	RA3-D-B2	RA3-D-S1	RA3-D-S2	RA3-D-S3
Minimum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	5	0.5	0.5	3.5
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	5	1	1	4
Sample Date	10/19/2015	10/19/2015	10/19/2015	10/19/2015	10/21/2015	10/21/2015	10/27/2015	10/27/2015	10/29/2015	12/30/2015	10/29/2015	10/29/2015	12/28/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
1,2,3,4,6,7,8-HpCDD	0.00079	0.000121	0.000119	0.000723	0.000272	0.000555	0.00019	0.0000194	0.000649	0.0000692	0.00000898	0.00000262	0.0000585
1,2,3,4,6,7,8-HpCDF	0.000281	0.0000417	0.0000375	0.00019	0.0000629	0.000125	0.0000442	0.00000441	0.000281	0.0000217	0.00000287	0.000000975	0.0000197
1,2,3,4,7,8,9-HpCDF	0.0000119 U	0.0000112 U	0.0000115 U	0.0000119 U	0.00000193	0.00000383	0.00000307	0.00000249 U	0.00000277	0.00000027 U	0.0000025 U	0.00000249 U	0.00000145 J
1,2,3,4,7,8-HxCDD	0.0000256	0.00000433	0.00000365	0.0000159	0.00000771	0.0000113	0.00000116	0.00000249 U	0.0000135	0.00000308	0.000000407	0.00000148	0.00000178 J
1,2,3,4,7,8-HxCDF	0.0000119 U	0.0000112 U	0.0000115 U	0.00000425	0.0000029	0.00000494	0.00000206	0.000000535	0.00000354	0.000000782 J	0.0000025 U	0.0000014	0.00000161 J
1,2,3,6,7,8-HxCDD	0.000456	0.0000827	0.0000714	0.000373	0.00014	0.000219	0.00000958	0.00000376	0.00047	0.0000549	0.00000349	0.00000249 U	0.0000166
1,2,3,6,7,8-HxCDF	0.00000525	0.0000112 U	0.0000115 U	0.00000468	0.00000334	0.0000054	0.000002	0.000000259	0.00000422	0.000000955 J	0.0000025 U	0.00000249 U	0.00000136 J
1,2,3,7,8,9-HxCDD	0.000326	0.00006	0.0000446	0.00023	0.0000922	0.000138	0.00000462	0.00000266	0.000249	0.0000368	0.0000026	0.00000113	0.0000112
1,2,3,7,8,9-HxCDF	0.0000119 U	0.0000112 U	0.0000115 U	0.0000119 U	0.00000117	0.00000199	0.000000769	0.00000249 U	0.00000102	0.00000025 U	0.0000025 U	0.00000249 U	0.000000607 J
1,2,3,7,8-PeCDD	0.000064	0.0000122	0.0000115 U	0.0000559	0.0000228	0.0000276	0.00000123	0.00000104	0.0000558	0.00000739	0.000000574	0.000000302	0.00000172 U
1,2,3,7,8-PeCDF	0.0000119 U	0.0000112 U	0.0000115 U	0.0000119 U	0.00000119	0.00000173	0.000000524	0.00000249 U	0.000000937	0.00000052 U	0.000000223	0.00000249 U	0.000000762 U
2,3,4,6,7,8-HxCDF	0.00000828	0.0000112 U	0.0000115 U	0.00000638	0.00000553	0.00000996	0.00000471	0.00000039	0.00000463	0.00000107 J	0.0000025 U	0.00000249 U	0.00000226 J
2,3,4,7,8-PeCDF	0.00000463	0.00000204	0.0000115 U	0.00000697	0.00000738	0.00000623	0.0000031	0.0000055	0.0000025 U	0.00000104 U	0.0000031	0.00000249 U	0.0000015 J
2,3,7,8-TCDD	0.00000365	0.00000223 U	0.0000023 U	0.00000292	0.00000116	0.00000178	0.000000498 U	0.000000499 U	0.0000037	0.0000056	0.0000005 U	0.000000498 U	0.000000208 U
2,3,7,8-TCDF	0.00000238 U	0.00000223 U	0.0000023 U	0.00000237 U	0.00000111	0.00000146	0.000000444	0.000000499 U	0.000000499 U	0.000000491 U	0.0000005 U	0.000000498 U	0.000000645 U
OCDD	0.00071	0.0000861	0.00016	0.00106	0.000686	0.00218	0.00163	0.000105	0.000362	0.00015	0.0000199	0.00000522	0.000425
OCDF	0.000105	0.0000163	0.0000233	0.000111	0.0000684	0.000125	0.000216	0.0000101	0.000126	0.0000192	0.0000029	0.000000407	0.0000338
Total HpCDD	0.00171	0.000249	0.000246	0.00154	0.000546	0.00111	0.000342	0.0000353	0.00136	0.000146	0.000017	0.00000567	0.000107
Total HpCDF	0.000453	0.0000685	0.0000693	0.000335	0.000131	0.000265	0.00018	0.0000129	0.000461	0.0000383	0.00000513	0.00000129	0.0000419
Total HxCDD	0.00337	0.000619	0.000466	0.00263	0.000904	0.0014	0.0000553	0.0000215	0.0027	0.000378	0.0000281	0.00000961	0.000104
Total HxCDF	0.000144	0.000011	0.0000113	0.000119	0.0000809	0.000155	0.0000796	0.00000815	0.000108	0.0000188	0.00000132	0.00000102	0.000025
Total PeCDD	0.000457	0.0000645	0.0000261	0.000346	0.000141	0.00019	0.0000063	0.00000441	0.000386	0.0000497	0.000004	0.00000158	0.00000644
Total PeCDF	0.0000436	0.0000147	0.00000923	0.000063	0.0000971	0.000161	0.0000864	0.00000548	0.0000224	0.00000869	0.00000186	0.000000861	0.0000117
Total TCDD	0.0000361	0	0	0.0000271	0.0000212	0.0000295	0.00000217	0.000000499 U	0.0000505	0.00000487	0.000000755	0.000000498 U	0.000000862
Total TCDF	0.00000353	0	0	0.0000111	0.0000359	0.0000518	0.000019	0.000000501	0.00000686	0.00000537	0.00000205	0.000000498 U	0.00000377
Dioxin/Furan TEQ (as reported in FS)	1.62E-04	2.92E-05	1.36E-05	1.34E-04	5.52E-05	7.80E-05	7.64E-06	2.24E-06	1.44E-04	1.87E-05	1.45E-06	6.29E-07	4.93E-06
Dioxin/Furan TEQ (ND = 1/2 DL)	1.64E-04	3.29E-05	2.49E-05	1.35E-04	5.52E-05	7.80E-05	7.89E-06	2.81E-06	1.44E-04	1.89E-05	2.24E-06	1.81E-06	5.93E-06

Please see notes at the end of table.

Table B-4
Historical Soil Sample Analytical Results - Dioxins/Furans
Willamette Cove Upland Facility
Portland, Oregon

	Dioxins/Furans (mg/kg)												
	Central Parcel												
Sample ID	RA3-D-S4	RA3-S1	RA3-S10	RA3-S11	RA3-S12	RA3-S13	RA3-S14	RA3-S15	RA3-S16	RA3-S17	RA3-S18	RA3-S19	RA3-S2
Minimum Depth (feet bgs)	3.5	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	12/30/2015	10/19/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/19/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
1,2,3,4,6,7,8-HpCDD	0.000122	0.000209	0.000386	0.00109	0.0000946	0.000109	0.00276	0.000304	0.00502	0.006	0.000148	0.000271	0.000442
1,2,3,4,6,7,8-HpCDF	0.0000294	0.000039	0.0000915	0.000271	0.0000197	0.0000231	0.000935	0.0000737	0.00152	0.00197	0.0000664	0.0000591	0.000107
1,2,3,4,7,8,9-HpCDF	0.0000013 J	0.0000112 U	0.0000028	0.00000734	0.000000747	0.000000906	0.0000411	0.00000462	0.0000154	0.00000037 U	0.00000206	0.00000135	0.000011 U
1,2,3,4,7,8-HxCDD	0.00000391	0.0000112 U	0.00000834	0.0000267	0.00000176	0.00000181	0.0000594	0.00000404	0.000106	0.000179	0.000004	0.00000643	0.0000116
1,2,3,4,7,8-HxCDF	0.00000213 J	0.0000112 U	0.00000473	0.0000111	0.00000108	0.000000925	0.0000176	0.0000116	0.0000216	0.0000379	0.00000496	0.00000223	0.00000662 J
1,2,3,6,7,8-HxCDD	0.0000485	0.0000735	0.000196	0.000455	0.0000275	0.0000285	0.00018	0.0000518	0.00274	0.00393	0.0000754	0.000125	0.000175
1,2,3,6,7,8-HxCDF	0.00000134 J	0.0000112 U	0.00000503	0.0000119	0.00000103	0.00000082	0.0000169	0.00000766	0.0000249	0.0000445	0.00000492	0.00000191	0.00000679 J
1,2,3,7,8,9-HxCDD	0.000032	0.0000341	0.000124	0.000287	0.0000172	0.000019	0.000121	0.0000176	0.00189	0.00256	0.0000498	0.0000963	0.000103
1,2,3,7,8,9-HxCDF	0.000000587 J	0.0000112 U	0.00000185	0.00000422	0.000000442	0.000000406	0.00000332	0.00000308	0.00000744	0.000013	0.00000199	0.000000764	0.000011 U
1,2,3,7,8-PeCDD	0.00000485	0.00000723 J	0.0000242	0.0000672	0.00000393	0.000004	0.0000338	0.00000587	0.000338	0.000591	0.0000129	0.0000247	0.000011 U
1,2,3,7,8-PeCDF	0.000000727 U	0.0000112 U	0.00000194	0.00000377	0.000000461	0.000000286	0.00000178	0.0000021	0.0000045	0.00000964	0.00000221	0.000000989	0.000011 U
2,3,4,6,7,8-HxCDF	0.00000195 J	0.00000436 J	0.00000892	0.000018	0.00000153	0.00000144	0.0000234	0.0000153	0.0000304	0.0000604	0.00000964	0.00000286	0.0000145
2,3,4,7,8-PeCDF	0.00000181 J	0.00000703 J	0.00000393	0.00000676	0.00000228	0.000000553	0.00000166	0.0000093	0.0000187	0.0000386	0.00000267	0.000000965	0.0000292
2,3,7,8-TCDD	0.000000375 U	0.00000223 U	0.00000119	0.00000358	0.0000005 U	0.00000034	0.00000205	0.000000592	0.000014	0.000027	0.00000103	0.00000299	0.00000219 U
2,3,7,8-TCDF	0.000000704 U	0.00000132 J	0.00000181	0.00000325	0.000000317	0.000000289	0.000000632	0.00000164	0.00000234	0.00000517	0.00000185	0.00000101	0.00000219 U
OCDD	0.000757	0.000917	0.000902	0.00383	0.000467	0.000514	0.0155	0.0024	0.00227	0.006	0.0004	0.000605	0.00136
OCDF	0.0000471	0.0000507	0.000075	0.000248	0.0000252	0.0000455	0.00431	0.000134	0.000622	0.000903	0.0000536	0.0000316	0.000054
Total HpCDD	0.000243	0.000411	0.00082	0.00221	0.000183	0.000213	0.00427	0.000568	0.0091	0.000168	0.000319	0.000565	0.000856
Total HpCDF	0.0000661	0.00009	0.000183	0.000543	0.0000442	0.000065	0.0034	0.000211	0.0025	0.00139	0.000127	0.000105	0.0002
Total HxCDD	0.000323	0.000363	0.00129	0.00297	0.000177	0.000189	0.000908	0.000204	0.0207	0.013	0.000524	0.000838	0.00119
Total HxCDF	0.0000346	0.0000681	0.000128	0.00029	0.0000271	0.0000268	0.000638	0.000232	0.000691	0.00315	0.000136	0.0000462	0.000226
Total PeCDD	0.0000329	0.0000414	0.000168	0.00044	0.0000251	0.0000253	0.000105	0.0000405	0.00227	0.0242	0.0000885	0.000143	0.00016
Total PeCDF	0.0000135	0.0000788	0.000155	0.000253	0.000024	0.0000179	0.000133	0.000287	0.000254	0.00105	0.000205	0.0000293	0.000294
Total TCDD	0.00000225	0.00000607	0.0000267	0.0000625	0.00000369	0.00000239	0.00000978	0.0000119	0.000206	0.00376	0.0000171	0.0000309	0.0000155
Total TCDF	0.00000562	0.0000202	0.0000572	0.0000886	0.0000076	0.0000066	0.0000307	0.0000682	0.0000753	0.000525	0.0000654	0.000016	0.0000779
Dioxin/Furan TEQ (as reported in FS)	1.62E-05	2.34E-05	6.68E-05	1.70E-04	1.10E-05	1.13E-05	1.22E-04	2.52E-05	9.06E-04	3.59E-04	3.24E-05	5.52E-05	4.64E-05
Dioxin/Furan TEQ (ND = 1/2 DL)	1.64E-05	2.70E-05	6.68E-05	1.70E-04	1.13E-05	1.13E-05	1.22E-04	2.52E-05	9.06E-04	1.39E-03	3.24E-05	5.52E-05	5.39E-05

Please see notes at the end of table.

Table B-4
Historical Soil Sample Analytical Results - Dioxins/Furans
Willamette Cove Upland Facility
Portland, Oregon

	Dioxins/Furans (mg/kg)												
	Central Parcel												
Sample ID	RA3-S20	RA3-S21	RA3-S22	RA3-S23	RA3-S24	RA3-S25	RA3-S26	RA3-S27	RA3-S28	RA3-S29	RA3-S3	RA3-S4	RA3-S5
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	12/22/2015	12/22/2015	10/19/2015	10/19/2015	10/19/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
1,2,3,4,6,7,8-HpCDD	0.00432	0.000257	0.000164	0.00043	0.000881	0.000603	0.00037	0.000185	0.00000793	0.000892	0.00282	0.00105	0.00191
1,2,3,4,6,7,8-HpCDF	0.00102	0.000151	0.0000497	0.0000711	0.000212	0.000193	0.0000746	0.0000484	0.0000027	0.000175	0.000965	0.000409	0.000701
1,2,3,4,7,8,9-HpCDF	0.0000193	0.00000303	0.00000159	0.00000337	0.00000859	0.0000044	0.00000471	0.00000364	8.88E-08 U	0.0000127	0.0000122 U	0.00000967 J	0.0000121 U
1,2,3,4,7,8-HxCDD	0.000114	0.00000558	0.0000053	0.00000626	0.0000181	0.0000171	0.00000482	0.00000241	0.000000403 U	0.00000429	0.0000841	0.0000425	0.0000589
1,2,3,4,7,8-HxCDF	0.000018	0.00000187	0.00000175	0.00000317	0.00000738	0.0000047	0.00000707	0.00000842	0.000000223 U	0.00000783	0.0000175	0.0000486	0.0000135
1,2,3,6,7,8-HxCDD	0.00219	0.000111	0.0000983	0.000136	0.000292	0.000446	0.0000474	0.0000199	0.00000454	0.000031	0.00178	0.000479	0.00124
1,2,3,6,7,8-HxCDF	0.0000228	0.00000176	0.00000205	0.00000299	0.00000748	0.00000595	0.0000116	0.00000737	0.000000072 U	0.0000053	0.0000198	0.0000334	0.000016
1,2,3,7,8,9-HxCDD	0.00132	0.0000683	0.000063	0.000077	0.000184	0.000202	0.0000318	0.0000103	0.0000028	0.0000113	0.00128	0.000324	0.000821
1,2,3,7,8,9-HxCDF	0.00000585	0.000000702	0.000000672	0.00000124	0.00000235	0.00000157	0.00000355	0.00000259	0.00000011 U	0.00000303	0.0000122 U	0.00000731 J	0.0000121 U
1,2,3,7,8-PeCDD	0.000365	0.0000183	0.0000229	0.0000133	0.0000537	0.000063	0.00000712	0.00000322	0.000000876 J	0.00000205 J	0.000242	0.0000803	0.000183
1,2,3,7,8-PeCDF	0.00000354	0.000000409	0.000000499	0.000000952	0.00000197	0.000000986	0.00000246	0.00000138	0.00000051 U	0.00000123 U	0.00000431 J	0.0000276	0.00000455 J
2,3,4,6,7,8-HxCDF	0.0000302	0.00000289	0.00000302	0.00000531	0.0000122	0.00000927	0.000027	0.0000162	0.000000324 J	0.0000114	0.0000237	0.0000244	0.0000225
2,3,4,7,8-PeCDF	0.00000356	0.000000622	0.000000947	0.00000668	0.0000044	0.00000288	0.00000903	0.00000476	0.000000326 U	0.000017	0.0000155	0.0000471	0.0000245
2,3,7,8-TCDD	0.0000207	0.00000093	0.00000155	0.00000049 U	0.00000342	0.00000298	0.000000821	0.000000913 U	0.000000168 U	0.00000051 U	0.0000111	0.00000654	0.0000091
2,3,7,8-TCDF	0.00000122	0.000000307	0.000000387	0.000000767	0.00000173	0.000000642	0.00000235	0.00000111	0.000000167 U	0.00000169 U	0.00000183 J	0.0000158	0.00000242 U
OCDD	0.0229	0.00137	0.000485	0.00187	0.00431	0.00189	0.0022	0.00131	0.0000196	0.00912	0.00199	0.00151	0.00127
OCDF	0.000653	0.0004	0.000061	0.000167	0.000467	0.000196	0.000235	0.000077	0.00000177 J	0.0012	0.000334	0.000174	0.000227
Total HpCDD	0.00787	0.000533	0.000359	0.0008	0.00177	0.00124	0.000727	0.000332	0.0000165	0.0017	0.00614	0.0022	0.00448
Total HpCDF	0.00196	0.000417	0.000116	0.0002	0.000568	0.000376	0.000244	0.000141	0.0000043	0.000799	0.00151	0.000627	0.00111
Total HxCDD	0.0146	0.000775	0.000725	0.000662	0.0019	0.00234	0.00038	0.000127	0.0000327	0.000159	0.0128	0.00359	0.00831
Total HxCDF	0.000592	0.0000845	0.0000523	0.0000944	0.000224	0.000158	0.00037	0.000242	0.000003	0.000247	0.000494	0.000407	0.000376
Total PeCDD	0.00236	0.00012	0.000144	0.0000787	0.000316	0.00037	0.0000598	0.0000249	0.000002	0.0000196	0.0017	0.000921	0.00135
Total PeCDF	0.000168	0.0000273	0.0000336	0.0000798	0.000172	0.000106	0.000582	0.000354	0.00000367	0.000142	0.00015	0.000437	0.000226
Total TCDD	0.00029	0.0000153	0.0000179	0.0000114	0.0000459	0.0000338	0.0000196	0.00000746	0.00000229	0.0000028	0.000132	0.000318	0.000172
Total TCDF	0.0000494	0.0000086	0.0000119	0.0000249	0.0000556	0.0000267	0.000128	0.0000726	0.000000655	0.00003	0.0000266	0.000266	0.0000667
Dioxin/Furan TEQ (as reported in FS)	8.18E-04	4.33E-05	4.45E-05	4.43E-05	1.23E-04	1.44E-04	2.95E-05	1.43E-05	1.76E-06	2.85E-05	6.17E-04	2.15E-04	4.43E-04
Dioxin/Furan TEQ (ND = 1/2 DL)	8.18E-04	4.33E-05	4.45E-05	4.45E-05	1.23E-04	1.44E-04	2.95E-05	1.48E-05	1.94E-06	2.88E-05	6.18E-04	2.14E-04	4.44E-04

Please see notes at the end of table.

Table B-4
Historical Soil Sample Analytical Results - Dioxins/Furans
Willamette Cove Upland Facility
Portland, Oregon

	Dioxins/Furans (mg/kg)												
	Central Parcel											East Parcel	West Parcel
Sample ID	RA3-S6	RA3-S7	RA3-S8	RA3-S9	Saturated Fill Soil	Soil Layers	WC-1 Surface	WC-1/2/3	WC-2 Surface	WC-3 Surface	Wharf Beach -1	DU-4	DP-2 (10-30)
Minimum Depth (feet bgs)	0	0	0	0	0	0	0.25	0.25	0.25	0.25	1	0	10
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0	0	0.75	1	0.75	0.75	1.5	0.5	30
Sample Date	10/28/2015	10/28/2015	10/28/2015	10/28/2015	12/19/2016	10/20/2015	10/1/2010	10/1/2010	10/1/2010	10/1/2010	9/27/2010	1/13/2014	12/19/2016
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Discrete	Composite	Discrete	Discrete	Discrete	ISM	Composite
1,2,3,4,6,7,8-HpCDD	0.000194	0.000139	0.000257	0.0121	0.00133	0.00214	0.002	0.0031	0.0012	0.0024	0.0000025 J	0.00181 E	0.0000327
1,2,3,4,6,7,8-HpCDF	0.000029	0.000088	0.0000577	0.00335	0.000214	0.000883	0.00043	0.00025	0.00021	0.0023	0.0000025 J	0.000171	0.0000205
1,2,3,4,7,8,9-HpCDF	0.00000144	0.00000149	0.00000113	0.0000381	0.000017	0.0000088	0.000052	0.000016	0.000019 J	0.00034	0.00000058 U	0.0000116	0.00000574
1,2,3,4,7,8-HxCDD	0.00000255	0.00000246	0.00000717	0.000282	0.0000107	0.00006	0.000042 J	0.000015	0.000025 J	0.00015	0.00000055 U	0.000016	0.000000602 U
1,2,3,4,7,8-HxCDF	0.00000264	0.00000279	0.00000216	0.0000484	0.0000227	0.0000102	0.00022	0.000022	0.000043 J	0.0014	0.0000014 J	0.0000177	0.0000363
1,2,3,6,7,8-HxCDD	0.0000352	0.0000246	0.000125	0.00792	0.0000521	0.00149	0.00015	0.00015	0.00011	0.00068	0.00000051 J	0.000116	0.00000163 J
1,2,3,6,7,8-HxCDF	0.00000185	0.00000232	0.00000199	0.0000584	0.0000141	0.0000122	0.0000046 P U	0.000013	0.0000022 P U	0.0000005 P U	0.0000022 J	0.0000112	0.0000103
1,2,3,7,8,9-HxCDD	0.0000172	0.0000153	0.0000938	0.00575	0.0000305	0.000923	0.00009	0.000029	0.000065	0.00043	0.00000049 U	0.0000439	0.00000077 J
1,2,3,7,8,9-HxCDF	0.000000965	0.0000012	0.000000812	0.000016	0.00000256	0.00000391	0.00012	0.000014	0.00002 J	0.001	0.00000096 J	0.00000574	0.00000251
1,2,3,7,8-PeCDD	0.00000544	0.00000456	0.0000212	0.000972	0.00000639	0.00019	0.000035 J	0.0000085	0.000018 J	0.00024	0.00000054 U	0.0000114	0.00000059 U
1,2,3,7,8-PeCDF	0.00000145	0.00000126	0.000000888	0.00000891	0.00000427	0.00000204	0.0000057 P U	0.0000058	0.0000028 P U	0.000000958 P U	0.00000061 U	0.00000515	0.0000175
2,3,4,6,7,8-HxCDF	0.00000305	0.00000428	0.00000277	0.000071	0.0000126	0.0000138	0.00031	0.000013	0.000058	0.0032	0.0000031 J	0.0000196	0.00000281
2,3,4,7,8-PeCDF	0.0000013	0.00000189	0.000000926	0.00000448	0.00000434	0.00000225	0.0015	0.0000083	0.00018	0.016	0.00000042 U	0.00000497	0.00000603
2,3,7,8-TCDD	0.00000198	0.00000127	0.00000297	0.0000401	0.000002	0.00000685	0.0000019 U	0.000001 J	0.0000045 J	0.000024	0.0000004 U	0.00000108	0.000000149 UE
2,3,7,8-TCDF	0.00000238	0.00000169	0.00000108	0.0000042	0.00000246	0.000000627	0.0000053 P U	0.000005	0.0000038 P U	0.0000016 P U	0.0000005 J	0.00000404	0.00000672
OCDD	0.0016	0.000867	0.000579	0.00518	0.0163	0.000821	0.013	0.027	0.0075	0.01	0.0000085 J	0.0122 E	0.000422
OCDF	0.0000481	0.0000534	0.0000331	0.00124	0.000924	0.000316	0.00063	0.00049	0.00024	0.00046	0.0000029 J	0.000279	0.0000387
Total HpCDD	0.000651	0.000295	0.000582	0.0226	0.00273	0.00447	0.0085	0.00057	0.0014	0.093 E	0.0000049	0.000461 P	0.0000713
Total HpCDF	0.0000776	0.000161	0.000106	0.00515	0.000941	0.00139	0.0039	0.006	0.0026	0.005	0.0000046 J	0.00323	0.0000485
Total HxCDD	0.000209	0.000168	0.000814	0.0452	0.00042	0.00959	0.0013	0.0008	0.0005	0.0063	0.0000045 J	0.00053	0.0000116
Total HxCDF	0.0000542	0.0000821	0.0000461	0.00131	0.000367	0.000317	0.0013	0.0006	0.00092	0.0073	0.00002	0.00054	0.00007
Total PeCDD	0.0000464	0.0000362	0.000142	0.00535	0.000046	0.00121	0.016	0.00014	0.0022	0.15 E	0.00000054 U	0.000153 P	0.00000098
Total PeCDF	0.0000582	0.0000873	0.0000284	0.000291	0.00012	0.000057	0.00051	0.000053	0.0002	0.0037	0.000034	0.000062	0.0000468
Total TCDD	0.0000258	0.000018	0.0000322	0.000469	0.0000149	0.0000934	0.00016	0.000035	0.000084	0.00089	0.0000004 U	0.0000159	0.000000462 U
Total TCDF	0.0000354	0.0000386	0.0000113	0.0000931	0.0000366	0.0000167	0.0035	0.000079	0.00061	0.016 E	0.000012	0.0000571 P	0.0000185
Dioxin/Furan TEQ (as reported in FS)	1.72E-05	1.45E-05	5.13E-05	2.59E-03	4.54E-05	4.80E-04	6.00E-04	8.00E-05	1.30E-04	5.70E-03	1.50E-06	6.12E-05	9.45E-06
Dioxin/Furan TEQ (ND = 1/2 DL)	1.72E-05	1.45E-05	5.13E-05	2.59E-03	4.54E-05	4.80E-04	6.08E-04	8.02E-05	1.25E-04	5.80E-03	1.52E-06	6.12E-05	9.49E-06

Please see notes at the end of table.

Table B-4
Historical Soil Sample Analytical Results - Dioxins/Furans
Willamette Cove Upland Facility
Portland, Oregon

	Dioxins/Furans (mg/kg)		
	West Parcel		
Sample ID	DP-4 (10-30)	DP-5 (10-30)	DU-7
Minimum Depth (feet bgs)	10	10	0
Maximum Depth (feet bgs)	30	30	0.5
Sample Date	12/21/2016	1/4/2017	1/13/2014
Sample Type	Composite	Composite	ISM
1,2,3,4,6,7,8-HpCDD	0.0000654	0.000201	0.000672
1,2,3,4,6,7,8-HpCDF	0.0000133	0.0000348	0.000172
1,2,3,4,7,8,9-HpCDF	0.000001 J	0.00000408	0.00000674
1,2,3,4,7,8-HxCDD	0.000000602 U	0.00000119 J	0.0000134
1,2,3,4,7,8-HxCDF	0.00000164	0.00000738	0.0000189
1,2,3,6,7,8-HxCDD	0.00000291	0.00000761	0.000285
1,2,3,6,7,8-HxCDF	0.00000115 J	0.00000317	0.00000847
1,2,3,7,8,9-HxCDD	0.00000147 J	0.0000046	0.00017
1,2,3,7,8,9-HxCDF	0.000000783 U	0.000000783 U	0.00000118
1,2,3,7,8-PeCDD	0.00000028 UE	0.00000142 J	0.0000386
1,2,3,7,8-PeCDF	0.000000604 J	0.00000261	0.00000802
2,3,4,6,7,8-HxCDF	0.00000104 J	0.00000289	0.0000074
2,3,4,7,8-PeCDF	0.000000679 UE	0.00000148 J	0.00000492
2,3,7,8-TCDD	0.00000025 UE	0.00000107	0.00000211
2,3,7,8-TCDF	0.000000669	0.00000185	0.00000545
OCDD	0.000798	0.00277	0.00286 E
OCDF	0.0000344	0.000137	0.000219
Total HpCDD	0.000144	0.000423	0.000169 P
Total HpCDF	0.0000403	0.000137	0.00146
Total HxCDD	0.0000255	0.0000873	0.00039
Total HxCDF	0.0000219	0.0000636	0.00197
Total PeCDD	0.00000274	0.0000142	0.0000715 P
Total PeCDF	0.00000972	0.0000291	0.000243
Total TCDD	0.00000156	0.00000481	0.0000236
Total TCDF	0.00000793	0.0000149	0.0000302 P
Dioxin/Furan TEQ (as reported in FS)	2.04E-06	9.21E-06	1.03E-04
Dioxin/Furan TEQ (ND = 1/2 DL)	2.02E-06	9.19E-06	1.03E-04

Notes:
1. mg/kg = Milligrams per kilogram.
2. ND = Not detected.
3. DL = Detection or reporting limit.
4. bgs = Below ground surface.
5. ISM = Sample collected using Incremental Sampling Methodology.
6. U = Analyte was not detected.
7. J = Result is estimated.
8. P = GC or HPLC confirmation criteria exceeded. Analyte could not be confirmed and is tentatively identified.
9. UJ = The analyte was analyzed for but was not detected. However, the detection limit may be inaccurate or impreci
10. E = Result was detected above the upper calibration limit and is estimated.
11. Shading = Sample locations removed during the 2008/2015 soil removal actions.

Table B-5
Historical Soil Analytical Results - Herbicides
Willamette Cove Upland Facility
Portland, Oregon

	Herbicides (mg/kg)						
	East Parcel					West Parcel	
Sample ID	B-21/S-1	TP-36/S-1	TP-38/S-1	TP-39/S-2	TP-40/S-1	B-2/S-2	TP-17/S-2
Minimum Depth (feet bgs)	0	0	0	1.5	0	2	1.5
Maximum Depth (feet bgs)	4	0.5	0.5	2	0.5	4	2
Sample Date	5/7/2001	4/16/2001	4/16/2001	4/16/2001	4/16/2001	5/10/2001	4/17/2001
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Dinoseb	2 U	1 U	2 U	2 U	1 U	2 U	1 U

Notes:

1. mg/kg = Milligrams per kilogram.
2. bgs = Below ground surface.
3. U = Analyte was not detected.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	Area-2-10a	Area-2-10b	Area-2-10c	Area-2-14a	Area-2-14b	Area-2-14c	Area-3-1	Area-3-10	Area-3-12	Area-3-13	Area-3-14	Area-3-15	Area-3-16	Area-3-17	Area-3-18	Area-3-19	Area-3-2	Area-3-20	Area-3-3
Minimum Depth (feet bgs)	0	0.5	1	0	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	1	1.5	0.5	1	1.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	1.26 U	1.22 U	1.18 U	1.38 U	1.2 U	1.3 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3.62	2.7	1.87	5.21	3.97	4.43	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	0.478	0.403	0.319	0.399	0.419	0.52	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	0.327	0.317	0.189 J	0.66	0.73	0.455	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	18.2	13.1	10.3	14.1	11.6	15.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	48.4	27.5	16.5	22.5	15.5	23.8	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	126	49.7	13.7	148	116	17.1	37.7	322	48.6	141	257	719	287	346	424	198	87.1	831	433
Mercury	0.648	0.309	0.124	0.136	0.0836 J	0.189	0.239	3.9	0.955	0.316	0.32	26.6	2.31	1.95	1.83	0.703	0.826	0.437	6.25
Nickel	20.6	17	16.1	20.6	16.5	18.9	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	2.52 U	2.44 U	2.36 U	2.75 U	2.39 U	2.6 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	0.252 U	0.244 U	0.236 U	0.275 U	0.239 U	0.26 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	0.252 U	0.244 U	0.236 U	0.275 U	0.239 U	0.26 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	101	74.6	45.4	121	95.8	61.6	--	--	--	--	--	--	--	--	--	--	--	--	--

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	Area-3-3a	Area-3-3b	Area-3-3c	Area-3-4	Area-3-5	Area-3-6	Area-3-7	Area-3-8	Area-3-9	Area-4-1	Area-4-2	Area-4-3	Area-4-4	Area-4-5	Area-4-6	Area-4-7	Area-5-1	Area-5-2	Area-5-3
Minimum Depth (feet bgs)	0	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	1	1.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	2/20/2015	2/20/2015	2/20/2015	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/14/2014	4/14/2014	4/14/2014
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	1.09 U	1.16 U	1.12 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	5.06	3.32	2.76	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	0.337	0.289	0.257	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	0.717	0.486	0.379	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	11.6	10.4	9.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	81.9	29.2	68.4	--	--	--	--	--	--	46.7	40.9	44.8	45.4	40.5	34.5	50	--	--	--
Lead	342	63.5	102	92.1	58.9	49.4	464	260	172	--	--	--	--	--	--	--	--	--	--
Mercury	0.958	0.204	0.197	1.4	0.158 J	0.223	1.81	1.04	1.75	--	--	--	--	--	--	--	3.16	1.92	4.54
Nickel	27.3	18.2	17.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	2.17 U	2.31 U	2.23 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	0.217 U	0.231 U	0.223 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	0.217 U	0.231 U	0.223 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	205	127	116	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	Area-5-4	Area-5-5	Area-5-6	Area-5-7	Area-5-8	Area-5-9	Area-6-1	Area-6-10	Area-6-11	Area-6-12	Area-6-13	Area-6-14	Area-6-15	Area-6-2	Area-6-3	Area-6-4	Area-6-5	Area-6-6	Area-6-6a
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	4/14/2014	2/20/2015
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.4
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23.9
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.262
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.65
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	18.4
Copper	--	--	--	--	--	--	758	434	378	451	795	197	179	360	42	234	408	819	323
Lead	--	--	--	--	--	--	--	--	535	--	--	126	185	521	62.6	--	--	--	197
Mercury	0.709	3.39	2.5	2.22	1.84	0.418	4.62	4.3	2.94	5.15	7.47	1.02	1.61	2.16	0.269	2.71	4.74	14.1	3.03
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	80.6
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.28 U
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.228 U
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.228 U
Zinc	--	--	--	--	--	--	475	338	310	514	546	186	442	304	92.9	319	393	426	265

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	Area-6-6b	Area-6-6c	Area-6-7	Area-6-8	Area-6-9	Area-6-9a	Area-6-9b	Area-6-9c	B-12/S-1	B-16/S-1	B-17/S-1	B-18/S-1	DU-5	DU-6	DU-6-COMP-1-1	DU-6-COMP-1-2	DU-6-COMP-1-3	DU-6-COMP-1-4	DU-6-COMP-1-5
Minimum Depth (feet bgs)	0.5	1	0	0	0	0	0.5	1	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	1	1.5	0.5	0.5	0.5	0.5	1	1.5	2	2	2	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	2/20/2015	2/20/2015	4/14/2014	4/14/2014	4/14/2014	2/20/2015	2/20/2015	2/20/2015	5/14/2001	5/7/2001	5/8/2001	5/7/2001	1/13/2014	1/13/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	ISM	ISM	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	1.16 U	1.07 U	--	--	--	1.24 U	1.07 U	1.16 U	--	--	0.5 UJ	3.32 J	1.29	0.51 U	--	--	--	--	--
Arsenic	2.05	2.41	--	--	--	2.87	2.14	2.35	2.7	3.52	4.82 J	--	6.02	4.95	--	--	--	--	--
Beryllium	0.291	0.256	--	--	--	0.421	0.332	0.301	--	--	3.33	--	0.679	0.678	--	--	--	--	--
Cadmium	0.256	0.192 J	--	--	--	0.235 J	0.236	0.208 J	1 U	1.2	4.32 U	--	0.5	0.37	--	--	--	--	--
Chromium	8.56	10.9	--	--	--	13.7	9.57	10.6	23	26.3	29.1 J	--	16.1	11.7	--	--	--	--	--
Copper	29.9	14.4	157	728	725	66.4	18.7	14.3	134	35.2	34.8 J	25.4 J	293	404	--	--	--	--	--
Lead	118	3.69	487	--	--	59.3	55.7	2.57	215 J	280 J	29.2 J	14.3 J	310	164	--	--	--	--	--
Mercury	0.086 J	0.0854 U	2.43	11.3	9.51	0.649	0.0705 J	0.0926 U	0.67	0.157	0.1 U	0.1 U	7 H	11 H	0.31 J2	0.841 J2	0.609 J2	0.112 J2	1.12 J2
Nickel	16	16.6	--	--	--	17.7	17.1	17.2	26.5	29.4	37.1 J	--	16.6	14.7	--	--	--	--	--
Selenium	2.33 U	2.14 U	--	--	--	2.48 U	2.14 U	2.31 U	--	--	0.1 U	--	0.0508 U	0.051 U	--	--	--	--	--
Silver	0.233 U	0.214 U	--	--	--	0.248 U	0.214 U	0.231 U	--	--	0.5 U	--	0.254 U	0.255 U	--	--	--	--	--
Thallium	0.233 U	0.214 U	--	--	--	0.248 U	0.214 U	0.231 U	--	--	0.5 U	--	0.635 U	0.637 U	--	--	--	--	--
Zinc	80.2	38.4	364	681	422	73.2	57.9	39	143	475	182 J	92.2 J	238	187	--	--	--	--	--

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	DU-6-COMP-1-6	DU-6-COMP-1-7	DU-6-COMP-2-1	DU-6-COMP-2-2	DU-6-COMP-2-3	DU-6-COMP-2-4	DU-6-COMP-2-5	DU-6-COMP-2-6	DU-6-COMP-3-1	DU-6-COMP-3-2	DU-6-COMP-3-3	DU-6-COMP-3-4	DU-6-COMP-3-5	DU-6-COMP-3-6	DU-6-COMP-4-1	DU-6-COMP-4-2	DU-6-COMP-4-3	DU-6-COMP-4-4	DU-6-COMP-4-5
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	8.29 J2	1.92 J2	0.956 J2	0.406 J2	0.534 J2	0.587 J2	0.516 J2	0.0796 J2	0.124 J	0.492 J2	0.183 J2	0.358 J2	0.142 J2	0.374 J2	3.88 J2	0.222 J2	1.82 J2	4.22 J2	0.113 J2
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	DU-6-COMP-4-6	DU-6-COMP-4-7	DU-6-COMP-5-1	DU-6-COMP-5-2	DU-6-COMP-5-3	DU-6-COMP-5-3a	DU-6-COMP-5-3b	DU-6-COMP-5-3c	DU-6-COMP-5-4	DU-6-COMP-5-5	DU-6-COMP-5-6	DU-6-COMP-5-6a	DU-6-COMP-5-6b	DU-6-COMP-5-6c	DU-6-COMP-5-6d	DU-6-COMP-5-6e	DU-6-COMP-5-6f	DU-6-COMP-6-1	DU-6-COMP-6-2
Minimum Depth (feet bgs)	0	0	0	0	0	0	0.5	1	0	0	0	0	0.5	1	1.5	2	2.5	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	1	1.5	0.5	0.5	0.5	0.5	1	1.5	2	2.5	3	0.5	0.5
Sample Date	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	2/20/2015	2/20/2015	2/20/2015	4/8/2014	4/8/2014	4/8/2014	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	4/8/2014	4/8/2014
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	--	--	--	--	--	1.25 U	1.21 U	1.19 U	--	--	--	1.89	2.15	2.55	1.84	2.45	1.33	--	--
Arsenic	--	--	--	--	--	4.7	3.55	2.74	--	--	--	22.2	16.6	12	23.9	10.3	10.8	--	--
Beryllium	--	--	--	--	--	0.35	0.424	0.368	--	--	--	0.345	0.392	0.508	0.42	0.37	0.394	--	--
Cadmium	--	--	--	--	--	0.4	0.206 J	0.238	--	--	--	1.58	2.87	2.98	2.38	1.81	1.53	--	--
Chromium	--	--	--	--	--	11.8	14.6	13.1	--	--	--	69.8	26.6	26.7	31.6	18.8	17.9	--	--
Copper	--	--	--	--	--	51	19	16.7	--	--	--	285	189	122	175	135	140	--	--
Lead	--	--	--	--	--	206	5.16	4.28	--	--	--	1760	1170	725	893	622	838	--	--
Mercury	0.0993 J2	0.132 J2	0.167 J2	0.244 J2	1.89 J2	0.387	0.097 U	0.095 U	0.799 J2	1.37 J2	2.07 J2	4.2	1.98	1.2	0.694	1.13	1.22	0.641 J2	0.316 J2
Nickel	--	--	--	--	--	18.4	21.7	20.1	--	--	--	23.4	21.1	44.4	27.3	26.1	20.2	--	--
Selenium	--	--	--	--	--	2.5 U	2.42 U	2.38 U	--	--	--	2.38 U	2.37 U	2.6 U	0.901 J	0.78 J	0.923 J	--	--
Silver	--	--	--	--	--	0.25 U	0.242 U	0.238 U	--	--	--	0.226 J	0.249	0.391	0.309	0.26 J	0.209 J	--	--
Thallium	--	--	--	--	--	0.25 U	0.242 U	0.238 U	--	--	--	0.119 J	0.309	0.43	0.445	0.246 J	0.234 J	--	--
Zinc	--	--	--	--	--	136	46.2	43.2	--	--	--	633	697	574	599	400	423	--	--

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	DU-6-COMP-6-3	DU-6-COMP-6-4	DU-6-COMP-6-5	DU-6-COMP-6-6	DU-6-COMP-7-1	DU-6-COMP-7-2	DU-6-COMP-7-3	DU-6-COMP-7-4	DU-6-COMP-7-5	DU-6-COMP-7-6	DU-6-COMP-8-1	DU-6-COMP-8-2	DU-6-COMP-8-3	DU-6-COMP-8-4	DU-6-COMP-8-5	DU-6-COMP-8-6	Matrix Comp	RA2-B1	RA2-B2
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0	0.5	0.5
Sample Date	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	4/8/2014	10/21/2015	10/14/2015	10/14/2015
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Composite
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.33 U	2.27 U	2.3 U
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	11.3	2.95	2.74
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.332	0.306	0.357
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.864	0.34	0.299
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	18.9	12.7	12.7
Copper	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	268	27.4	30.4
Lead	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	305	42.1	60.4
Mercury	0.339 J2	1.03 J2	2.44 J2	11.3 J2	4.69 J2	3.35 J2	14.9 J2	0.582 J2	0.568 J2	1.41 J2	4.62 J2	1.99 J2	5.34 J2	1.42 J2	25.3 J2	1.98 J2	2.04	0.613	0.79
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	26.4	24.2	23.9
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.66 U	2.27 U	2.3 U
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.266 U	0.227 U	0.23 U
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.266 U	0.227 U	0.23 U
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	286	84.6	92.1

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	RA2-B3	RA2-S1	RA2-S2	RA2-S3	RA2-S4	RA2-S5	RA2-S6	RA2-S7	RA2-S8	RA2-S9	RA3-B1	RA3-B10	RA3-B11	RA3-B12	RA3-B13	RA3-B14	RA3-B15	RA3-B16	RA3-B2
Minimum Depth (feet bgs)	1	0	0	0	0	0	0	0	0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5
Maximum Depth (feet bgs)	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5
Sample Date	10/29/2015	10/14/2015	10/14/2015	10/14/2015	10/14/2015	10/14/2015	10/29/2015	10/29/2015	12/21/2015	12/21/2015	10/19/2015	10/19/2015	10/19/2015	10/21/2015	10/27/2015	10/28/2015	1/5/2016	1/5/2016	10/19/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
Antimony	1.17 U	2.31 U	2.34 U	2.23 U	2.35 U	2.17 U	1.14 U	1.19 U	1.33 U	1.3 U	1.17 U	2.75	1.18 U	2.43	1.13 U	1.18 U	1.15 U	1.24 U	1.11 U
Arsenic	3.17	5.53	4.49	7.62	2.61	3.08	3.17	4.14	2.9	2.9	3.38	9.4	3.13	4.82	5.03	7.66	1.92	9.2	3.64
Beryllium	0.446	0.485	0.456	0.39	0.423	0.347	0.388	0.333	0.306	0.351	0.315	0.285	0.391	0.316	0.272	0.294	0.334	0.297	0.323
Cadmium	1.17 U	0.427	0.363	0.39	0.235	0.282	1.14 U	1.19 U	0.306	0.39	0.443	0.451	0.355	0.338	0.521	0.271	0.23 U	0.297	0.279
Chromium	14.5	17.6	18	15.3	15.4	15.7	15.2	15.8	13.3	13.4	11.1	12.9	13.8	18.1	12.5	11	9.93	13.2	13
Copper	35.2	48.8	40.6	30.2	32.4	35.5	42.3	42.2	39.1	31.1	52.2	55.6	61.5	74	70	82.2	12.5	162 Q	26
Lead	68	46.8	65.2	79.3	61.4	64.8	157	83.9	66.9	57.2	220	87.3	44.9	99.1	137	154	5.36	148 Q	81.7
Mercury	0.599	0.892	1.19	0.691	0.736	1.66	1.04	0.893	1.89	1.06	0.173	0.264	0.21	0.998	2.59	1.34	0.0922 U	13.4	0.17
Nickel	20.4	39.2	60.6	31.1	20.4	21.1	26.5	127	27.3	26.8	18.6	17.8	19.2	20.3	16	15	15.3	17.7	16.9
Selenium	2.35 U	2.31 U	2.34 U	2.23 U	2.35 U	2.17 U	2.28 U	2.38 U	1.33 U	1.3 U	1.17 U	1.19 U	1.18 U	1.13 U	2.27 U	2.35 U	1.15 U	1.24 U	1.11 U
Silver	0.235 U	0.231 U	0.234 U	0.223 U	0.235 U	0.217 U	0.228 U	0.238 U	0.266 U	0.26 U	0.233 U	0.237 U	0.237 U	0.226 U	0.227 U	0.235 U	0.23 U	0.247 U	0.223 U
Thallium	0.235 U	0.231 U	0.234 U	0.223 U	0.235 U	0.217 U	0.228 U	0.238 U	0.266 U	0.26 U	0.233 U	0.237 U	0.237 U	0.226 U	0.227 U	0.235 U	0.23 U	0.247 U	0.223 U
Zinc	99.5	109	121	125	89.1	89.7	109	187	120	108	164	274	84.1	159	510	122	37.5	171	100

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	RA3-B3	RA3-B4	RA3-B5	RA3-B6	RA3-B7	RA3-B8	RA3-B9	RA3-D-B1	RA3-D-B2	RA3-D-S1	RA3-D-S2	RA3-D-S3	RA3-D-S4	RA3-S1	RA3-S10	RA3-S11	RA3-S12	RA3-S13	RA3-S14
Minimum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	5	0.5	0.5	3.5	3.5	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	5	1	1	4	4	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/19/2015	10/19/2015	10/19/2015	10/21/2015	10/21/2015	10/27/2015	10/27/2015	10/29/2015	12/30/2015	10/29/2015	10/29/2015	12/28/2015	12/30/2015	10/19/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
Antimony	1.07 U	1.12 U	1.15 U	3	4.62	1.04 U	1.03 U	1.12 U	1.19 U	103	2.24 U	1.29 U	1.42 U	1.1 U	7.13	3.18	1.25	1.17 U	1.18 U
Arsenic	2.31	2.22	8.45	13.4	11.7	4.42	1.88	4.14	3.01	20	4.95	4.35	2.95	3.5	9.35	8.33	3.45	3.51	2.6
Beryllium	0.277	0.246	0.31	0.257	0.351	0.248	0.248	0.337	0.286	0.362	0.347	0.464	0.427	0.308	0.376	0.267	0.271	0.246	0.236
Cadmium	0.288	0.223 U	0.448	0.867	0.511	0.207 U	0.207 U	0.394	0.238 U	1.81	0.526	0.309	0.285 U	0.628	1.02	1	0.228	0.458	0.236 U
Chromium	6.56	9.3	15.7	15.9	19.5	8.3	7.45	14.3	10.6	28.8	17	13.5	14.1	13.6	18.4	22.9	11.1	10.3	8.7
Copper	43.7	28.4	99.7	229	106	51	10.5	64.8	29.5	676	64.6	32.3	31	31.5	135	221	38.1	33.9	20.4
Lead	94.4	27.1	295	423	226	49.4	3.44	64.9 Q	58.6	1010	190	54.5	63.4	163	525	463	81.4	69.5	27.5
Mercury	0.193	0.367	6.27	11	1.26	1.62	0.0826 U	4.42	0.193	47.8	1.85	0.121	0.244	0.552	3.55	2.67	0.251	0.247	0.0943 U
Nickel	12.1	15.5	44	23.6	31.1	12.3	13	19	33.8	64.4	27.7	21.6	14.6	18.4	31.4	32	17.8	14.8	13.3
Selenium	1.07 U	1.12 U	1.15 U	1.07 U	1.06 U	2.07 U	2.07 U	2.25 U	1.19 U	2.19 U	2.24 U	1.29 U	1.42 U	1.1 U	2.59 U	2.67 U	2.17 U	2.35 U	2.36 U
Silver	0.213 U	0.223 U	0.23 U	0.214 U	0.213 U	0.207 U	0.207 U	0.225 U	0.238 U	0.219 U	0.224 U	0.258 U	0.285 U	0.22 U	0.259 U	0.267 U	0.217 U	0.235 U	0.236 U
Thallium	0.213 U	0.223 U	0.23 U	0.214 U	0.213 U	0.207 U	0.207 U	0.225 U	0.238 U	0.219 U	0.224 U	0.258 U	0.285 U	0.22 U	0.259 U	0.267 U	0.217 U	0.235 U	0.236 U
Zinc	121	57.6	183	325	195	65.3	30.5	196	86.6	920	173	109	87.7	202	319	364	90.7	78.6	51.9

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	RA3-S15	RA3-S16	RA3-S17	RA3-S18	RA3-S19	RA3-S2	RA3-S20	RA3-S21	RA3-S22	RA3-S23	RA3-S24	RA3-S25	RA3-S26	RA3-S27	RA3-S28	RA3-S29	RA3-S3	RA3-S4	RA3-S5
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/19/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	12/22/2015	12/22/2015	10/19/2015	10/19/2015	10/19/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
Antimony	1.54	2.39	4.1	1.15 U	1.23 U	1.19 U	1.42	1.09 U	1.2 U	1.18 U	1.08 U	1.13 U	1.16 U	1.49	3.28	1.15 U	1.12 U	6.99	2.13
Arsenic	5.41	10.6	14.5	5.56	4.47	4.15	5.25	4.66	12.2	12.4	10.3	6.1	7.78	7.09	9.12	15.3	3.87	23.1	6.5
Beryllium	0.257 U	0.289	0.274 U	0.276	0.246	0.238	0.219 U	0.328	0.36	0.353	0.26	0.226 U	0.289	0.323	0.262	0.275	0.247	0.254	0.301
Cadmium	0.501	0.439	0.684	0.679	0.553	0.547	0.437	0.218 U	0.384	0.459	0.249	0.271	0.254	0.242	0.433	0.504	0.505	0.819	0.278
Chromium	11.1	15	18.9	13.4	11.4	9.36	13.7	11.6	15.4	18.1	9.22	10.5	13.4	12.9	7.68	16.7	13.1	13	13.1
Copper	55.2	177	122	71.5	57.4	39.1 Q	49.4	72.8	146	110	86	100	105	49.5	61	170	39.5	66.2	48.3
Lead	88.3	121	336	120	112	224	195	62	188	334	178	175	304	105	389	158	217	466	84.9
Mercury	0.23	0.627	2.48	0.669	1.95	0.319	1.34	1.07	4.58	2.63	2.48	1.38	1.33	0.806	0.47	3.05	0.707	0.302	0.251
Nickel	13.3	19.7	19.1	20.6	14.3	15.8	18.8	14.4	17.6	18.6	11.4	13.2	18.5	18.2	13.5	17.3	17.4	15.4	16.3
Selenium	2.57 U	2.31 U	2.74 U	2.3 U	2.46 U	1.19 U	2.19 U	2.18 U	2.4 U	2.35 U	2.17 U	2.26 U	2.31 U	2.31 U	1.14 U	1.15 U	1.12 U	1.15 U	1.16 U
Silver	0.257 U	0.231 U	0.274 U	0.23 U	0.246 U	0.238 U	0.219 U	0.218 U	0.24 U	0.235 U	0.217 U	0.226 U	0.231 U	0.231 U	0.228 U	0.229 U	0.224 U	0.231 U	0.232 U
Thallium	0.257 U	0.231 U	0.274 U	0.23 U	0.246 U	0.238 U	0.219 U	0.218 U	0.24 U	0.235 U	0.217 U	0.226 U	0.231 U	0.231 U	0.228 U	0.229 U	0.224 U	0.231 U	0.232 U
Zinc	265	161	357	402	225	186	243	77.2	153	170	114	106	108	183	183	191	162	234	132

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	RA3-S6	RA3-S7	RA3-S8	RA3-S9	RA5-B1	RA5-B2	RA5-S1	RA5-S2	RA5-S3	RA5-S4	RA6-B1	RA6-B11	RA6-B12	RA6-B13	RA6-B14	RA6-B15	RA6-B16	RA6-B17	RA6-B18
Minimum Depth (feet bgs)	0	0	0	0	0.5	0.5	0	0	0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/27/2015	10/27/2015	10/27/2015	10/28/2015	10/14/2015	10/14/2015	10/14/2015	10/14/2015	10/14/2015	10/14/2015	10/29/2015	10/27/2015	10/27/2015	11/3/2015	10/27/2015	11/6/2015	10/16/2015	11/6/2015	10/27/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
Antimony	1.27 U	12.1	1.18 U	1.46 U	1.13 U	1.06 U	1.25 U	1.03 U	2.13	1.11 U	1.41	1.21 U	1.19 U	2.44 U	1.12 U	2.25	1.14 U	1.07 U	1.08 U
Arsenic	5.34	29.8	3.71	8.3	2.84	6.77	3.44	14	14	3.85	6.67	4.53	2.54	2.04	14.2	4.12	5.51	3.07	2.7
Beryllium	0.405	0.394	0.378	0.291	0.294	0.296	0.376	0.341	0.284	0.311	0.259	0.291	0.381	0.354	0.324	0.355	0.456	0.3	0.347
Cadmium	0.544	0.947	0.473	0.714	0.475	0.624	0.25 U	0.672	1.11	0.622	1.24 U	0.508	0.238 U	0.44	0.748	0.222 U	0.399	0.215 U	0.336
Chromium	14	17.7	13.5	18.8	11.2	12.3	15.9	16.5	18.1	12.2	60	13.9	10.6	12.6	59.3	17.3	25.6	18.7	13.8
Copper	28	62	30.3	147	28.5	55.2	24.9	77.9	143	42	1210	252	23.5 Q	23.5	1660	20.4	84.8	17.3	57.2
Lead	76.1	261	91.6	438	10.7	123	20	174	387	40 Q	320	136	36.4 Q	15.3	194	12.8	48	5.21	28.2
Mercury	0.135	0.174	0.384	1.35	0.106	0.631	0.266	1.21	2.41	0.531 Q	53.1	4.91	0.116	0.179	16.1	0.0887 U	0.612	0.0858 U	0.275
Nickel	16.5	19	15.9	46.2	16.5	17.7	21.7	23	25	17.9	19.7	14	15.7	15.7	16.7	20.6	24.1	20.5	18
Selenium	2.53 U	2.46 U	2.36 U	2.91 U	2.26 U	2.12 U	2.5 U	2.07 U	2.1 U	2.22 U	2.47 U	2.42 U	2.38 U	2.44 U	2.23 U	1.11 U	1.14 U	1.07 U	2.17 U
Silver	0.253 U	0.246 U	0.236 U	0.291 U	0.226 U	0.212 U	0.25 U	0.207 U	0.21 U	0.222 U	0.247 U	0.242 U	0.238 U	0.244 U	0.223 U	0.222 U	0.228 U	0.215 U	0.217 U
Thallium	0.253 U	0.246 U	0.236 U	0.291 U	0.226 U	0.212 U	0.25 U	0.207 U	0.21 U	0.222 U	0.247 U	0.242 U	0.238 U	0.244 U	0.223 U	0.222 U	0.228 U	0.215 U	0.217 U
Zinc	138	575	134	287	89.7	241	78.7	205	253	163	529	180	60.2	109	406	63.1	126	52.1	99.9

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	RA6-B19	RA6-B2	RA6-B20	RA6-B21	RA6-B22	RA6-B23	RA6-B24	RA6-B25	RA6-B26	RA6-B27	RA6-B3	RA6-B4	RA6-B5	RA6-B6	RA6-B7	RA6-B8	RA6-B9	RA6-S1	RA6-S10
Minimum Depth (feet bgs)	0.5	0.5	0.5	0.5	1	1	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	1	1	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/15/2015	10/29/2015	10/15/2015	10/15/2015	12/22/2015	12/22/2015	12/22/2015	12/22/2015	12/22/2015	12/22/2015	10/29/2015	11/3/2015	11/3/2015	10/27/2015	10/27/2015	11/3/2015	11/3/2015	10/15/2015	10/29/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
Antimony	1.08 U	1.13 U	1.15 U	1.11 U	1.06 U	1.14 U	1.16 U	1.15 U	1.19 U	1.2 U	1.2 U	2.05 U	2.3 U	14.8	1.13 U	2.46 U	2.29 U	3.08	2.06
Arsenic	2.72	2.1	4.21	3.02	2.59	2.32	1.83	2.4	2.27	2.62	6.89	1.77	2.33	31.1	3.38	6.11	2.37	5.94	6.95
Beryllium	0.324	0.315	0.38	0.321	0.276	0.284	0.278	0.31	0.274	0.335	0.239 U	0.287	0.321	0.252	0.338	0.246 U	0.333	0.334	0.409
Cadmium	0.378	1.13 U	0.254	0.221 U	0.212 U	0.228 U	0.232 U	0.229 U	0.239 U	0.239 U	2.19	0.205 U	0.23 U	1.04	0.958	2.43	1.38	0.496	1.2 U
Chromium	15.5	10.5	17	14.6	12.9	12.5	9.03	10.8	11	13.1	77.7	9.19	10.6	41.3	29.8	86	10.6	24.2	20.5
Copper	26.1	118	65.1	38.4	16.3	14.6	11.8	17.3	12.5	16.7	3450	24.1	18.7	1030	1120	4090	20.5	191	51.9
Lead	111	71	19.5	18.7	12.8	89.4	6.79	11.5	3.88	6.76	421	2.88	25.6	435	150	522	7.7	209	59.9
Mercury	0.0865 U	1.37 Q	0.233	0.164	0.103	0.091 U	0.0928 U	0.0918 U	0.0954 U	0.103	11.3	0.082 U	0.0919 U	18.6	24.5	6.74	0.0918 U	1.1	0.284
Nickel	18.2	11.6	22.2	17	15.6	14.2	14.2	15.3	14.9	17	14.5	15.1	14.6	62.2	11	14.8	15.9	25.2	21
Selenium	1.08 U	2.25 U	1.15 U	1.11 U	1.06 U	1.14 U	1.16 U	1.15 U	1.19 U	1.2 U	2.39 U	2.05 U	2.3 U	2.19 U	2.25 U	2.46 U	2.29 U	1.08 U	2.41 U
Silver	0.216 U	0.225 U	0.23 U	0.221 U	0.212 U	0.228 U	0.232 U	0.229 U	0.239 U	0.239 U	0.239 U	0.205 U	0.23 U	0.219 U	0.225 U	0.246 U	0.229 U	0.216 U	0.241 U
Thallium	0.216 U	0.225 U	0.23 U	0.221 U	0.212 U	0.228 U	0.232 U	0.229 U	0.239 U	0.239 U	0.239 U	0.205 U	0.23 U	0.219 U	0.225 U	0.246 U	0.229 U	0.216 U	0.241 U
Zinc	128	81.7	93.1	58.6	52.1	63	36.4	55.8	39.8	48.4	730	38.3	48.3	534	302	867	205	183	120

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

Need to check this one

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	RA6-S14	RA6-S15	RA6-S16	RA6-S17	RA6-S18	RA6-S19	RA6-S2	RA6-S3	RA6-S4	RA6-S5	RA6-S6	RA6-S7	RA6-S8	RA6-S9	Soil Layers	SS-12	SS-13	SS-14	SS-15
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0	0.5	0.5	0.5	0.5
Sample Date	11/3/2015	11/3/2015	11/3/2015	11/3/2015	11/3/2015	11/3/2015	10/15/2015	10/16/2015	10/16/2015	10/29/2015	10/29/2015	10/29/2015	10/29/2015	10/29/2015	10/20/2015	1/17/2002	1/17/2002	1/17/2002	1/17/2002
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Discrete	Discrete	Discrete	Discrete
Antimony	2.45 U	2.37 U	1.07 U	7.7	1.2 U	1.38 U	1.18 U	1.2 U	6.68	4.27	2.23	2.38	3.66	1.26	3.17	--	--	--	--
Arsenic	7.83	2.41	2.78	25.1	2.23	6.45	5.89	5.48	13	14.4	8.08	5.98	9.73	2.8	20.8	5.45	16.1	20.5	4.23
Beryllium	0.245	0.391	0.278	0.296	0.311	0.399	0.39	0.529	0.307	0.444	0.268	0.243 U	0.283	0.34	0.442	--	--	--	--
Cadmium	0.514	0.439	0.215 U	2.16	0.683	1.1	0.638	0.986	0.829	1.5	1.22 U	1.22 U	1.18 U	1.26 U	11.8	--	--	--	--
Chromium	13.9	13.4	10.3	42.8 J	8.81	31.4	26.6	27.4	30	55	30.4	15.7	16	12.9	22.5	18.9 J	19.3 J	38.3 J	18.6 J
Copper	136	19.2	46.9	323	20.9	237	264	105	512	1370	525	230	387	44.9	1090	81.4	102	273	63
Lead	231	46.8	15.6	744 J	25.4	271	160	92.7	320	530	352	342	187	55.3	803	280 J	636 J	755 J	313 J
Mercury	2.31	0.0948 U	0.236	3.48	0.106	2.82	1.47	0.576	3.19	5.37	2.21	1.58	1.67	0.397	66.9	0.4	0.221	9.13	0.34
Nickel	31.9	15.6	15.5	32.1	13.3	30.3	26.7	27.2	44.2	105	29.8	23.4	15.9	17.8	35.3	25.4 J	29.7 J	42.5 J	21.2 J
Selenium	2.45 U	2.37 U	1.07 U	1.23 U	1.2 U	1.38 U	1.18 U	1.2 U	1.14 U	2.61 U	2.43 U	2.43 U	2.36 U	2.25 U	3.27 U	--	--	--	--
Silver	0.245 U	0.237 U	0.214 U	0.23	0.239 U	0.275 U	0.236 U	0.24 U	0.227 U	0.261 U	0.243 U	0.243 U	0.236 U	0.252 U	0.327 U	--	--	--	--
Thallium	0.245 U	0.237 U	0.214 U	0.246 U	0.239 U	0.275 U	0.236 U	0.24 U	0.227 U	0.261 U	0.243 U	0.243 U	0.236 U	0.252 U	0.327 U	--	--	--	--
Zinc	181	97.1	67.7	688 J	314	285	204	252	371	556	361	258	259	69.4	1460	228	461	740	167

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel																		
Sample ID	SS-17	SS-18	SS-19	SS-24	SS-26	SS-27	SS-29	SS-30	SS-31	SS-5	SS-6	TP-10	TP-22/S-1	TP-25/S-1	TP-25/S-2	TP-26/S-1	TP-27/S-1	TP-28/S-3	TP-29/S-1
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	3.5	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.8	0.5	0.5	2	0.5	0.5	4	0.5
Sample Date	1/17/2002	1/17/2002	1/17/2002	1/18/2002	1/18/2002	1/18/2002	1/18/2002	1/18/2002	1/18/2002	1/17/2002	1/17/2002	10/19/1995	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/18/2001
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	0.5 UJ	--	--	0.5 UJ	0.65 J	--	--
Arsenic	3.6	9.58	40.3	11.4	15.8	7.13	20.2	26.2	4.7	3.36	2.34	--	3.9	16.2	1.76	3.88	2.43	1.9	7
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	0.5 U	--	--	0.5 U	0.5 U	--	--
Cadmium	--	--	--	--	--	--	--	--	--	0.5 U	0.431 U	--	0.5 U	0.5 U	1 U	0.573	0.5 U	0.5 U	0.5 U
Chromium	18.7 J	27.8 J	68.6 J	18.3 J	35.7 J	25 J	54.9 J	72.6 J	26.5 J	47.5 J	13.2 J	--	21.3 J	30.4	17.7	20.8	11	14.6	24.5
Copper	37.7	226	744	121	708	307	1690	743	57.9	48.3	16.6	--	42.9 J	313	18.7	40	34.6	14.7	230
Lead	36 J	820 J	468 J	322 J	532 J	568 J	513 J	564 J	184 J	25.3 J	7.14 J	23	116 J	591 J	2.72 J	114 J	35.6 J	3 J	475 J
Mercury	1.09	1.34	0.747	0.237	10.6	1.54	4.53	6.15	0.333	1.04	0.214	--	0.663 J	20.2 J	0.1 U	0.754	0.1 U	0.1 UJ	1.18
Nickel	25.8 J	32.4 J	121 J	26.5 J	60.5 J	31.4 J	41.6 J	44.3 J	29.3 J	40.1 J	17.2 J	--	71.3 J	49.2	22.7	24.6	19	21.6 J	29.6
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	0.5 U	--	--	0.5 UJ	0.5 UJ	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	0.5 U	--	--	1 U	1 U	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	0.5 U	--	--	0.5 U	0.5 U	--	--
Zinc	107	387	623	154	510	290	758	721	233	87.8	49.8	--	114 J	388 J	55.1	209 J	159 J	50.3	280 J

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)									
	Central Parcel									
Sample ID	TP-31/S-2	TP-33/S-1	TP-34/S-1	TP-34/S-2	TP-6	TP-7	TP-8	WC-1 Surface	WC-1/2/3	WC-2 Surface
Minimum Depth (feet bgs)	1.5	0	0	1.5	0	0	0	0.25	0.25	0.25
Maximum Depth (feet bgs)	2	0.5	0.5	2	3	0.5	4	0.75	1	0.75
Sample Date	4/16/2001	4/16/2001	4/16/2001	4/16/2001	10/19/1995	10/19/1995	10/19/1995	10/1/2010	10/1/2010	10/1/2010
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Discrete
Antimony	--	--	--	--	--	--	--	6.9	4.9	7.2
Arsenic	3.34 J	6.02 J	6.5	2.86 J	--	--	--	24.8	8.6	11.9
Beryllium	--	--	--	--	--	--	--	0.31	0.19	0.38
Cadmium	5 U	5 U	1.26	5 U	--	--	--	0.37	1.7	0.49
Chromium	14.7 J	22.3 J	110	18.4 J	--	--	--	62.1	42.3	48.8
Copper	41.5 J	371 J	3010	69.6 J	--	--	--	262	251	188
Lead	86 J	534 J	475 J	527 J	22	1420	20 U	889	693	770
Mercury	0.392 J	1.46 J	9.09	0.315 J	--	--	--	8.1	5.5	1.7
Nickel	21.6 J	44.7 J	18.4	21 J	--	--	--	54.5	28.4	43.1
Selenium	--	--	--	--	--	--	--	0.2 J	0.75	0.21 J
Silver	--	--	--	--	--	--	--	0.6	0.44 J	0.4 J
Thallium	--	--	--	--	--	--	--	0.07 J	0.24	0.077 J
Zinc	67.6 J	321 J	890 J	218 J	--	--	--	451	548	383

	Metals (mg/kg)									
	Central Parcel									
Sample ID	WC-3 Surface	WCP-1 (1.0)	WCP-1 (1.5)	WCP-2 (1.0)	WCP-2 (1.5)	WCP-3 (1.0)	WCP-3 (1.5)	WCP-4 (1.0)	WCP-4 (1.5)
Minimum Depth (feet bgs)	0.25	1	1.5	1	1.5	1	1.5	1	1.5
Maximum Depth (feet bgs)	0.75	1	1.5	1	1.5	1	1.5	1	1.5
Sample Date	10/1/2010	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/30/2007
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	2.5	--	--	--	--	--	--		
Arsenic	7.3	2.4	--	2.39	--	2.84		2.63	--
Beryllium	0.28	--	--	--	--	--	--	--	--
Cadmium	0.88	--	--	--	--	--	--	--	--
Chromium	31.7	12.8	--	11.8	--	13.6	--	12.8	--
Copper	195	15	--	18.4	--	20.8	--	16.6	--
Lead	727	5.65	6.28	3.56	2.57	7.4	2.76	11.1	2.57
Mercury	1.4	0.104 U	--	0.107 U	--	0.0946 U	--	0.173	--
Nickel	49.1	--	--	--	--	--	--	--	--
Selenium	0.13 J	--	--	--	--	--	--	--	--
Silver	0.35 J	--	--	--	--	--	--	--	--
Thallium	0.056 J	--	--	--	--	--	--	--	--
Zinc	410	61.8	--	386	--	65.2	--	46.4	--

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																			
	Central Parcel																			
Sample ID	WCP-5 (1.0)	WCP-5 (1.5)	WCP-6 (1.0)	WCP-6 (1.5)	WCP-7 (1.0)	WCP-7 (1.5)	WCP-8 (1.0)	WCP-8 (1.5)	WCP-9 (1.0)	WC-SSP (Comp)-1	WC-SSP (Comp)-2	WC-SSP-1-1	WC-SSP-1-2	WC-SSP-3-1	WC-SSP-3-2	SSQ(Composite)	SSR(Composite)	SSS(Composite)	WC-SSS-1a
Minimum Depth (feet bgs)	1	1.5	1	1.5	1	1.5	1	1.5	1	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	1	1.5	1	1.5	1	1.5	1	1.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/30/2007	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/1/2010	10/1/2010	10/1/2010	10/1/2010
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Composite	Discrete
Antimony										0.21 J	0.23 U	0.81	3	0.25 U	0.22 U	0.18 U	0.21 U	3.1	0.42 J
Arsenic	3.32	--	2.15	--	2.18	--	2.68	--	2.37	4.8	5.2	7.9	10.1	2.9	5.6	3.3	4.4	12.1	4.3
Beryllium	--	--	--	--	--	--	--	--	--	0.31	0.3	0.3	0.32	0.28	0.41	0.3	0.36	0.34	0.27
Cadmium	--	--	--	--	--	--	--	--	--	0.75	0.018 U	0.017 U	0.97	0.02 U	0.057 J	0.15	0.065 J	0.76	0.43
Chromium	12.8	--	13.1	--	13.4	--	12.6	--	12.9	15.9	13.7	13.4	18.7	14.2	18.1	13.7	19.8	25.5	12.6
Copper	38.3	--	27.2	--	15.3	--	18	--	15.9	2860	1030	5440	2420	28.2	27.2	27.2	22.2	116	57.7
Lead	71.5	6.5	4.28	11.2	5.42	4.53	5.48	2.96	7.24	262	175	436	386	15.7	23.8	13.8	18.3	733	203
Mercury	0.404	--	6.12	--	0.0941 U	--	0.109 U	--	0.116	3.5	1.9	9.8	3.4	0.15	0.077 J	0.11	0.033 J	2.4	2.7
Nickel	--	--	--	--	--	--	--	--	--	16.4	17.3	19.2	20.4	18	20.8	14.2	19.6	28.4	22.2
Selenium	--	--	--	--	--	--	--	--	--	0.87	0.11 U	0.1 U	1.5	0.12 U	1.7	1	1	0.89	0.11 U
Silver	--	--	--	--	--	--	--	--	--	0.51	0.28 J	0.54	0.48 J	0.22 J	0.076 J	0.28 J	0.083 J	0.12 J	0.2 J
Thallium	--	--	--	--	--	--	--	--	--	0.28	0.2	0.77	0.41	0.052 J	0.05 J	0.062 J	0.045 J	0.044 J	0.039 J
Zinc	290	--	222	--	53.1	--	1200	--	121	538	298	1030	680	53.4	59.7	69	66.1	876	234

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	Central Parcel												East Parcel						
Sample ID	WC-SSS-1b	WC-SSS-2a	WC-SSS-2b	WC-SST(Comp)-1	WC-SST-(Comp)-2	WC-SST-1-1	WC-SST-1-2	WC-SST-2-1	WC-SST-2-2	WC-SSV-1-1	WC-SSV-1-2	Wharf Beach -1	Area-6-16	Area-6-17a	Area-6-17b	Area-6-17c	B-23/S-1	B-27/S-1	Beach Cove-1
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	1	0	1.5	2	2.5	0	0	12
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.5	0.5	2	2.5	3	2	2	18
Sample Date	10/1/2010	10/1/2010	10/1/2010	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/4/2010	9/27/2010	4/14/2014	2/20/2015	2/20/2015	2/20/2015	5/15/2001	5/11/2001	9/27/2010
Sample Type	Discrete	Discrete	Discrete	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	8.4	1.1	2.5	0.26 J	0.39 J	0.44 J	0.31 J	0.29 U	0.27 J	29.9	11.3	0.57 J	--	1.17 U	1.21 U	1.11 U	2.85	0.788 J	154
Arsenic	15.9	3.9	21.3	5.6	4.7	3.3	5.4	5	5.7	7.5	30.9	39	--	4.26	3.34	2.77	--	0.5 U	14.8
Beryllium	0.28	0.3	0.25	0.5	0.34	0.28	0.47	0.55	0.41	0.45	0.36	0.45	--	0.339	0.302	0.277	--	0.5 U	0.27 J
Cadmium	0.19	0.088	0.83	0.18	0.49	0.075 J	0.38	0.024 U	0.87	1.9	0.028 U	1	--	0.525	0.41	0.244	1 U	0.641	0.3
Chromium	20.2	14.4	35.7	29.5	16.3	13.4	25.2	26.7	17.2	25.4	36.5	33.4	--	21.3	14.1	8.56	31.4	4.45 J	14.5
Copper	140	33.6	417	89.9	58.6	98.7	71.4	75.2	36.7	3360	693	1400	163	214	105	14.4 Q	28.1	24.8	72.9
Lead	388	111	4040	119	1430	186	84.7	52.2	1800	677	833	8660	657	61.6	56.9	2.31	17.7 J	1.49	1160
Mercury	2.9	0.24	4.8	1.1	1.3	0.62	0.76	1.2	0.66	0.6	1.4	113	1.44	2.41	1.07	0.0886 U	0.1 U	0.1 U	0.085
Nickel	25.5	21.8	39.9	26.3	69.5	23.2	24.7	28.6	57.5	39.3	144	25.3	--	19.5	19.1	14.3	23.4	50.2 J	15.1
Selenium	0.1 U	0.11 U	0.096 J	1.5	0.13 U	0.12 U	1.7	0.14 U	1.5	1.8	1.2	0.82	--	2.34 U	2.41 U	2.21 U	--	0.5 U	0.6 J
Silver	0.18 J	0.16 J	0.66	0.33 J	0.28 J	0.55	0.19 J	0.43 J	0.074 J	2.8	1.7	0.18 J BU	--	0.234 U	0.241 U	0.221 U	--	0.5 U	0.87 J BU
Thallium	0.044 J	0.047 J	0.048 J	0.083 J	0.067 J	0.063 J	0.12	0.11 J	0.074 J	0.15	0.49	0.08 J	--	0.234 U	0.241 U	0.221 U	--	0.5 U	0.18 J
Zinc	653	148	1460	117	472	138	166	119	788	412	838	684	469	162	125	35.6	128	206	119

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	East Parcel																		
Sample ID	Beach Cove-2	DU-4	HA-7/S-2	RA6-B10	RA6-S16	RA6-S17	RA6-S18	SR3	SR4	SS-33	SS-34	SS-35	TP-36/S-1	Trench 1/2	Trench 3/4	WC-SSK	WC-SSL-1 Composite	WC-SSL-1-1	WC-SSL-1-2
Minimum Depth (feet bgs)	12	0	0.5	0.5	0	0	0	0	0	0	0	0	0	8	8	0	0	0	0
Maximum Depth (feet bgs)	18	0.5	1	0.5	0.5	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5	8	8	0.5	0.5	0.5	0.5
Sample Date	9/27/2010	1/13/2014	5/17/2001	11/3/2015	11/3/2015	11/3/2015	11/3/2015	10/4/1991	10/4/1991	1/18/2002	1/18/2002	1/18/2002	4/16/2001	9/28/2010	9/29/2010	12/21/2005	9/28/2010	9/28/2010	9/28/2010
Sample Type	Discrete	ISM	Discrete	Composite	Composite	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Composite	Composite	Discrete	Discrete
Antimony	0.96 J	2.89	7.48 J	2.27 U	2.14 U	7.7	2.39 U	--	--	0.522 J	0.889 J	2.42 J	--	3.4	6.9	0.652 U	13.3	24.8	192
Arsenic	2.5	3.67	3.63	2.11	2.78	25.1	2.23	3.5 J	2.9	1.55	2.47	1.99	2.59	6.8	4	3.03	12.1	10.3	36.2
Beryllium	0.18 J	0.716	0.296	0.341	0.278	0.296	0.311	--	--	--	--	--	--	0.27	0.2 J	0.652 U	0.28	0.43	0.26
Cadmium	0.8	0.368	0.05 U	0.227 U	0.214 U	2.16	0.683	--	--	--	--	--	--	0.3	0.15	0.652 U	1.7	0.02 U	0.019 U
Chromium	11.7	11.4	21.9	8.58	10.3	42.8 Q	8.81	14	14	15.6 J	13.4 J	10 J	--	17	18	13.5	61.8	33.4	145
Copper	36.2	65.1	99.2	17.4	46.9	323	20.9	36	23	30.3 J	49.5 J	32.7 J	18.6	34.8	130	42.2	746	143	47500
Lead	59.4	201	70	15.5	15.6	744	25.4	--	--	35.7	36.7	48.5	12 J	92.3	137	41.2	610	631	3090
Mercury	0.24	0.0541 H	0.1 U	0.0909 U	0.236	3.48	0.106	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.087 J	0.054 J	0.0703 U	0.073 J	0.14	0.051 J
Nickel	12.4	13.9	33.9	13.4	15.5	32.1	13.3	--	--	16.1 J	16.1 J	19.2 J	--	17.6	20.9	20.3	54.7	45.4	306
Selenium	0.29 J	0.0508 U	0.209	2.27 U	2.14 U	2.46 U	2.39 U	--	--	--	--	--	--	0.83	0.79	0.652 U	0.71	0.14 J	0.54
Silver	0.68 J BU	0.254 U	0.0983	0.227 U	0.214 U	0.32	0.239 U	--	--	--	--	--	--	0.22 J	0.66 J	0.652 U	0.62	0.3 J	8.6
Thallium	0.076 J	0.635 U	0.05 U	0.227 U	0.214 U	0.246 U	0.239 U	--	--	--	--	--	--	0.044 J	0.055 J	0.652 U	0.085 J	0.072 J	0.044 J
Zinc	555	221	274	49.9	67.7	688	314	120 J	110 J	98.3	179	123	60.5 J	159	115	177	697	849	1810

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																	
	East Parcel													West Parcel					
Sample ID	WC-SSL-1-3	WC-SSL-1-4	WC-SSL-2 Composite	WC-SSL-2-1	WC-SSL-2-2	WC-SSL-2-3	WC-SSL-2-4	WC-SSN Composite	WC-SSO Composite	WC-SSO-1	WC-SSO-2	WC-SSO-3	WC-SSO-4	Area-1-1	Area-1-2	Area-1-3	Area-1-4	Area-1-5	Area-1-6
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	9/28/2010	9/28/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	4/9/2014	4/9/2014	4/9/2014	4/9/2014	4/9/2014	4/9/2014
Sample Type	Discrete	Discrete	Composite	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Antimony	12.5	140	23.3	21.5	4.8	7	38.5	0.23 U	1.3	0.78	0.36 J	1	0.88	--	--	--	--	--	--
Arsenic	10.7	11.5	15.1	9.8	5.8	9.7	10.2	3.3	6.1	4.8	5.5	5.2	3.7	--	--	--	--	--	--
Beryllium	0.33	0.59	0.31	0.43	0.38	0.48	0.37	0.29	0.37	0.34	0.39	0.31	0.35	--	--	--	--	--	--
Cadmium	0.019 U	0.023 U	1.3	0.019 U	0.018 U	0.018 U	0.017 U	0.12	1	0.48	0.5	0.75	0.45	--	--	--	--	--	--
Chromium	39.9	35.1	48.5	38.7	32.9	62	26.3	16.4	21.9	17.2	14.4	14.8	22.4	--	--	--	--	--	--
Copper	233	153	13500	207	194	276	204	17.5	51.9	37.1	87.5	37.4	28.3	--	--	--	--	--	--
Lead	381	915	1150	147	145	169	362	11.6	126	193	111	66.8	76	--	--	--	--	--	--
Mercury	0.066 J	0.022 J	0.085 J	0.14	0.07 J	0.074 J	0.059 J	0.019 J	0.21	0.21	1.1	0.059 J	0.058 J	0.271	0.143 U	0.0852 U	0.114 U	0.181 U	0.208 U
Nickel	53.6	45.3	73	47.9	35	47	41.3	19.9	28.1	25.6	19.7	27.7	27.4	--	--	--	--	--	--
Selenium	0.23 J	0.14 U	1.1	0.11 J	0.29 J	0.11 U	0.23 J	0.9	1.3	0.13 U	0.12 U	0.15 J	0.12 U	--	--	--	--	--	--
Silver	0.77	0.8	4.4	0.53	0.45 J	0.37 J	0.32 J	0.36 J	0.15 J	0.29 J	0.21 J	0.21 J	0.2 J	--	--	--	--	--	--
Thallium	0.062 J	0.027 J	0.072 J	0.064 J	0.068 J	0.021 J	0.056 J	0.052 J	0.064 J	0.069 J	0.058 J	0.059 J	0.049 J	--	--	--	--	--	--
Zinc	586	231	524	421	415	294	1640	74.7	377	264	222	440	341	--	--	--	--	--	--

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)																		
	West Parcel																		
Sample ID	Area-1-7	Area-1-8	Area-1-9	B-1/S-2	B-2/S-1	DP-1 (10-25)	DP-1 (35-40)	DP-2 (10-30)	DP-2 (40-45)	DP-3 (10-30)	DP-3 (35-40)	DP-4 (10-30)	DP-4 (40-45)	DP-5 (10-30)	DP-5 (40-45)	DU-7	RA1 B1	RA1 S1	RA1 S2
Minimum Depth (feet bgs)	0	0	0	2	0	10	35	10	40	10	35	10	40	10	40	0	1	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	4	2	25	40	30	45	30	40	30	42	30	45	0.5	1	1	1
Sample Date	4/9/2014	4/9/2014	4/9/2014	5/8/2001	5/10/2001	12/14/2016	12/14/2016	12/19/2016	12/19/2016	12/21/2016	12/21/2016	12/21/2016	12/21/2016	1/4/2017	1/4/2017	1/13/2014	10/14/2015	10/14/2015	10/14/2015
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	ISM	Composite	Composite	Composite
Antimony	--	--	--	--	0.5 UJ	--	--	--	--	--	--	--	--	--	--	0.519 U	--	--	--
Arsenic	--	--	--	2.63 J	3.07	9.83	8.57	3.7	4.73	5.93	1.29	4.09	5.7	3.46	3.27	4.52	3.83	2.88	3.18
Beryllium	--	--	--	--	5 U	--	--	--	--	--	--	--	--	--	--	1.09	--	--	--
Cadmium	--	--	--	42.7 U	4.68 U	--	--	--	--	--	--	--	--	--	--	0.337	0.232 U	0.3	0.267
Chromium	--	--	--	20.6 J	15.3 J	--	--	--	--	--	--	--	--	--	--	19.2	--	--	--
Copper	--	--	--	18.5 J	22.3	--	--	--	--	--	--	--	--	--	--	102	19.2	24.5	18.4
Lead	--	--	--	31 J	9.81	--	--	--	--	--	--	--	--	--	--	43	18.9	18.2	19.2
Mercury	0.106 U	0.124 U	0.0609 U	0.1 U	0.1 U	--	--	--	--	--	--	--	--	--	--	0.359 H	0.0928 U	0.133	0.0889 U
Nickel	--	--	--	16.5 J	19.7 J	--	--	--	--	--	--	--	--	--	--	15.4	--	--	--
Selenium	--	--	--	--	0.5 U	--	--	--	--	--	--	--	--	--	--	0.0519 U	--	--	--
Silver	--	--	--	--	0.5 U	--	--	--	--	--	--	--	--	--	--	0.26 U	--	--	--
Thallium	--	--	--	--	0.5 U	--	--	--	--	--	--	--	--	--	--	0.649 U	--	--	--
Zinc	--	--	--	85.7 J	93.1	--	--	--	--	--	--	--	--	--	--	151	62.5	88.2	64.8

Please see notes at the end of table.

Table B-6
Historical Soil Analytical Results - Metals
Willamette Cove Upland Facility
Portland, Oregon

	Metals (mg/kg)				
	West Parcel				
Sample ID	RA1 S3	RA1 S4	TP-16/S-1	TP-17/S-1	TP-3
Minimum Depth (feet bgs)	0	0	0	0	0
Maximum Depth (feet bgs)	1	1	0.5	0.5	3.8
Sample Date	10/14/2015	10/14/2015	4/17/2001	4/17/2001	10/19/1995
Sample Type	Composite	Composite	Discrete	Discrete	Discrete
Antimony	--	--	--	0.5 UJ	10 U
Arsenic	2.34	8.92	5.36	2.88	4
Beryllium	--	--	--	0.5 U	1 U
Cadmium	0.231 U	0.436	--	4.45 U	1 U
Chromium	--	--	--	13.7	18
Copper	14.9	34.8	23	26.1 J	31
Lead	12.6	48.9	21.5 J	22.7 J	95
Mercury	0.0923 U	0.0997 U	0.1 U	0.1 U	3.5
Nickel	--	--	--	17.3	24
Selenium	--	--	--	0.5 U	1 U
Silver	--	--	--	0.5 U	2 U
Thallium	--	--	--	0.5 U	1 U
Zinc	48.8	118	82.2 J	71.1 J	173

Notes:
1. mg/kg = Milligrams per kilogram.
2. -- = Value not available.
3. bgs = Below ground surface.
4. ISM = Sample collected using Incremental Sampling Methodology.
5. U = Analyte was not detected.
6. J = Result is estimated.
7. Q = The matrix spike and/or duplicate analysis was outside laboratory control limits. Result is estimated.
8. UJ = The analyte was analyzed for but was not detected. However, the detection limit may be inaccurate or imprecise.
9. E = Result was detected above the upper calibration limit and is estimated.
10. J2 = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample. The precision goal of 30% was exceeded for this analyte by the results of the lab duplicate.
11. H = Sample was analyzed outside recommended holding time at client request.
12. Shading = Sample locations removed during the 2008/2015 soil removal actions.

Table B-7
Historical Soil Sample Analytical Results - PAHs
Willamette Cove Upland Facility
Portland, Oregon

	PAHs (mg/kg)																					
	Central Parcel																					
Sample ID	Area-2-1	Area-2-10	Area-2-10a	Area-2-10b	Area-2-10c	Area-2-11	Area-2-12	Area-2-13	Area-2-14a	Area-2-14b	Area-2-14c	Area-2-2	Area-2-3	Area-2-4	Area-2-5	Area-2-6	Area-2-7	Area-2-8	Area-2-9	Area-3-3a	Area-3-3b	Area-3-3c
Minimum Depth (feet bgs)	0	0	0	0.5	1	0	0	0	0	0.5	1	0	0	0	0	0	0	0	0	0	0.5	1
Maximum Depth (feet bgs)	0.5	0.5	0.5	1	1.5	0.5	0.5	0.5	0.5	1	1.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1.5
Sample Date	4/10/2014	4/10/2014	2/20/2015	2/20/2015	2/20/2015	4/10/2014	4/10/2014	4/10/2014	2/20/2015	2/20/2015	2/20/2015	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	4/10/2014	2/20/2015	2/20/2015	2/20/2015
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
1-Methylnaphthalene	0.276 J2	2.1 J2	0.0635 U	0.0611 U	0.0593 U	1.62 J2	0.0438 J	0.103 U	0.0971	0.00517 J	0.00896 U	2.21 J2	0.342 J2	0.124 J2	0.0352 U	0.136 J2	0.191 J	0.125 U	2.36 J2	0.0787	0.0354 J	0.0557 U
2-Methylnaphthalene	0.389 J2	2.64 J2	0.0667	0.0611 U	0.0333 J	3.89 J2	0.119 J2	0.26 J2	0.14	0.011	0.00541 J	4.92 J2	0.845 J2	0.324 J2	0.0588 J	0.419 J2	0.589 J2	0.156 J	6.23 J2	0.177	0.0631	0.0557 U
Acenaphthene	0.0602 J	0.791	0.0244 J	0.0306 U	0.0297 U	0.266 U	0.0285 U	0.103 U	0.101	0.00867 U	0.00896 U	0.318 U	0.119 U	0.0585 U	0.0352 U	0.0588 U	0.117 U	0.125 U	0.33 U	0.0298 U	0.0287 U	0.0279 U
Acenaphthylene	1.17 J2	3.79 J2	0.117 Q	0.0373	0.0749	2.59 J2	0.0812 J2	0.187 J	0.461	0.0325	0.0114	4.15 J2	0.682 J2	0.388 J2	0.106 J2	0.507 J2	0.417 J2	0.178 J	3.97 J2	0.0298 U	0.0287 U	0.0279 U
Anthracene	1.16 J2	6.45 J2	0.115	0.0235 J	0.0503	1.89 J2	0.0789 J2	0.131 J	0.387	0.0149	0.0058 J	3.22 J2	0.506 J2	0.271 J2	0.0727 J2	0.375 J2	0.306 J2	0.125 U	2.59 J2	0.0217 J	0.0287 U	0.0279 U
Benzo(a)anthracene	1.98 J2	10.4 J2	0.39 Q	0.0854	0.105	5.27 J2	0.236 J2	0.501 J2	1.52	0.0763	0.0275	11 J2	1.33 J2	0.975 J2	0.321 J2	1.34 J2	0.873 J2	0.342 J2	9.02 J2	0.0979	0.054	0.0255 J
Benzo(a)pyrene	3.33 J2	12 J2	0.554 Q	0.119	0.225	8.75 J2	0.333 J2	0.693 J2	2.51	0.177	0.0598	17.5 J2	2.32 J2	1.9 J2	0.589 J2	2.67 J2	1.53 J2	0.586 J2	13 J2	0.131	0.0809	0.0476
Benzo(b)fluoranthene	4.69	18.2	0.554 M-02, Q	0.127 M-02	0.226 M-02	10.4	0.533	1.18	3.26 Q	0.22 Q	0.0799 Q	22.6	3.11	2.7	0.879	3.51	2.19	0.77	16.6	0.194 M-02	0.117 M-02	0.0501 M-02
Benzo(g,h,i)perylene	4.14	12.9	0.478 Q	0.185	0.293	9.43	0.351	0.769	2.55	0.213	0.0811	20.8	2.64	2.41	0.811	3.5	1.68	0.74	13	0.105	0.0736	0.0328
Benzo(k)fluoranthene	2.86	14.4	0.238 M-02	0.0442 J	0.0851 M-02	8.05	0.33	0.756				16.2	2.15	1.43	0.456	2.02	1.39	0.56	13.4	0.058 M-02	0.0384 J, M-02	0.0243 J, M-02
Chrysene	0.38 J2	1.44 J2	0.458 Q	0.0996	0.181	1.36 J2	0.0461 J	0.103 U	1.94	0.11	0.0408	2.31 J2	0.351 J2	0.268 J2	0.0715 J2	0.378 J2	0.219 J J2	0.125 U	1.94 J2	0.225	0.116	0.0324
Dibenzo(a,h)anthracene	0.0567 J	0.297 J	0.0789	0.02 J	0.0373	0.266 U	0.0285 U	0.103 U	0.297	0.0256	0.00785 J	0.318 U	0.119 U	0.0585 U	0.0352 U	0.0588 U	0.117 U	0.125 U	0.33 U	0.0418	0.0182 J	0.0279 U
Dibenzofuran	--	--	0.0298 J	0.0306 U	0.0297 U	--	--	--	0.0519 U	0.00867 U	0.00896 U	--	--	--	--	--	--	--	--	0.0191 J	0.0287 U	0.0279 U
Fluoranthene	4.63 J2	27.6 J2	0.732	0.292	0.333	5.47 J2	0.317 J2	0.52 J2	2.89	0.111	0.0542	14.7 J2	1.28 J2	1.48 J2	0.512 J2	1.87 J2	0.836 J2	0.421 J2	10 J2	0.117	0.0777	0.0409
Fluorene	0.405 J2	2.16 J2	0.0257 J	0.0306 U	0.0169 J	0.504 J	0.0285 U	0.103 U	0.127	0.00466 J	0.00896 U	1.15 J2	0.119 U	0.0664 J	0.0352 U	0.0722 J	0.117 U	0.125 U	0.769 J2	0.0298 U	0.0287 U	0.0279 U
Indeno(1,2,3-cd)pyrene	3.2	10.4	0.387 Q	0.132	0.211	6.96	0.284	0.613	2.12	0.169	0.0633	15.4	2	1.89	0.609	2.61	1.31	0.578	9.71	0.0883	0.0576	0.0289
Naphthalene	1.2 J2	3.96 J2	0.232 Q	0.0611 U	0.0481 J	6.81 J2	0.218 J2	0.484 J2	0.333	0.0307	0.0192	7.67 J2	1.57 J2	0.702 J2	0.132 J2	0.906 J2	1.13 J2	0.354 J2	11 J2	0.0974	0.0402 J	0.0557 U
Phenanthrene	4.47 J2	30 J2	0.396	0.192	0.276	4.15 J2	0.19 J2	0.327 J2	1.71	0.0515	0.0369	13.4 J2	0.826 J2	0.911 J2	0.259 J2	0.952 J2	0.65 J2	0.237 J	5.94 J2	0.21	0.106	0.0276 J
Pyrene	6 J2	35 J2	0.812	0.241	0.378	10.5 J2	0.432 J2	0.872 J2	3.96	0.166	0.0698	25 J2	2.38 J2	2.15 J2	0.675 J2	2.87 J2	1.58 J2	0.656 J2	18.8 J2	0.127	0.085	0.0432
Anthanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b+k)fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HPAH (as reported in FS)	31.2667 J	142.637 J	--	--	--	--	2.8621 J	5.904 J	--	--	--	145.51 J	17.561 J	15.203 J	4.9235 J	20.768 J	11.608 J	4.653 J	105.47 J	--	--	--
Total LPAH (as reported in FS)	8.8542 J	49.791 J	--	--	--	--	0.6871 J	1.389 J	--	--	--	34.51 J	4.429 J	2.6624 J	0.6285 J	3.2312 J	3.092 J	0.925 J	30.499 J	--	--	--
Total PAHs (as reported in FS)	40.1209 J	192.428 J	--	--	--	--	3.5492 J	7.293 J	--	--	--	180.02 J	21.99 J	17.8654 J	5.552 J	23.9992 J	14.7 J	5.578 J	135.969 J	--	--	--
BaP Eq (as reported in FS)	4.40268 J	16.34244 J	--	--	--	11.09486 J	0.4416461 J	0.92996 J	--	--	--	22.56431 J	2.985851 J	2.471068 J	0.7745315 J	3.436578 J	1.981419 J	0.7606 J	16.66894 J	--	--	--
Total HPAH (ND = 1/2 DL)	31.2667	142.637	4.6819	1.3452	2.0744	66.323	2.87635	6.007	21.047	1.2679	0.48425	145.669	17.6205	15.23225	4.9411	20.7974	11.667	4.778	105.635	1.185	0.718	0.340
Total LPAH (ND = 1/2 DL)	8.8542	49.791	0.9768	0.3445	0.51435	19.967	0.7156	1.492	3.259	0.149595	0.08767	34.669	4.548	2.69165	0.6637	3.2606	3.2090	1.1125	30.6640	0.5508	0.2667	0.1391
Total PAHs (ND = 1/2 DL)	40.1209	192.428	5.6587	1.6897	2.58875	86.29	3.59195	7.499	24.306	1.417495	0.57192	180.338	22.1685	17.9239	5.6048	24.058	14.876	5.891	136.299	1.736	0.985	0.479
BaP Eq (ND = 1/2 DL)	4.40268	16.34244	0.768838	0.1739816	0.317532	11.22786	0.4558961	0.9815115	3.49894	0.24924	0.0847608	22.72331	3.045351	2.500318	0.7921315	3.465978	2.0399	0.8232	16.8339	0.2116	0.1225	0.0723

Please see notes at the end of table.

Table B-7
Historical Soil Sample Analytical Results - PAHs
Willamette Cove Upland Facility
Portland, Oregon

PAHs (mg/kg) — Central Parcel

Sample ID	Area-6-9a	Area-6-9b	Area-6-9c	B-16/S-1	DU-5	DU-6	DU-6-COMP-5-3a	DU-6-COMP-5-3b	DU-6-COMP-5-3c	DU-6-COMP-5-6a	DU-6-COMP-5-6b	DU-6-COMP-5-6c
Minimum Depth (feet bgs)	0	0.5	1	0	0	0	0	0.5	1	0	0.5	1
Maximum Depth (feet bgs)	0.5	1	1.5	2	0.5	0.5	0.5	1	1.5	0.5	1	1.5
Sample Date	2/20/2015	2/20/2015	2/20/2015	5/7/2001	1/13/2014	1/13/2014	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015
Sample Type	Discrete	Discrete	Discrete	Discrete	ISM	ISM	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
1-Methylnaphthalene	0.0244 U	0.0057 U	0.00585 U	--	0.00717	0.0123	0.0628 U	0.00575 U	0.00583 U	0.041 J	0.0341 J	0.064 U
2-Methylnaphthalene	0.0244 U	0.0057 U	0.00585 U	--	0.0172	0.0277	0.0628 U	0.00575 U	0.00583 U	0.103	0.0614	0.064 U
Acenaphthene	0.0122 U	0.00286 U	0.00293 U	0.067 U	0.00979	0.0151	0.0315 U	0.00288 U	0.00292 U	0.029 U	0.0297 U	0.032 U
Acenaphthylene	0.0122 U	0.00286 U	0.00293 U	0.067 U	0.042	0.113	0.0251 J	0.00288 U	0.00292 U	0.0393	0.0225 J	0.032 U
Anthracene	0.0122 U	0.00286 U	0.00293 U	0.067 U	0.0569	0.103	0.0315	0.00288 U	0.00292 U	0.0702	0.0457	0.032 U
Benzo(a)anthracene	0.00974 J	0.00286 U	0.00293 U	0.107	0.162	0.4	0.189	0.00288 U	0.00292 U	0.231	0.203	0.0833
Benzo(a)pyrene	0.023	0.00428 U	0.00439 U	0.181	0.288	0.66	0.349	0.00432 U	0.00437 U	0.342	0.28	0.131
Benzo(b)fluoranthene	0.0307 M-02	0.00428 U	0.00439 U	0.187	0.361	0.648	0.426 M-02	0.00432 U	0.00437 U	0.707 M-02	0.576 M-02	0.292 M-02
Benzo(g,h,i)perylene	0.0158	0.00286 U	0.00293 U	0.193	0.255	0.716	0.337	0.00288 U	0.00292 U	0.306	0.371	0.299
Benzo(k)fluoranthene	0.0127 J	0.00428 U	0.00439 U	0.133	0.313	0.521	0.13 M-02	0.00432 U	0.00437 U	0.228 M-02	0.2 M-02	0.094 M-02
Chrysene	0.0147)2, M	0.00286 U	0.00293 U	0.149	0.292	0.592	0.319	0.00288 U	0.00292 U	0.48	0.371	0.163
Dibenzo(a,h)anthracene	0.0122 U	0.00286 U	0.00293 U	0.067 U	0.0667	0.224	0.0337	0.00288 U	0.00292 U	0.0872	0.0651	0.0373
Dibenzofuran	0.0122 U	0.00286 U	0.00293 U	--	--	--	0.0315 U	0.00288 U	0.00292 U	0.0558	0.0436	0.0185 J
Fluoranthene	0.0109 J	0.00286 U	0.00293 U	0.19	0.53	0.73	0.749	0.00288 U	0.00292 U	0.372	0.323	0.139
Fluorene	0.0122 U	0.00286 U	0.00293 U	0.067 U	0.00677 U	0.00747	0.0162 J	0.00288 U	0.00292 U	0.029 U	0.0297 U	0.032 U
Indeno(1,2,3-cd)pyrene	0.0162	0.00286 U	0.00293 U	0.158	0.172	0.623	0.279	0.00288 U	0.00292 U	0.246	0.272	0.228
Naphthalene	0.0244 U	0.0057 U	0.00585 U	0.067 U	0.0198	0.036	0.0523 J	0.00575 U	0.00583 U	0.13	0.0908	0.0392 J
Phenanthrene	0.0122 U	0.00286 U	0.00293 U	0.0867	0.136	0.292	0.563	0.00288 U	0.00292 U	0.365	0.274	0.101
Pyrene	0.017	0.00286 U	0.00293 U	0.206	0.278	0.579	0.923	0.00166 J	0.00292 U	0.366	0.338	0.122
Anthanthrene	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b+k)fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	--	--	--	--	--	--	--	--	--	--	--	--
Total HPAH (as reported in FS)	--	--	--	1.504	2.7177	5.693	--	--	--	--	--	--
Total LPAH (as reported in FS)	--	--	--	0.0867	0.28169	0.59427	--	--	--	--	--	--
Total PAHs (as reported in FS)	--	--	--	1.4837	2.99939	6.28727	--	--	--	--	--	--
BaP Eq (as reported in FS)	--	--	--	0.227679	0.427622	1.056902	--	--	--	--	--	--
Total HPAH (ND = 1/2 DL)	0.15684	0.00428	0.00439	1.5375	2.7177	5.693	3.7347	0.01678	0.00437	3.3652	2.9991	1.5886
Total LPAH (ND = 1/2 DL)	0.0244	0.0057	0.00585	0.2542	0.285075	0.59427	0.73525	0.00575	0.00583	0.7365	0.5241	0.2362
Total PAHs (ND = 1/2 DL)	0.18124	0.00998	0.01024	1.7917	3.002775	6.28727	4.46995	0.02253	0.0102	4.1017	3.5232	1.8248
BaP Eq (ND = 1/2 DL)	0.0349057	0.00428	0.00439	0.261179	0.427622	1.056902	0.473719	0.00432	0.00437	0.55036	0.452571	0.229733

Sample ID	HA-6/S-1	RA2-B1	RA2-B2	RA2-B3	RA2-S1	RA2-S2	RA2-S3	RA2-S4	RA2-S5
Minimum Depth (feet bgs)	0	0	0	1	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5
Sample Date	5/18/2001	10/14/2015	10/14/2015	10/29/2015	10/14/2015	10/14/2015	10/14/2015	10/14/2015	10/14/2015
Sample Type	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
1-Methylnaphthalene	--	0.0937	0.554	0.225	0.354	0.0819	0.167	0.0502	0.0938
2-Methylnaphthalene	0.66 U	0.199	1.39	0.615	0.794	0.197	0.379	0.114	0.225
Acenaphthene	0.195 U	0.0485	0.0633	0.0333	0.106	0.0358	0.0626	0.00965 U	0.0233
Acenaphthylene	0.195 U	0.566	1.19	0.578	1.31	0.314	0.996	0.12	0.339
Anthracene	0.195 U	0.331	0.826	0.304	0.862	0.225	0.52	0.0723	0.172
Benzo(a)anthracene	0.402	1.06	4.35	1.14	3.28	1.12	1.82	0.24	0.641
Benzo(a)pyrene	0.568	2.55	4.94	2.3	6.13	1.64	4.42	0.457	1.42
Benzo(b)fluoranthene	0.672	2.11 M-02	4.2 M-02	1.96 M-02	5.45 M-02	1.99 M-02	3.53 M-02	0.408 M-02	1.22 M-02
Benzo(g,h,i)perylene	0.633	2.93	3.92	1.56	8.09	1.83	5.35	0.491	1.47
Benzo(k)fluoranthene	0.465	0.637 M-02	1.03 M-02	2.43 M-02	1.64 M-02	0.486 M-02	0.895 M-02	0.124 M-02	0.306 M-02
Chrysene	0.689	1.55	6.44	1.69	4.77	2.37	2.69	0.337	0.928
Dibenzo(a,h)anthracene	0.195 U	0.388	0.766	0.348	0.889	0.348	0.643	0.0744	0.223
Dibenzofuran	0.66 U	0.0149	0.066	0.0316	0.0593	0.0234	0.0319	0.00965 U	0.0143
Fluoranthene	0.932	2.31	4.91	1.32	6.15	1.58	3.9	0.344	1.07
Fluorene	0.195 U	0.0693 M-02	0.22 M-02	0.1	0.17 M-02	0.0442 M-02	0.198	0.0176 M-02	0.05 M-02
Indeno(1,2,3-cd)pyrene	0.484	2.38	3.13	1.46	5.91	1.46	3.69	0.399	1.21
Naphthalene	0.195 U	0.398	2.28	0.996	1.71	0.43	0.78	0.191	0.398
Phenanthrene	0.436	1.13	2.73	0.973	2.6	0.838	2.32	0.183	0.465
Pyrene	0.896	3.35	9.6	2.57	9.19	2.36	5.99	0.551	1.8
Anthanthrene	--	--	--	--	--	--	--	--	--
Benzo(b+k)fluoranthene	0.66 U	--	--	--	--	--	--	--	--
Benzo(e)pyrene	--	--	--	--	--	--	--	--	--
Total HPAH (as reported in FS)	5.741	16.518	38.056	16.778	44.409	12.708	28.503	2.8934	8.762
Total LPAH (as reported in FS)	0.436	2.8504	9.3196	3.8559	7.9653	2.1893	5.4545	0.7481	1.7804
Total PAHs (as reported in FS)	2.264	--	--	--	--	--	--	--	--
BaP Eq (as reported in FS)	0.729139	3.53022	6.92994	3.14559	8.58507	2.4705	6.03214	0.642587	1.968788
Total HPAH (ND = 1/2 DL)	5.8385	19.265	43.286	16.778	51.499	15.184	32.928	3.425	10.288
Total LPAH (ND = 1/2 DL)	1.2535	2.7418	8.6993	3.5993	7.5520	2.0840	5.2556	0.7027	1.6723
Total PAHs (ND = 1/2 DL)	7.092	22.0068	51.9853	20.3773	59.051	17.268	38.184	4.128	11.960
BaP Eq (ND = 1/2 DL)	0.826639	3.50092	6.89074	3.12999	8.5042	2.4522	5.9786	0.6377	1.9541

Please see notes at the end of table.

Table B-7
Historical Soil Sample Analytical Results - PAHs
Willamette Cove Upland Facility
Portland, Oregon

	PAHs (mg/kg)																					
	Central Parcel																					
Sample ID	RA2-S6	RA2-S7	RA2-S8	RA2-S9	SS-10	SS-11	SS-13	SS-14	SS-15	SS-16	SS-17	SS-18	SS-23	SS-28	SS-4	SS-8	SS-9	TP-22/S-1	TP-23/S-1	TP-24/S-1	TP-25/S-1	TP-27/S-1	TP-29/S-1
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/29/2015	10/29/2015	12/21/2015	12/21/2015	1/17/2002	1/17/2002	1/17/2002	1/17/2002	1/17/2002	1/17/2002	1/17/2002	1/17/2002	1/17/2002	1/17/2002	1/17/2002	1/17/2002	1/17/2002	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/18/2001
Sample Type	Composite	Composite	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
1-Methylnaphthalene	0.194 Q	0.866	0.104	0.499	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	0.498 Q	2.7	0.237	0.349	--	--	--	--	--	--	--	--	--	--	--	--	--	3.13	--	--	--	--	--
Acenaphthene	0.0655 Q	0.176	0.123	0.11	0.067 U	0.0268 U	0.0134 U	0.0806	0.0134 U	0.0134 U	0.0134 U	0.067 U	0.0268 U	0.0268 U	0.0268 U	0.134 U	0.67 U	8.38 U	0.0268 U	0.0268 U	0.137	0.168 U	0.0268 U
Acenaphthylene	1.09	2.53	1.05	0.58	0.176	0.0268 U	0.0134 U	0.067 U	0.0134 U	0.0185	0.0134 U	0.135	0.867	0.0515	0.0682	0.305	3.57	12.2	0.0268 U	0.0302	0.0981	0.168 U	0.0451
Anthracene	0.981 Q	1.68	1.01 M-02	0.822	0.103	0.0268 U	0.0134 U	0.194	0.0142	0.0193	0.0134 U	0.169	0.761	0.0402	0.11	0.325	2.43	8.65	0.0517	0.0268 U	0.277	0.168 U	0.0575
Benzo(a)anthracene	3.32	4.85	3.76	1.19	0.345	0.095	0.0895	0.396	0.0458	0.0856	0.0549	0.53	2.89	0.273	0.746	1.54	10.3	23.6	0.202	0.142	1.06	0.168 U	0.104
Benzo(a)pyrene	5.52	10.8	0.55 M-02	1.29 M-02	0.659	0.135	0.116	0.382	0.0404	0.129	0.0632	0.707	3.38	0.414	1.01	2.04	20.2	46.3	0.302	0.254	1.11	0.338	0.121
Benzo(b)fluoranthene	4.99 M-02	9.6 M-02	5.15	1.03 M-02	0.375	0.246	0.129	0.604	0.0893	0.161	0.062	1.45	3.61	0.454	0.984	2.54	23.3	27.5	0.279	0.257	1.29	0.413	0.185
Benzo(g,h,i)perylene	5.76	12.2	5.76	8.76	0.841	0.188	0.141	0.529	0.0681	0.184	0.0613	1.23	4.74	0.279	1.39	1.91	29.2	44.3	0.245	0.226	0.776	0.351	0.124
Benzo(k)fluoranthene	1.57 M-02	2.56 M-02	1.61	2.98	0.369	0.0268 U	0.0896	0.34	0.0432	0.0984	0.059	0.994	2.71	0.402	0.53	0.134 U	0.67 U	24.2	0.249	0.209	1.31	0.341	0.136
Chrysene	3.9	8.2	5.22	1.74	0.496	0.151	0.115	0.538	0.0903	0.144	0.07	1.08	4.68	0.421	1.18	1.72	14.1	39.1	0.295	0.239	1.4	0.343	0.217
Dibenzo(a,h)anthracene	0.854 M-02	1.94 M-02	0.683	0.191	0.147	0.0378	0.0313	0.148	0.0184	0.0396	0.0172	0.269	1.09	0.0838	0.286	0.474	3.89	9.13	0.064	0.0445	0.267	0.168 U	0.0272
Dibenzofuran	0.0399	0.164	0.0304	0.583	--	--	--	--	--	--	--	--	--	--	--	--	--	1.65 U	--	--	--	--	--
Fluoranthene	5.82	6.54	8.35	1.83	0.4	0.144	0.128	0.737	0.0868	0.177	0.0788	0.613	5.07	0.363	1.14	2.3	19	30.3	0.31	0.258	2.07	0.328	0.179
Fluorene	0.123 Q	0.328	0.228	0.493	0.067 U	0.0268 U	0.0134 U	0.108	0.0134 U	0.0134 U	0.0134 U	0.067 U	0.536 U	0.0268 U	0.0268 U	0.0268 U	3.35 U	8.38 U	0.0268 U	0.0268 U	0.0926	0.168 U	0.0268 U
Indeno(1,2,3-cd)pyrene	4.66	9.85	4.72	0.743	0.543	0.133	0.108	0.43	0.0548	0.131	0.0505	0.94	3.49	0.246	0.869	1.36	18.2	27.9	0.199	0.173	0.705	0.0268	0.0963
Naphthalene	0.922 Q	4.98	0.503	0.21	0.101	0.0268 U	0.0134 U	0.0773	0.0245	0.0217	0.0134 U	0.074	0.386	0.0268 U	0.0441	0.162	1.07	8.38 U	0.0268 U	0.0268 U	0.067 U	0.168 U	0.0268 U
Phenanthrene	1.68	5.9	5.51	3.96	0.163	0.0562	0.043	0.73	0.0593	0.0761	0.0385	0.267	3.38	0.147	0.586	0.951	11.2 J	21.8	0.203	0.0914	1.28	0.174	0.111
Pyrene	7.05	11.6	11.7	3.15	0.732	0.191	0.144	0.637	0.0699	0.171	0.0807	0.621	5.41	0.522	1.52	3.04	29.8	52.1	0.321	0.296	1.75	0.322	0.192
Anthanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b+k)fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	18.89	--	--	--	--	--
Benzo(e)pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HPAH (as reported in FS)	43.444	78.14	46.953	20.584	4.907	1.3208	1.0914	4.741	0.607	1.3206	0.5976	8.434	37.07	3.4578	9.655	16.924	167.99 J	324.43	2.466	2.0985	11.738	2.4628	1.3815
Total LPAH (as reported in FS)	5.5934	19.324	8.7954	7.606	0.543	0.0562	0.043	1.1899	0.098	0.1356	0.0385	0.645	5.394	0.2387	0.8083	1.743	18.27 J	45.78	0.2547	0.1216	1.8847	0.174	0.2136
Total PAHs (as reported in FS)	--	--	--	--	5.105	1.282	1.0449	4.8503	0.5699	1.2096	0.5192	7.099	35.964	2.9695	10.4633	18.667	186.26 J	367.08	2.7207	2.2201	13.4857	2.6368	1.5951
BaP Eq (as reported in FS)	7.7482	15.3258	2.67492	1.89644	0.936486	0.220351	0.180961	0.676938	0.0783123	0.207488	0.0978	1.27902	5.50078	0.599541	1.56238	3.05972	29.2841	63.6111	0.436785	0.358029	1.697	0.385733	0.188307
Total HPAH (ND = 1/2 DL)	43.444	78.14	47.503	22.904	4.907	1.3342	1.0914	4.741	0.607	1.3206	0.5976	8.434	37.07	3.4578	9.655	16.991	168.325	324.430	2.466	2.099	11.738	2.631	1.382
Total LPAH (ND = 1/2 DL)	5.3595	18.294	8.661	6.524	0.61	0.1232	0.0765	1.2234	0.1181	0.149	0.072	0.712	5.6754	0.2789	0.8351	1.8234	20.28	58.3500	0.3083	0.1752	1.9182	0.5940	0.2538
Total PAHs (ND = 1/2 DL)	48.804	96.434	56.164	29.428	5.517	1.4574	1.1679	5.9644	0.7251	1.4696	0.6696	9.146	42.7454	3.7367	10.4901	18.8144	188.605	382.780	2.774	2.274	13.656	3.225	1.635
BaP Eq (ND = 1/2 DL)	0.0000	15.2038	2.61732	1.80884	0.936486	0.220485	0.180961	0.676938	0.0783123	0.207488	0.0978	1.27902	5.50078	0.599541	1.56238	3.06039	29.28745	63.6111	0.4368	0.3580	1.6970	0.4781	0.1883

Please see notes at the end of table.

Table B-7
Historical Soil Sample Analytical Results - PAHs
Willamette Cove Upland Facility
Portland, Oregon

PAHs (mg/kg) — Central Parcel

Sample ID	TP-33/S-1	TP-34/S-1	WC-1/2/3	WC-SSC	WC-SSD	WC-SSE	WC-SSE-1	WC-SSE-2	WC-SSE-3	WC-SSE-4
Minimum Depth (feet bgs)	0	0	0.25	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	4/16/2001	4/16/2001	10/1/2010	12/21/2005	12/21/2005	12/21/2005	12/21/2005	12/21/2005	12/21/2005	12/21/2005
Sample Type	Discrete	Discrete	Composite	Composite	Composite	Composite	Discrete	Discrete	Discrete	Discrete
1-Methylnaphthalene	--	--	0.0153	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	0.035	--	--	--	--	--	--	--
Acenaphthene	0.067 U	0.067 U	0.0075	0.0166 U	0.0166 U	0.0153 U	0.0151 UJ	0.0161 UJ	0.0149 UJ	0.0154 UJ
Acenaphthylene	0.067 U	0.067 U	0.0194	0.0552	0.0507	0.0646	0.0151 UJ	0.0161 UJ	0.0149 UJ	0.0154 UJ
Anthracene	0.067 U	0.067 U	0.0273	0.0167	0.0166 U	0.0893	0.0151 UJ	0.0161 UJ	0.0149 UJ	0.0154 UJ
Benzo(a)anthracene	0.067 U	0.0787	0.0821	0.104	0.141	0.663	0.0209 J	0.0449 J	0.0309 J	0.0154 UJ
Benzo(a)pyrene	0.177	0.152	0.121	0.234	0.265	0.494	0.0315 J	0.0686 J	0.0325 J	0.0154 UJ
Benzo(b)fluoranthene	0.185	0.286	0.155	0.151	0.17	0.307	0.0357 J	0.0556 J	0.0266 J	0.0154 UJ
Benzo(g,h,i)perylene	0.19	0.288	0.0908	0.193	0.137	0.133	0.0187 J	0.0337 J	0.0149 UJ	0.0154 UJ
Benzo(k)fluoranthene	0.128	0.326	0.0946	0.139	0.168	0.337	0.0293 J	0.0491 J	0.0254 J	0.0154 UJ
Chrysene	0.143	0.208	0.116	0.146	0.2	0.971	0.032 J	0.0636 J	0.0296 J	0.0154 UJ
Dibenzo(a,h)anthracene	0.067 U	0.0996	0.0346	0.0328	0.0285	0.0442	0.0151 UJ	0.0161 UJ	0.0149 UJ	0.0154 UJ
Dibenzofuran	--	--	--	--	--	--	--	--	--	--
Fluoranthene	0.229	0.0841	0.152	0.141	0.124	1.15	0.0321 J	0.0489 J	0.0427 J	0.0154 UJ
Fluorene	0.067 U	0.067 U	0.0095	0.0166 U	0.0166 U	0.0482	0.0151 UJ	0.0161 UJ	0.0149 UJ	0.0154 UJ
Indeno(1,2,3-cd)pyrene	0.133	0.261	0.0786	0.137	0.106	0.102	0.0156 J	0.026 J	0.0149 UJ	0.0154 UJ
Naphthalene	0.067 U	0.067 U	0.0752	0.0209	0.0266	0.0387	0.0151 UJ	0.0161 UJ	0.0149 UJ	0.0154 UJ
Phenanthrene	0.15	0.067 U	0.104	0.0538	0.0325	1.8	0.0151 UJ	0.0208 J	0.0149 UJ	0.0154 UJ
Pyrene	0.274	0.0827	0.139	0.196	0.223	1.97	0.0393 J	0.076 J	0.0435 J	0.0154 UJ
Anthanthrene	--	--	--	--	--	--	--	--	--	--
Benzo(b+k)fluoranthene	--	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	--	--	--	--	--	--	--	--	--	--
Total HPAH (as reported in FS)	1.459	1.8661	1.0637	1.4738	1.5625	6.1712	0.2551 J	0.4664 J	0.2312 J	0.0154 UJ
Total LPAH (as reported in FS)	0.15	0.067 U	0.2779	0.1466	0.1098	2.0408	0.0151 UJ	0.0208 J	0.0149 UJ	0.0154 UJ
Total PAHs (as reported in FS)	1.609	1.8661	1.3066	1.6204	1.6723	3.3222	0.167 J	0.2973 J	0.1412 J	0.0154 UJ
BaP Eq (as reported in FS)	0.210223	0.317638	0.188232	0.307536	0.33708	0.649741	0.039045 J	0.0818046 J	0.0385336 J	0.0154 UJ
Total HPAH (ND = 1/2 DL)	1.526	1.8661	1.0637	1.4738	1.5625	6.1712	0.26265 J	0.47445 J	0.25355 J	0.0154 UJ
Total LPAH (ND = 1/2 DL)	0.3175	0.067	0.2779	0.1632	0.1347	2.04845	0.0151 UJ	0.06105 J	0.0149 UJ	0.0154 UJ
Total PAHs (ND = 1/2 DL)	1.8435	1.9331	1.3416	1.637	1.6972	8.21965	0.27775 J	0.5355 J	0.26845 J	0.0308 UJ
BaP Eq (ND = 1/2 DL)	0.247073	0.317638	0.188232	0.307536	0.33708	0.649741	0.046595 J	0.0898546 J	0.0467286 J	0.0154 UJ

Sample ID	WC-SSP (Comp)-1	WC-SSP (Comp)-2	WC-SSP-1-1	WC-SSP-1-2	WC-SSP-3-1	WC-SSP-3-2	WC-SSQ(Composite)	WC-SSR(Composite)	WC-SSS(Composite)	WC-SST(Comp)-1	WC-SST-(Comp)-2	WC-SST-1-1
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/4/2010	10/1/2010	10/1/2010	10/1/2010	10/4/2010	10/4/2010	10/4/2010
Sample Type	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Composite	Composite	Composite	Discrete
1-Methylnaphthalene	0.0307	0.0332	0.0601	0.0838 J	0.0018 U	0.00095 U	0.0009 U	0.00093 U	0.0105	0.0124	0.0044 J	0.0016 J
2-Methylnaphthalene	0.0695	0.0583	0.132	0.175	0.0038 U	0.002 U	0.0025 J	0.0019 U	0.022	0.019	0.0074 J	0.0032 J
Acenaphthene	0.0211	0.0415	0.0258	0.11	0.0032 U	0.0017 U	0.0016 U	0.0016 U	0.0067 J	0.0221	0.0035 U	0.0021 J
Acenaphthylene	0.699	1.08	1.18	2.97	0.0017 J	0.0012 J	0.0068	0.0017 J	0.0189	0.104	0.0083 J	0.02
Anthracene	0.371	1.29	0.826	2.42	0.0023 J	0.0017 J	0.0176	0.0023 J	0.0216	0.183	0.0095 J	0.0342
Benzo(a)anthracene	1.58	2.5	3.79	5.41	0.0076 J	0.0046 J	0.105	0.0138	0.093	1.03	0.053	0.139
Benzo(a)pyrene	4.06	6.89	11.2	12.9	0.0112 J	0.0059 J	0.0981	0.0201	0.137	1.03	0.106	0.164
Benzo(b)fluoranthene	3.14	5.74	9.33	9.64	0.0078 J	0.0045 J	0.0703	0.0176	0.176	0.719	0.0877	0.0984
Benzo(g,h,i)perylene	2.62	2.48	4.26	5.52	0.0099 J	0.0065 J	0.0356	0.0131	0.0797	0.434	0.0969	0.0977
Benzo(k)fluoranthene	3.39	5.83	10.5	10	0.0096 J	0.0043 J	0.0653	0.0137	0.108	0.642	0.0713	0.139
Chrysene	1.81	3.37	5.32	7.59	0.0091 J	0.0041 J	0.0897	0.0164	0.143	0.926	0.0706	0.154
Dibenzo(a,h)anthracene	0.621	1.28	2.02	2.81	0.0021 J	0.00081 J	0.0155	0.0033 J	0.0235	0.186	0.0301	0.0326
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	1.96	4.47	3.93	8.34	0.0111 J	0.0073	0.163	0.0183	0.164	1.22	0.0688	0.305
Fluorene	0.0479	0.174	0.177	0.37	0.0037 U	0.0019 U	0.0025 J	0.0019 U	0.0065 J	0.031	0.004 U	0.0052 J
Indeno(1,2,3-cd)pyrene	2.1	2.41	3.96	5.23	0.0065 J	0.0035 J	0.0331	0.0106	0.0695	0.401	0.0742	0.079
Naphthalene	0.214	0.167	0.468	0.506	0.0037 U	0.0019 U	0.004 J	0.002 J	0.0357	0.0352	0.0177	0.0088
Phenanthrene	0.56	2.33	0.712	4.03	0.0064 U	0.0039 J	0.028	0.0068 J	0.0869	0.392	0.0373	0.114
Pyrene	1.88	4.29	4.49	7.27	0.0142	0.0082	0.162	0.0219	0.179	1.27	0.0772	0.348
Anthanthrene	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b+k)fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	--	--	--	--	--	--	--	--	--	--	--	--
Total HPAH (as reported in FS)	23.161	39.26	58.8	74.71	0.0891 J	0.04971 J	0.8376	0.1488 J	1.1727	7.858	0.7358	1.5567
Total LPAH (as reported in FS)	1.9825	5.1408	3.5208	10.581	0.004 J	0.0068 J	0.0614 J	0.0128 J	0.1983 J	0.7863	0.0802 J	0.1875 J
Total PAHs (as reported in FS)	25.074	44.3425	62.1888	85.116	0.0931 J	0.05651 J	0.8965 J	0.1616 J	1.349 J	8.6253	0.8086 J	1.741 J
BaP Eq (as reported in FS)	5.39871	9.29667	15.03832	17.84559	0.0155951 J	0.0080171 J	0.1351827	0.0277534 J	0.195573	1.438346	0.1583736	0.229784
Total HPAH (ND = 1/2 DL)	23.161	39.26	58.8	74.71	0.0891	0.04971	0.838	0.149	1.173	7.858	0.736	1.557
Total LPAH (ND = 1/2 DL)	1.9825	5.1408	3.5208	10.581	0.0144	0.01055	0.0622	0.0155	0.1983	0.7863	0.0840	0.1875
Total PAHs (ND = 1/2 DL)	25.1435	44.4008	62.3208	85.291	0.1035	0.06026	0.900	0.164	1.371	8.644	0.820	1.744
BaP Eq (ND = 1/2 DL)	5.39871	9.29667	15.03832	17.84559	0.0155951	0.0080171	0.1352	0.0278	0.1956	1.4383	0.1584	0.2298

Please see notes at the end of table.

Table B-7
Historical Soil Sample Analytical Results - PAHs
Willamette Cove Upland Facility
Portland, Oregon

	PAHs (mg/kg)																						
	Central Parcel				East Parcel																		
Sample ID	WC-SST-2-1	WC-SSU(Composite)	WC-SSX(Composite)	Wharf Beach - 1	B-26/S-1	B-28/S-1	Beach Cove-1	Beach Cove-2	DU-4	SR3	SR4	SS-32	TP-35/S-1	TP-37/S-1	TP-38/S-2	TP-39/S-2	Trench 1/2	Trench 3/4	WC-SSL-1 Composite	WC-SSL-1-1	WC-SSL-1-2	WC-SSL-1-3
Minimum Depth (feet bgs)	0	0	0	1	0	0.5	12	12	0	0	0	0	0	0	1.5	1.5	8	8	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	1.5	2	1	18	18	0.5	0.2	0.2	0.5	0.5	0.5	2	2	8	8	0.5	0.5	0.5	0.5
Sample Date	10/4/2010	10/1/2010	10/4/2010	9/27/2010	5/11/2001	5/17/2001	9/27/2010	9/27/2010	1/13/2014	10/4/1991	10/4/1991	1/17/2002	4/16/2001	4/16/2001	4/16/2001	4/16/2001	9/28/2010	9/29/2010	9/28/2010	9/28/2010	9/28/2010	9/28/2010
Sample Type	Discrete	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Discrete	ISM	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Composite	Discrete	Discrete	Discrete
1-Methylnaphthalene	0.0089 J	0.0015 J	0.005 U	0.0395	--	--	0.108	0.0118 J	0.00677 U	--	--	--	--	--	--	--	0.0615	0.029	0.0671	0.0927	0.0239	0.0145
2-Methylnaphthalene	0.0184	0.0019 J	0.005 U	0.0793	--	--	0.0709	0.018 J	0.00751	--	--	--	--	--	1.65 U	--	0.113	0.0752	0.146	0.259	0.0654	0.0407
Acenaphthene	0.0115 J	0.0016 U	0.005 U	0.013	0.0134 U	0.168 UJ	0.118	0.0145 J	0.00677 U	0.041 UJ	0.044 UJ	0.0134 U	0.067 U	0.168 U	0.168 U	0.0268 U	0.0282	0.0051 J	0.0292	0.0648	0.0116	0.0095
Acenaphthylene	0.0311	0.0014 J	0.00088 U	0.0507	0.0134 U	0.168 UJ	0.0731	0.0169 J	0.0327	0.02 UJ	0.022 UJ	0.0424	0.067 U	0.168 U	0.168 U	0.0268 U	0.0463	0.0313	0.138	0.289	0.0361	0.0813
Anthracene	0.0509	0.0029 J	0.005 U	0.0344	0.0134 U	0.168 UJ	0.519 J	0.0102 U	0.0238	0.02 UJ	0.022 UJ	0.0271	0.067 U	0.168 U	0.168 U	0.0268 U	0.0289	0.0196	0.171	0.328	0.0406	0.0567
Benzo(a)anthracene	0.0931	0.0138	0.005 U	0.103	0.0163	0.168 UJ	2.82	0.401	0.0938	0.055 J	0.022 UJ	0.132	0.067 U	0.173	0.168 U	0.0268 U	0.078	0.0664	0.336	0.568	0.0691	0.218
Benzo(a)pyrene	0.144	0.0211	0.005 U	0.0777	0.0134 U	0.182 J	0.849	0.222	0.219	0.3 J	0.022 UJ	0.216	0.145	0.2	0.374	0.0366	0.0793	0.0586	0.512	0.589	0.0734	0.311
Benzo(b)fluoranthene	0.109	0.0208	0.00076 U	0.123 J	0.0134 U	0.191 J	1.76 J	0.51 J	0.195	0.35 J	0.022 UJ	0.186	0.243	0.261	0.413	0.0427	0.0574 J	0.0415 J	0.675	0.782	0.0732	0.237
Benzo(g,h,i)perylene	0.111	0.0145	0.005 U	0.0295	0.0134 U	0.171 J	0.38	0.161 J	0.156	0.17 J	0.11 UJ	0.15	0.167	0.168 U	0.335	0.0316	0.0466	0.0239	0.343	0.335	0.0564	0.286
Benzo(k)fluoranthene	0.103	0.0172	0.005 U	0.11 J	0.0134 U	0.168 UJ	1.56 J	0.488 J	0.165			0.184	0.184	0.178	0.306	0.0325	0.0637 J	0.0484 J	0.332	0.555	0.0574	0.221
Chrysene	0.118	0.0185	0.005 U	0.146	0.0162	0.205 J	6.22	1.28	0.192	0.1 J	0.031 J	0.169	0.199	0.292	0.232	0.0441	0.0926	0.0937	0.449	0.803	0.0868	0.295
Dibenzo(a,h)anthracene	0.0268	0.0053 J	0.005 U	0.0128	0.0134 U	0.168 UJ	0.233 J	0.136 J	0.0414	0.1 UJ	0.11 UJ	0.0471	0.067 U	0.168 U	0.168 U	0.0268 U	0.0137	0.0081 J	0.0856	0.127	0.0147	0.043
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.65 U	--	--	--	--	--	--	--
Fluoranthene	0.185	0.0213	0.005 U	0.315	0.0292	0.274 J	1.26	0.249	0.238	0.077 J	0.045 J	0.228	0.232	0.396	0.168 U	0.0508	0.16	0.208	0.507	0.745	0.0916	0.342
Fluorene	0.0153 J	0.0019 U	0.005 U	0.03	0.0134 U	0.168 UJ	0.577	0.0119 J	0.00677 U	0.02 UJ	0.022 UJ	0.0134 U	0.067 U	0.168 U	0.168 U	0.0268 U	0.0331	0.0159	0.0391	0.0808	0.0137	0.0209
Indeno(1,2,3-cd)pyrene	0.0858	0.0125	0.005 U	0.0296	0.0134 U	0.168 UJ	0.169	0.138	0.119	0.2 J	0.11 UJ	0.137	0.141	0.168 U	0.279	0.0268 U	0.0347	0.0209	0.269	0.278	0.039	0.174
Naphthalene	0.0403	0.0035 J	0.005 U	0.203	0.0134 U	0.168 UJ	0.13	0.063	0.00986	0.068 J	0.022 UJ	0.0134 U	0.067 U	0.168 U	0.168 U	0.0268 U	0.421	0.146	0.277	0.506	0.0996	0.0902
Phenanthrene	0.121	0.0118	0.005 U	0.187	0.0134 U	0.0778 J	2.71	0.126 J	0.0801	0.037 J	0.029 J	0.115	0.121	0.168 U	0.168 U	0.0297	0.153	0.139	0.313	0.47	0.106	0.165
Pyrene	0.209	0.0231	0.005 U	0.256	0.0261	0.263 J	3.37	0.532	0.151	0.1 J	0.046 J	0.244	0.198	0.33	0.168 U	0.0458	0.19	0.141	0.549	0.798	0.116	0.437
Anthanthrene	--	--	--	--	--	--	--	--	--	0.1 UJ	0.11 UJ	--	--	--	--	--	--	--	--	--	--	--
Benzo(b+k)fluoranthene	--	--	--	--	--	--	--	--	--	0.35 J	0.022 UJ	--	--	--	1.65 U	--	--	--	--	--	--	--
Benzo(e)pyrene	--	--	--	--	--	--	--	--	--	0.21 J	0.022 UJ	--	--	--	--	--	--	--	--	--	--	--
Total HPAH (as reported in FS)	1.1847	0.1681 J	0.005 U	1.2026	0.0878	1.286 J	18.621	4.117	1.5702	1.002 J	0.122 J	1.6931	1.509	1.83	1.939	0.2841	0.816 J	0.7105 J	4.0576	5.58	0.6776	2.564
Total LPAH (as reported in FS)	0.2885 J	0.0215 J	0.005 U	0.6369	0.0134 U	0.0778 J	4.306	0.2621	0.15397	0.105 J	0.029 J	0.1845	0.121	0.168 U	0.168 U	0.0297	0.8235	0.4321 J	1.1133	1.9976	0.373	0.4643
Total PAHs (as reported in FS)	1.4548 J	0.1877 J	0.005 U	1.8395	0.0878002	1.3638 J	22.927	4.3791	1.72417	1.107 J	0.151 J	1.8776	1.63	1.83	1.939	0.3138	1.128 J	0.9576 J	5.0249	7.3186	0.9852	2.9876
BaP Eq (as reported in FS)	0.200738	0.0313005 J	0.005 U	0.117601	0.0016462	0.201305 J	1.58252	0.47067	0.303022	0.3256 J	0.000031 J	0.310609	0.185439	0.245472	0.446492	0.0412391	0.1107396 J	0.0801577 J	0.729369	0.885153	0.1068908	0.419405
Total HPAH (ND = 1/2 DL)	1.1847	0.1681	0.005	1.2026	0.128	1.622 J	18.621	4.117	1.5702	1.402 J	0.32 J	1.6931	1.576	2.082	2.275	0.3243	0.816	0.711	4.058	5.580	0.678	2.564
Total LPAH (ND = 1/2 DL)	0.2885	0.02325	0.005	0.5974	0.0134 U	0.4978 J	4.198	0.2554	0.16074	0.1555 J	0.095 J	0.2046	0.2885	0.168 U	1.65	0.0967	0.8235	0.4321	1.1133	1.9976	0.3730	0.4643
Total PAHs (ND = 1/2 DL)	1.4732	0.19135	0.01	1.8	0.1414	2.1198 J	22.819	4.3724	1.73094	1.5575 J	0.415 J	1.8977	1.8645	2.25	3.925	0.421	1.640	1.143	5.171	7.578	1.051	3.028
BaP Eq (ND = 1/2 DL)	0.200738	0.0313005	0.005	0.117306	0.0164532	0.302945 J	1.57872	0.46906	0.303022	0.4106 J	0.073731 J	0.310609	0.222289	0.337872	0.538892	0.0573191	0.1107	0.0802	0.7294	0.8852	0.1069	0.4194

Please see notes at the end of table.

Table B-7
Historical Soil Sample Analytical Results - PAHs
Willamette Cove Upland Facility
Portland, Oregon

	PAHs (mg/kg)																			
	East Parcel																			
Sample ID	WC-SSL-1-4	WC-SSL-2 Composite	WC-SSM Composite	WC-SSN Composite	WC-SSO Composite	B-8/S-2	DP-2 (10-30)	DP-2 (40-45)	DP-4 (10-30)	DP-4 (40-45)	DP-5 (10-30)	DP-5 (40-45)	DU-7	SS-1	SS-2	SS-3	TP-18/S-4	TP-19/S-2	TP-20/S-1	TP-21/S-2
Minimum Depth (feet bgs)	0	0	0	0	0	2	10	40	10	40	10	40	0	0	0	0	5.5	1.5	0	1.5
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	4	30	45	30	42	30	45	0.5	0.5	0.5	0.5	6	2	0.5	2
Sample Date	9/28/2010	9/30/2010	9/30/2010	9/30/2010	9/30/2010	5/10/2001	12/19/2016	12/19/2016	12/21/2016	12/21/2016	1/4/2017	1/4/2017	1/13/2014	1/17/2002	1/17/2002	1/17/2002	5/6/2001	4/18/2001	4/17/2001	4/17/2001
Sample Type	Discrete	Composite	Composite	Composite	Composite	Discrete	Composite	Composite	Composite	Composite	Composite	Composite	ISM	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
1-Methylnaphthalene	0.0151	0.0644	0.00092 U	0.00093 U	0.0108	--	0.035	0.161	0.0087 J	0.402	0.0434	0.067 U	0.00693 U	--	--	--	--	--	--	--
2-Methylnaphthalene	0.0368	0.193	0.0019 U	0.0019 U	0.0263	--	0.0552	0.219	0.0175	0.9	0.0874	0.151	0.00786	--	--	--	--	--	--	1.65 U
Acenaphthene	0.0127	0.0127	0.0016 U	0.0016 U	0.0042 J	0.067 U	0.0399	0.264	0.0162	0.899	0.221	0.167	0.0164	0.0268 U	0.0134 U	0.0268 U	0.0268 U	0.067 U	0.0268 U	0.067 U
Acenaphthylene	0.108	0.154	0.002 J	0.0011 J	0.0166	0.152	0.0328	0.0318	0.0141	0.173 U	0.0529	0.0336 U	0.0189	0.0268 U	0.0134 U	0.0268 U	0.0268 U	0.067 U	0.0268 U	0.243
Anthracene	0.107	0.0791	0.004 J	0.0009 J	0.0099	0.067 U	0.0425	0.0931	0.015	0.483	0.127	0.0601	0.0387	0.0268 U	0.0134 U	0.0268 U	0.0268 U	0.067 U	0.0353	0.102
Benzo(a)anthracene	0.145	0.19	0.0159	0.0032 J	0.0384	0.198	0.084 M-02	0.0814 M-02	0.0318 M-02	0.749	0.217 M-02	0.0889 M-02	0.187	0.141	0.0737	0.0836	0.0295	0.067 U	0.16	0.295
Benzo(a)pyrene	0.182	0.272	0.0164	0.0052 J	0.0619	0.404	0.111	0.0777	0.0359	0.815	0.291	0.148	0.313	0.214	0.102	0.123	0.0584	0.1	0.289	0.927
Benzo(b)fluoranthene	0.194	0.243	0.0142	0.0052 J	0.0546	0.423	0.107 M-02	0.103 M-02	0.0385 M-02	1.26 M-02	0.287 M-02	0.149 M-02	0.265	0.202	0.1	0.116	0.0633	0.0919	0.286	0.726
Benzo(g,h,i)perylene	0.178	0.105	0.0074	0.0056 J	0.0441	0.544	0.102	0.0729	0.0341	0.482	0.291	0.126	0.238	0.246	0.105	0.18	0.0613	0.0938	0.258	0.915
Benzo(k)fluoranthene	0.144	0.173	0.011	0.0031 J	0.0421	0.287	0.0374 M-02	0.0385 M-02	0.0144 M-02	0.369 M-02	0.0882 M-02	0.0604 M-02	0.252	0.181	0.0868	0.802	0.0437	0.0829	0.205	0.608
Chrysene	0.22	0.243	0.0151	0.0047 J	0.056	0.352	0.113 M-02	0.117 M-02	0.0365 M-02	1.3	0.284 M-02	0.124 M-02	0.255	0.195	0.0893	0.118	0.063	0.0942	0.21	0.554
Dibenzo(a,h)anthracene	0.0507	0.0354	0.003 J	0.00091 J	0.0121	0.0891	0.0141	0.011 J	0.0109 U	0.173 U	0.0288	0.0336 U	0.0669	0.0594	0.0266	0.047	0.0268 U	0.067 U	0.0572	0.159
Dibenzofuran	--	--	--	--	--	--	0.00956 J	0.112	0.00839 J	0.693	0.0344	--	--	--	--	--	--	--	--	1.65 U
Fluoranthene	0.152	0.258	0.0255	0.0046 J	0.0846	0.59	0.153	0.301	0.0843	3.17	0.881	0.325	0.508	0.226	0.105	0.109	0.0618	0.119	0.255	0.727
Fluorene	0.0228	0.0149	0.0019 U	0.0019 U	0.0059 J	0.067 U	0.0306	0.18	0.0128	0.765	0.124	0.0918	0.0136	0.0268 U	0.0134 U	0.0268 U	0.0268 U	0.067 U	0.0268 U	0.067 U
Indeno(1,2,3-cd)pyrene	0.12	0.101	0.0066 J	0.0035 J	0.0348	0.404	0.0849	0.0607	0.0291	0.516	0.233	0.0947	0.148	0.191	0.082	0.126	0.042	0.0704	0.208	0.724
Naphthalene	0.064	0.211	0.003 J	0.0031 J	0.0839	0.067 U	0.104	0.491	0.0365	2.05 Q	0.288	0.952 Q	0.0101	0.0268 U	0.0134 U	0.0268 U	0.0268 U	0.067 U	0.0268 U	0.067 U
Phenanthrene	0.117	0.188	0.0094	0.0033 U	0.0624	0.277	0.145	0.611	0.0606	2.75	1.03	0.335	0.141	0.0948	0.0473	0.0579	0.0354	0.067 U	0.127	0.409
Pyrene	0.205	0.353	0.0255	0.0054 J	0.0948	0.633	0.218	0.321	0.103	2.99	1.07	0.394	0.26	0.224	0.105	0.104	0.0723	0.119	0.225	0.716
Anthanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b+k)fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.65 U
Benzo(e)pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HPAH (as reported in FS)	1.5907	1.9734	0.1406 J	0.04141 J	0.5234	3.9241	--	--	--	--	--	--	2.4929	1.8794	0.8754	1.8086	0.4953	0.7712	2.1532	6.351
Total LPAH (as reported in FS)	0.4683	0.8527	0.0184 J	0.0051 J	0.2092 J	0.429	--	--	--	--	--	--	0.24656	0.0948	0.0473	0.0579	0.0354001	0.067 U	0.1623	0.754
Total PAHs (as reported in FS)	2.0222	2.6331	0.159 J	0.04651 J	0.7063 J	4.3531	--	--	--	--	--	--	2.73946	1.9742	0.9227	1.8665	0.5307002	0.7712	2.3155	7.105
BaP Eq (as reported in FS)	0.28026	0.362773	0.0231951 J	0.0073357 J	0.087257	0.598822	--	--	--	--	--	--	0.442675	0.328805	0.1551273	0.210698	0.072993	0.1171532	0.41386	1.267134
Total HPAH (ND = 1/2 DL)	1.5907	1.9734	0.1406	0.04141	0.5234	3.9241	1.0244	1.1842	0.41305	11.7375	3.671	1.5268	2.4929	1.8794	0.8754	1.8086	0.509	0.838	2.153	6.351
Total LPAH (ND = 1/2 DL)	0.4683	0.8527	0.0211	0.00945	0.2092	0.563	0.45	1.8899	0.1727	7.9335	1.9303	1.7737	0.24656	0.1618	0.0808	0.1249	0.1024	0.0670 U	0.2159	1.6795
Total PAHs (ND = 1/2 DL)	2.059	2.8261	0.1617	0.05086	0.7326	4.4871	1.4744	3.0741	0.58575	19.671	5.6013	3.3005	2.73946	2.0412	0.9562	1.9335	0.611	0.905	2.369	8.031
BaP Eq (ND = 1/2 DL)	0.28026	0.362773	0.0231951	0.0073357	0.087257	0.598822	0.153177	0.113712	0.0514705	1.15899	0.394666	0.198788	0.442675	0.328805	0.1551273	0.210698	0.0858	0.1540	0.4139	1.2671

Notes:

1. mg/kg = Milligrams per kilogram.
2. ND = Not detected.
3. DL = Detection or reporting limit.
4. bgs = Below ground surface.
5. ISM = Sample collected using Incremental Sampling Methodology.
6. PAH = Polycyclic Aromatic Hydrocarbons
7. HPAH = High Molecular Weight PAHs
8. LPAH = Low Molecular Weight PAHs
9. BaP Eq = Benzo(a)pyrene Equivalent
10. U = Analyte was not detected.
11. J = Result is estimated.
12. UJ = The analyte was analyzed for but was not detected. However, the detection limit may be inaccurate or imprecise.
13. M-02 = the result is estimated due to matrix interference.
14. M-04 = due to matrix interference, this analyte cannot be accurately quantified. The reported result may contain a high bias
15. J2 = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample. The precision goal of 30% was exceeded for this analyte by the results of the lab duplicate.
16. Q = the matrix spike and/or duplicate analysis was outside laboratory control limits.
17. Shading = Sample locations removed during the 2008/2015 soil removal actions.

Table B-8
Historical Soil Sample Analytical Results - Pesticides
Willamette Cove Upland Facility
Portland, Oregon

	Pesticides (mg/kg)								
	Central Parcel			East Parcel					
Sample ID	B-18/S-1	TP-27/S-1	TP-29/S-1	B-26/S-1	B-27/S-1	SS-36	SS-37	SS-38	TP-39/S-2
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	1.5
Maximum Depth (feet bgs)	2	0.5	0.5	2	2	0.5	0.5	0.5	2
Sample Date	5/7/2001	4/17/2001	4/18/2001	5/11/2001	5/11/2001	1/18/2002	1/18/2002	1/18/2002	4/16/2001
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
4,4'-DDD	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
4,4'-DDE	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
4,4'-DDT	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.00763	0.0571
Aldrin	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
alpha-Endosulfan	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
alpha-Hexachlorocyclohexane	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
beta-Endosulfan	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
beta-Hexachlorocyclohexane	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Chlordane (technical)	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
cis-Chlordane	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
delta-Hexachlorocyclohexane	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Dieldrin	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Endosulfan sulfate	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Endrin	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Endrin aldehyde	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Endrin ketone	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
gamma-Chlordane	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
gamma-Hexachlorocyclohexane	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Heptachlor	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Heptachlor epoxide	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Methoxychlor	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U
Toxaphene	0.2 U	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Total of 4,4'-DDD, -DDE, -DDT (as reported in FS)	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.00763	0.0571
Total of 4,4'-DDD, -DDE, -DDT (ND = 1/2 DL)	0.0067 U	0.0067 UJ	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0067 U	0.0143	0.0638

Notes:
1. mg/kg = Milligrams per kilogram.
2. ND = Not detected.
3. DL = Detection or reporting limit.
4. bgs = Below ground surface.
5. U = Analyte was not detected.
6. UJ = The analyte was analyzed for but was not detected. However, the detection limit may be inaccurate or imprecise.

Table B-9
Historical Soil Sample Analytical Results - Formaldehyde
Willamette Cove Upland Facility
Portland, Oregon

	Formaldehyde (mg/kg)			
	East Parcel		West Parcel	
Sample ID	B-21/S-1	TP-36/S-3	B-2/S-2	TP-17/S-2
Minimum Depth (feet bgs)	0	3.5	2	1.5
Maximum Depth (feet bgs)	4	4	4	2
Sample Date	5/7/2001	4/10/2001	5/10/2001	4/17/2001
Sample Type	Discrete	Discrete	Discrete	Discrete
Formaldehyde	2 UJ	2 U	2 U	2 U

Notes:
1. mg/kg = Milligrams per kilogram.
2. bgs = Below ground surface.
3. U = Analyte was not detected.

Table B-10
Historical Soil Sample Analytical Results - Total Petroleum Hydrocarbons
Willamette Cove Upland Facility
Portland, Oregon

	Total Petroleum Hydrocarbons (mg/kg)																		
	Central Parcel																		
Sample ID	B-16/S-1	B-20/S-2	HA-6/S-1	HA-6/S-3	SS-10	SS-8	SS-9	TP-22/S-1	TP-22/S-4	TP-23/S-1	TP-23/S-3	TP-24/S-1	TP-25/S-1	TP-26/S-1	TP-27/S-1	TP-27/S-2	TP-28/S-1	TP-28/S-3	TP-29/S-1
Minimum Depth (feet bgs)	0	2	0	1	0	0	0	0	5.5	0	3.5	0	0	0	0	1.5	0	3.5	0
Maximum Depth (feet bgs)	2	4	0.5	2	0.5	0.5	0.5	0.5	6	0.5	4	0.5	0.5	0.5	0.5	2	0.5	4	0.5
Sample Date	5/7/2001	5/7/2001	5/18/2001	5/18/2001	1/17/2002	1/17/2002	1/17/2002	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/18/2001
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Gasoline Range Hydrocarbons	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Hydrocarbons	30.8	25 U	68.5	125 U	31.4	86	779	2390	79.3	25 U	25 U	25 U	25 U	25 U	116	25 U	25 U	25 U	50 U
Oil Range Hydrocarbons	219	50 U	250	300	144	290	2060	5960	176	83.3	50 U	69.6	139	50 U	450	50 U	50 U	50 U	304
Motor Oil	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Please see notes at the end of table.

Table B-10
Historical Soil Sample Analytical Results - Total Petroleum Hydrocarbons
Willamette Cove Upland Facility
Portland, Oregon

	Total Petroleum Hydrocarbons (mg/kg)																	
	Central Parcel								East Parcel									
Sample ID	TP-29/S-4	TP-31/S-3	TP-33/S-1	TP-33/S-3	TP-34/S-1	TP-34/S-2	WC-1/2/3	Wharf Beach -1	B-21/S-1	B-22/S-1	B-24/S-1	B-25/S-2	B-26/S-1	B-28/S-1	B-29/S-1	B-30/S-1	Beach Cove-1	Beach Cove-2	EX-1
Minimum Depth (feet bgs)	5.5	3.5	0	3.5	0	1.5	0.25	1	0	0	0	2	0	0.5	0	0	12	12	2
Maximum Depth (feet bgs)	6	4	0.5	4	0.5	2	1	1.5	4	2	4	4	2	1	4	4	18	18	2
Sample Date	4/18/2001	4/16/2001	4/16/2001	4/16/2001	4/16/2001	4/16/2001	10/1/2010	9/27/2010	5/7/2001	5/15/2001	5/17/2001	5/7/2001	5/11/2001	5/17/2001	5/17/2001	5/17/2001	9/27/2010	9/27/2010	10/28/2004
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Gasoline Range Hydrocarbons	--	--	--	--	--	--	20.5 U	1.4 J	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Hydrocarbons	25 U	25 UJ	25 U	25 U	50 U	25 UJ	72.3	397	25 U	25 U	25 U	25 U	25 U	32.8	27.9	25 U	18500	14900	89.4
Oil Range Hydrocarbons	50 U	50 UJ	170	50 U	232	50 UJ	--	199	50 U	113	50 U	50 U	50 U	187	158	94.2	49400	46700	299
Motor Oil	--	--	--	--	--	--	738	--	--	--	--	--	--	--	--	--	--	--	--

Please see notes at the end of table.

Table B-10
Historical Soil Sample Analytical Results - Total Petroleum Hydrocarbons
Willamette Cove Upland Facility
Portland, Oregon

	Total Petroleum Hydrocarbons (mg/kg)																		
	East Parcel															West Parcel			
Sample ID	EX-2	EX-4	EX-5	HA-1	HA-7/S-2	TP-35/S-1	TP-35/S-4	TP-36/S-1	TP-37/S-1	TP-38/S-2	TP-39/S-2	TP-40/S-1	TP-40/S-4	Trench 1/2	Trench 3/4	B-1/S-2	B-2/S-1	B-6/S-1	B-7/S-1
Minimum Depth (feet bgs)	2	4	2	0	0.5	0	5.5	0	0	1.5	1.5	0	5.5	8	8	2	0	0	0
Maximum Depth (feet bgs)	2	4	2	6	1	0.5	6	0.5	0.5	2	2	0.5	6	8	8	4	2	2	2
Sample Date	10/28/2004	10/28/2004	10/28/2004	12/12/1988	5/17/2001	4/16/2001	4/16/2001	4/16/2001	4/16/2001	4/16/2001	4/16/2001	4/16/2001	4/16/2001	9/28/2010	9/29/2010	5/8/2001	5/10/2001	5/9/2001	5/9/2001
Sample Type	Discrete	Discrete	Discrete	Composite	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Discrete	Discrete	Discrete	Discrete
Gasoline Range Hydrocarbons	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Hydrocarbons	576	4500	5220	--	25 U	250 U	25 U	25 U	86.8	250 U	25 U	25 U	25 U	236	1340	25 U	25 U	25 U	25 U
Oil Range Hydrocarbons	2040	8390	11300	200 U	50 U	390	50 U	50 U	217	1830	55.2	50 U	50 U	--	--	87.5	50 U	67.8	52.5
Motor Oil	--	--	--	--	--	--	--	--	--	--	--	--	--	1050	1140	--	--	--	--

Please see notes at the end of table.

Table B-10
Historical Soil Sample Analytical Results - Total Petroleum Hydrocarbons
Willamette Cove Upland Facility
Portland, Oregon

	Total Petroleum Hydrocarbons (mg/kg)													
	West Parcel													
Sample ID	B-8/S-2	HA-5/S-1	Hahn-005	Hahn-007	TP-16/S-1	TP-16/S-3	TP-17/S-1	TP-17/S-2	TP-18/S-1	TP-18/S-4	TP-19/S-2	TP-20/S-1	TP-21/S-2	TP-21/S-4
Minimum Depth (feet bgs)	2	0	10	9	0	3.5	0	1.5	0	5.5	1.5	0	1.5	5.5
Maximum Depth (feet bgs)	4	0.5	10	9	0.5	4	0.5	2	0.5	6	2	0.5	2	6
Sample Date	5/10/2001	4/18/2001	7/9/1999	7/9/1999	4/17/2001	4/17/2001	4/17/2001	4/17/2001	4/18/2001	4/18/2001	4/18/2001	4/17/2001	4/17/2001	4/17/2001
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Gasoline Range Hydrocarbons	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Hydrocarbons	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	50 U	25 U	25 U	250 U	25 U
Oil Range Hydrocarbons	68	50 U	100 U	100 U	50 U	50 U	50 U	50 U	50 U	379	123	81.8	1040	73.3
Motor Oil	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
1. mg/kg = Milligrams per kilogram.
2. -- = Value not available.
3. bgs = Below ground surface.
4. U = Analyte was not detected.
5. J = Result is estimated.
6. UJ = The analyte was analyzed for but was not detected. However, the detection limit may be inaccurate or imprecise.
7. Shading = Sample locations removed during the 2008/2015 soil removal actions.

Table B-11
Historical Soil Sample Analytical Results - Phenols
Willamette Cove Upland Facility
Portland, Oregon

	Phenols (mg/kg)																			
	Central Parcel																			
Sample ID	Area-2-10a	Area-2-10b	Area-2-10c	Area-3-3a	Area-3-3b	Area-3-3c	Area-6-9a	Area-6-9b	Area-6-9c	DU-6-COMP-5-3a	DU-6-COMP-5-3b	DU-6-COMP-5-3c	DU-6-COMP-5-6a	DU-6-COMP-5-6b	DU-6-COMP-5-6c	HA-6/S-1	Matrix Comp	RA3-B1	RA3-B10	RA3-B11
Minimum Depth (feet bgs)	0	0.5	1	0	0.5	1	0	0.5	1	0	0.5	1	0	0.5	1	0	0	0.5	0.5	0.5
Maximum Depth (feet bgs)	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	0	0.5	0.5	0.5
Sample Date	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	5/18/2001	10/21/2015	10/19/2015	10/19/2015	10/19/2015
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Composite	Composite
2,3,4,6-Tetrachlorophenol	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	2.62	3.05	1.2	--	0.0883 U	0.0589 U	0.0141 U	0.0141 U
2,3,5,6-Tetrachlorophenol	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.144 U	0.148 U	0.0846 J	--	0.0883 U	0.0589 U	0.0141 U	0.0141 U
2,4,5-Trichlorophenol	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.144 U	0.0788 J	0.16 U	0.66 U	0.0883 U	0.0589 U	0.0141 U	0.0141 U
2,4,6-Trichlorophenol	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.0859 J	0.0834 J	0.16 U	0.66 U	0.0883 U	0.0589 U	0.0141 U	0.0141 U
2,4-Dichlorophenol	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.144 U	0.148 U	0.16 U	0.66 U	0.0883 U	0.0589 U	0.0141 U	0.0141 U
2,4-Dimethylphenol	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.144 U	0.148 U	0.16 U	2 U	--	--	--	--
2,4-Dinitrophenol	0.794 U	0.764 U	0.743 U	0.745 U	0.717 U	0.697 U	0.306 U	0.111 U	0.114 U	0.786 U	0.112 U	0.114 U	0.724 U	0.742 U	0.801 U	4 U	--	--	--	--
2,6-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.144 U	0.148 U	0.16 U	0.66 U	0.0883 U	0.0589 U	0.0141 U	0.0141 U
2-methyl-4,6-dinitrophenol	0.794 U	0.764 U	0.743 U	0.745 U	0.717 U	0.697 U	0.306 U	0.0714 U	0.0732 U	0.786 U	0.072 U	0.0729 U	0.724 U	0.742 U	0.801 U	--	--	--	--	--
2-Methylphenol	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	--	--	--	--
2-Nitrophenol	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	0.66 U	--	--	--	--
3- and 4-Methylphenol	0.0794 U	0.0764 U	0.0743 U	0.0525 J	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	--	--	--	--
4-Chloro-3-methylphenol	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	0.66 U	0.177 U	0.118 U	0.0284 U	0.0284 U
4-Nitrophenol	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	2 U	--	--	--	--
Pentachlorophenol	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.584	0.61	0.319 J	2 U	0.177 U	0.118 U	0.0284 U	0.0284 U
Phenol	0.0635 U	0.0611 U	0.0593 U	0.0595 U	0.0573 U	0.0557 U	0.0244 U	0.0057 U	0.00585 U	0.0628 U	0.00575 U	0.00583 U	0.0579 U	0.0593 U	0.064 U	0.66 U	--	--	--	--
Cresol (Methylphenol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Please see notes at the end of table.

Table B-11
Historical Soil Sample Analytical Results - Phenols
Willamette Cove Upland Facility
Portland, Oregon

	Phenols (mg/kg)																			
	Central Parcel																			
Sample ID	RA3-B12	RA3-B13	RA3-B14	RA3-B2	RA3-B3	RA3-B4	RA3-B5	RA3-B6	RA3-B7	RA3-B8	RA3-B9	RA3-D-B1	RA3-D-S1	RA3-D-S2	RA3-S1	RA3-S10	RA3-S11	RA3-S12	RA3-S13	RA3-S14
Minimum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	0.5	0.5	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	1	1	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/21/2015	10/27/2015	10/28/2015	10/19/2015	10/19/2015	10/19/2015	10/19/2015	10/21/2015	10/21/2015	10/27/2015	10/27/2015	10/29/2015	10/29/2015	10/29/2015	10/19/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
2,3,4,6-Tetrachlorophenol	0.055 U	0.0778 U	0.155 U	0.0137 U	0.0139 U	0.014 U	0.0563 U	0.0549 U	0.0543 U	0.0753 U	0.0739 U	0.0697 U	0.273 U	0.136 U	0.0599 U	0.174 U	0.177 U	0.0748 U	0.0749 U	0.0734 U
2,3,5,6-Tetrachlorophenol	0.055 U	0.0778 U	0.155 U	0.0137 U	0.0139 U	0.014 U	0.0563 U	0.0549 U	0.0543 U	0.0753 U	0.0739 U	0.0697 U	0.273 U	0.136 U	0.0599 U	0.174 U	0.177 U	0.0748 U	0.0749 U	0.0734 U
2,4,5-Trichlorophenol	0.055 U	0.0778 U	0.155 U	0.0137 U	0.0139 U	0.014 U	0.0563 U	0.0549 U	0.0543 U	0.0753 U	0.0739 U	0.0697 U	0.273 U	0.136 U	0.0599 U	0.174 U	0.177 U	0.0748 U	0.0749 U	0.0734 U
2,4,6-Trichlorophenol	0.055 U	0.0778 U	0.155 U	0.0137 U	0.0139 U	0.014 U	0.0563 U	0.0549 U	0.0543 U	0.0753 U	0.0739 U	0.0697 U	0.273 U	0.136 U	0.0599 U	0.174 U	0.177 U	0.0748 U	0.0749 U	0.0734 U
2,4-Dichlorophenol	0.055 U	0.0778 U	0.155 U	0.0137 U	0.0139 U	0.014 U	0.0563 U	0.0549 U	0.0543 U	0.0753 U	0.0739 U	0.0697 U	0.273 U	0.136 U	0.0599 U	0.174 U	0.177 U	0.0748 U	0.0749 U	0.0734 U
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	0.055 U	0.0778 U	0.155 U	0.0137 U	0.0139 U	0.014 U	0.0563 U	0.0549 U	0.0543 U	0.0753 U	0.0739 U	--	--	--	0.0599 U	0.174 U	0.177 U	0.0748 U	0.0749 U	0.0734 U
2-methyl-4,6-dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3- and 4-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-methylphenol	0.11 U	0.156 U	0.311 U	0.0274 U	0.028 U	0.0282 U	0.113 U	0.11 U	0.109 U	0.151 U	0.148 U	0.14 U	0.547 U	0.274 U	0.12 U	0.349 U	0.356 U	0.15 U	0.15 U	0.147 U
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	0.11 U	0.156 U	0.311 U	0.0274 U	0.028 U	0.0282 U	0.113 U	0.11 U	0.109 U	0.151 U	0.148 U	0.14 U	0.547 U	0.274 U	0.12 U	0.349 U	0.356 U	0.15 U	0.15 U	0.147 U
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cresol (Methylphenol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Please see notes at the end of table.

Table B-11
Historical Soil Sample Analytical Results - Phenols
Willamette Cove Upland Facility
Portland, Oregon

	Phenols (mg/kg)																			
	Central Parcel																			
Sample ID	RA3-S15	RA3-S16	RA3-S17	RA3-S18	RA3-S19	RA3-S2	RA3-S20	RA3-S21	RA3-S22	RA3-S23	RA3-S24	RA3-S25	RA3-S26	RA3-S27	RA3-S28	RA3-S29	RA3-S3	RA3-S4	RA3-S5	RA3-S6
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum Depth (feet bgs)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/19/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	10/28/2015	12/22/2015	12/22/2015	10/19/2015	10/19/2015	10/19/2015	10/27/2015
Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
2,3,4,6-Tetrachlorophenol	0.163 U	0.0795 U	0.172 U	0.0788 U	0.176 U	0.0594 U	0.0787 U	0.075 U	0.151 U	0.158 U	0.148 U	0.0779 U	0.296 U	0.156 U	0.0559 U	0.0573 U	0.0585 U	0.056 U	0.0576 U	0.0838 U
2,3,5,6-Tetrachlorophenol	0.163 U	0.0795 U	0.172 U	0.0788 U	0.176 U	0.0594 U	0.0787 U	0.075 U	0.151 U	0.158 U	0.148 U	0.0779 U	0.296 U	0.156 U	0.0559 U	0.0573 U	0.0585 U	0.056 U	0.0576 U	0.0838 U
2,4,5-Trichlorophenol	0.163 U	0.0795 U	0.172 U	0.0788 U	0.176 U	0.0594 U	0.0787 U	0.075 U	0.151 U	0.158 U	0.148 U	0.0779 U	0.296 U	0.156 U	0.0559 U	0.0573 U	0.0585 U	0.056 U	0.0576 U	0.0838 U
2,4,6-Trichlorophenol	0.163 U	0.0795 U	0.172 U	0.0788 U	0.176 U	0.0594 U	0.0787 U	0.075 U	0.151 U	0.158 U	0.148 U	0.0779 U	0.296 U	0.156 U	0.0559 U	0.0573 U	0.0585 U	0.056 U	0.0576 U	0.0838 U
2,4-Dichlorophenol	0.163 U	0.0795 U	0.172 U	0.0788 U	0.176 U	0.0594 U	0.0787 U	0.075 U	0.151 U	0.158 U	0.148 U	0.0779 U	0.296 U	0.156 U	0.0559 U	0.0573 U	0.0585 U	0.056 U	0.0576 U	0.0838 U
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dichlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	0.163 U	0.0795 U	0.172 U	0.0788 U	0.176 U	0.0594 U	0.0787 U	0.075 U	0.151 U	0.158 U	0.148 U	0.0779 U	0.296 U	0.156 U	0.0559 U	0.0573 U	0.0585 U	0.056 U	0.0576 U	0.0838 U
2-methyl-4,6-dinitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3- and 4-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-methylphenol	0.328 U	0.16 U	0.345 U	0.158 U	0.352 U	0.119 U	0.158 U	0.151 U	0.303 U	0.317 U	0.297 U	0.156 U	0.594 U	0.314 U	0.112 U	0.115 U	0.117 U	0.112 U	0.116 U	0.168 U
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	0.328 U	0.16 U	0.345 U	0.158 U	0.352 U	0.119 U	0.158 U	0.151 U	0.303 U	0.317 U	0.297 U	0.156 U	0.594 U	0.314 U	0.112 U	0.115 U	0.117 U	0.112 U	0.116 U	0.168 U
Phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cresol (Methylphenol)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Please see notes at the end of table.

Table B-11
Historical Soil Sample Analytical Results - Phenols
Willamette Cove Upland Facility
Portland, Oregon

	Phenols (mg/kg)																			
	Cental Parcel					East Parcel									West Parcel					
Sample ID	RA3-S7	RA3-S8	RA3-S9	Soil Layers	TP-22/S-1	B-21/S-1	SR3	SR4	TP-15	TP-36/S-1	TP-38/S-1	TP-38/S-2	TP-39/S-2	TP-40/S-1	B-2/S-2	DP-4 (40-45)	DP-5 (40-45)	TP-17/S-2	TP-18/S-4	TP-21/S-2
Minimum Depth (feet bgs)	0	0	0	0	0	0	0	0	0	0	0	1.5	1.5	0	2	40	40	1.5	5.5	1.5
Maximum Depth (feet bgs)	0.5	0.5	0.5	0	0.5	4	0.2	0.2	4	0.5	0.5	2	2	0.5	4	45	45	2	6	2
Sample Date	10/27/2015	10/27/2015	10/28/2015	10/20/2015	4/17/2001	5/7/2001	10/4/1991	10/4/1991	10/19/1995	4/16/2001	4/16/2001	4/16/2001	4/16/2001	4/16/2001	5/10/2001	12/21/2016	1/4/2017	4/17/2001	4/19/2001	4/17/2001
Sample Type	Composite	Composite	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Discrete	Discrete	Discrete
2,3,4,6-Tetrachlorophenol	0.0819 U	0.0776 U	0.184 U	0.209 U	--	--	0.1 UJ	0.11 UJ	--	--	--	--	--	--	--	0.861 U	0.167 U	--	--	--
2,3,5,6-Tetrachlorophenol	0.0819 U	0.0776 U	0.184 U	0.209 U	--	--	0.1 UJ	0.11 UJ	--	--	--	--	--	--	--	0.861 U	0.167 U	--	--	--
2,4,5-Trichlorophenol	0.0819 U	0.0776 U	0.184 U	0.209 U	1.65 U	2 U	0.2 UJ	0.22 UJ	--	1 U	2 U	1.65 U	2 U	1 U	2 U	0.861 U	0.167 U	1 U	1 U	1.65 U
2,4,6-Trichlorophenol	0.0819 U	0.0776 U	0.184 U	0.209 U	1.65 U	2 U	0.1 UJ	0.11 UJ	0.005 U	1 U	2 U	1.65 U	2 U	1 U	2 U	0.861 U	0.167 U	1 U	2 U	1.65 U
2,4-Dichlorophenol	0.0819 U	0.0776 U	0.184 U	0.209 U	1.65 U	2 U	0.2 UJ	0.22 UJ		1 U	2 U	1.65 U	2 U	1 U	2 U	0.861 U	0.167 U	1 U	2 U	1.65 U
2,4-Dimethylphenol	--	--	--	--	5 U	2 U	--	--	--	1 U	2 U	5 U	2 U	1 U	2 U	0.861 U	0.167 U	1 U	2 U	5 U
2,4-Dinitrophenol	--	--	--	--	10 U	5 U	--	--	--	2.5 U	5 U	10 U	5 U	2.5 U	5 U	4.32 U	0.838 U	2.5 U	2 U	10 U
2,6-Dichlorophenol	--	--	--	--	--	2 U	0.2 UJ	0.22 UJ	--	1 U	2 U	--	2 U	1 U	2 U	--	--	1 U	5 U	--
2-Chlorophenol	0.0819 U	0.0776 U	0.184 U	0.209 U	1.65 U	2 U	--	--	--	1 U	2 U	1.65 U	2 U	1 U	2 U	0.861 U	0.167 U	1 U	2 U	1.65 U
2-methyl-4,6-dinitrophenol	--	--	--	--	--	2 U	--	--	--	1 U	2 U	--	2 U	1 U	2 U	4.32 U	0.838 U	1 U	2 U	--
2-Methylphenol	--	--	--	--	1.65 U	--	--	--	--	1 U	--	1.65 U	--	--	--	0.432 U	0.0838 U	--	2 U	1.65 U
2-Nitrophenol	--	--	--	--	1.65 U	2 U	--	--	--	--	2 U	1.65 U	2 U	1 U	2 U	1.73 U	0.336 U	1 U	2 U	1.65 U
3- and 4-Methylphenol	--	--	--	--	1.65 U	--	--	--	--	--	--	1.65 U	--	--	--	0.432 U	0.0859 M-04	--	--	1.65 U
4-Chloro-3-methylphenol	0.164 U	0.156 U	0.369 U	0.42 U	1.65 U	2 U	--	--	--	1 U	2 U	1.65 U	2 U	1 U	2 U	1.73 U	0.336 U	1 U	2 U	1.65 U
4-Nitrophenol	--	--	--	--	5 U	2 U	--	--	--	1 U	2 U	5 U	2 U	1 U	2 U	1.73 U	0.336 U	1 U	2 U	5 U
Pentachlorophenol	0.164 U	0.156 U	0.369 U	0.42 U	5 U	2 U	0.2 UJ	0.22 UJ	0.014	1 U	2 U	5 U	2 U	1 U	2 U	1.73 U	0.336 U	1 U	2 U	5 U
Phenol	--	--	--	--	1.65 U	2 U	--	--	--	1 U	2 U	1.65 U	2 U	1 U	2 U	0.345 U	0.067 U	1 U	2 U	1.65 U
Cresol (Methylphenol)	--	--	--	--	--	4 U	--	--	--	2 U	4 U	--	4 U	2 U	4 U	--	--	2 U	4 U	--
Tetrachlorophenol	--	--	--	--	--	2 U	--	--	0.005 U	1 U	2 U	--	2 U	1 U	2 U	--	--	1 U	2 U	--

Notes:
1. mg/kg = Milligrams per kilogram.
2. bgs = Below ground surface.
3. U = Analyte was not detected.
4. J = Result is estimated.
5. M-04 = due to matrix interference, this analyte cannot be accurately quantified. The reported result may contain a high bias
6. UJ = The analyte was analyzed for but was not detected. However, the detection limit may be inaccurate or imprecise.
7. Shading = Sample locations removed during the 2008/2015 soil removal actions.

Table B-12
Historical Soil Sample Analytical Results - SVOCs
Willamette Cove Upland Facility
Portland, Oregon

	SVOCs (mg/kg)																						
	Central Parcel																	East Parcel			West Parcel		
Sample ID	Area-2-10a	Area-2-10b	Area-2-10c	Area-3-3a	Area-3-3b	Area-3-3c	Area-6-9a	Area-6-9b	Area-6-9c	DU-6-COMP-5-3a	DU-6-COMP-5-3b	DU-6-COMP-5-3c	DU-6-COMP-5-6a	DU-6-COMP-5-6b	DU-6-COMP-5-6c	HA-6/S-1	TP-22/S-1	SR3	SR4	TP-38/S-2	DP-4 (40-45)	DP-5 (40-45)	TP-21/S-2
Minimum Depth (feet bgs)	0	0.5	1	0	0.5	1	0	0.5	1	0	0.5	1	0	0.5	1	0	0	0	0	1.5	40	40	1.5
Maximum Depth (feet bgs)	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	0.5	0.2	0.2	2	45	45	2
Sample Date	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	2/20/2015	5/18/2001	4/17/2001	10/4/1991	10/4/1991	4/16/2001	12/21/2016	1/4/2017	4/17/2001
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Discrete
1,2,4-Trichlorobenzene	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	1.65 U	--	--	1.65 U	0.432 U	0.0838 U	1.65 U
1,2-Dichlorobenzene	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	2 U	5 U	--	--	5 U	0.432 U	0.0838 U	5 U
1,2-Dinitrobenzene	0.794 U	0.764 U	0.743 U	0.745 U	0.717 U	0.697 U	0.306 U	0.0714 U	0.0732 U	0.786 U	0.072 U	0.0729 U	0.724 U	0.742 U	0.801 U	--	--	--	--	--	4.32 U	0.838 U	--
1,3-Dichlorobenzene	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	2 U	5 U	--	--	5 U	0.432 U	0.0838 U	5 U
1,3-Dinitrobenzene	0.794 U	0.764 U	0.743 U	0.745 U	0.717 U	0.697 U	0.306 U	0.0714 U	0.0732 U	0.786 U	0.072 U	0.0729 U	0.724 U	0.742 U	0.801 U	--	--	--	--	--	4.32 U	0.838 U	--
1,4-Dichlorobenzene	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	2 U	5 U	--	--	5 U	0.432 U	0.0838 U	5 U
1,4-Dinitrobenzene	0.794 U	0.764 U	0.743 U	0.745 U	0.717 U	0.697 U	0.306 U	0.0714 U	0.0732 U	0.786 U	0.072 U	0.0729 U	0.724 U	0.742 U	0.801 U	--	--	--	--	--	4.32 U	0.838 U	--
2,4-Dinitrotoluene	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	1 U	2.5 U	--	--	2.5 U	1.73 U	0.336 U	2.5 U
2,6-Dinitrotoluene	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	1 U	2.5 U	--	--	2.5 U	1.73 U	0.336 U	2.5 U
2-Chloronaphthalene	0.0318 U	0.0306 U	0.0297 U	0.0298 U	0.0287 U	0.0279 U	0.0122 U	0.00286 U	0.00293 U	0.0315 U	0.00288 U	0.00292 U	0.029 U	0.0297 U	0.032 U	0.66 U	1.65 U	--	--	1.65 U	0.173 U	0.0336 U	1.65 U
2-Nitroaniline	0.635 U	0.611 U	0.593 U	0.595 U	0.573 U	0.557 U	0.244 U	0.057 U	0.0585 U	0.628 U	0.0575 U	0.0583 U	0.579 U	0.593 U	0.64 U	0.66 U	1.65 U	--	--	1.65 U	3.45 U	0.67 U	1.65 U
3,3'-Dichlorobenzidine	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	2 U	5 U	--	--	5 U	8.64 U	0.336 U	5 U
3-Nitroaniline	0.635 U	0.611 U	0.593 U	0.595 U	0.573 U	0.557 U	0.244 U	0.057 U	0.0585 U	0.628 U	0.0575 U	0.0583 U	0.579 U	0.593 U	0.64 U	2 U	5 U	--	--	5 U	3.45 U	0.67 U	5 U
4-Bromophenyl phenyl ether	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	1.65 U	--	--	1.65 U	0.432 U	0.0838 U	1.65 U
4-Chloroaniline	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	4 U	10 U	--	--	10 U	0.432 U	0.0838 U	10 U
4-Chlorophenyl phenyl ether	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	1.65 U	--	--	1.65 U	0.432 U	0.0838 U	1.65 U
4-Nitroaniline	0.635 U	0.611 U	0.593 U	0.595 U	0.573 U	0.557 U	0.244 U	0.057 U	0.0585 U	0.628 U	0.0575 U	0.0583 U	0.579 U	0.593 U	0.64 U	0.66 U	1.65 U	--	--	1.65 U	3.45 U	0.67 U	1.65 U
Aniline	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.144 U	0.148 U	0.16 U	--	--	--	--	--	0.861 U	0.167 U	--
Azobenzene (1,2-DPH)	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	--	--	--	--	--	0.432 U	0.0838 U	--
Benzoic acid	3.96 U	3.82 U	3.71 U	3.72 U	3.58 U	3.48 U	1.53 U	0.356 U	0.365 U	3.92 U	0.359 U	0.364 U	3.62 U	3.71 U	4 U	2 U	5 U	--	--	5 U	21.6 U	4.19 U	5 U
Benzyl alcohol	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.144 U	0.148 U	0.16 U	0.66 U	1.65 U	--	--	1.65 U	0.861 U	0.167 U	1.65 U
Bis(2-Chloroethoxy) methane	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	1.65 U	--	--	1.65 U	0.432 U	0.0838 U	1.65 U
Bis(2-Chloroethyl) ether	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	1.65 U	--	--	1.65 U	0.432 U	0.0838 U	1.65 U
Bis(2-Chloroisopropyl) ether	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	1.65 U	--	--	1.65 U	0.432 U	0.0838 U	1.65 U
Bis(2-Ethylhexyl) adipate	0.794 U	0.764 U	0.743 U	0.745 U	0.717 U	0.697 U	0.306 U	0.0714 U	0.0732 U	0.786 U	0.072 U	0.0729 U	0.724 U	0.742 U	0.801 U	--	--	--	--	--	4.32 U	0.838 U	--
Bis(2-ethylhexyl)phthalate	0.476 U	0.458 U	0.445 U	0.447 U	0.43 U	0.418 U	0.183 U	0.0428 U	0.0439 U	0.471 U	0.0432 U	0.0268 J	0.434 U	0.445 U	0.48 U	4 U	10 U	--	--	10 U	2.59 U	0.503 U	10 U
Butyl benzyl phthalate	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.018 J	0.0155 J	0.29 U	0.297 U	0.32 U	0.66 U	1.65 U	--	--	1.65 U	1.73 U	0.336 U	1.65 U
Carbazole	0.0324 J	0.0458 U	0.0325 J	0.0254 J	0.043 U	0.0418 U	0.0183 U	0.00428 U	0.00439 U	0.0266 J	0.00432 U	0.00437 U	0.0638	0.038 J	0.048 U	--	--	0.41 UJ	0.044 UJ	--	0.259 U	0.0503 U	--
Dibenzofuran	0.0298 J	0.0306 U	0.0297 U	0.0191 J	0.0287 U	0.0279 U	0.0122 U	0.00286 U	0.00293 U	0.0315 U	0.00288 U	0.00292 U	0.0558	0.0436	0.0185 J	0.66 U	1.65 U	--	--	1.65 U	0.693	0.0637	1.65 U
Diethyl phthalate	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	0.66 U	1.65 U	--	--	1.65 U	1.73 U	0.336 U	1.65 U
Dimethyl phthalate	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	0.66 U	1.65 U	--	--	1.65 U	1.73 U	0.336 U	1.65 U
Di-n-butylphthalate	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0306	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	2 U	5 U	--	--	5 U	1.73 U	0.336 U	5 U
Di-n-octyl phthalate	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	0.66 U	3.3 U	--	--	1.65 U	1.73 U	0.336 U	1.65 U
Hexachlorobenzene	0.0318 U	0.0306 U	0.0297 U	0.0298 U	0.0287 U	0.0279 U	0.0122 U	0.00286 U	0.00293 U	0.0315 U	0.00288 U	0.00292 U	0.335	0.456	0.0909	0.66 U	1.65 U	0.041 UJ	0.044 UJ	1.65 U	0.173 U	0.0336 U	1.65 U
Hexachlorobutadiene	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	2 U	5 U	0.1 UJ	0.11 UJ	5 U	0.432 U	0.0838 U	5 U
Hexachlorocyclopentadiene	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.144 U	0.148 U	0.16 U	2 U	5 U	--	--	5 U	0.861 U	0.167 U	5 U
Hexachloroethane	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	2 U	5 U	--	--	5 U	0.432 U	0.0838 U	5 U
Isophorone	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	1.65 U	--	--	1.65 U	0.432 U	0.0838 U	1.65 U
Nitrobenzene	0.318 U	0.306 U	0.297 U	0.298 U	0.287 U	0.279 U	0.122 U	0.0286 U	0.0293 U	0.315 U	0.0288 U	0.0292 U	0.29 U	0.297 U	0.32 U	0.66 U	1.65 U	--	--	1.65 U	1.73 U	0.336 U	1.65 U
N-Nitrosodimethylamine	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	--	--	--	--	--	0.432 U	0.0838 U	--
N-Nitroso-di-n-propylamine	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	--	--	--	--	--	0.432 U	0.0838 U	--
N-Nitrosodiphenylamine	0.0794 U	0.0764 U	0.0743 U	0.0745 U	0.0717 U	0.0697 U	0.0306 U	0.00714 U	0.00732 U	0.0786 U	0.0072 U	0.00729 U	0.0724 U	0.0742 U	0.0801 U	0.66 U	1.65 U	--	--	1.65 U	0.432 U	0.0838 U	1.65 U
Pyridine	0.158 U	0.152 U	0.148 U	0.149 U	0.143 U	0.139 U	0.061 U	0.0142 U	0.0146 U	0.157 U	0.0144 U	0.0145 U	0.144 U	0.148 U	0.16 U	--	--	--	--	--	0.861 U	0.167 U	--
N-Nitrosodipropylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.66 U	1.65 U	--	--	1.65 U	--	--	1.65 U
Methyl n-butyl ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2 U	5 U	--	--	5 U	--	--	5 U

Notes:

1. mg/kg = Milligrams per kilogram.
2. SVOCs = Semi-volatile Organic Compounds.
3. bgs = Below ground surface.
4. U = Analyte was not detected.
5. J = Result is estimated.
6. UJ = The analyte was analyzed for but was not detected. However, the detection limit may be inaccurate or imprecise.
7. Shading = Sample locations removed during the 2008/2015 soil removal actions.

Table B-13
Historical Soil Sample Analytical Results - VOCs
Willamette Cove Upland Facility
Portland, Oregon

	VOCs (mg/kg)																					
	Central Parcel					East Parcel							West Parcel									
Sample ID	TP-26/S-2	TP-29/S-3	TP-30/S-3	TP-31/S-2	Wharf Beach -1	B-21/S-1	B-27/S-2	Beach Cove-1	Beach Cove-2	TP-11	Trench 1/2	Trench 3/4	B-2/S-2	DP-2 (40-45)	DP-5(30-35)	DP-5(45-50)	DP-5(55-60)	TP-16/S-3	TP-17/S-2	TP-18/S-4	TP-2	TP-3
Minimum Depth (feet bgs)	1.5	3.5	3.5	1.5	1	0	2	12	12	0	8	8	2	40	30	45	55	3.5	1.5	5.5	0	0
Maximum Depth (feet bgs)	2	4	4	2	1.5	4	4	18	18	3	8	8	4	45	35	50	60	4	2	6	0.5	3.8
Sample Date	4/17/2001	4/18/2001	4/16/2001	4/16/2001	9/27/2010	5/7/2001	5/11/2001	9/27/2010	9/27/2010	10/19/1995	9/28/2010	9/29/2010	5/10/2001	12/19/2016	1/4/2017	1/4/2017	1/4/2017	4/17/2001	4/17/2001	7/14/2001	10/20/1995	10/19/1995
Sample Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Composite	Composite	Discrete	Composite	Composite	Composite	Composite	Discrete	Discrete	Discrete	Discrete	Discrete
1,1,1,2-Tetrachloroethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00021 U	0.1 U	0.1 U	0.00052 U	0.0011 U	--	0.0046 U	0.0071 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	--	--
1,1,1-Trichloroethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00026 U	0.1 U	0.1 U	0.00065 U	0.0014 U	0.005 U	0.0048 U	0.0075 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,1,2,2-Tetrachloroethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00039 U	0.1 U	0.1 U	0.00099 U	0.0021 U	0.005 U	0.0062 U	0.0096 U	0.1 U	0.189 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,1,2-Trichloroethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00039 U	0.1 U	0.1 U	0.00099 U	0.0021 U	0.005 U	0.0047 U	0.0072 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,1-Dichloroethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00034 U	0.1 U	0.1 U	0.00084 U	0.0018 U	0.005 U	0.004 U	0.0062 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,1-Dichloroethene	0.1 U	0.1 U	0.1 U	0.1 U	0.00053 U	0.1 U	0.1 U	0.0013 U	0.0028 U	0.005 U	0.007 U	0.0109 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,1-Dichloropropene	0.1 U	0.1 U	0.1 U	0.1 U	0.00049 U	0.1 U	0.1 U	0.0012 U	0.0026 U	0.005 U	0.0102 U	0.0158 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,2,3-Trichlorobenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00039 U	0.1 U	0.1 U	0.00099 U	0.005 J	0.02 U	0.0062 U	0.0096 U	0.1 U	0.472 U	0.469 U	0.376 U	0.304 U	0.1 U	0.1 U	0.1 U	0.02 U	0.02 U
1,2,4-Trichlorobenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00038 J BU	0.1 U	0.1 U	0.00086 U	0.0041 J	0.02 U	0.0044 U	0.0068 U	0.1 U	--	0.469 U	0.376 U	0.304 U	0.1 U	0.1 U	0.1 U	0.02 U	0.02 U
1,2,3-Trichloropropane	0.1 U	0.1 U	0.1 U	0.1 U	0.00048 U	0.1 U	0.1 U	0.0012 U	0.0025 U	0.005 U	0.0175 U	0.0271 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,2,4-Trimethylbenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00098 J BU	0.1 U	0.1 U	0.0477	0.0144 J	0.02 U	0.0089 J	0.0132 J	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.02 U	0.02 U
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.00055 U	0.5 U	0.5 U	0.0014 U	0.0029 U	0.02 U	0.0397 U	0.0617 U	0.5 U	0.472 U	0.469 U	0.376 U	0.304 U	0.5 U	0.5 U	0.5 U	0.02 U	0.02 U
1,2-Dichloroethane	0.1 U	0.1 U	0.1 U	0.1 U	0.0003 U	0.1 U	0.1 U	0.00079 U	0.0016 U	0.005 U	0.0075 U	0.0116 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,2-Dichlorobenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00035 U	0.1 U	0.1 U	0.00075 U	0.0016 U	0.005 U	0.0039 U	0.006 U	0.1 U	--	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,2-Dichloroethane	--	--	--	--	0.00031 U	--	--	0.00088 U	0.0019 J	--	--	--	--	0.0472 U	0.0469 U	0.0376 U	0.0304 U	--	--	0.1 U	--	--
1,2-Dichloropropane	0.1 U	0.1 U	0.1 U	0.1 U	0.00026 U	0.1 U	0.1 U	0.00064 U	0.0013 U	0.005 U	0.0065 U	0.0101 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,3,5-Trimethylbenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00045 U	0.1 U	0.1 U	0.0189	0.0045 J	0.02 U	0.0028 U	0.0044 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.02 U	0.02 U
1,3-Dichloropropane	0.1 U	0.1 U	0.1 U	0.1 U	0.00039 U	0.1 U	0.1 U	0.00099 U	0.0021 U	0.005 U	0.006 U	0.0094 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,3-Dichlorobenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00027 U	0.1 U	0.1 U	0.00068 U	0.0019 J	0.005 U	0.0034 J	0.0052 J	0.1 U	--	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
1,4-Dichlorobenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00034 U	0.1 U	0.1 U	0.0037 J	0.0031 J	0.005 U	0.0058 J	0.023 J	0.1 U	--	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
2,2-Dichloropropane	--	--	--	--	0.00026 U	--	--	0.00066 U	0.0014 U	--	--	--	--	0.0945 U	0.0939 U	0.0751 U	0.0607 U	--	--	0.1 U	--	--
2-Butanone	--	--	--	--	0.0021 U	--	--	0.198	0.0301 J	--	--	--	--	0.945 U	0.939 U	0.751 U	0.607 U	--	--	1 U	--	--
2-Chlorotoluene	--	--	--	--	0.00045 U	--	--	0.0011 U	0.0023 U	--	--	--	--	0.0945 U	0.0939 U	0.0751 U	0.0607 U	--	--	0.1 U	--	--
2-Hexanone	--	--	--	--	0.00051 U	--	--	0.0013 U	0.0027 U	--	--	--	--	0.945 U	0.939 U	0.751 U	0.607 U	--	--	1 U	--	--
4-Chlorotoluene	--	--	--	--	0.00038 U	--	--	0.00094 U	0.002 U	--	--	--	--	0.0945 U	0.0939 U	0.0751 U	0.0607 U	--	--	0.1 U	--	--
4-Isopropyltoluene	--	--	--	--	0.00055 U	--	--	0.01 J	0.0029 U	--	--	--	--	0.0945 U	0.0939 U	0.0751 U	0.0607 U	--	--	0.2 U	--	--
1-Methyl-4-isopropylbenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.00043 U	0.2 U	0.2 U	0.0011 U	0.0023 U	0.02 U	0.0135 J	0.0448 J	0.2 U	--	--	--	--	0.2 U	0.2 U	--	0.02 U	0.02 U
4-Methyl-2-pentanone	--	--	--	--	--	--	--	--	--	--	--	--	--	0.945 U	0.939 U	0.751 U	0.607 U	--	--	0.5 U	--	--
2,2-Dichloropropane	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	0.1 U	--	--	0.005 U	0.0079 U	0.0123 U	0.1 U	--	--	--	--	0.1 U	0.1 U	--	0.005 U	0.005 U
2-Chlorotoluene	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	0.1 U	--	--	0.02 U	0.0027 U	0.0042 U	0.1 U	--	--	--	--	0.1 U	0.1 U	--	0.02 U	0.02 U
4-Chlorotoluene	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	0.1 U	--	--	0.02 U	0.0044 U	0.0068 U	0.1 U	--	--	--	--	0.1 U	0.1 U	--	0.02 U	0.02 U
Acetone	1 U	1 U	1 U	1 U	0.0054 J	1 U	1 U	1.18	0.21	0.05 U	0.0352 U	0.0546 U	1 U	1.89 U	1.88 U	1.5 U	1.21 U	1 U	1 U	1 U	0.05 U	0.05 U
Benzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00021 U	0.1 U	0.1 U	0.00057 J	0.0011 U	0.005 U	0.0071 J	0.0117 J	0.1 U	0.0189 U	0.0188 U	0.015 U	0.0121 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Bromobenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00033 U	0.1 U	0.1 U	0.00083 U	0.0017 U	0.005 U	0.0019 U	0.003 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Bromochloromethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00031 U	0.1 U	0.1 U	0.00078 U	0.0016 U	0.005 U	0.0077 U	0.012 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Bromodichloromethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00017 U	0.1 U	0.1 U	0.00042 U	0.00087 U	0.005 U	0.0072 U	0.0112 U	0.1 U	0.189 U	0.188 U	0.15 U	0.121 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Bromoform	0.1 U	0.1 U	0.1 U	0.1 U	0.00033 U	0.1 U	0.1 U	0.00082 U	0.0017 U	0.005 U	0.009 U	0.014 U	0.1 U	0.189 U	0.188 U	0.15 U	0.121 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Bromomethane	0.5 U	0.5 U	0.5 U	0.5 U	0.00045 U	0.5 U	0.5 U	0.0011 U	0.0024 U	0.005 U	0.0258 U	0.0401 U	0.5 U	0.945 U	0.939 U	0.751 U	0.607 U	0.5 U	0.5 U	0.5 U	0.005 U	0.005 U
Carbon disulfide	1 U	1 U	1 U	1 U	0.0004 U	1 U	1 U	0.0074 J	0.0028 J	0.005 U	0.0225 U	0.035 U	1 U	--	--	--	--	1 U	1 U	1 U	0.005 U	0.005 U
Carbon tetrachloride	0.1 U	0.1 U	0.1 U	0.1 U	0.00026 U	0.1 U	0.1 U	0.00064 U	0.0013 U	0.005 U	0.0064 U	0.0099 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Chlorobenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00026 U	0.1 U	0.1 U	0.00065 U	0.0014 U	0.005 U	0.0033 J	0.0043 J	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Chloroethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00041 U	0.1 U	0.1 U	0.001 U	0.0021 U	0.005 U	0.007 U	0.0109 U	0.1 U	0.945 U	0.939 U	0.751 U	0.607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Chloroform	0.1 U	0.1 U	0.1 U	0.1 U	0.00028 U	0.1 U	0.1 U	0.00069 U	0.0014 U	0.005 U	0.0054 U	0.0084 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Chloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.00029 U	0.5 U	0.5 U	0.00073 U	0.0015 U	0.005 U	0.0115 J	0.0231 J	0.5 U	0.472 U	0.469 U	0.376 U	0.304 U	0.5 U	0.5 U	0.5 U	0.005 U	0.005 U
cis-1,2-Dichloroethene	0.1 U	0.1 U	0.1 U	0.1 U	0.0003 U	0.1 U	0.1 U	0.00074 U	0.0015 U	0.005 U	0.0046 U	0.0071 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
cis-1,3-Dichloropropene	0.1 U	0.1 U	0.1 U	0.1 U	0.00019 U	0.1 U	0.1 U	0.00046 U	0.00097 U	0.005 U	0.0039 U	0.006 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Dibromochloromethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00014 U	0.1 U	0.1 U	0.00036 U	0.00075 U	0.005 U	0.0034 U	0.0053 U	0.1 U	0.189 U	0.188 U	0.15 U	0.121 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Dibromomethane	--	--	--	--	0.0003 U	--	--	0.00074 U	0.0015 U	--	--	--	--	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.5 U	--	0.1 U	--	--
Dichlorodifluoromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.00059 U	0.5 U	0.5 U	0.0015 U	0.0031 U	0.005 U	0.0093 U	0.0144 U	0.5 U	0.189 U	0.188 U	0.15 U	0.121 U	--	0.5 U	0.5 U	0.005 U	0.005 U
Ethylbenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00054 U	0.1 U	0.1 U	0.0098 J	0.0035 J	0.005 U	0.0055 J	0.0091 J	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Ethylene dibromide	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	0.1 U	--	--	0.02 U	0.0044 U	0.0068 U	0.1 U	--	--	--	--	0.1 U	0.1 U	--	0.02 U	0.02 U
Hexachlorobutadiene	0.2 U	0.2 U	0.2 U	0.2 U	0.00042 U	0.2 U	0.2 U	0.0011 U	0.0022 U	0.02 U	0.0196 U	0.0304 U	0.2 U	--	0.188 U	0.15 U	0.121 U	0.2 U	0.2 U	0.2 U	0.02 U	0.02 U
Isopropylbenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.00049 U	0.2 U	0.2 U	0.0012 U	0.0026 U	0.02 U	0.0034 J	0.0062 J	0.2 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.2 U	0.2 U	0.2 U	0.02 U	0.02 U
m,p-Xylene	0.2 U	0.2 U	0.2 U	0.2 U	0.0017 J BU	0.2 U	0.2 U	0.0203 J	0.0121 J	0.005 U	0.016 J	0.0208 J	0.2 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.2 U	0.2 U	0.2 U	0.005 U	0.005 U
Methyl isobutyl ketone	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	--	--	0.02 U	0.0073 U	0.0114 U	0.5 U	--	--	--	--	0.5 U	0.5 U	--	0.02 U	0.02 U
Methyl n-butyl ketone	1 U	1 U	1 U	1 U	--	1 U	1 U	--	--	0.02 U	0.0254 U	0.0395 U	1 U	--	--	--	--	1 U	1 U	--	0.02 U	0.02 U
Methyl tert-butyl ether	0.1 U	0.1 U	0.1 U	0.1 U	0.00035 U	0.1 U	0.1 U	0.00089 U	0.0019 U	--	0.0027 U	0.0042 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	--	--
Methylene bromide	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	0.1 U	--	--	0.005 U	0.0067 U	0.0104 U	0.1 U	--	--	--	--	0.1 U	0.1 U	--	0.005 U	0.005 U
Methylene chloride	0.5 U	0.5 U	0.5 U	0.5 U	0.0037 U	0.5 U	0.5 U	0.0094 U	0.0196 U	0.014	0.0057 U	0.0088 U	0.5 U	0.472 U	0.469 U	0.376 U	0.304 U	0.5 U	0.5 U	0.5 U	0.01 U	0.013
Methylethyl ketone	1 U	1 U	1 U	1 U	--	1 U	1 U	--	--	0.02 U	0.0878 U	0.136 U	1 U	--	--	--	--	1 U	1 U	--	0.02 U	0.02 U
Naphthalene	0.2 U	0.2 U	0.2 U	0.2 U	0.00078 U	0.2 U	0.2 U	0.0019 U	0.0041 U	0.02 U	0.0225 J	0.0362 J	0.228	0.189 U	0.188 U	0.15 U	0.121 U	0.2 U	0.2 U	0.2 U	0.02 U	0.02 U
n-Butylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.00065 U	0.5 U	0.5 U	0.0016 U	0.0035 J	0.02 U	0.009 J	0.0131 J	0.5 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.5 U	0.5 U	0.5 U	0.02 U	0.02 U
n-Propylbenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.0005 U	0.1 U	0.1 U	0.0108	0.0037 J	0.02 U	0.0071 J	0.0084 J	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.02 U	0.02 U
o-Xylene	0.1 U	0.1 U	0.1 U	0.1 U	0.00046 U	0.1 U	0.1 U	0.0087 J	0.0036 J	0.005 U	0.0055 J	0.0071 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Sec-butylbenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00059 U	0.1 U	0.1 U	0.0044 J	0.0031 U	0.02 U	0.0051 J	0.0069 J	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.02 U	0.02 U
Styrene	0.1 U	0.1 U	0.1 U	0.1 U	0.00061 J	0.1 U	0.1 U	0.001 J	0.0021 U	0.005 U	0.0037 J	0.0054 J	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
tert-Butylbenzene	0.1 U	0.1 U	0.1 U	0.1 U	0.00049 U	0.1 U	0.1 U	0.0012 U	0.0026 U	0.02 U	0.0014 U	0.0021 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.02 U	0.02 U
Tetrachloroethene	0.1 U	0.1 U	0.1 U	0.1 U	0.00054 U	0.1 U	0.1 U	0.0014 U	0.0028 U	0.005 U	0.0089 U	0.0139 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Toluene	0.1 U	0.1 U	0.1 U	0.1 U	0.00053 J	0.1 U	0.1 U	0.0094 J	0.003 J	0.005 U	0.069 J	0.0988 J	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Total Xylenes	0.2 U	0.2 U	0.2 U	0.2 U	0.0017 J BU	0.2 U	0.2 U	0.029 J	0.0156 J	0.005 U	0.0214 J	0.0268 J	0.2 U	--	--	--	--	0.2 U	0.2 U	0.2 U	0.005 U	0.005 U
trans-1,2-Dichloroethene	0.1 U	0.1 U	0.1 U	0.1 U	0.00042 U	0.1 U	0.1 U	0.0011 U	0.0022 U	0.005 U	0.0039 U	0.006 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
trans-1,3-Dichloropropene	0.1 U	0.1 U	0.1 U	0.1 U	0.0003 U	0.1 U	0.1 U	0.00075 U	0.0016 U	0.005 U	0.0035 U	0.0054 U	0.1 U	0.0945 U	0.0939 U	0.0751 U	0.0607 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Trichloroethene	0.1 U	0.1 U	0.1 U	0.1 U	0.0003 U	0.1 U	0.1 U	0.00075 U	0.0016 U	0.005 U	0.0036 U	0.0056 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Trichlorofluoromethane	0.1 U	0.1 U	0.1 U	0.1 U	0.00032 U	0.1 U	0.1 U	0.00081 U	0.0017 U	0.005 U	0.0092 U	0.0143 U	0.1 U	0.189 U	0.188 U	0.15 U	0.121 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U
Vinyl chloride	0.1 U	0.1 U	0.1 U	0.1 U	0.0004 U	0.1 U	0.1 U	0.00099 U	0.0021 U	0.005 U	0.0053 U	0.0082 U	0.1 U	0.0472 U	0.0469 U	0.0376 U	0.0304 U	0.1 U	0.1 U	0.1 U	0.005 U	0.005 U

Notes:
1. mg/kg = Milligrams per kilogram.
2. VOCs = Volatile Organic Compounds.
3. bgs = Below ground surface.
4. U = Analyte was not detected.
5. J = Result is estimated.
6. UJ = The analyte was analyzed for but was not detected. However, the detection limit may be inaccurate or imprecise.
7. Shading = Sample locations removed during the 2008/2015 soil removal actions.

Appendix C

Sampling and Analysis Plan/Quality Assurance Project Plan

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Tables

Figures

1.0 Introduction

This Sampling and Analysis Plan (SAP) was prepared to present a detailed account of field and laboratory procedures for soil sampling at the Willamette Cove Upland Facility (the Site) in support of the Remedial-Design Investigation (RDI). This SAP includes the sampling and monitoring activities to be conducted during the remedial design and remedial action phases. These activities are in support of the Oregon Department of Environmental Quality (DEQ) Record of Decision (ROD) dated March 2021 that selected a remedial action for the Willamette Cove Upland Facility in the St. Johns area of Portland, Oregon. Figure 1 is a Facility Location Map. The ROD was developed based on the DEQ Staff Report Recommended Remedial Action for the Willamette Cove Upland Site (DEQ, March 2020). The selected remedial action will address the presence of polychlorinated dibenzo-p-dioxins and furans (dioxins/furans), metals, petroleum hydrocarbons (including polycyclic aromatic hydrocarbons [PAHs]), polychlorinated biphenyls (PCBs), and semi-volatile organic compounds (SVOCs) in soils. The Site is shown on Figure 2 and includes the Willamette Cove Upland Facility riverward from the top of riverbank.

This SAP is a component of the RDI Work Plan and is prepared in accordance Oregon DEQ guidance for the preparation of quality assurance (QA) documents for environmental cleanup programs (DEQ, 2015). The purpose of this SAP is to describe assessment activities and their purpose for defining the remedial design. The Quality Assurance Project Plan (QAPP) technical elements were developed in accordance with the Oregon DEQ *Quality Assurance Project Plan for EPA PA/SI Investigations* (DEQ, 2017).

2.0 Purpose/Background

2.1 Purpose

The purpose of the RDI is to gather sufficient information to design the remedial action for the Site. The specific objectives of the RDI include the following:

- Define the lateral and vertical extent of soil hot spots designated for excavation and off-site disposal;
- Define the lateral and vertical extent of soil posing excess risk to human and ecological receptors that will be excavated and consolidated in an on-site capped cell or off-site disposal;
- Define the lateral and vertical extent of soil with excess ecological receptor risk that will remain in place following excavation of soil described above; and
- Generate data to support residual risk assessment.

2.2 Background

Since 1988, a succession of site-specific investigations and removal actions have been implemented at the Site. In November 2000, the Port and Metro entered into a voluntary agreement (ECVC-NWR-00-26) with

DEQ to perform a remedial investigation / feasibility study (RI/FS) and implement any needed source control measures to prevent releases to Portland Harbor. In December 2000, the EPA identified the Portland Harbor area of the lower Willamette River as a Superfund Site (ID No. ORSFN1002155) and placed it on the National Priorities List (NPL) due to concerns of contamination in Willamette River sediments and potential risks to human health and the environment from consuming fish. The EPA selected a final action for the Portland Harbor in the January 2017 Record of Decision (ROD).

The Port and Metro conducted the remedial investigation (RI) of the Site between April 2001 and September 2002. The RI combined historical information (prior to 2001) and results of the investigation to develop a conceptual site model and a list of contaminants of interest. Multiple subsequent investigations were conducted between 2002 and 2017 to further investigate areas identified in the RI and resolve data gaps. A Feasibility Study (FS) and Source Control Evaluation (SCE) was conducted in 2019 (Apex, 2019). The DEQ selected a final remedial action for the upland site in the March 2021 ROD (DEQ, 2021). The DEQ used the FS to prepare the ROD presenting the selected Site remedy. Section 4.0 of the Work Plan describes the selected remedy in more detail.

3.0 Project Management and Tasks

As part of the RDI Work Plan development and implementation, roles and responsibilities will be assigned to experienced scientists and engineers. Responsibilities of the team members, as well as laboratory project managers, are described below.

- DEQ Project Manager: Erin McDonnell – Responsible for reviewing and approving work plans and reports for design at Willamette Cove.
- Port of Portland Project Manager: Dwight Leisle – Responsible for reviewing project documentation and overall direction of project.
- Program Manager (Apex): Herb Clough – Provides QA/QC and overall program management for Port projects managed by Apex.
- Project Manager (Apex): Steve Misner – Provides support for execution of Port responsibilities, responsible for reporting, coordinates subcontractor support, and manages the project schedule and budget.
- Quality Assurance/Quality Control (QA/QC) Manager and Database Analyst (Apex): Kelsi Evans – Responsible for data quality review of plans, laboratory data reports, and data summary reports. Ensures integrity of data relative to data quality objectives and will ensure that the data is properly validated prior to use. Responsible for loading field and laboratory analytical EDDs, performing database quality checks, updating the database as necessary, and comparing database records against laboratory hard copy reports.

- Field Director (Apex): Jake Munsey, an RG in Oregon, will be the field director for the remedial design investigation. Responsible for coordinating all field activities in accordance with the RDI Work Plan and this SAP. The field director will arrange all sampling containers and oversee sampling, ensure SOPs are being followed in the field, coordinate with the QA/QC Manager and the Project Manager, assist in managing wastes generated during the investigation.
- Site Safety and Health Officer (Apex): Robert Schettler – Responsible for ensuring that physical and chemical hazards are appropriately mitigated through effective execution of the Sitewide Health and Safety Plan.
- Laboratory Data Manager (Apex Laboratories): Darrell Auvil – Client manager for the analytical laboratory contracted for the analysis of samples. Apex Laboratories is responsible for conducting laboratory analysis or subcontracting laboratory analytical services. Apex Laboratories and subcontract laboratories maintain a current certification from the National Environmental Laboratory Accreditation Program (NELAP) and the Oregon Environmental Laboratory Accreditation Program (ORELAP). Apex Laboratories is not affiliated with Apex Companies, LLC.
- Project Scientists, Engineers, and Technicians (Apex): Includes qualified geologists, chemists, engineers, and field technicians supporting data collection, analysis, and reporting.

4.0 Data Quality Objectives

The general data quality objectives for this project are to develop and implement procedures for obtaining and evaluating data of a specified quality that can be used to evaluate upland soil conditions. Soil data will be collected to evaluate where soil contamination in the upland exceed acceptable levels for both human health and ecology, and to document “hot spot” concentrations in areas where there are elevated levels of contamination. This will be achieved by conducting chemical characterization for the investigation for the remedial design of the Willamette Cove Upland Facility. Physical characterization of the site soil and topography is also necessary to determine if proposed remediation is feasible due to space limitations, flooding, or seismic concerns. The objectives of soil characterization are: (1) Define the vertical and lateral extent of contamination in upland soil that pose excess risk to human and ecological health; (2) determine areas of excavation, off-site disposal, in-place capping, or covering based on soil characterization results and risk to human and ecological health; (3) develop plan for confirmation sampling; (4) refine the conceptual site model (CSM); (5) generate data to support residual risk assessment; and (6) develop long-term monitoring and maintenance of all engineering controls.

4.1 Decision

The decision uses environmental data to determine where remediation is necessary at the Willamette Cove Upland site. Data collected for upland soil will be used to evaluate if soil contamination exceeds applicable levels presented in the FS (preliminary remediation goals [PRGs] and hot spot concentrations for human and ecological health). Those PRGs in the FS were adopted as cleanup levels for the RDI and subsequent remedial action. Contaminant concentrations present above these levels will determine the recommended remediation type.

The principal study questions include:

1. Are soil contaminants of concern (COC) concentrations above acceptable PRGs or hot spot levels for exposure to human receptors?
2. Are soil COC concentrations above acceptable PRGs or hot spot levels for ecological receptors?

Data obtained from this remedial design investigation will help to develop a remedial action plan that is protective of human and ecological health.

The selected remedial action plan may include the following elements, depending on the nature and extent of contamination found during the remedial design investigation.

- For soil that exceeds hot spot concentrations for human health, remediation will include excavation and offsite disposal.
- For soil that exceeds non-dioxin/furan hot spot levels for ecological health, remediation will include excavation and offsite disposal.
- For soil below hot spot levels but above human health PRGs, remediation will include excavation and consolidation in an on-site capped cell or off-site disposal.
- For soil with higher risk to plants and animals including dioxin/furan hot spots, remediation will include excavation and consolidation in an on-site capped cell or off-site disposal.
- For lower-level risk residual soil remaining after offsite disposal and onsite consolidation and capping, remediation will include covering with clean topsoil (cover thickness to be determined from level of residual risk).

Excavation and offsite disposal may be necessary for soil designated for on-site consolidation to the extent that on-site consolidation/capping is not feasible due to space limitations or flooding or seismic concerns.

4.2 Inputs

4.2.1 Information Sources

To support the decision, an evaluation of existing site information will be performed to aid in the identification of representative sections and COCs within the Willamette Cove Upland parcels. Existing site information will include (if available) a review of previous site reconnaissance, site plans, topographic maps, aerial photographs, lidar maps, geologic maps, soil survey information in the vicinity of the Site, previous investigation data, boring logs, well logs, geotechnical reports, and bathymetry maps for the Willamette River.

The nature and extent of contamination that poses a risk to human and ecological health has been adopted from the FS (Apex, 2019). However, the FS included riverbank data, which is not within the area of remediation for the upland portion of the Site. The riverbank data was generally used to identify COCs but has otherwise been eliminated from consideration for this RDI.

4.2.2 Basis of Information Needed

The information generated for this RDI will need to represent a large area with multiple receptors. The location of the Site (adjacent to the Willamette River) is within an ecologically rich area that includes birds, mammals, plants, and invertebrates. Future use of the site will also increase human receptor activity. This RDI will determine COC concentrations that pose an unacceptable risk to these receptors and will determine the subsequent remedial action.

4.2.3 Sampling and Analysis Methods for Information Needed

Soil sampling procedures will use primarily incremental sampling methodology (ISM) to characterize the upland soil. Each ISM decision unit (DU) will cover an area of approximately one-half acre. The upland area coverage of these SUs, coupled with their small area size, will allow evaluation of a broad range of receptors including mammals, birds, plants, invertebrates, and humans. Focused composite sampling will be used to assess conditions beneath the concrete slab on the East Parcel and may be used in follow-up sampling to better define small hot spot areas.

COCs were adopted from the FS and are further discussed in subsection 3.3.1 of the Work Plan. Laboratory preparation and analytical methods were chosen to meet PRGs and hot spot concentrations using accredited methods and laboratories for soil analysis through the National Environmental Laboratory Accreditation Program (NELAP) and the Oregon Environmental Laboratory Accreditation Program (ORELAP).

4.3 Boundaries of Study

The target area includes the upland portion of the Site, which is approximately 3,000 feet long and varies from 110 to 700 feet in width. The Site as defined in the VCP Agreement covers approximately 24 acres of upland area that is inland from the ordinary low water line (OLWL). However, the scope of work for the VCP Agreement limits the work to inland from the mean high water (MHW) line (defined as 13.3 feet, North American vertical datum 88 [NAVD88] datum) to the property line with the Union Pacific Railroad (UPRR). DEQ, and the EPA have agreed that the riverbank at the Site (defined as the area from the waterline to the top of bank [TOB]) will be addressed as part of in-water activity. Therefore, the RDI does not include any portion of the Facility below the TOB. The Site covers an area of approximately 18.63 acres, divided as follows: West Parcel 4.28 acres; Central Parcel 7.76 acres; and East Parcel 6.59 acres.

The maximum sampling depth is 3 feet. This is the maximum exposure depth for the receptors with identified unacceptable risk at the Site.

Practical constraints of the sampling design that may inhibit collecting a complete data set include thick vegetation, transient trespassers who are living on the property, and hardscapes including boulders and concrete structures. The grid sample design layout will consider known constraints that may inhibit the sampling plan and will be adjusted accordingly as discussed in Section 5.

4.4 Analytical Approach

The analytical approach includes the following decision rules.

1. If COCs are above human health and non-dioxin/furan ecological health hot spot concentrations for soil within a sampling unit, then soil within that sampling unit will be considered for excavation and offsite disposal.
2. If COCs are below hot spot concentrations but above PRGs for human health, then soil within that sampling unit will be considered for consolidation and capping onsite.
3. If COCs are above PRGs or dioxin/furan hot spot concentrations for ecological health, then soil within that sampling unit will be considered for consolidation and capping onsite.
4. If residual soil remaining after excavation exceeds ecological PRGs, then that soil will be covered in place.

4.5 Acceptance Criteria

Errors in sampling and measurement contribute to the total study error and will reflect directly in the decision error. If upland soil exceeds PRGs and hot spot concentrations, then confirmation sampling/analysis may be necessary to support appropriate site management decisions. Additional criteria will be evaluated including detection and reporting limits in comparison to remediation goals and risk levels and acceptable levels of data quality to ensure that data obtained from chemical analysis is representative of actual site conditions.

The following general hypotheses were considered when determining the consequences of decision errors.

H_o: Soil results for COCs pose a risk to human and ecological health.
H_a: Soil results for COCs do not pose a risk to human and ecological health.

A primary consequence of making a false acceptance error is that soil will be unnecessarily disposed of when lesser remedial actions may have been adequate. The consequence of making a false rejection would be that soil remaining could possibly endanger human health and the environment. Since making a false rejection would cause more severe consequences, all results that are near but not exceeding PRGs and hot spot concentrations will be considered for additional sampling and follow-up to confirm risk level.

4.6 Optimizing the Design

To address human and ecological health risks, Apex will conduct incremental sampling methodology (ISM) across the West, Central, and East Parcels, including the soil berms along the north border of the East Parcel (composite samples will be collected from beneath the concrete slab on the East Parcel). ISM was chosen to characterize risk across the Site based on the time, cost, and reliability of results. The methodology provides representative soil concentrations from specific volumes (the DUs) by collecting soil samples within increments within the DU. These increment samples are combined, processed, and subsampled at the laboratory according to field and laboratory protocols. Subsamples are then processed and analyzed by the laboratory to represent the mean for the volume of soil in the subsample.

The proper implementation of ISM improves the reliability of results and can avoid issues involving decisions errors. ISM addresses soil heterogeneity, which can dramatically influence contaminant concentrations. In the field contaminant concentrations can vary greatly within just a few inches. Generic methods that mix sample in the field (i.e., composite samples homogenized using stainless steel bowl and spoon) do not efficiently homogenize wet soil, especially soil that is strongly aggregated. Any cohesive soil clumps must be mechanically broken apart to achieve homogeneity. Field mixing techniques also cause segregation of particles, meaning that smaller or denser particles move to the bottom and larger less-dense particles move to the top. Contaminant concentration can be directly related to particle size so stratifying these particles by mixing or transport can influence concentrations. It is also common for laboratories to subsample by scooping off the top of sample containers. This will likely not represent the concentration of the whole soil sample collected, especially if the sample is segregated. The amount of soil subsampled by the laboratory can also be quite small in relation to the amount of soil collected and results indicate that subsamples that have smaller analytical masses vary more greatly than larger ones. When ISM is implemented, soil samples are processed by air-drying, grinding, and sieving, to achieve a uniform particle size and mass while theoretically intending to provide every soil particle in the SU with an equal probability of being incorporated into the incremental sample. The number of increments controls variability due to distributional heterogeneity and the total sample mass controls the variability resulting from particle-to-particle compositional heterogeneity. Field replicates are used to determine if a particular sampling design is providing sufficiently accurate results for the SU. The field replicate can determine if independent sampling within the SU provides similar concentrations. If concentrations are not similar, then the design may need to be changed to one that is reproducible (ITRC, 2020).

Due to sampling constraints, composite sampling will be utilized within the area covered by a concrete slab in the East Parcel. Sampling designs are discussed in Section 5.0.

5.0 Sample Process Design

The Willamette Cove Upland soil sampling design builds upon previous investigations and evaluations to help develop a detailed conceptual site model (CSM) and further delineate soil concentrations to inform remedial actions. The CSM developed for the site indicates that higher concentrations of COCs are expected at the ground surface and concentrations will decrease with depth. This model is supported by the historical sampling. At locations where vertical sampling has been conducted, concentrations typically decrease with depth. The data suggest that the minimum sampling depth should be one foot on the West Parcel, up to three feet on the Central Parcel (outside the small debris area), and 1.2 feet on the East Parcel. For the purpose of this RDI and to achieve DQOs, the maximum sampling depth of three feet bgs will be implemented across the Site.

The ISM sampling design was developed using guidance from the Interstate Technology and Regulatory Council (ITRC, 2020), Oregon DEQ (DEQ, 2020), and the Hawaii Department of Health (HDOH, 2021). The rationale for the proposed upland soil sampling is further described in Section 6.0 of the Remedial Design Investigation Work Plan. Sampling locations are presented in Table C-1 and are shown on Figure 5. Sample locations are also presented with COCs in Table C-2.

5.1 Sample Locations

ISM Sampling DU-1 through DU 38 and DU-41. The sampling design includes 39 DUs across the Willamette Cove Upland area. Within each DU, an ISM sample will be collected from depths of 0-1 foot below ground surface (bgs), 1-2 feet bgs, and 2-3 feet bgs. Each DU will be sampled using systematic random sampling for a total of 30 increments. Areas of each DU range from 0.39 to 0.54 acres and are listed in Table C-1 and shown on Figure 5. The number and size of each DU was selected so that risk for multiple receptors (mobile and non-mobile) could be evaluated. The shape of DU areas was determined by evaluating historical land use, land forms, and historical data. The DUs are bounded by the Willamette Cove Upland Facility boundary to the north, east, and west and top of bank (TOB) to the south.

Each DU will be sampled using a 30-point systematic random sampling design where increment locations are evenly spaced on a rectangular grid following the Hawaii Department of Health Technical Guidance Manual (HDOH, 2021). The target increment spacing for the 30 increments is determined by the square root of 1/30 of the DU area. For a 0.5 acre DU, the spacing is 27 feet. For each DU, the corresponding grid spacing was placed over the DU and adjusted until 30 intersection points were contained within the DU boundary. Figures C-1 through C-39 show the locations the increment samples for DU-1 through DU-39.

If the increment location cannot be sampled due to buried debris or other obstruction, then the increment will be relocated two feet to the north of the original increment location and will be documented by the field staff. If the alternate point cannot be sampled, subsequent relocations to the east, west, south, followed by additional two-foot offsets will continue as needed until the increment is collected.

Each increment sample location will be located using GPS coordinates and marked using stakes. If samples are not collected on the same day as staked, the locations will be re-verified before sampling. In the event that GPS reception is impacted by tree cover or other interference, increment locations will be identified by measurement to adjacent increment locations.

Field replicates will be collected from each depth interval for 20 percent of the DUs (total of eight replicates). Two field replicates plus the primary incremental sample will be collected from locations DU-5 (West Parcel), DU-11 (Central Parcel), DU-13 (Central Parcel), DU-16 (Central Parcel) DU-18 (Central Parcel), DU-22 (Central Parcel), DU-37 (East Parcel), and DU-38 (East Parcel) at each depth interval. Field replicates will be collected using systematic random sampling (as described above) using an equilateral triangle centered on the midpoint in each cell. The points of the triangle should be located approximately 6 feet from the increment sample location in the cell. Increments collected from the top will be labeled "A" (primary sample), the lower left triangle point will be labeled "B" (replicate sample), and the lower right will be labeled "C" (replicate sample). Increments of the same letter will be combined in the field and will represent one field replicate collected from the DU. Field replicate data will be reviewed for precision to confirm the sampling design produces statistically acceptable results. See Section 11.2 for review criteria of field replicates.

ISM Sampling DU-41. One additional DU, DU-41, will include the two soil berms on the East Parcel that parallel the south side of the road that separates the Facility from the UPRR tracks. The western berm is approximately 310 feet long and the eastern berm is approximately 80 feet long. The 30-point ISM sample from DU-41 will be collected consistent with the other DUs from depth intervals of 0-1, 1-2, and 2-3 feet bgs.

Composite Sampling DU-39 and DU-40. The concrete slab on the West Parcel will be divided in half with the halves designated as DU-39 and DU-40. Five-point composite samples will be collected from each DU at the depth intervals of 0 – 1, 1 – 2, and 2 - 3 feet bgs. The sample locations will be determined using the systematic random sampling method similar to the ISM samples in other DUs but with larger spacing and only five grid nodes per DU. The composite samples will be processed using ISM methodologies described above. No replicate samples are planned for the concrete slab area.

5.2 Sample Collection

Soil sample collection methods are described below. The methodology may be revised to realize efficiencies while achieving the same level of sample integrity and quality assurance/quality control.

5.2.1 ISM Sampling

ISM sample increments will be collected by hand to obtain a soil increment that is approximately one-inch in diameter and 1 foot in length. Each ISM sample will consist of 30 sub-increments of equal volume, resulting in a total ISM sample volume of approximately 0.8 gallons (approximately 3,900 grams based on field method testing). The ISM samples will be collected in laboratory-supplied one-gallon containers.

The general sequence for sample collection will be as follows:

- Measure and stake location of each sample increment in the DU as described in Section 5.1 above;
- Collect the 0-1 foot interval sample increments as described below;
- Excavate to a depth of 1 foot at each increment location using methods described below;
- Collect the 1-2 foot interval sample increments;
- Excavate to a depth of 2 feet at increment location;
- Collect the 2-3 foot interval sample increments; and
- Backfill the excavations.

Sample Increment Collection Method. The sample increment will be collected using a powered hand-held drill with a one-inch-diameter drill bit. A flat plate with a raised guide tube will be placed on the prepared surface. A collection bucket with a hole in the bottom will slide over the guide tube. The powered drill will be used to auger a one-inch-diameter hole vertically through the guide tube to a depth of one foot below the plate. The drill bit will be marked with the target drill depth (1 foot plus the height of the guide tube) to ensure a consistent quantity of sample collection. The drill cuttings will be captured in the bucket. The entire contents of the collection bucket will be transferred to the sample container.

The sampling surface will be prepared as follows. At the ground surface, vegetation will be cleared sufficiently to create a stable surface for the plate. No soil will be moved. At each subsequent depth, the excavated surface will be trimmed by hand to create a flat surface at the target depth. Loose soil will be removed from the sample location to assure that no soil from the overlying interval is present. To the extent possible, sampling in each DU will be completed from all three depths before moving to the next DU.

Between sample increments collected in the same DU and at the same depth interval, the sample collection equipment will be decontaminated by dry brushing to remove loose soil. Between depth intervals or between DUs, sampling equipment will be decontaminated following the decontamination procedures outlined in Section 9.0.

Excavation Method. A mini-excavator will be used to access the 1-foot and 2-foot depths for sampling. The size of the excavated pits will be kept to the minimum necessary to access the sample depths with the sampling tools. For sampling efficiency, the 1=foot-deep pit (to collect the 1-2 foot sample) will be excavated within 1 foot horizontally to the north of the 0-1 foot increment and the 2-foot-deep pit (to collect the 2-3 foot sample) will be excavated within one foot horizontally to the south of the 0-1 foot increment. The excavation depth will be carefully monitored to assure that the excavation does not penetrate below the target depth. Final trimming to the target depth will be conducted by hand. The excavator will use a smooth-blade bucket.[1] The perimeter of the area of active sampling (i.e., the DUs being sampled on that day) will be visibly marked (e.g., with flagging) to alert individuals of the open pits. All open pits will be under the visual supervision of sampling staff. Excavated material will be stockpiled adjacent to the pit, segregating each 1-foot depth interval of material. After sampling is completed, the pit will be backfilled with the excavated material with the material replaced in the sample depth interval from which it was excavated. The soil will be compacted by tamping with the excavator bucket. Between sub-increment sample locations (in the same DU and same depth interval), the excavator bucket will be dry brushed to remove loose soil prior to moving to the next location. The excavator bucket will be decontaminated between each DU or depth interval following the decontamination procedures outlined in Section 9.0.

In areas of limited access, excavation may be conducted by hand or vacuum excavation. Hand or vacuum excavation will be conducted as described above for the mini-excavator except as follows. For vacuum excavation, the excavated material will be collected in the vacuum tank and will be considered IDW to be handled in accordance with Section 10. The vacuum excavation pits will be backfilled using soil obtained from a commercial off-site source.

5.2.2 Composite Sampling

Soil sample locations in the concrete slab area will require concrete coring to access the underlying soil. Vacuum extraction or hand sampling equipment will be used to access the target sampling depth. Each composite sample will consist of 5 increments for each sample depth for a total of 6 composite samples. The increments will be collected at the same depths as the ISM samples (0 – 1, 1 – 2, and 2 - 3 feet bgs) using a hand coring device to collect a minimum of 200 grams of soil (for each increment) uniformly over the full sample depth interval. The five increments will be combined in a separate container for each depth. Composite samples will be processed in the laboratory using ISM methodologies.

5.2.3 Soil Logging

Soil descriptions and logging will be completed on bulk ISM samples. The field geologist or engineer will describe the general soil characteristics of each ISM unit, noting any indications of contamination based on sheen testing, olfactory response, and photoionization detector (PID) reading, and will describe the lithologic characteristics using the Unified Soil Classification System (USCS) in general accordance with ASTM 2487/2488. Other features such as sorting, sedimentary features, mineralogy, contacts with other soil types and the presence of anthropogenic material will be noted, if relevant.

[1] A toothed bucket may be used if necessary to excavate dense soil. In that event, the excavation depth shall be measured to the depth penetrated by the tip of the teeth. Loose material will be removed to the target excavation depth by hand or after switching to a smooth-blade bucket.

5.2.4 Inadvertent Archaeological or Historical Resource Discovery

The RDI exploration depths (0 to 3 feet) are anticipated to be entirely within fill material, which likely varies from 20 to 30 feet thick, so it is unlikely that archaeological or historical resources will be encountered. However, in the unlikely event of an inadvertent discovery of any of the following (with the exception of the brick and other debris described in Section 2.1.7), work within 100 feet of the area will be stopped and the protocols described in the Oregon State Historic Preservation office (SHPO) Archaeological Inadvertent Discovery Plan (IDP) template will be followed:

- Stone flakes, arrowheads, stone tools, bone or wooden tools, baskets, beads;
- Historic building materials such as nails, glass, metal such as cans, barrel rings, farm implements, ceramics, bottles, marbles, beads;
- Layers of discolored earth resulting from hearth fire;
- Structural remains such as foundations;
- Shell Middens; or
- Human skeletal remains and/or bone fragments which may be whole or fragmented.

If any of the above are discovered, the following actions will be taken in accordance with the IDP template:

- Contractor will completely secure the location and contact:
    - Apex (Steve Misner, 503-924-4704 ext 1925 [office] or 503-348-3906 [cell])
    - Archaeological Investigations Northwest, Inc., (AINW, Eva Hulst, 503-761-6605 [office] or 971-645-1939 [cell]

  If AINW confirms that the discovery is archaeological, contact:
    - The EPA Remedial Project Manager (Eva DeMaria, 206-553-1970 [office]);
    - The Oregon State Historic Preservation Office (Dennis Griffin, 503-986-0674);
    - And must consult with appropriate Native American Tribes for finds of Native American origin. The Commission on Indian Services (CIS) will designate the appropriate Tribes; contact Mitch Sparks (503-986-1067).
- If the discovery consists of human remains, the contractor will stop work in and adjacent to the discovery, will completely secure the work area from further disturbance, and will immediately contact:
    - Apex (Steve Misner, 503-348-3906);
    - AINW (Eva Hulse, 971-645-1939 [cell], 503-761-6605 [office]);
    - The EPA Remedial Project Manager (Eva DeMaria, 206-553-1970 [office]);

  - o Oregon State Police (Chris Allori, 503-731-4717 [office], (503) 708-6461 [cell]);
  - o CIS (Mitch Sparks, 503-986-1067);
  - o Appropriate Native American Tribes, as designated by CIS;
  - o The Oregon State Historic Preservation Office (Dennis Griffin, 503-986-0674).

  NOTE: If you discover bones but are unsure if they are human, contact AINW.

- Proceeding with Work:
  - o Ground-disturbing activities can proceed *after* the proper archaeological inspections have occurred and environmental clearances are obtained.
  - o After an inadvertent discovery, some areas may be designated as close monitoring or "no work" zones.

5.3 Sample Processing Procedures

ISM and composite samples will be processed by Apex Laboratories. Apex Laboratories will follow SOP G-105 R-02 Representative Sampling Methodology (RSM). The SOP is confidential and proprietary and circulation is restricted, the following is a summary of the sample processing that will be used.

- Air dry entire ISM sample (approximately 3,900 grams) at room temperature on Teflon lined baking sheet(s) in low humidity and dust-controlled room. Sample will be turned during process to speed drying;
- Sieve entire sample to less than 2 mm using hammer mill or sieve stack;
- Place entire dried sample less than 2 mm in diameter into hopper of Sectorial Splitter and split representative sample for particle size reduction. Split sample size is minimum of 25% of sample or 300 grams whichever is greater;
- Place representatively split sample in tungsten (W) or Zirconia (Z) puck mill and grind to fine powder (approximately 50 micron (W)- to <70-micron (Zr). The number of sample particles will be increased more than 20,000 times. The particles of processed sample are of similar size and shape. The small size and uniformity of particles greatly reduces sampling error;
- The mass of representative powder for metals digestion will be 2 grams.

Laboratory quality assurance/quality control (QA/QC) will include a method blank and a batch laboratory control sample (LCS), sample duplicate 1 (DUP1), sample duplicate 2 (DUP2), sample matrix spike (MS). Sample replicates will be formed by subsampling multiple increments of powdered sample.

The remainder of the processed sample will be archived for potential follow up analysis. The analytical testing plan is provided in Section 7.0.

5.4 Preparatory Activities

Property Access. Apex will provide notification to Metro personnel to coordinate access to the Site.

Underground Utility Location. Prior to conducting any ground disturbance work that is expected to be greater than one-foot deep Apex will mark out the perimeter of the general proposed sampling areas with marking paint to enable the identification of nearby underground utilities. Apex will contact the Oregon Utility Notification Center, who will in turn notify the various utilities in the area to mark any public underground installations. Apex will also procure a private utility locator to survey the perimeter of the work area for underground utilities. If potential anomalies are identified on the perimeter, the private utility locator will be instructed to trace and mark the anomaly towards the sampling area.

Boreholes advanced using vacuum extraction and/or hand tools (e.g., hand auger) are acceptable methods of hand clearing for utilities. For locations sampled using an excavator, a bucket attachment with a flat edge will be used where possible as a means to avoid damage to utilities, if encountered. However, in areas where compacted soil is present (ex. near or on roads and pathways), a toothed bucket may be required. In addition, a spotter will be present during excavation activities to assist with identifying and avoiding utilities.

If any underground utilities are identified within two feet of a proposed sample location, Apex will adjust the proposed sample location before sampling commences. Apex will also adjust the proposed sample locations to provide for a safety buffer for Site features that may interfere with personnel health and safely, if applicable.

Site Health and Safety Plan. A Site-specific health and safety plan (HASP) has been prepared for the proposed activities (Appendix D of the Work Plan). The HASP was prepared in general accordance with the Occupational Safety and Health Act (OSHA) and the Oregon Administrative Rules (OAR). A copy of the HASP will be maintained at the Site during the field activities.

Emissions and Spills. A portion of the soil sampling will be conducted using petroleum-fueled, hydraulically controlled equipment. The following best management practices will be implemented to reduce emissions and reduce potential environmental impacts.

- Equipment will be well maintained;
- Where applicable, equipment will be required to use ultra-low-sulfur diesel;
- Equipment will not be allowed to idle when not in use;
- Refueling will not occur within 100 feet of surface water; and
- Contractors will be required to maintain a spill kit for immediate response in the event of a release of fuel or hydraulic fluid.

Obviously Contaminated Material. If obviously contaminated material such as petroleum-like substances or strong odors are encountered during sampling activities, the material will be returned to the excavation as described above and the observed contaminate characteristics and location will be described in the field notes.

5.5 Sample Location Control

Horizontal sample location control of the sample increments will be achieved using a high-accuracy, handheld global positioning system device (GPS; Trimble© Gwo7X™) with sub meter accuracy. The target coordinates will be entered into the GPS device prior to mobilizing to facilitate locating and marking them in the field. For increment sample locations that cannot be located with GPS, the increment will be located using a measuring tape from adjacent increment locations.

Field replicates will be collected using an equilateral triangle centered on the planned increment location in each cell of the gridded pattern. The points of the triangle should be located approximately 6 feet from the increment location in the cell. Increments collected from the top will be labeled “A” (primary sample), the lower left triangle point will be labeled “B” (replicate sample), and the lower right will be labeled “C” (replicate sample).

Any adjustments to the increment locations will be documented in field notes and a new GPS location will be collected from the adjusted point. Substantive changes in the scope of work or modifications required based on field conditions will be documented in field notes and discussed in the implementation report as a deviation from the Work Plan.

6.0 Documentation

Project files including this Sampling and Analysis Plan, Standard Operating Procedures (SOPs), and other documents used for this project will be kept up-to-date and filed electronically in a central project folder. The most recent documents will only be present in the main project folder and older versions will be kept at a separate archival location. All project personnel will have access to the main project folder and any updates to these documents will be communicated electronically with all project staff by the Project Manager.

Records pertaining to the project will include field records, GPS system data, chain-of-custody forms, and laboratory documentation. All project records will be stored and maintained in a secure manner by the Port for a minimum of ten years. The Project Manager is responsible for filing the necessary documents and ensuring their completeness. Finalized electronic records will be maintained by Apex and will be provided to the Port and the DEQ upon request.

6.1 Field Documentation

Field activities and samples must be properly documented during the sampling process. Documentation of field activities provides an accurate and comprehensive record of the work performed sufficient for a technical peer to reconstruct the day's activities and provide certification that all necessary requirements were met. General requirements include:

- Use of project-specific field forms.
  - o The specific information requested depends on the nature of the work being performed and on the form being used. Information fields that are not applicable should be noted "N/A" or with other appropriate notations.
- Use of bound, waterproof field books as the primary source for information collection and recording. Field books should be dedicated to the project and appropriately labeled.
  - o Appropriate header information documented on each page, including project title, project number, date, weather conditions, changes in weather conditions, other persons (if any) in the field party, and author.
- Field documentation entries using indelible ink.
- Legible data entries. A single line should be drawn through incorrect entries and the corrected entry should be written next to the original strikeout. Strikeouts are to be initialed and dated by the originator.
- Applicable units of measurement with entry values.
- Field records maintained in project files unless otherwise specified by a client or stipulated by a contract.
- Representative photographs of project activities. These photographs should be representative of the work being performed, and specific to the project. There must be sufficient photographs to create a photographic log of events if necessary, for reporting activities.

6.1.1 Documentation Entries

A chronology of field events will be recorded. General entry requirements include:

- Visitors to the site;
- Summary of pertinent project communications;
- A description of the day's field activities, in chronological sequence using military time notation (e.g. 9:00 am: 0900, and 5:00 pm: 1700);
- If applicable, calibration of measuring and test equipment and identification of the calibration standard(s) and use of a Calibration Log, if available, with cross-reference entered into the field book;
- Field equipment identification, including type, manufacturer, model number, or other specific information;
- General weather conditions, including temperature, wind speed, and direction readings, including time of measurement and units;
- Safety and/or monitoring equipment readings, including time of measurements and units;
- If applicable, reference in the field notebook to specific forms used for collection of data;
- Substantive changes in the scope of work or modifications required based on field conditions will be documented on the Field Change Request Form and must be approved by the Port and DEQ. Any communications with the Port or regulatory agencies to discuss such modifications will be documented; and
- Other unusual events.

6.1.2 Specific Requirements

Sample Collection. Sample collection data will be documented in a bound field book and/or on a sample collection form. Where both are being used, information contained in one is cross-referenced to the other. Entries include:

- Sample identification number, location taken, depth interval, sample media, sample preservative, collection time, and date;
- Sample collection method and protocol;
- Physical description of the sample (standard classification system for soil – ASTM D2488);
- If a composite sample, the sample's make up, including number and locations (i.e. coordinates) of individual contributing grab samples;
- Quality-control-related samples collected (e.g. duplicates, replicates, field blanks);
- Container description and sample volume;

- Pertinent technical comments; and
- Identification of personnel collecting the sample.

Sample Labeling. Sample labels must be prepared and attached to sample containers. Labels will either be provided by the laboratory performing the analyses or will be generated internally and will be water-proof and self-adhering. The information to be provided includes:

- Sample identification number;
- Sample date and collection time;
- Physical description of the soil sample;
- Analytical parameters;
- Preservatives, if present;
- Sample location; and
- Client.

Soil Logs. The field logbook will include clear information concerning sample collection activities. Sample logging will be completed for each bulk ISM DU and locations where composite samples are collected. Sample logs will be recorded on pre-printed log forms. In addition to standard entries of personnel, date, and time, the log sheet will also include the following information:

- Names(s) of personnel logging the samples;
- Administrative and technical information included in the header;
- Types of equipment used;
- Descriptions of subsurface materials encountered, and the number and type of samples collected, if any;
- Subsurface exploration depth and units of measure;
- Length of recovery, if applicable;
- Sample type and sample number for analytical samples collected (these data are also to be entered on the sample collection log, if used, and the sample label); and
- Narrative description of the soil (using standard classification system) and other pertinent information.

6.2 Analytical Documentation

All records pertaining to analytical data will be kept by the laboratory for a minimum of seven years. Analytical results will be provided as a PDF and electronic data deliverable (EDD) in a Microsoft Excel database format. Laboratory results for sample analysis will be stored electronically by Apex and the Port.

6.3 Data Reduction

Reports generated in the field and laboratory will be included with project reports. Data generated by the analytical laboratory will be provided electronically. The Project Manager will arrange for validation of the analytical data package by reviewing for any discrepancies between this SAP, the chain-of-custody, and analyses performed. If any discrepancies are found, the analytical laboratory will be contacted for additional information.

For reporting purposes, EDDs provided in a database format will be used to generate analytical data tables. All reportable data in tables will be checked against original laboratory reports. Data provided on field notes to be presented in data tables will be entered manually and 100% of manually entered data will undergo a secondary check for accuracy.

6.4 Reporting

Results will be presented in remedial design investigation report and the data will be evaluated to determine if cleanup actions are required at the Facility. The remedial design investigation report will include the following:

- Summary of field activities including field notes and forms;
- Sampling locations in both tabular and mapped format;
- Sampling results tables and discussion;
- Analytical data quality and validation review; and
- Screening of chemical analytical data against human and ecological health criteria.

7.0 Analytical Testing Program

This section summarizes the analytical testing program for upland soil to be collected as part of the RDI Work Plan. Analytical testing will be completed in accordance with EPA-approved methods and this SAP. Each analytical testing method has been reviewed to comply with DQOs, as defined in Section 4.0. As such, contract laboratories are expected to meet the following requirements:

- Prepare and analyze samples in accordance with analytical methods defined in this SAP;
- Reporting requirements for deliverables including electronic data;
- Turnaround times;
- Implement QA/QC procedures as defined in the SAP and in compliance with laboratory accreditation;
- Communicate any QA/QC errors that may affect data quality;
- Allow audits, if necessary.

Table C-2 provides the proposed chemical analyses. Analytes, methods, analytical laboratory, method detection limits, minimum reporting limits, and target detection limit goals (PRGs and hot spot concentrations) are listed in Table C-3. Method detection limits included in Table C-3 were calculated by each laboratory using instrument-specific MDL study data and statistical analysis.

Analytical methods will be performed by Apex Laboratories of Tigard, Oregon (Apex Laboratories, OR01039) and subcontractors of Apex Laboratories. Apex Laboratories will process all ISM and composite samples before submitting samples to a subcontract laboratory. Turnaround time for data packages is expected to be between 2 and 3 weeks from the receipt of the last soil sample; however, turnaround times may be extended if complex matrices are encountered and require additional cleanup or dilution. Analytical data will be reported with standard QA/QC samples (method blanks, laboratory control samples, matrix spikes, laboratory duplicates, and surrogates) and raw data will not be reviewed.

8.0 Sample Containers and Handling

8.1 Container Requirements

Requirements for sample containers are provided in Table C-4. Samples will generally be collected in glass containers with Teflon®-lined lids to minimize adsorption and potential loss of analyte concentration. Containers will be supplied by the analytical laboratory.

8.2 Labeling Requirements

A sample label will be affixed to every sample container before sample collection. Sample labels must be water-proof and self-adhere to sample containers. Labels will be provided by the laboratory and require the following information, as discussed in Section 6.1:

- Sample identification number;
- Sample date and collection time;
- Physical description of the sample (e.g. water, solid, gas);

- Analytical parameters;
- Preservatives, if present;
- Sample location; and
- Client.

8.3 Packaging and Shipping Requirements

Each individual sample container will be wrapped with bubble wrap or other suitable packing material and immediately packed in a cooler with wet ice. One copy of the chain-of-custody form will be placed in a sealed plastic bag taped to the inside of the cooler lid. The samples will be either be delivered to the analytical laboratory by Apex or a courier service, or the laboratory will pick up the samples within 48 hours of collection. Chain-of-custody seals will not be necessary for coolers since samples will be transported directly to the laboratory.

9.0 Decontamination Procedures

Consistent decontamination procedures will be used for all sampling and laboratory procedures. The objectives of decontamination are to prevent the introduction of contamination into samples from sampling equipment or other samples, to prevent contamination from leaving the site via sampling equipment or personnel, to prevent exposure of field personnel to contaminated materials, and to prevent cross-contamination within the laboratory.

9.1 Personnel Decontamination

Personnel decontamination procedures depend on the level of protection specified for a given activity. Regardless of the level of protection required, field personnel should thoroughly wash their hands and faces before taking any work breaks and at the end of the day.

9.2 Sampling Equipment

Decontamination procedures are designed to remove trace-level contaminants from sampling equipment to prevent the cross contamination between sample collection locations. To prevent cross contamination between DUs sample locations, clean dedicated (if disposable) or decontaminated sampling equipment (if non-disposable) will be used for each sampling location and discarded or cleaned after use. However, soil coring and sampling equipment does not need to be cleaned between each increment location for each depth within a sampling unit for ISM. Cleaning of non-disposable items will consist of washing in a detergent (e.g., Alconox®) solution, rinsing with tap water, followed with a deionized water rinse. This process will be repeated if visual signs of contamination are still present. Mechanical equipment (excavator bucket and vacuum excavation tube) will be decontaminated between DUs by brushing lose solids from equipment followed by washing as described above for smaller sampling equipment. Wash and rinse water will be collected in a five-gallon bucket.

9.3 Laboratory Decontamination

Laboratory decontamination will involve strict adherence to laboratory SOPs and best practices. All work areas and equipment must be appropriately cleaned between samples to prevent cross-contamination. The laboratory will certify that laboratory-based contamination is not present by analyzing calibration blanks, instrument blanks, and/or method blanks at method-specified intervals. If contamination is present, then additional instrument cleaning or re-extraction may be necessary.

10.0 Investigation Derived Waste Handling

Material excavated using mechanical or hand methods is not considered investigation derived waste (IDW) and will be returned to the excavation from which it was removed.

Soil generated from vacuum extraction activities or that has been processed for compositing and decontamination water will be considered investigation derived waste (IDW). IDW will be containerized on-site in Department of Transportation (DOT)-approved drums for disposal. Each drum will be labeled with the project name, general contents, and date. The selected disposal option will be determined based on analytical results of the samples. Drums will be transported off-site and disposed of within 90-days from sample collection. Disposable items, such as gloves, protective overalls (e.g., Tyvek®), paper towels, etc., will be placed in plastic bags after use and deposited in trash receptacles for disposal.

11.0 Quality Assurance Project Plan

11.1 Quality Assurance Objectives for Measured Data

The elements included in this section are consistent with those specified in EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 (EPA, 2001). 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 evaluate soil conditions. To collect such information, analytical data must have an appropriate degree of accuracy and reproducibility, samples collected must be representative of actual field conditions, and samples must be collected and analyzed using unbroken chain-of-custody procedures.

The data quality objectives (DQOs) for this project are presented in Section 4.0 and were established based on the EPA Guidance for the Data Quality Objectives Process, EPA QA/G-4 (EPA, 2006). They are the basis for the design of the data collection plan and, as such, the DQOs specify the type, quality, and quantity of data to be collected and how the data are to be used to make the appropriate decisions for the project.

Method detection limits (MDL), minimum reporting limits (RL), and analytical results will be compared to action levels for each COC in the media of concern as part of the DQOs. The MDLs and RLs listed in Table C-3 are the expected limits based on instrument capabilities. In some cases, sample matrix or high target analyte concentrations may increase these limits. If sample conditions are such that MDLs exceed the screening levels, an acceptable alternative will be determined.

Specific QA objectives are as follows:

1. Establish sampling techniques that will produce analytical data representative of the media being measured.
2. Ensure that data collection and measurement procedures are standardized among all participants.
3. Monitor the performance of the various measurement systems being used in the program to maintain statistical control and provide rapid feedback, so that corrective measures, if needed, can be taken before data quality is compromised.
4. Periodically assess the performance of these measurement systems and their components.
5. Verify that reported data are sufficiently precise, accurate, representative, comparable, and complete, so that they are suitable for their intended use.

Precision, bias, accuracy, representatives, completeness, comparability, and sensitivity parameters are used as data quality indicators (DQI) and are defined below. Measurement parameters for DQIs are provided in the Quality Assurance Project Plan for EPA PA/SI Investigations (DEQ, 2017).

11.1.1 Precision

Precision is a measure of the reproducibility of data under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. For duplicate measurements, precision can be expressed as the relative percent difference (RPD). Duplicate measurements can include the following field and laboratory QC samples: field duplicates; laboratory duplicates; matrix spike (MS) and matrix spike duplicate (MSD) batch pairs; and/or laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) batch pairs.

The RPD is calculated using the following equation:

(1) $$RPD = \frac{X_s - X_d}{(X_s + X_d)/2} \times 100\%$$

where:

X_s = analytical result of the primary measurement
X_d = analytical result of the duplicate measurement

11.1.2 Bias

Bias is the persistent distortion of measurement data that can cause an error in either direction (high or low). Bias can be determined from field blanks, trip blanks, equipment blanks, LCS/LCSDs, MS/MSDs, and surrogates.

11.1.3 Accuracy

Accuracy is the measure of error between the measured concentration and the accepted reference value. Accuracy is inferred from the recovery data of laboratory spiked samples. Quality assurance samples used to measure accuracy include: LCS/LCSDs, MS/MSDs, and surrogates. Surrogates are implemented when organic constituents are of interest.

Accuracy is calculated using the following equation:

(2) $$A = \frac{(X_{ss} - X_s)}{T} \times 100\%$$

where:

A = accuracy
X_{ss} = analytical result obtained from the spiked sample
X_s = analytical result obtained from the sample
T = true value of the added spike

11.1.4 Representativeness

Representativeness is a measure of how closely the data reflect the characteristic of a population, variation in parameters at a single location, a process condition, or an environmental condition. This data quality indicator is dependent in the design and proper implementation of the sampling program. Development of sampling plans include considerations such as site history, geography, demography, waste present, field screening parameters, data quality objectives, analytical parameters and methods and sampling approaches. Documentation of field activities will confirm that protocols are followed according to the sampling plan. In addition to documentation, QC samples are also used to show that field screening and laboratory results are representative of actual field conditions. These QC samples may include as appropriate: field blanks, trip blanks, equipment blanks, and field duplicates.

11.1.5 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is essentially that a sufficient amount of valid data be generated. Completeness will be judged by the Project Quality Assurance Manager and the Project Manager based on laboratory data quality and adherence to field sampling protocols. The completeness goal for this project is 95%.

Completeness (percent complete, or PC) of the data is determined by the following equation:

(3)

$$PC = \frac{\text{Number of samples with valid data}}{\text{Number of planned samples}} \times 100\%$$

11.1.6 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The objective is to assure that all data developed during the sampling are comparable. Comparability of the data will be assured by using EPA-defined procedures which specify sample collection, handling, and analytical methods.

11.1.7 Sensitivity

Sensitivity is the ability of an analytical method or instrument to discriminate between measurement responses representing different concentrations. This capability is established during the planning phase to meet project-specific objectives. It is important to be able to detect the target analytes at the levels of interest. Sensitivity requirements include the establishment of various limits, such as, method detection limits (MDLs), and project-specific reporting limits (RLs) and calibration requirements. The MDLs are normally based on an interference-free matrix (that is, reagent water or purified solid), which do not consider matrix effects and may not be achievable for environmental samples.

11.2 Quality Control

This section includes quality control checks that will be used to determine data quality. Control limits are provided in the Quality Assurance Project Plan for EPA PA/SI Investigations (DEQ, 2017) and frequency of field quality control samples is provided in Table C-5.

11.2.1 Field Quality Control Samples

Equipment Blanks. An equipment blank is a sample prepared in the field by rinsing equipment with deionized blank water after decontamination. The laboratory then analyzes that rinsate water for target analytes to determine if cross-contamination may have been present in the field. An equipment blank will be collected for each sample collection method and will be analyzed by methods presented in Table C-3. A total of five (5) equipment blanks are projected based on the sampling and processing techniques provided in Section 5.2. If contaminants are present at concentrations greater than the reporting limit, then cross-contamination may have occurred. If target analytes are detected in samples above the reporting limit and less than ten times the equipment blank concentration, then those samples may reflect possible high bias due to contamination and will be 'J+' flagged within data tables provided by Apex. Analytical data may not be corrected based on the concentration found in the equipment blank.

Field Replicates. Field replicates will be collected from each depth interval for 20 percent of DUs as described in Section 5.1 and analyzed for the COCs presented in Table C-2.

Data evaluation will be conducted in accordance with the Interstate Technology and Regulatory Council (ITRC) Incremental Sampling Methodology Update (ITRC, 2020) and the interim final updates to the 2016 State of Hawaii Department of Health (HIDOH) Decision Unit and Multi Increment Sampling Methods (DU-MIS) Guidance for data quality evaluation (HIDOH, 2021). The relative standard deviation (RSD) and arithmetic mean will be calculated using the triplicate field replicate data. For results that are not detected above the method detection limit (MDL), the MDL will be used in the RSD and arithmetic mean calculations. The RSD reflects the precision of the total sampling method, including combined field and laboratory error. The lower the RSD, the more precise the sampling method used and the more reproducible and reliable the data for individual DU where replicate samples were not collected.

As summarized in the HIDOH SU-MIS Guidance (HIDOH, 2021), an RSD for replicate sample data ≤35% suggests that the sampling method has good reproducibility, and the data can be used for reliable decision making. An RSD >35% but ≤50% indicates less reliable but still acceptable data for decision making. An RSD >50% but ≤100% indicates poor data precision and may indicate that the DU will need to be resampled with a greater number of increments and increased total bulk sample mass. Alternatively, for analytes where the RSD is >50% but ≤100%, and if deemed acceptable by the Port and DEQ, the RSD will be used to upwardly adjust data for DUs where replicate samples were not collected to reflect a hypothetical, "maximum" concentration of the contaminant. An RSD >100% indicates very poor data precision and the likely need to resample will be discussed with the Port and DEQ. However, sample data that significantly exceeds the PRGs and hot spot concentrations will generally be acceptable for decision making even though the RSD of the replicate data indicate very poor precision.

Laboratory data will also be reviewed to determine if laboratory error accounts for most of the total error in the sample data. If laboratory duplicate samples are reasonably close, then error is most likely related to collection of the sample in the field. It should be noted that high RSDs can become unavoidable as contaminant concentrations approach the laboratory reporting and detection limits. Replicate sample RSDs also typically increase as the contaminant contamination increases (nearing the upper limit of calibration) and when dilutions are performed.

According to OAR 340-122-0084(1)(f), *DEQ has determined that the mean concentration generated using ISM with adequate increments is a better estimate of exposure acceptable to the Department for the evaluation of chronic effects. The ISM mean estimate is also acceptable to assess the central tendency exposure for both human health and ecological risk assessments.* Therefore, the mean concentration generated using ISM for analytes where the field replicate RSD is ≤50% will be compared directly to PRGs and hot spot concentrations. For RSDs >50%, data will be reviewed for laboratory data quality and magnitude of concentrations in comparison to PRGs and hot spot concentrations. For the field replicate analytes that have a high RSD (>50%), the highest concentration from the field replicates will be used to compare directly to PRGs and hot spot concentrations instead of the arithmetic mean. Additionally, the RSD may be used to upwardly adjust data for DUs where replicate samples were not collected to compare directly to PRGs and hot spot concentrations.

Field Duplicates. A field duplicate is a separate sample collected from the same locations as the primary sample to document sampling and analytical precision and representativeness. Two field duplicates will be collected from discrete soil sample locations beneath the concrete slab from the target depth range of 0 – 1 foot bgs. The field duplicates collected from these locations will be analyzed for metals and PAHs. The RPD for results greater than five times the reporting limit must be less than 50 percent for organic analytes (PAHs) and less than 35 percent for inorganic analytes (metals). For results that are less than five times the reporting limit, the absolute difference between the two results must be less than ±2 times the reporting limit for organic analytes and ±RL for inorganic analytes. If either of these criteria are exceeded, then detected results will be 'J' flagged as estimated values.

11.2.2 Laboratory Quality Control Checks

Holding Times. The holding time requirements specified in Table C-4 are method derived and must be met to ensure true representation of field conditions. The holding time begins once the sample is collected and is dependent on sample preservation and collection procedures. A secondary holding time may occur for samples that require extraction and includes the time from sample preparation to analysis. Depending on the method, the holding time concludes when the sample is analyzed or when the sample is prepared. If holding times are exceeded detected results will be 'J' flagged and not detected results will be 'UJ' flagged. If gross exceedances occur (greater than two times the original holding time) then results will be 'R' flagged as unusable. PCBs and dioxins/furans are stable and persistent in the environment and do not have a recommended holding time; therefore, holding time exceedance will be evaluated based on professional judgement and national guidance.

Instrument Calibration. Instrument calibration includes periodic calibrations at defined intervals and operational calibrations that are performed daily. Qualified personnel will calibrate laboratory instruments prior to sample analysis according to the procedures specified in each method and the Laboratory QA/QC manager is responsible for ensuring that instruments are calibrated in accordance with SOPs. Calibration shall be verified at method-specified intervals throughout the analysis sequence and standards must be vendor-certified. The frequency and acceptance criteria for calibration are specified for each analytical method. When multipoint calibration is specified, the concentrations of the calibration standards should bracket those expected in the samples. Samples should be diluted, if necessary, to bring analyte responses within the calibration range. Data that exceed the calibration range cannot be reported by the laboratory unless qualified as an estimated value. The initial calibration curve shall be verified as accurate with a standard purchased or prepared from an independent second source. The initial calibration verification involves the analysis of a standard containing all the target analytes, typically in the middle of the calibration range, each time the initial calibration is performed.

Calibration Blanks. A calibration blank or instrument blank will be prepared and analyzed before samples are to be analyzed and at continued method-specified intervals. Detections in the calibration blank must be less than five times the concentration detected in samples. If this is exceeded, the source of the contamination should be identified and corrected, and samples should be reanalyzed.

Instrument Performance Checks. Analysis methods that require a mass spectrometer detector must check instrument performance with an ion abundance standard. The ion abundance standard or tune check solution should meet method and instrument manufacturer guidelines. If the instrument check does not meet these criteria, then analysis should be halted, and the source of the error should be identified and corrected.

Sample Dilution. Dilutions must be made if sample concentrations exceed the upper limit of quantitation. Samples will be diluted to approximately the mid-range of the calibration curve and final dilution results must be above the reporting limit.

Surrogates. Surrogates are organic compounds that are similar in chemical composition to the analytes of interest but are not likely to be found in the environment. They are spiked at a known concentration into environmental and batch QC samples prior to sample preparation and analysis. Surrogate recoveries for environmental samples are used to evaluate matrix interference, sample preparation efficiency, and analysis performance on a sample-specific basis. Surrogates will be controlled according to method and laboratory criteria. If the recovery of the surrogate is above the upper control limit, then detected may be 'J+' flagged as estimated values that may be biased high, and not detected values will not be qualified. If the surrogate recovery is below the lower control limit, then detected values may be 'J-' flagged as estimated values that may be biased low, and not detected values will be 'UJ' flagged as estimated not detected values at the reporting limit. If surrogates are outside of the control limit due to dilution, then results are considered estimated.

Method Blanks. A method blank (MB) is a quality control sample prepared by the laboratory from an analyte-free matrix similar to samples within the analytical batch and are analyzed along with environmental and other QC samples. Method blank samples are prepared and analyzed exactly as other field samples within the analytical batch, following the same initial and final volumes, complete sample preparation, cleanup steps, and analytical procedures. It is used to assess laboratory contamination or background interferences that might result in elevated concentration levels or false positive data. Results for the method blank must be below the reporting unless target analytes are not detected above the reporting limit within associated batch samples or the concentration found in the samples is ten times greater than the method blank concentration. If target analytes are present in the MB and the sample, sample results must be compared to the MB results prior to the calculation for dilutions, if a dilution was performed on the sample. Corrective action must be taken by the laboratory if target analytes are detected in batch samples above the reporting limit and less than ten times the MB concentration. Depending on holding time violations and other factors, samples will need to be re-prepared and re-analyzed to eliminate the contamination source. Any samples that reflect possible high bias due to contamination will be ‘B’ flagged by the laboratory and ‘J+’ flagged within data tables provided by Apex. Analytical data may not be corrected based on the concentration found in the MB.

Laboratory Duplicates. A laboratory duplicate is a secondary aliquot taken from a field sample by the laboratory which is prepared and analyzed by the laboratory by the same method specifications as other samples within the analytical batch. The RPD between the primary and duplicate analysis are calculated and demonstrates the precision of the laboratory. In soil and biphasic samples, it would also indicate homogeneity. RPD values should be less than the method or laboratory criteria. If the RPD control criteria is exceeded, detected results will be ‘J’ flagged as estimated values.

Laboratory Control Samples. The LCS will consist of analyte-free matrix, depending on the batch matrix, spiked with known amounts of target analytes that come from a source different than that used for calibration standards. The LCS is used to assess laboratory method performance by recovering analytes within a matrix and reflects accuracy within an analytical batch. If LCS results are outside the specified control limits, corrective action must be taken, including sample re-preparation and/or reanalysis, if appropriate. A laboratory control sample duplicate (LCSD) is analyzed to assess precision by comparing the primary and duplicate individual analyte results. The RPD between the initial and duplicate LCS is calculated and must be within control limits. Any LCS recovery outside of QC limits affects results within the entire batch and will require qualification and corrective action.

Depending on the recovery of the target analyte, detected results may be ‘J+’ or ‘J-‘ flagged as estimated values with either a high or low bias, respectively. If a target analyte is detected above the upper control limit and the associated sample is not detected for this same analyte, then no qualification is necessary. If the target analyte is recovered below the lower control limit and the analyte is not detected in the associated sample, then the not detected value is estimated at the reporting limit and is ‘UJ’ flagged.

If the RPD between the LCS and LCSD exceeds the control limit, then detected results will be 'J' flagged and not detected results will not be qualified.

Matrix Spikes. A matrix spike (MS) is a field sample spiked with target analytes of a known concentration before sample preparation and is analyzed by method specifications like other samples within the analytical batch. The recovery of target analytes indicates possible sample matrix interferences and possible bias can be assumed if recoveries are outside of control limits. A duplicate matrix spike (MSD) is analyzed and individual analyte results are compared to the initial MS, which is expressed as an RPD. If the MS or MSD exceed quality control criteria, then only the sample used as the source will be qualified. If the recovery or RPD of target analyte is outside of the control limit, then the analyte detections in the source sample will be 'J' flagged. If the analyte is not detected in the sample and the analyte recovery is above the upper control limit, then data will not be qualified. If the analyte is not detected in the sample and the analyte recovery is below the lower control limit, then data will be 'UJ' flagged.

11.2.3 Quality Control Flags and Qualifiers

Data qualifier flags, if required, are defined below, and will be applied to the electronic sample results. If multiple flags are required for a result, the most severe flag will be applied to the electronic result. The hierarchy of flags from the most severe to the least severe will be as follows: R, J, UJ, U.

Flag	Definition
J	The reported value is an estimated concentration of analyte in the sample. For dioxin/furan results, the estimated maximum possible concentration (EMPC) will be reported.
J+	Failure of quality control criteria suggest result is estimated and biased high.
J-	Failure of quality control criteria suggest result is estimated and biased low.
R	Quality control criteria was not met, and the resulting data is rejected.
U	This analyte was analyzed for but not detected at or above the specified detection limit.
UJ	The analyte was not detected in the sample, but the quantitation limit is estimated due to quality control failures.

11.3 Sampling Protocols

11.3.1 Methods

Sampling methods are presented in Section 5. These procedures are designed to ensure that:

- All samples collected are consistent with DQOs; and
- Samples are identified, handled, and transported in a manner that does not alter the representativeness of the data from the actual site conditions.

11.3.2 Sample Containers, Preservation, and Holding Times

The contracted analytical laboratory will provide the required sample containers for all samples, including QC. All containers will have been cleaned and certified free of the analytes of concern for this project. Sample containers may not be reused. The contracted laboratory will add analyte-free preservatives to sampling containers in accordance with the specific analytical methods. The case narrative will include any container issues and what corrective action was taken, if any.

The containers, minimum sample quantities, required preservatives, and maximum holding times for project analytes are described in Table C-4.

11.4 Sample and Document Custody Procedures

The various methods used to document field sample collection and laboratory operation are presented below and in Section 6.

11.4.1 Field Chain-of-Custody Procedures

Sample chain of custody refers to the process of tracking the possession of a sample from the time it is collected in the field through the laboratory analysis. A sample is considered to be under a person's custody if:

- It is in a person's physical possession;
- In view of the person after possession has been taken; or
- Secured by that person so that no one can tamper with the sample or secured by that person in an area which is restricted to authorized personnel.

A chain-of-custody form is used to record possession of a sample and to document analyses requested. Each time the sample bottles or samples are transferred between individuals, both the sender and receiver sign and date the chain-of-custody form. When a sample shipment is transported to the laboratory, a copy of the chain-of-custody form is included in the transport container (i.e., ice chest).

The chain-of-custody forms are used to record the following information:

- Sample identification number;
- Sample collector's signature;
- Date and time of collection;
- Description of sample;
- Analyses requested;

- Shipper's name and address;
- Receiver's name and address; and
- Signatures of persons involved in chain of custody.

11.4.2 Laboratory Sample Custody

Once the samples reach the laboratory, all information on the Chain of Custody (COC) form will be checked against sample labels for discrepancies. The condition, temperature, and appropriate preservation of samples will be checked and documented on the COC form. The sample integrity issues in the received samples and their resolution will be documented in laboratory records. All sample information will then be entered into a laboratory information management system, and unique analytical sample identifiers will be assigned.

Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Subcontracted analyses will be documented with the COC form. Samples will be stored by the laboratory at the temperatures specified in Table C-4. Temperatures of storage refrigerators will be checked twice daily and recorded by the analytical laboratory. Samples will be stored by the laboratory and disposed of in accordance with applicable local, state, and federal regulations. Disposal records will be maintained by the laboratory.

11.4.3 Analytical Documentation

All records pertaining to analytical data will be kept by the laboratory for a minimum of five years. Where applicable by analytical method, these records may include: calibration data, instrumentation performance checks, matrix checks, internal standard recovery data, surrogate recovery data, qualifier ion and spectra data, blank analysis data, retention times, second-column compound confirmation, method detection limit studies, reporting limit standard recoveries, laboratory analytical batch quality control samples, analytical run logs, analytical batches, bench sheets, sample storage logs, and proficiency testing information.

Analytical data will be reported as Level 4 data packages but will be evaluated using Level 2B criteria unless further evaluation is necessary (EPA, 2009). This includes a case narrative, sample matrix, collection date/time, receipt date/time, sample results corrected for dilution, dilution factors, detection limits, reporting limits, units, extraction/preparation date/time, analysis date/time, qualifiers with definitions, quality control sample results (surrogates, method blank, laboratory control samples, matric spikes, laboratory duplicates), quality control sample recovery limits, chain-of-custody documentation, and sample integrity observations upon receipt. Analytical results will be provided as a PDF and electronic data deliverable (EDD) in a Microsoft Excel database format. Laboratory results for sample analysis will be stored electronically by Apex and the Port.

11.4.4 Corrections to Documentation

All original data are recorded in field notes and on chain-of-custody forms using indelible ink. Documents will be retained even if they are illegible or contain inaccuracies that require correction.

If an error is made on a document, the individual making the entry will correct the document by crossing a line through the error, entering the correct information, and initialing and dating the correction. Any subsequent error discovered on a document is corrected, initialed, and dated by the person who made the entry.

11.5 Instrument/Equipment Testing, Inspection, and Maintenance

This section presents the procedures for testing, inspection, and maintenance for field and laboratory equipment.

11.5.1 Field Instrument/Equipment

Maintenance responsibilities for field equipment are assigned to the field team leader for specific sampling tasks. However, the field team using the equipment is responsible for checking the status of the equipment prior to use and reporting any problems encountered. Field equipment will be inspected daily before the start of work. Maintenance will be performed following manufacturers guidelines, or when equipment is not performing optimally (not calibrating correctly, apparent drift in readings, or giving readings that are not likely for the apparent field condition). Equipment will be tested before leaving for the field site. If any errors are indicated, the field equipment will not be used, and backup equipment will be rented from a reputable rental company until the faulty equipment can be serviced. Any equipment that cannot be serviced will be replaced. Equipment/Instruments that may be used in the field include a Photoionization Detector (PID) and a handheld global positioning system device (GPS; Trimble© Gwo7X™).

11.6 Instrument/Equipment Calibration Procedures and Frequency

This section presents the calibration procedures and frequency for field and laboratory equipment.

11.6.1 Field Instrument/Equipment

Field equipment will be calibrated before the start of work. Calibration will be in accordance with procedures and schedules outlined in the manufacturer’s operations manual. Calibrated equipment will be uniquely identified by using either the manufacturer’s serial number or other means. Equipment that fails calibration or becomes inoperable during use will be removed from service and either segregated to prevent inadvertent use or tagged to indicate it is out of calibration. Such equipment will be repaired and satisfactorily recalibrated. Equipment that cannot be repaired will be replaced.

11.7 Data Reduction, Validation, and Reporting

Reports generated in the field and laboratory will be included with project reports.

The Project Manager will assure validation of the analytical data. The laboratory generating analytical data for this project will be required to submit results that are supported by sufficient backup and QA/QC data to enable the reviewer to determine the quality of the data. Validity of the laboratory data will be determined based on the quality control objectives outlined in Section 4. Data validity will also be determined based upon the sampling procedures and documentation outlined in Sections 5 and 6. Upon completion of the review, the Project Manager will be responsible for assuring development of a QA/QC report on the analytical data.

11.8 Field and Laboratory Corrective Action

Conditions adverse to data quality must be promptly investigated, evaluated, and corrected. Adverse conditions may include instrument malfunctions, deficiencies in quality control criteria, deviations from SOPs, and errors in data reduction, validation, or documentation.

11.8.1 Field Corrective Action

Any project team member may initiate a field corrective action process. The corrective action process consists of identifying a problem, acting to eliminate the problem, monitoring the effectiveness of the corrective action, verifying that the problem has been eliminated, and documenting the corrective action.

Field corrective actions can include such activities as correcting chain of custody forms, solving problems associated with sample collection, re-packing samples to ensure sample integrity, correcting an entry in field notes, or providing a team member with additional training in sampling procedures. More extensive corrective actions might involve re-sampling or evaluating and revising sampling procedures. The field team leader will summarize the problem, establish possible causes, and designate the person responsible for a corrective action. The field team leader will then verify that the initial action has been taken and that it appears to be effective. Finally, the field team leader will follow up at a later time to verify that the problem has been resolved.

If a corrective action could potentially affect the quality of the analytical process, the field team leader must notify the Project Manager immediately.

11.8.2 Laboratory Corrective Action

The analytical laboratories analyze samples according to specific methods with required QC standards. All analytical data are reviewed to ensure that the required QC measures have been taken and that all specified QC standards have been met. Some examples of situations that might require laboratory corrective action include the following:

- QC data are outside the control limit ranges for precision and accuracy established for laboratory samples;
- Blanks contain target analytes above acceptable levels;
- Deficiencies are detected by the laboratory QA director during internal or external audits, or from the results of performance evaluation samples;
- Undesirable trends are detected in QC data;
- There are unusual changes in detection limits; and/or
- Inquiries concerning data quality are received.

If the bench analyst identifies a QC violation, corrective action will be taken immediately. The analyst will notify his or her supervisor of the problem and the investigation being performed. Some examples of analyst-level corrective action can include the following:

- Recalculating mathematical calculations;
- Reanalyzing suspect samples; and/or
- Recalibrating analytical instruments.

If the problem persists or cannot be identified, the matter must be referred to the laboratory supervisor and QA/QC officer for further investigation. All laboratory QC problems that could affect the quality of the final data should be discussed with the Project Manager as part of the corrective action process. Some examples of managerial-level corrective action include the following:

- Evaluating and amending sub-sampling or analytical procedures;
- Resampling and analyzing new samples; and/or
- Qualifying or rejecting the data.

Once resolved, full documentation of the corrective action must be included with the applicable data package prior to submittal to the project manager. Any substantive changes that may affect data quality will be communicated with the Port and DEQ.

11.9 Corrective Actions

If the quality control audit detects unacceptable conditions or data, the Project Manager will be responsible for developing and initiating corrective action. Corrective action may include the following:

- Reanalyzing the samples, if holding time criteria permit;
- Resampling and analyzing;

- Evaluating and amending sampling and analytical procedures; and
- Accepting data and acknowledging level of uncertainty or inaccuracy by flagging the data.

11.10 Laboratory Quality Assurance Review

A QA review will be conducted that presents a QA/QC evaluation of the data collected during the sampling activities for inclusion in the final report. In addition to an opinion regarding the validity of the data, the QA/QC evaluation will address the following:

- Any adverse conditions or deviations from the SAP;
- Assessment of analytical data for precision, accuracy, and completeness evaluated based on criteria developed in this SAP;
- Significant QA problems and recommended solutions; and
- Corrective actions taken for any problems previously identified.

Table C-1
Sample Locations and Numbering
Willamette Cove Upland Facility
Portland, Oregon

Parcel	Decision Unit Name	Decision Unit Size (Acres)	Type
West	DU-1	0.50	30-PT ISM
	DU-2	0.50	30-PT ISM
	DU-3	0.43	30-PT ISM
	DU-4	0.42	30-PT ISM
	DU-5	0.53	30-PT ISM
	DU-6	0.53	30-PT ISM
	DU-7	0.49	30-PT ISM
	DU-8	0.44	30-PT ISM
	DU-9	0.43	30-PT ISM
Central	DU-10	0.49	30-PT ISM
	DU-11	0.54	30-PT ISM
	DU-12	0.44	30-PT ISM
	DU-13	0.52	30-PT ISM
	DU-14	0.44	30-PT ISM
	DU-15	0.49	30-PT ISM
	DU-16	0.48	30-PT ISM
	DU-17	0.50	30-PT ISM
	DU-18	0.41	30-PT ISM
	DU-19	0.51	30-PT ISM
	DU-20	0.49	30-PT ISM
	DU-21	0.39	30-PT ISM
	DU-22	0.46	30-PT ISM
	DU-23	0.50	30-PT ISM
	DU-24	0.44	30-PT ISM
	DU-25	0.45	30-PT ISM
	DU-26	0.44	30-PT ISM
East	DU-27	0.40	30-PT ISM
	DU-28	0.43	30-PT ISM
	DU-29	0.42	30-PT ISM
	DU-30	0.42	30-PT ISM
	DU-31	0.48	30-PT ISM
	DU-32	0.46	30-PT ISM
	DU-33	0.39	30-PT ISM
	DU-34	0.40	30-PT ISM

Please see notes at end of table.

Table C-1
Sample Locations and Numbering
Willamette Cove Upland Facility
Portland, Oregon

Parcel	Decision Unit Name	Decision Unit Size (Acres)	Type
East	DU-35	0.39	30-PT ISM
	DU-36	0.42	30-PT ISM
	DU-37	0.48	30-PT ISM
	DU-38	0.44	30-PT-ISM
East (Concrete Slab)	DU-39	<0.5	5-PT Composite[1]
	DU-40	<0.5	5-PT Composite[1]
East Soil Berms	DU-41	0.40	30-PT-ISM

Notes:
1. Composite samples will processed using ISM methodologies.

Table C-2
Sampling Plan Summary
Willamette Cove Upland Facility
Portland, Oregon

Parcel	Decision Unit	Sample Type	Sample Depth (feet bgs)	Sample ID	Sampling Plan													
					Metals EPA Method 6020B									Dioxins/ Furans	PAHs	Dibenzofuran	PCBs	Archive
					Antimony	Arsenic	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	EPA Method 1613B	EPA Method 8270E-SIM	EPA Method 8270E-SIM	EPA Method 8082A	
West	DU-1	ISM	0-1	DU-1 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-1 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-1 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-2	ISM	0-1	DU-2 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-2 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-2 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-3	ISM	0-1	DU-3 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-3 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-3 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-4	ISM	0-1	DU-4 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-4 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-4 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-5	ISM	0-1	DU-5 (0-1)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-5 (0-1)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-5 (0-1)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-5 (1-2)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-5 (1-2)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-5 (1-2)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-5 (2-3)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-5 (2-3)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-5 (2-3)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-6	ISM	0-1	DU-6 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-6 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-6 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-7	ISM	0-1	DU-7 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-7 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-7 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-8	ISM	0-1	DU-8 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-8 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-8 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-9	ISM	0-1	DU-9 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-9 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-9 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Central	DU-10	ISM	0-1	DU-10 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-10 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-10 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Please see notes at end of table.

Table C-2
Sampling Plan Summary
Willamette Cove Upland Facility
Portland, Oregon

Parcel	Decision Unit	Sample Type	Sample Depth (feet bgs)	Sample ID	Sampling Plan													
					Metals EPA Method 6020B									Dioxins/ Furans	PAHs	Dibenzofuran	PCBs	Archive
					Antimony	Arsenic	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	EPA Method 1613B	EPA Method 8270E-SIM	EPA Method 8270E-SIM	EPA Method 8082A	
Central	DU-11	ISM	0-1	DU-1 (0-1)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-11 (0-1)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-11 (0-1)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-11 (1-2)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-11 (1-2)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-11 (1-2)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-11 (2-3)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-11 (2-3)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-11 (2-3)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-12	ISM	0-1	DU-12 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-12 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-12 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-13	ISM	0-1	DU-13 (0-1)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-13 (0-1)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-13 (0-1)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-13 (1-2)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-13 (1-2)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-13 (1-2)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-13 (2-3)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-13 (2-3)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-13 (2-3)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-14	ISM	0-1	DU-14 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-14 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-14 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-15	ISM	0-1	DU-15 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-15 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-15 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-16	ISM	0-1	DU-16 (0-1)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-16 (0-1)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-16 (0-1)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-16 (1-2)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-16 (1-2)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-16 (1-2)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-16 (2-3)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-16 (2-3)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-16 (2-3)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-17	ISM	0-1	DU-17 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-17 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-17 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Please see notes at end of table.

Table C-2
Sampling Plan Summary
Willamette Cove Upland Facility
Portland, Oregon

Parcel	Decision Unit	Sample Type	Sample Depth (feet bgs)	Sample ID	Sampling Plan													
					Metals EPA Method 6020B									Dioxins/ Furans EPA Method	PAHs	Dibenzofuran	PCBs	Archive
					Antimony	Arsenic	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	EPA Method 1613B	EPA Method 8270E-SIM	EPA Method 8270E-SIM	EPA Method 8082A	
Central	DU-18	ISM	0-1	DU-18 (0-1)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-18 (0-1)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-18 (0-1)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-18 (1-2)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-18 (1-2)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-18 (1-2)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-18 (2-3)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-18 (2-3)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-18 (2-3)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-19	ISM	0-1	DU-19 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-19 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-19 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-20	ISM	0-1	DU-20 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-20 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-20 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-21	ISM	0-1	DU-21 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-21 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-21 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-22	ISM	0-1	DU-22 (0-1)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-22 (0-1)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-22 (0-1)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-22 (1-2)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-22 (1-2)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-22 (1-2)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-22 (2-3)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-22 (2-3)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-22 (2-3)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-23	ISM	0-1	DU-23 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-23 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-23 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-24	ISM	0-1	DU-24 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-24 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-24 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-25	ISM	0-1	DU-25 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-25 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-25 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Please see notes at end of table.

Table C-2
Sampling Plan Summary
Willamette Cove Upland Facility
Portland, Oregon

Parcel	Decision Unit	Sample Type	Sample Depth (feet bgs)	Sample ID	Sampling Plan													
					Metals EPA Method 6020B									Dioxins/ Furans EPA Method 1613B	PAHs EPA Method 8270E-SIM	Dibenzofuran EPA Method 8270E-SIM	PCBs EPA Method 8082A	Archive
					Antimony	Arsenic	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc					
East	DU-26	ISM	0-1	DU-26 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-26 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-26 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-27	ISM	0-1	DU-27 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-27 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-27 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-28	ISM	0-1	DU-28 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-28 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-28 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-29	ISM	0-1	DU-29 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-29 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-29 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-30	ISM	0-1	DU-30 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-30 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-30 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-31	ISM	0-1	DU-31 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-31 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-31 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-32	ISM	0-1	DU-32 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-32 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-32 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-33	ISM	0-1	DU-33 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-33 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-33 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-34	ISM	0-1	DU-34 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-34 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-34 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-35	ISM	0-1	DU-35 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-35 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-35 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-36	ISM	0-1	DU-36 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-36 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-36 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Please see notes at end of table.

Table C-2
Sampling Plan Summary
Willamette Cove Upland Facility
Portland, Oregon

Parcel	Decision Unit	Sample Type	Sample Depth (feet bgs)	Sample ID	Sampling Plan													
					Metals EPA Method 6020B									Dioxins/ Furans EPA Method	PAHs	Dibenzofuran	PCBs	Archive
					Antimony	Arsenic	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	EPA Method 1613B	EPA Method 8270E-SIM	EPA Method 8270E-SIM	EPA Method 8082A	
East	DU-37	ISM	0-1	DU-37 (0-1)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-37 (0-1)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-37 (0-1)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-37 (1-2)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-37 (1-2)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-37 (1-2)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-37 (2-3)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-37 (2-3)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-37 (2-3)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-38	ISM	0-1	DU-38 (0-1)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-38 (0-1)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			0-1 FR	DU-38 (0-1)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-38 (1-2)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-38 (1-2)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2 FR	DU-38 (1-2)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-38 (2-3)A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-38 (2-3)B	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3 FR	DU-38 (2-3)C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Conctrete Slab	DU-39	Composite[9]	0-1	DU-39 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-39 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-39 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	DU-40	Composite[9]	0-1	DU-40 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-40 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-40 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Soil Berms	DU-41	ISM	0-1	DU-41 (0-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			1-2	DU-41 (1-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2-3	DU-41 (2-3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Notes:
1. ISM = Incremental Sampling Methodology.
2. bgs = Below ground surface.
3. PAHs = Polycyclic aromatic hydrocarbons.
4. PCBs = Polychlorinated biphenyls.
5. Sampling units will comprise of 30 individual increments selected by systematic random sampling.
6. EPA = United States Environmental Protection Agency.
7. Archived samples will be stored at -18 degrees Celsius.
8. FR = Field replicate. Field replicates are collected at different locations within the same ISM cell as the primary sample.
9. Composite samples will be processed using ISM protocols.

Table C-3
Analytical Methods – Reporting Limit Goals
Willamette Cove Upland Facility
Portland, Oregon

Parameter	Method	Analytical Laboratory	Units	Method Detection Limit	Minimum Reporting Limit	Ecological				Human Health			
						Discrete/Composite		ISM		Discrete/Composite		ISM	
						PRG	Hot Spot Level	PRG	Hot Spot Level	PRG	Hot Spot Level	PRG	Hot Spot Level
Polycyclic Aromatic Hydrocarbons (PAHs)													
Acenaphthene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Acenaphthylene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Anthracene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Benz(a)anthracene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Benzo(a)pyrene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Benzo(b+k)fluoranthene(s)	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Chrysene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Fluoranthene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Fluorene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
2-Methylnaphthalene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Naphthalene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Phenanthrene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Pyrene	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
Dibenzofuran	EPA 8270E SIM	Apex Labs	mg/kg	0.005	0.01	0.01	0.1	0.01	0.1	--	--	--	--
Total HPAH	Calculated	--	mg/kg	0.005	0.01	5.6	56	5.6	56	--	--	--	--
Total LPAH	Calculated	--	mg/kg	0.005	0.01	29	290	29	290	--	--	--	--
Total PAHs	Calculated	--	mg/kg	0.005	0.01	--	--	--	--	--	--	--	--
cPAHs (BaP eq)	Calculated	--	mg/kg	0.005	0.01	--	--	--	--	0.55	55	0.55	55
Polychlorinated Biphenyl Aroclors (PCBs)													
Aroclor 1016	EPA 8082A	Apex Labs	mg/kg	0.002	0.004	--	--	--	--	--	--	--	--
Aroclor 1221	EPA 8082A	Apex Labs	mg/kg	0.002	0.004	--	--	--	--	--	--	--	--
Aroclor 1232	EPA 8082A	Apex Labs	mg/kg	0.002	0.004	--	--	--	--	--	--	--	--
Aroclor 1242	EPA 8082A	Apex Labs	mg/kg	0.002	0.004	--	--	--	--	--	--	--	--
Aroclor 1248	EPA 8082A	Apex Labs	mg/kg	0.002	0.004	--	--	--	--	--	--	--	--
Aroclor 1254	EPA 8082A	Apex Labs	mg/kg	0.002	0.004	--	--	--	--	--	--	--	--
Aroclor 1260	EPA 8082A	Apex Labs	mg/kg	0.002	0.004	--	--	--	--	--	--	--	--
Aroclor 1262	EPA 8082A	Apex Labs	mg/kg	0.002	0.004	--	--	--	--	--	--	--	--
Aroclor 1268	EPA 8082A	Apex Labs	mg/kg	0.002	0.004	--	--	--	--	--	--	--	--
Total PCBs	Calculated	--	mg/kg	0.002	0.004	0.098	0.98	0.098	0.98	0.74	40	0.74	40
Dioxins/Furans													
2,3,7,8 TCDD	EPA 1613B	Ceres Analytical	mg/kg	0.000000086	0.0000005	--	--	--	--	--	--	--	--
1,2,3,7,8 PeCDD	EPA 1613B	Ceres Analytical	mg/kg	0.000000232	0.0000025	--	--	--	--	--	--	--	--
1,2,3,4,7,8 HxCDD	EPA 1613B	Ceres Analytical	mg/kg	0.000000547	0.0000025	--	--	--	--	--	--	--	--
1,2,3,6,7,8 HxCDD	EPA 1613B	Ceres Analytical	mg/kg	0.000000497	0.0000025	--	--	--	--	--	--	--	--
1,2,3,7,8,9 HxCDD	EPA 1613B	Ceres Analytical	mg/kg	0.000000723	0.0000025	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8 HpCDD	EPA 1613B	Ceres Analytical	mg/kg	0.000000327	0.0000025	--	--	--	--	--	--	--	--
OCDD	EPA 1613B	Ceres Analytical	mg/kg	0.000001185	0.000005	--	--	--	--	--	--	--	--
2,3,7,8 TCDF	EPA 1613B	Ceres Analytical	mg/kg	0.000000105	0.0000005	--	--	--	--	--	--	--	--
1,2,3,7,8 PeCDF	EPA 1613B	Ceres Analytical	mg/kg	0.000000415	0.0000025	--	--	--	--	--	--	--	--
2,3,4,7,8 PeCDF	EPA 1613B	Ceres Analytical	mg/kg	0.000000345	0.0000025	--	--	--	--	--	--	--	--
1,2,3,4,7,8 HxCDF	EPA 1613B	Ceres Analytical	mg/kg	0.000000281	0.0000025	--	--	--	--	--	--	--	--
1,2,3,6,7,8 HxCDF	EPA 1613B	Ceres Analytical	mg/kg	0.000000311	0.0000025	--	--	--	--	--	--	--	--
2,3,4,6,7,8 HxCDF	EPA 1613B	Ceres Analytical	mg/kg	0.0000005	0.0000025	--	--	--	--	--	--	--	--
1,2,3,7,8,9 HxCDF	EPA 1613B	Ceres Analytical	mg/kg	0.000000483	0.0000025	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8 HpCDF	EPA 1613B	Ceres Analytical	mg/kg	0.000000376	0.0000025	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9 HpCDF	EPA 1613B	Ceres Analytical	mg/kg	0.000000268	0.0000025	--	--	--	--	--	--	--	--
OCDF	EPA 1613B	Ceres Analytical	mg/kg	0.00000095	0.000005	--	--	--	--	--	--	--	--
Total TEQ	Calculated	--	mg/kg	0.000001185	0.0000050	0.0000061	0.000061	0.0000061	0.000061	0.000015	0.0015	0.000015	0.0015
Metals													
Antimony	EPA 6020B	Apex Labs	mg/kg	0.5	1	2.7	27	2.7	27	24.3	243	24.3	243
Arsenic	EPA 6020B	Apex Labs	mg/kg	0.5	1	18	180	18	180	8.8	140	4.4	140
Chromium	EPA 6020B	Apex Labs	mg/kg	0.5	1	76	76	39	39	--	--	--	--
Copper	EPA 6020B	Apex Labs	mg/kg	1	2	70	700	70	700	11000	110000	11000	110000
Lead	EPA 6020B	Apex Labs	mg/kg	0.5	1	79	330	33	330	400	4000	400	4000
Mercury	EPA 6020B	Apex Labs	mg/kg	0.04	0.08	0.23	0.23	0.073	0.15	--	--	--	--
Nickel	EPA 6020B	Apex Labs	mg/kg	1	2	47	200	23	200	--	--	--	--
Selenium	EPA 6020B	Apex Labs	mg/kg	0.5	1	0.71	5.2	0.52	5.2	--	--	--	--
Zinc	EPA 6020B	Apex Labs	mg/kg	2	4	180	1200	120	1200	--	--	--	--

Notes:

1. mg/kg = Milligrams per kilogram.
2. EPA = United States Environmental Protection Agency.
3. MDL = Method detection limit.
4. MRL = Minimum reporting limit.
5. PRG = Preliminary Remedial Goal: cleanup level adopted from the *Revised Feasibility Study and Source Control Evaluation, Willamette Cove Upland Facility* (Apex, 2019).
6. Hot spot level adopted from the *Revised Feasibility Study and Source Control Evaluation, Willamette Cove Upland Facility* (Apex, 2019).

Table C-4
Analytical Methods – Sample Container Requirements
Willamette Cove Upland Facility
Portland, Oregon

Analysis	Preparation Method	Analysis Method	ISM Container	Composite Container	Storage Temperature	Holding Time	
						Sampling to Preparation	Preparation to Analysis
Metals	EPA 3051A	EPA 6020B	1-gallon glass wide-mouthed jar	4-oz glass jar	4±2°C	180 days	
Mercury	EPA 3051A	EPA 6020B			4±2°C	28 days	
PAHs	EPA 3546	EPA 8270E SIM			4±2°C	14 days	40 days
					-18°C	1 year	40 days
Dibenzofuran	EPA 3546	EPA 8270E SIM		8-oz glass jar	4±2°C	14 days	40 days
					-18°C	1 year	40 days
PCB Aroclors	EPA 3546	EPA 8082A			4±2°C	None	
					-18°C		
Dioxins/Furans	EPA 1613	EPA 1613B			4±2°C	None	
					-18°C		
Archive Sample	--	--	--	--	-18°C	90 days [6]	

Notes:

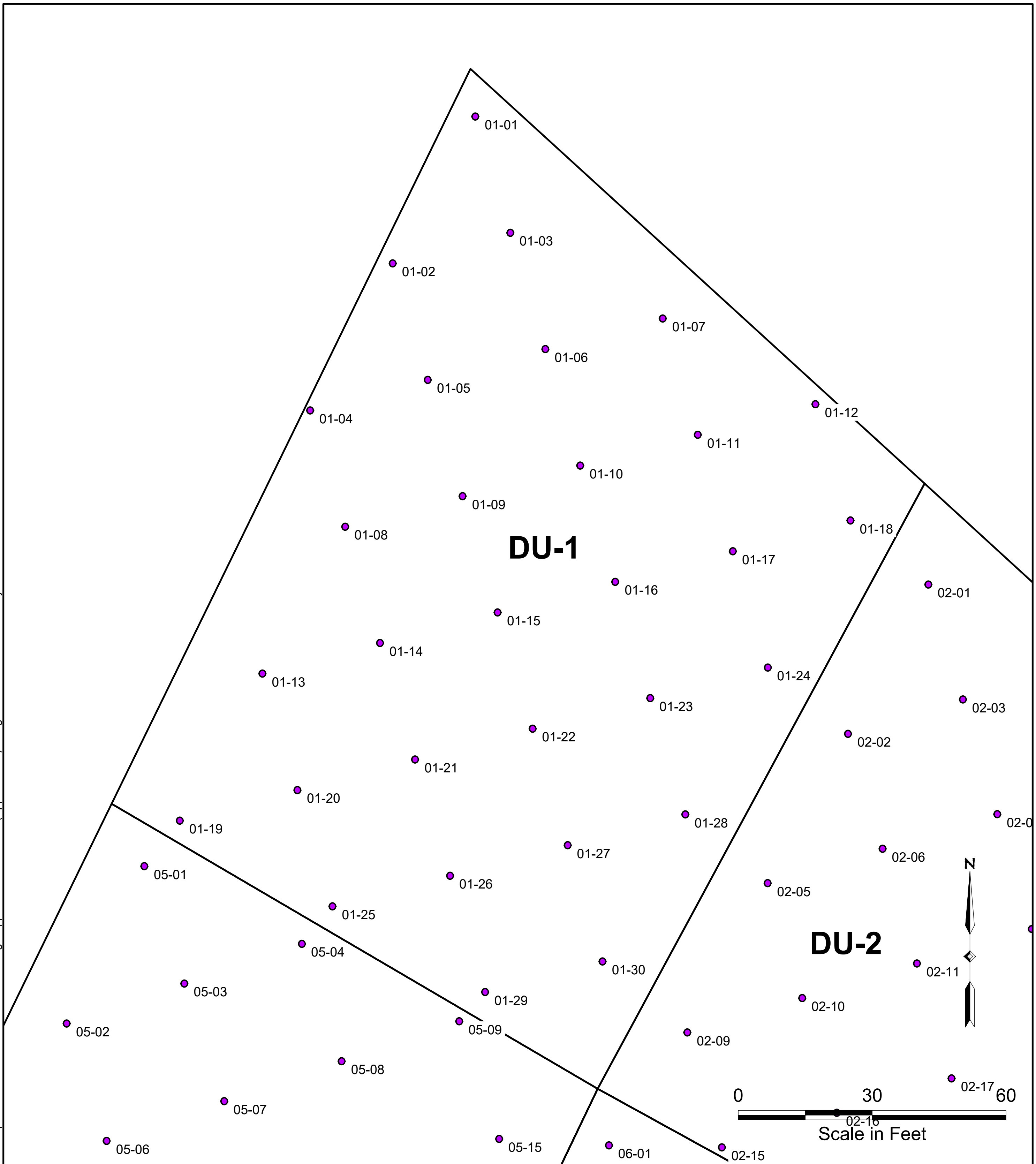
1. EPA = United States Environmental Protection Agency.
2. PAHs = Polycyclic aromatic hydrocarbons.
3. PCBs = Polychlorinated biphenyls.
4. °C = Degrees Celsius.
5. oz = ounce.
6. Archive samples will be held by Apex Labs for an initial 90 days. Additional extensions may be necessary and will be communicated with the Port and DEQ.

Table C-5
Field Quality Control Samples
Willamette Cove Upland Facility
Portland, Oregon

Analysis	Analytical Method	Equipment Blank	Field Replicate	Field Duplicate
Metals	EPA 6020B	1 per sample collection method	20% of DUs	None[5]
Mercury	EPA 6020B	1 per sample collection method	20% of DUs	None[5]
PAHs	EPA 8270E SIM	1 per sample collection method	20% of DUs	None[5]
Dibenzofuran	EPA 8270E SIM	1 per sample collection method	20% of DUs	None[5]
PCB Aroclors	EPA 8082A	1 per sample collection method	20% of DUs	None[5]
Dioxins/Furans	EPA 1613B	1 per sample collection method	20% of DUs	None[5]

Notes:

1. EPA = U.S. Environmental Protection Agency.
2. PCBs = Polychlorinated biphenyls.
3. PAHs = Polycyclic aromatic hydrocarbons.
4. DU = Decision Unit.
5. Analysis for composite samples only. No field duplicates will be prepared for composite samples.



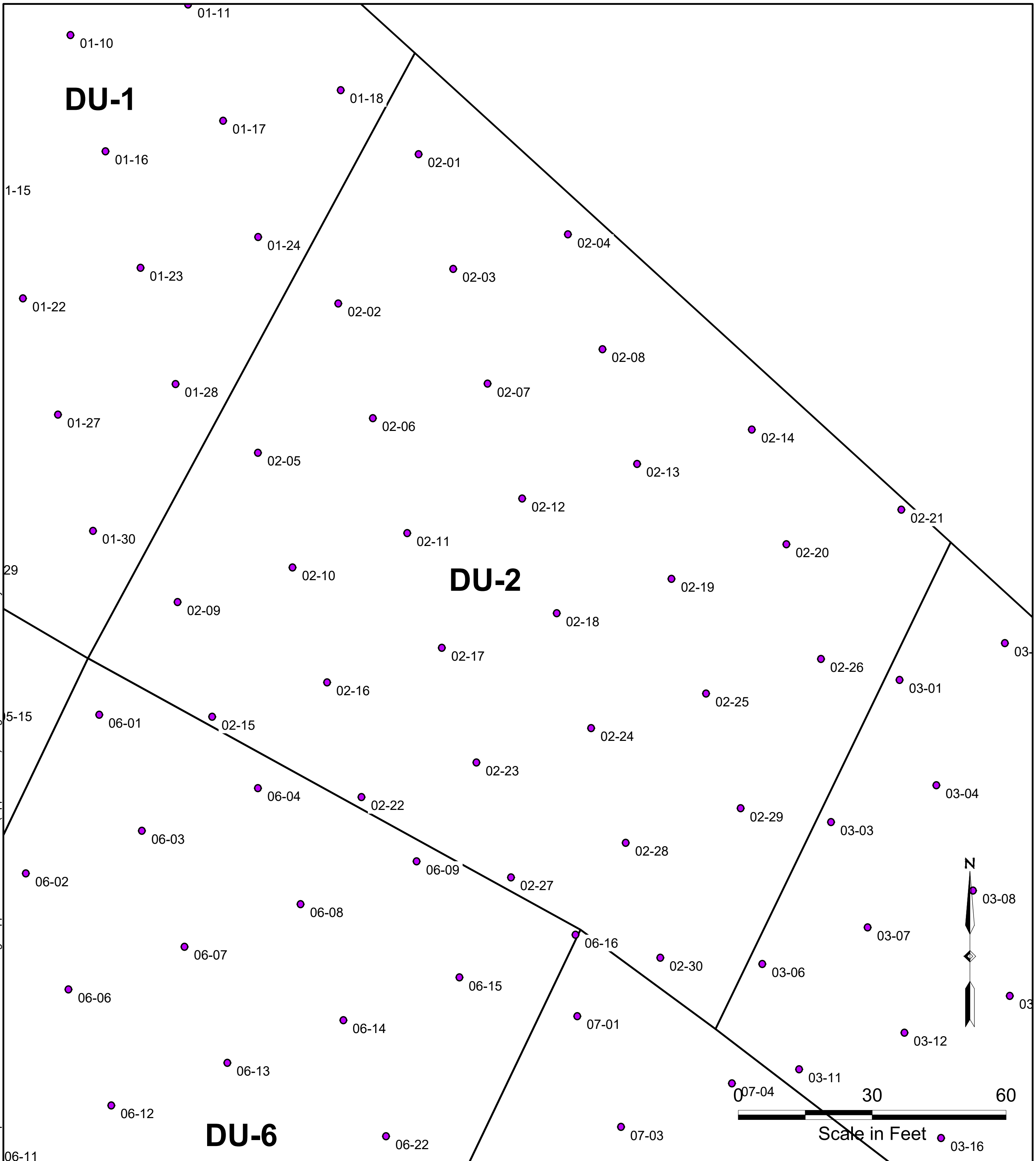
Legend:

● Increment Sample Location

DU-1 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC
		July 2022		Appendix **C1**



Legend:

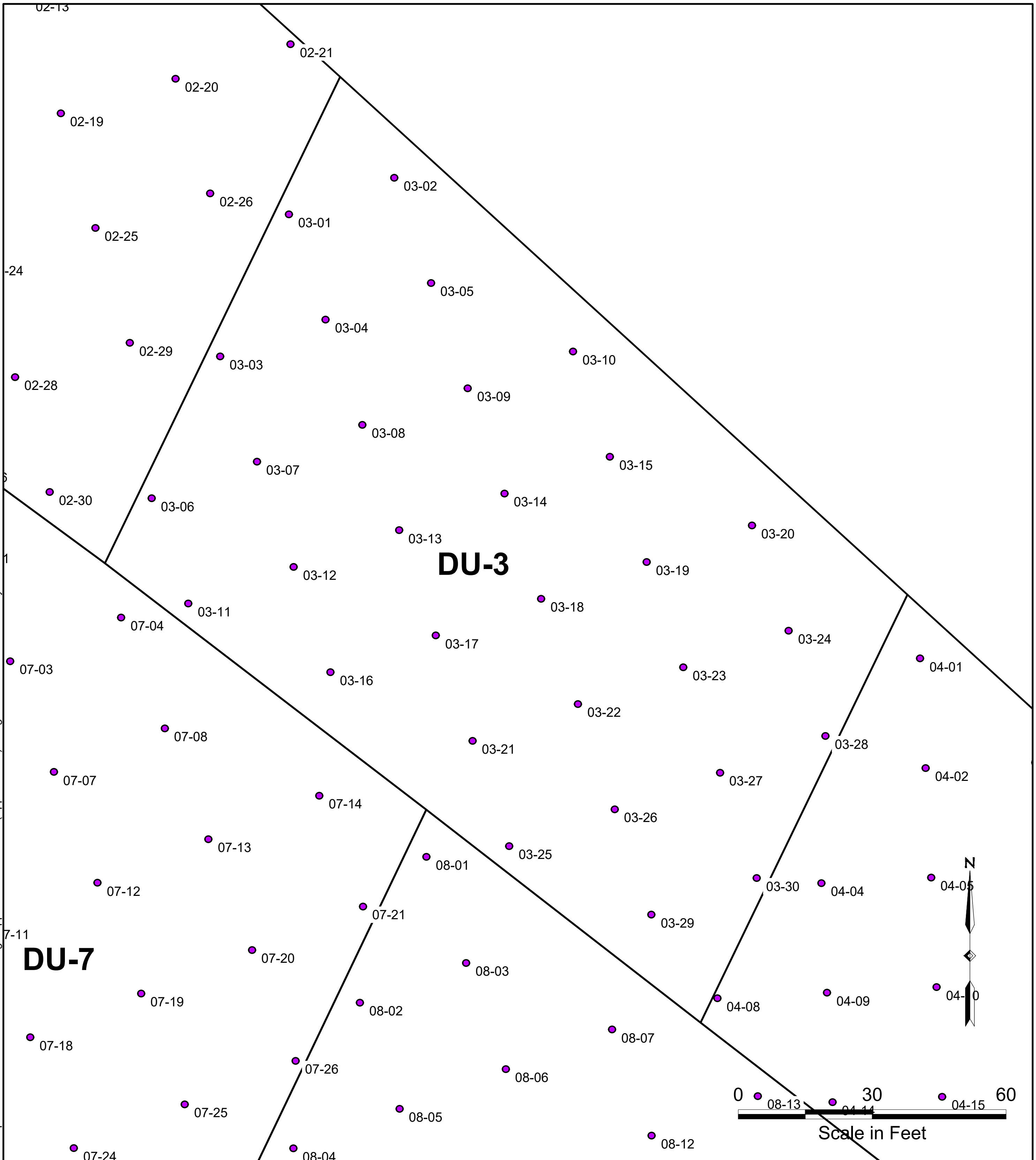
● Increment Sample Location

DU-2 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix
	July 2022			C2

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

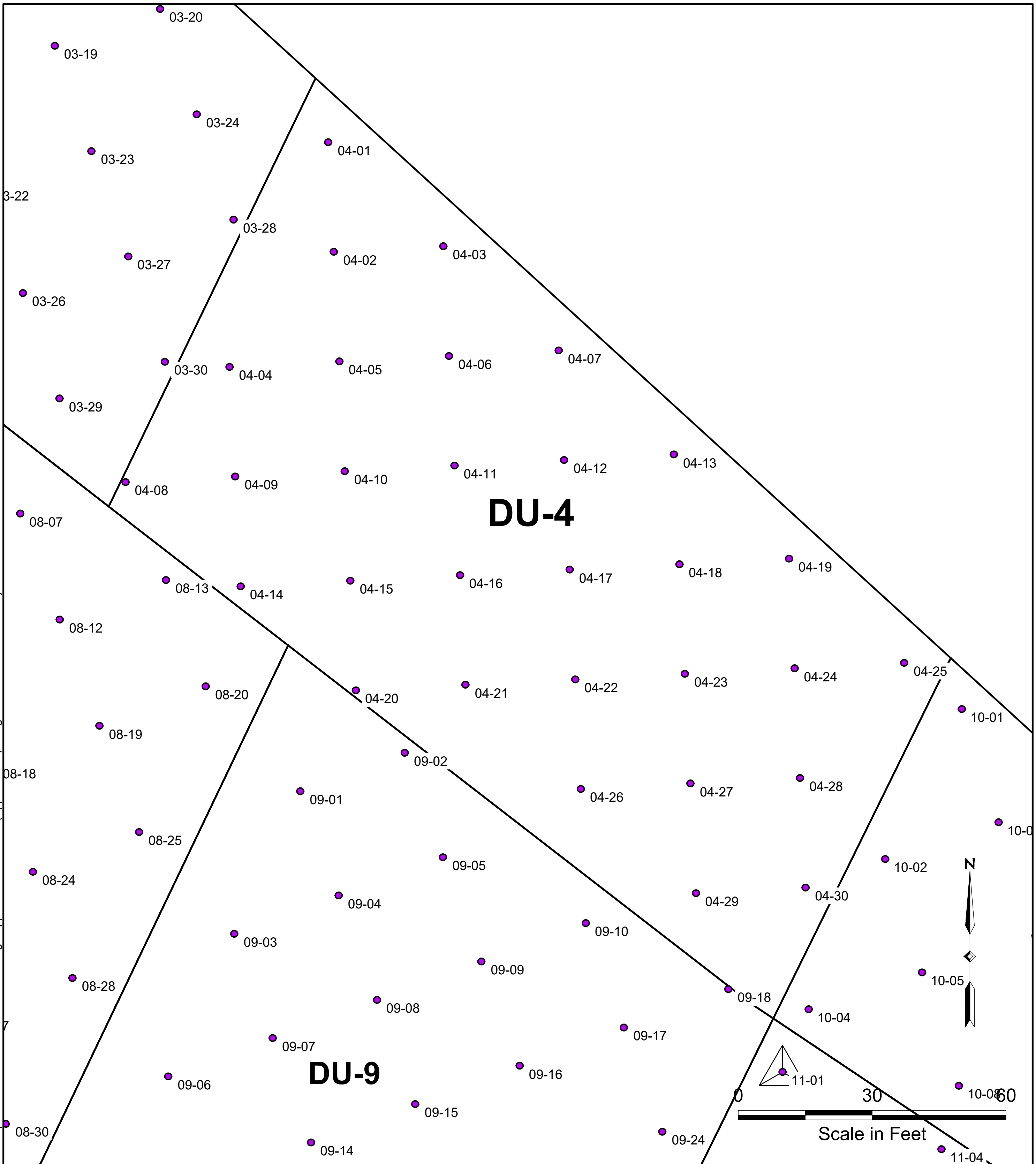
Increment Sample Location

DU-3 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC
		July 2022		Appendix **C3**

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

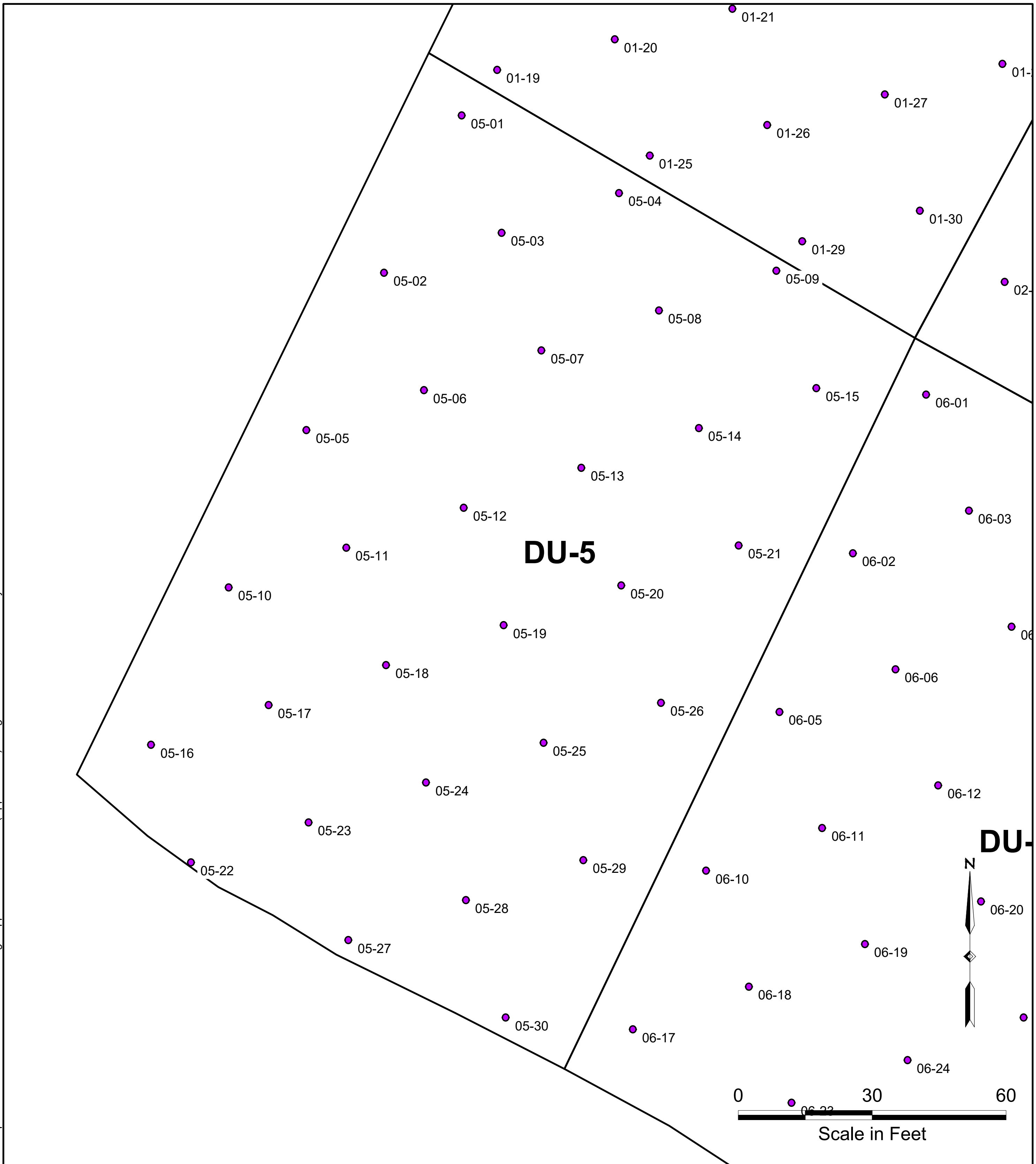
Increment Sample Location

DU-4 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix C4
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

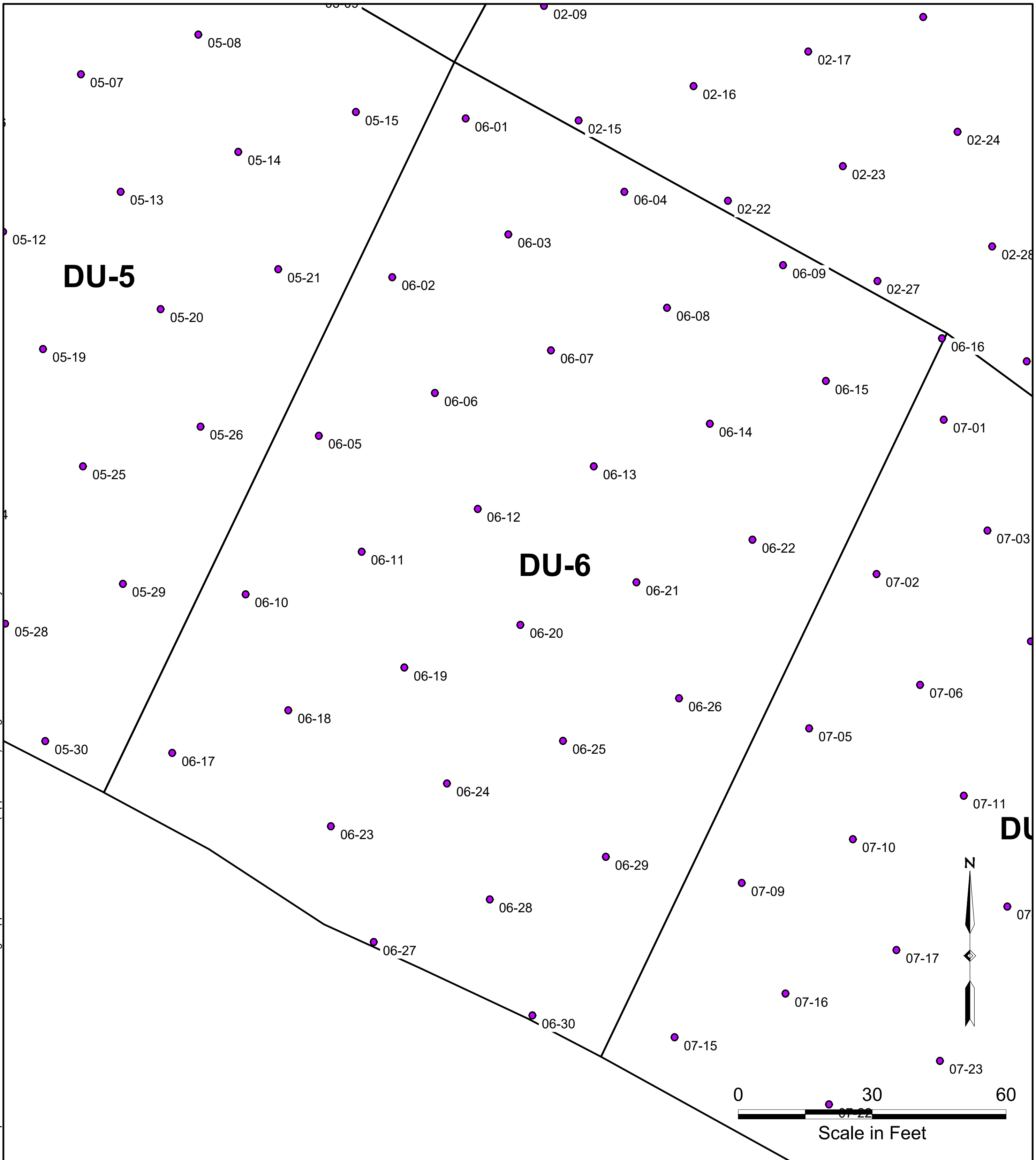
Increment Sample Location

DU-5 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C5**
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

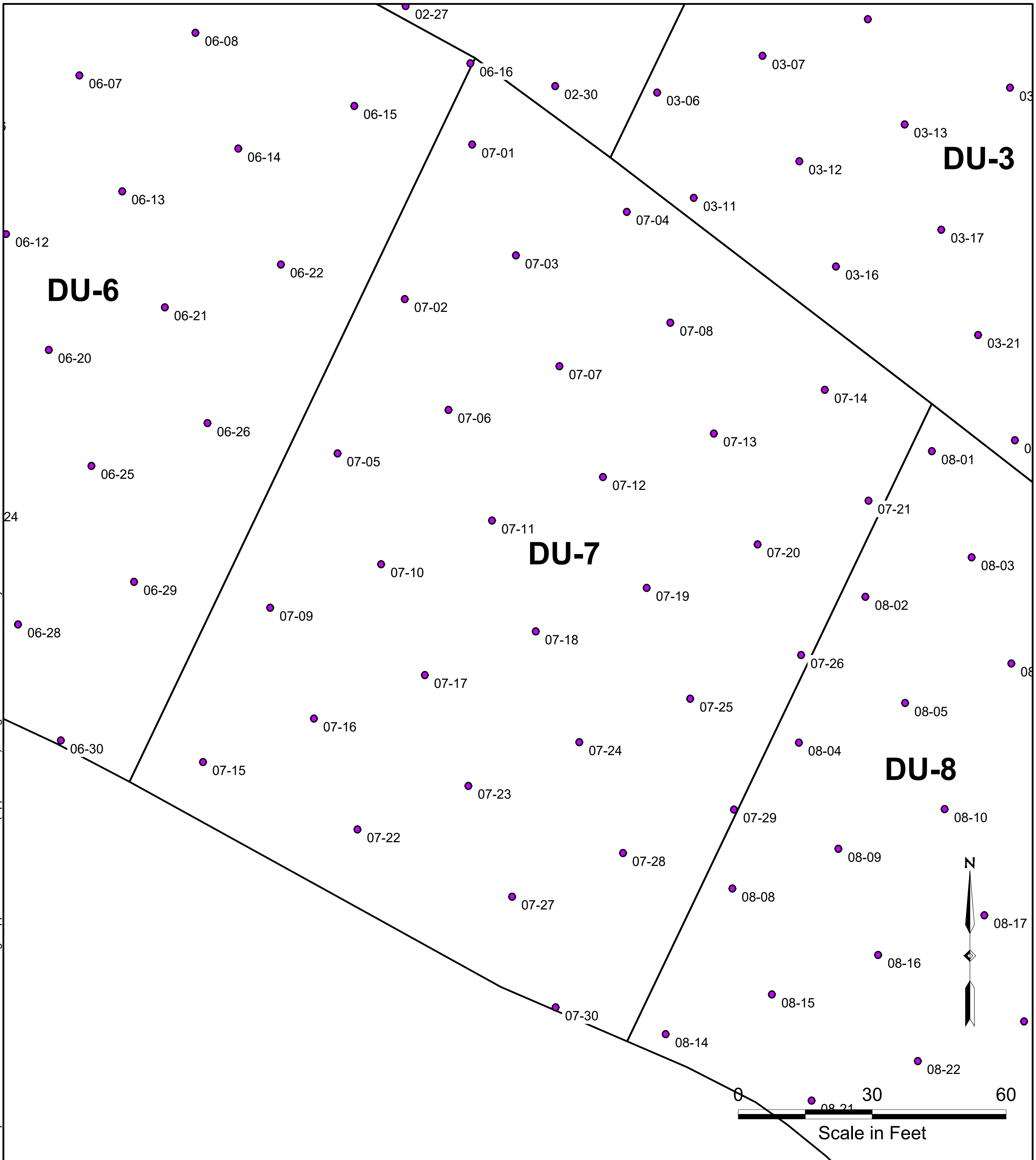
Increment Sample Location

DU-6 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix
	July 2022			C6

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

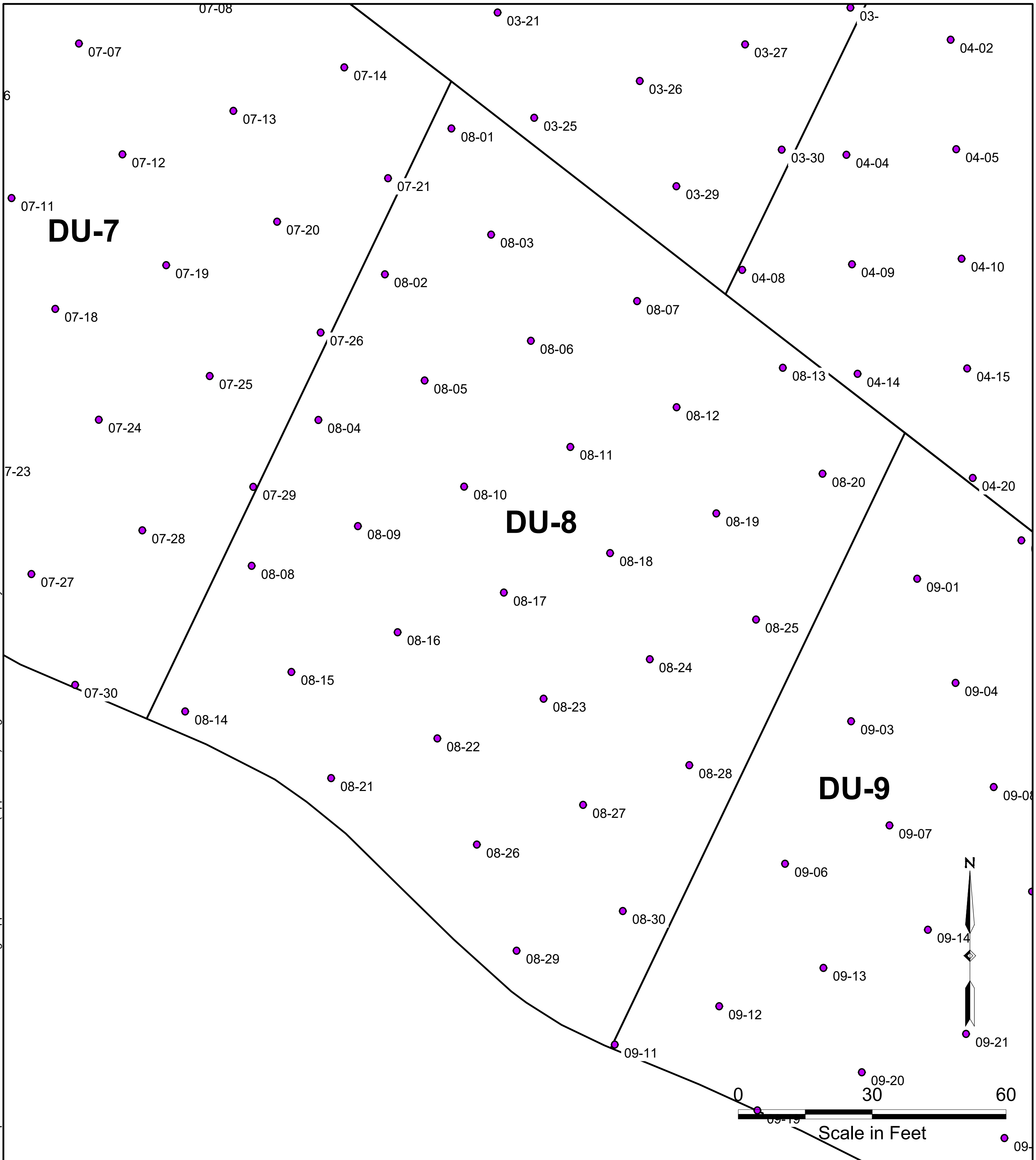
Increment Sample Location

DU-7 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C7**
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

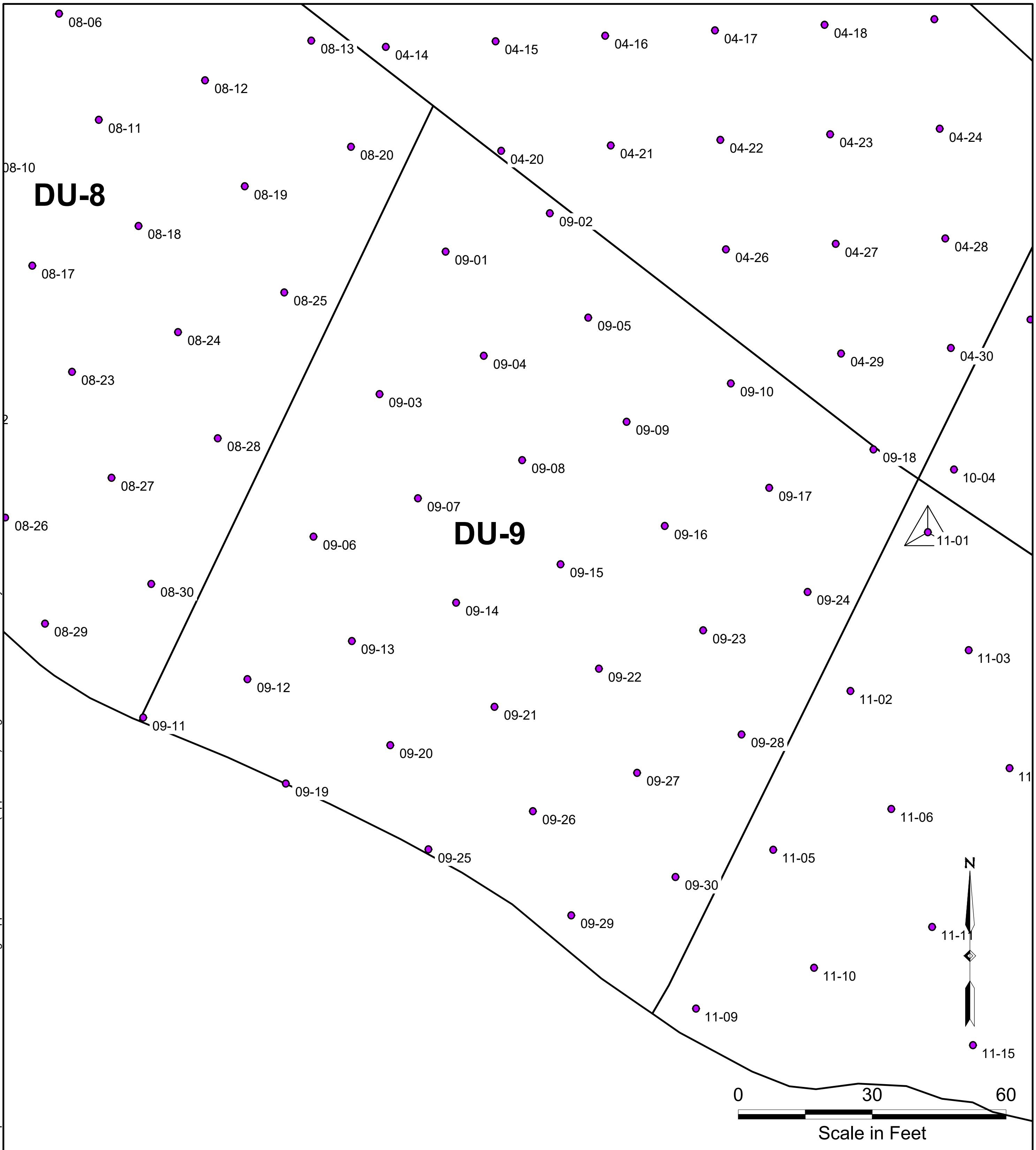
Increment Sample Location

DU-8 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix
	July 2022			C8

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

Increment Sample Location

DU-9 Sampling Grid

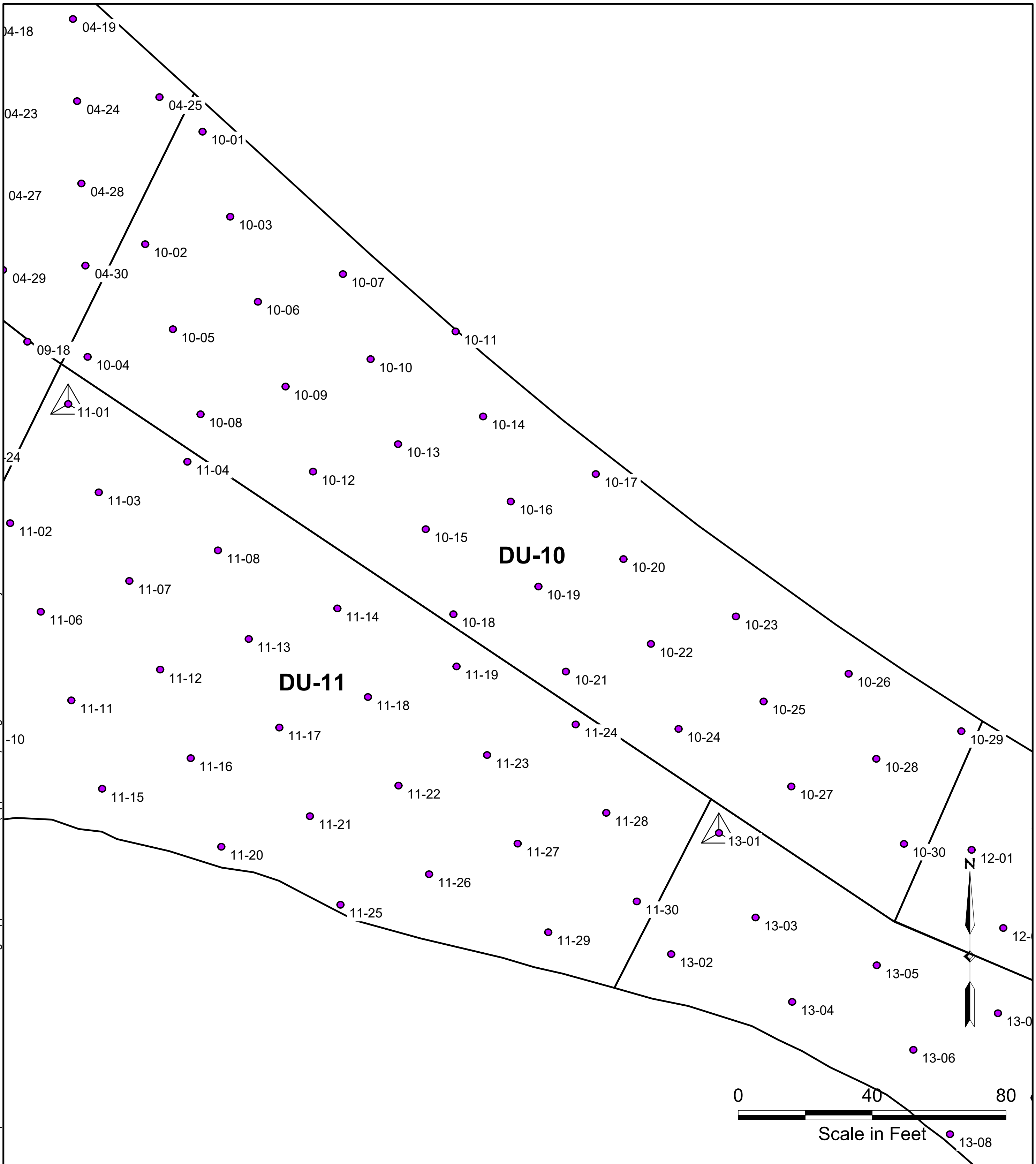
Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number:	Drawn:	Approved:	Appendix
320001056-18	JP	HC	
July 2022			C9

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

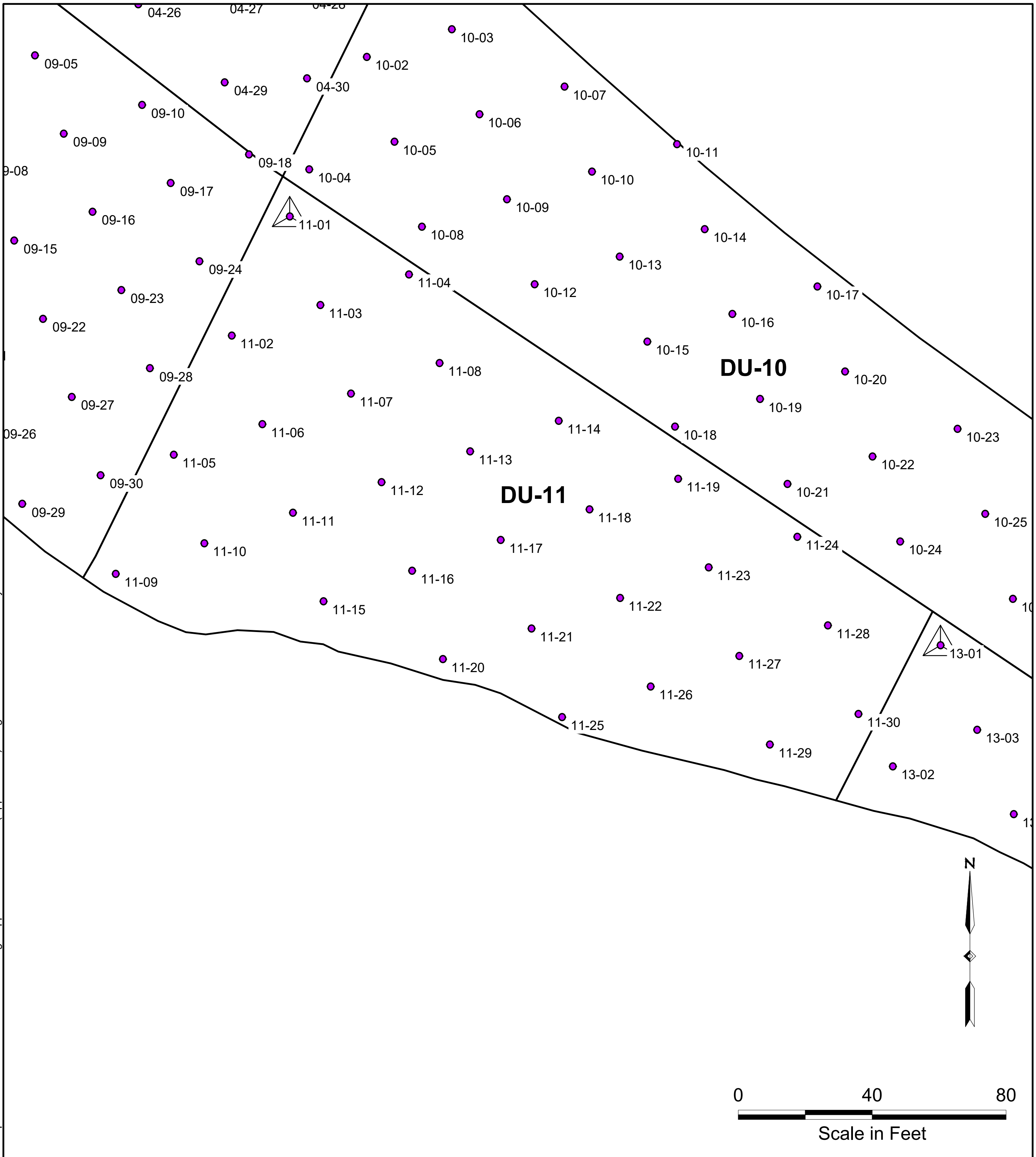
Increment Sample Location

DU-10 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C10**
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

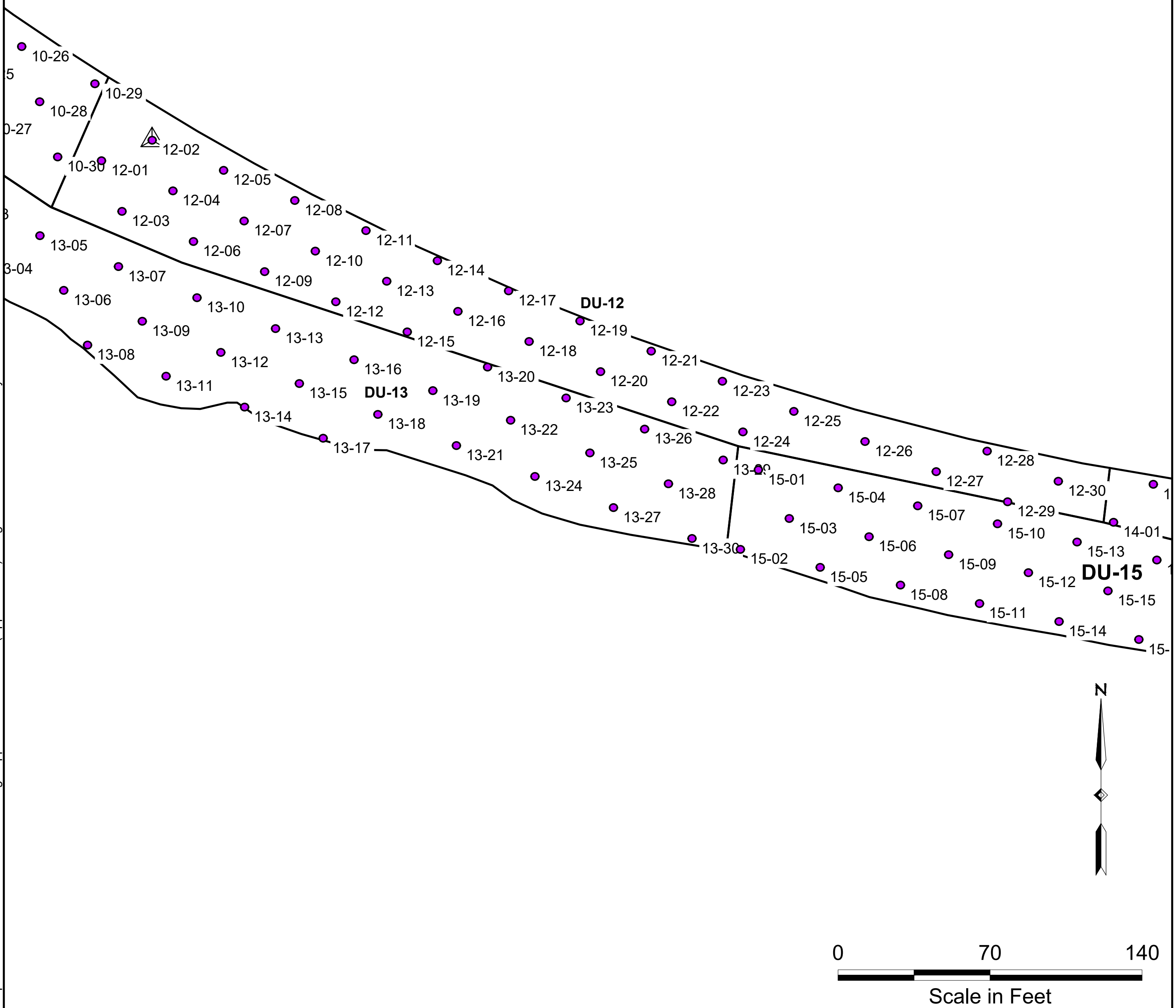
- Increment Sample Location
- Offset Sample Location

DU-11 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX — Apex Companies, LLC, 3015 SW First Avenue, Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix C11
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



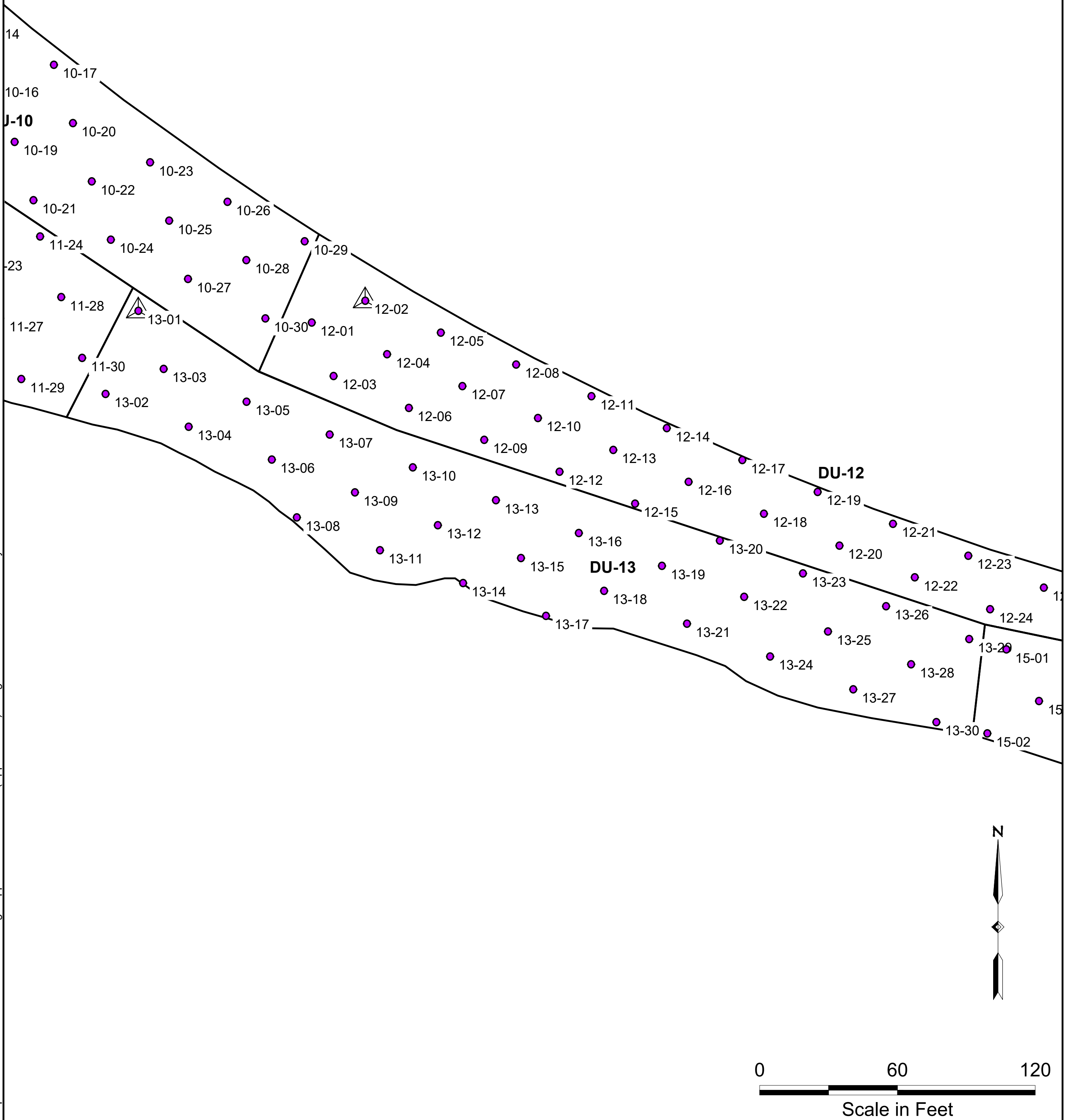
Legend:

- Increment Sample Location
- Offset Sample Location

DU-12 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C12**
	July 2022			



Legend:

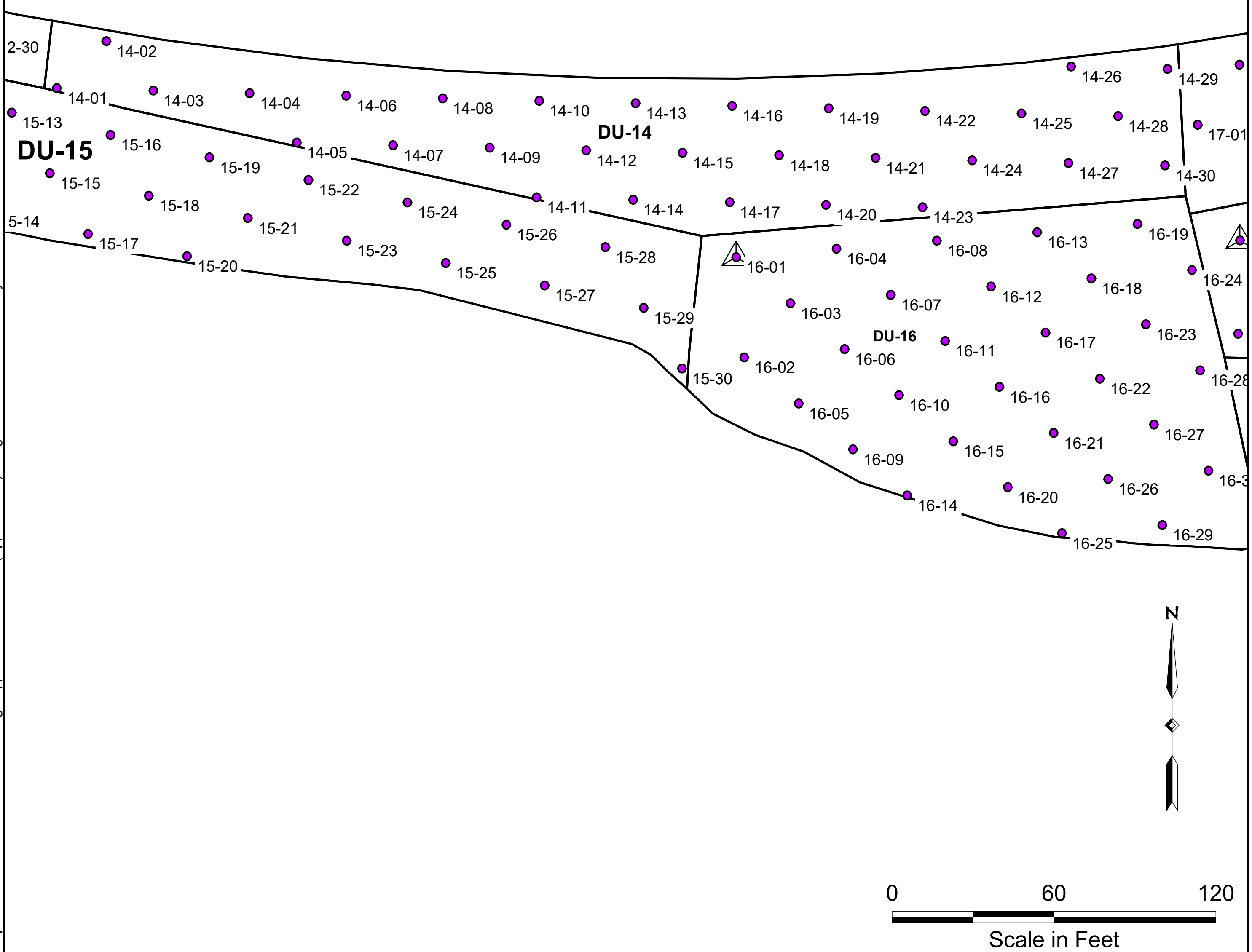
- Increment Sample Location
- Offset Sample Location

DU-13 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C13**
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

Increment Sample Location

DU-14 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC
		July 2022		

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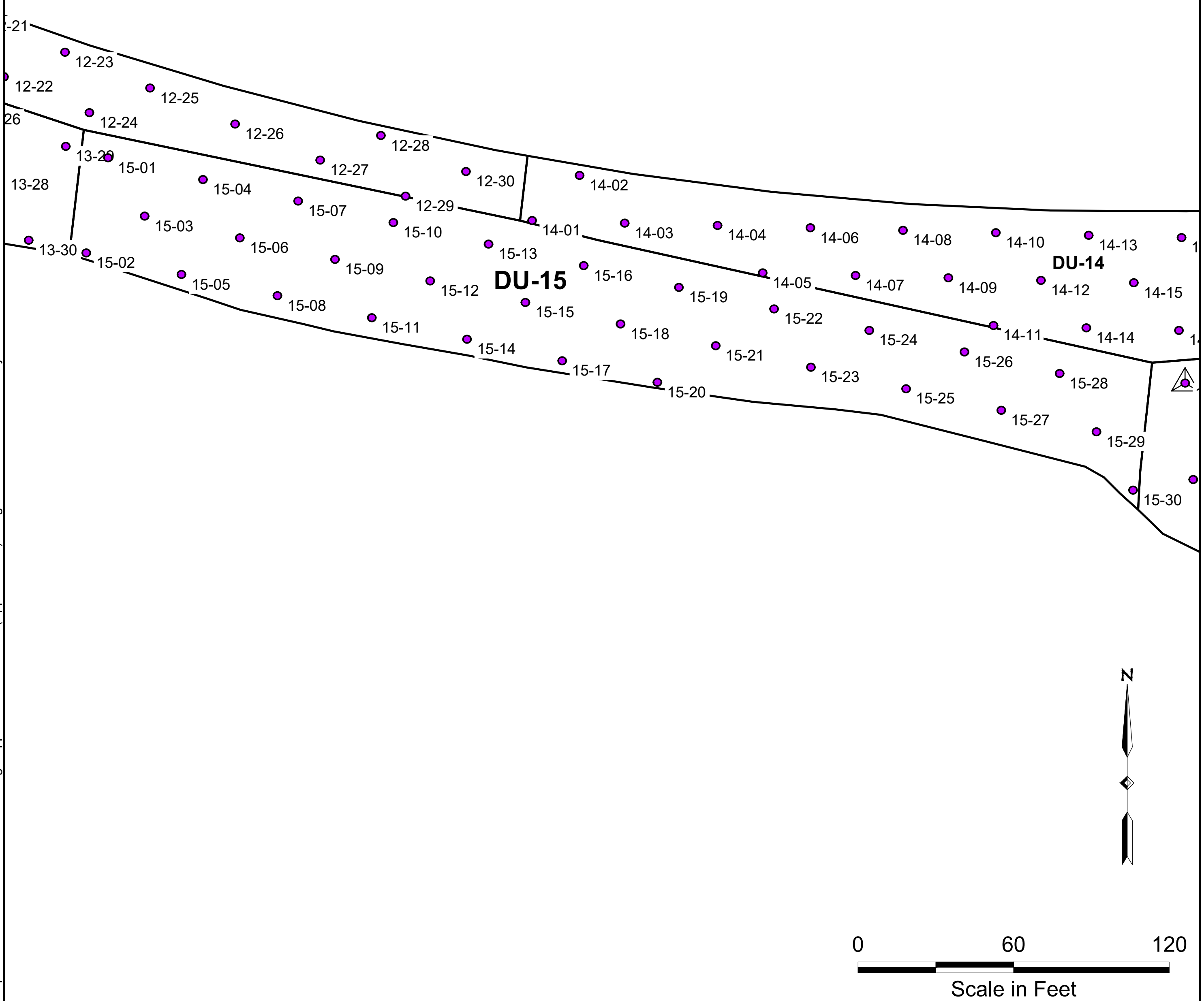
C14

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg   Modified 6/27/2022 by JPoore



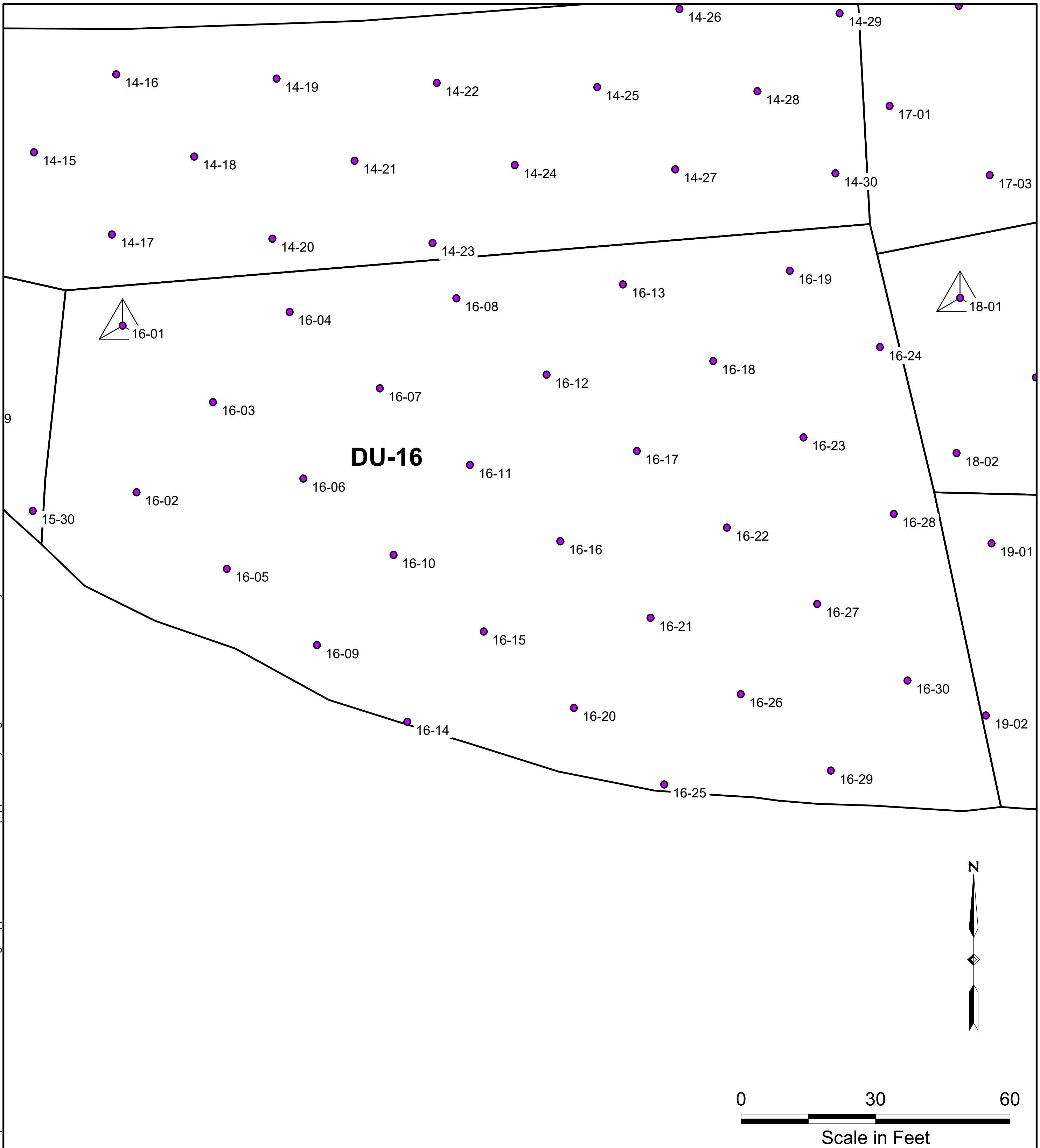
Legend:

● Increment Sample Location

DU-15 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX — Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C15**
	July 2022			



Legend:

Increment Sample Location

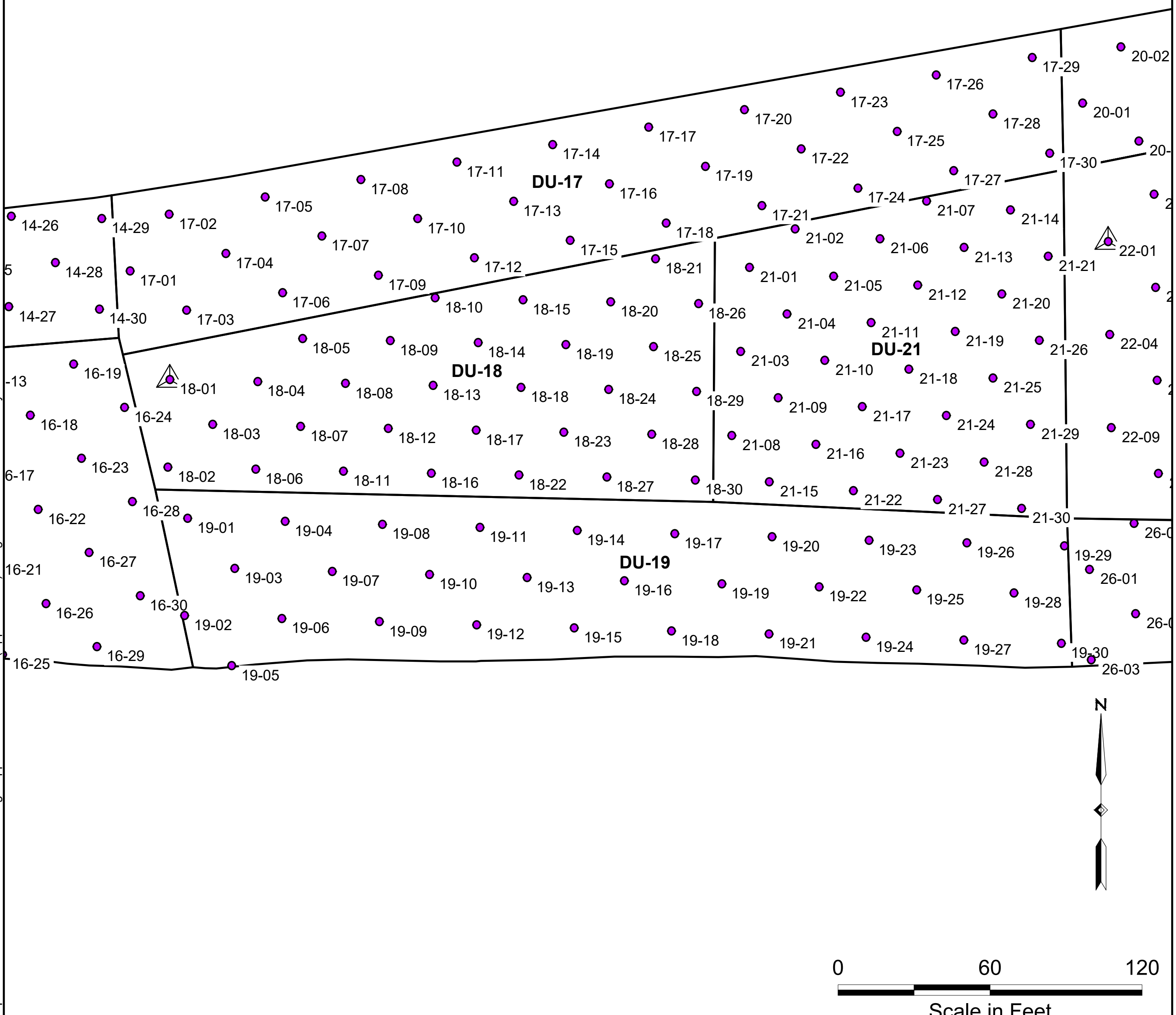
Offset Sample Location

DU-16 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C16**
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

● Increment Sample Location

DU-17 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC
		July 2022		

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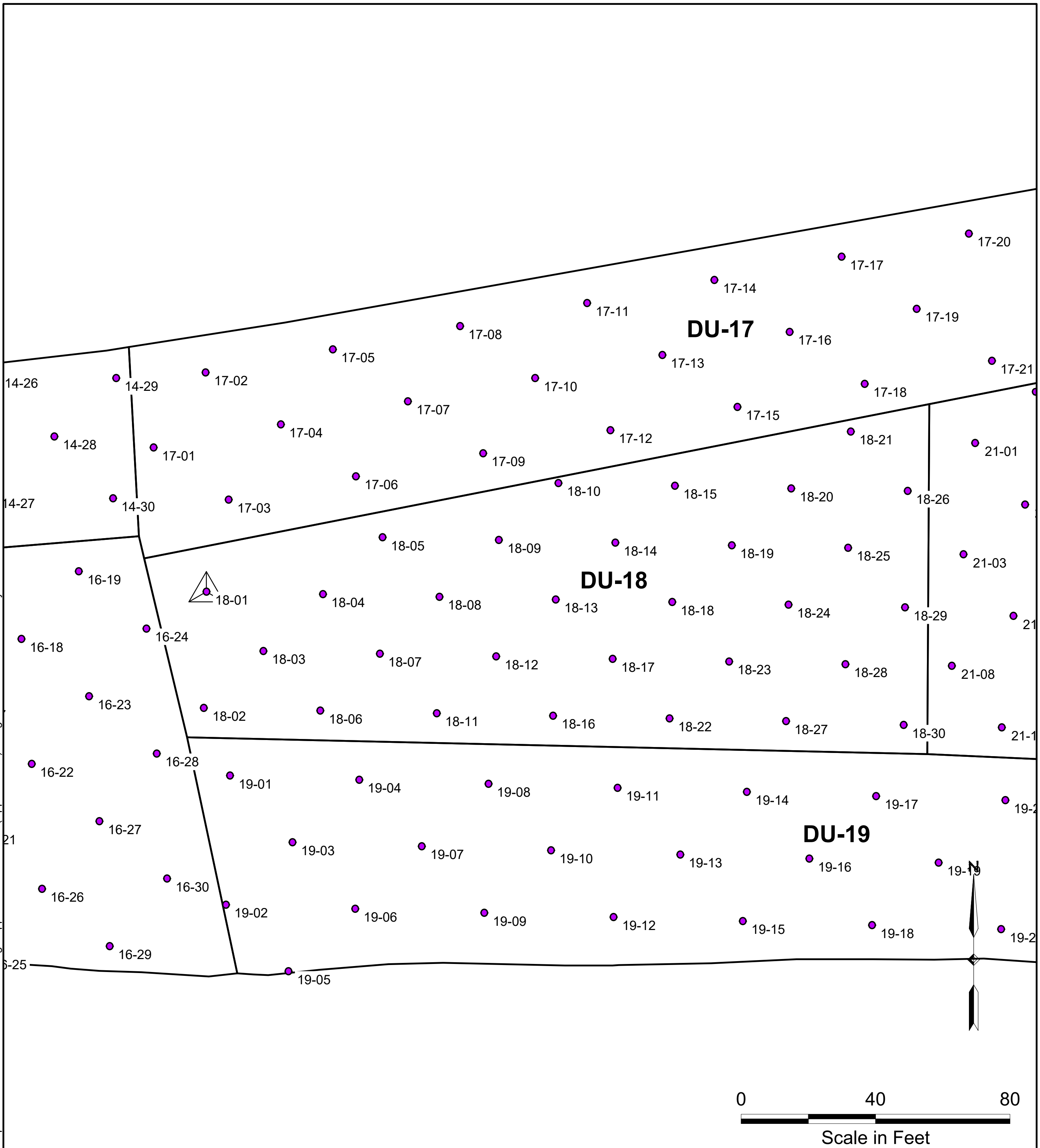
C17

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

Increment Sample Location

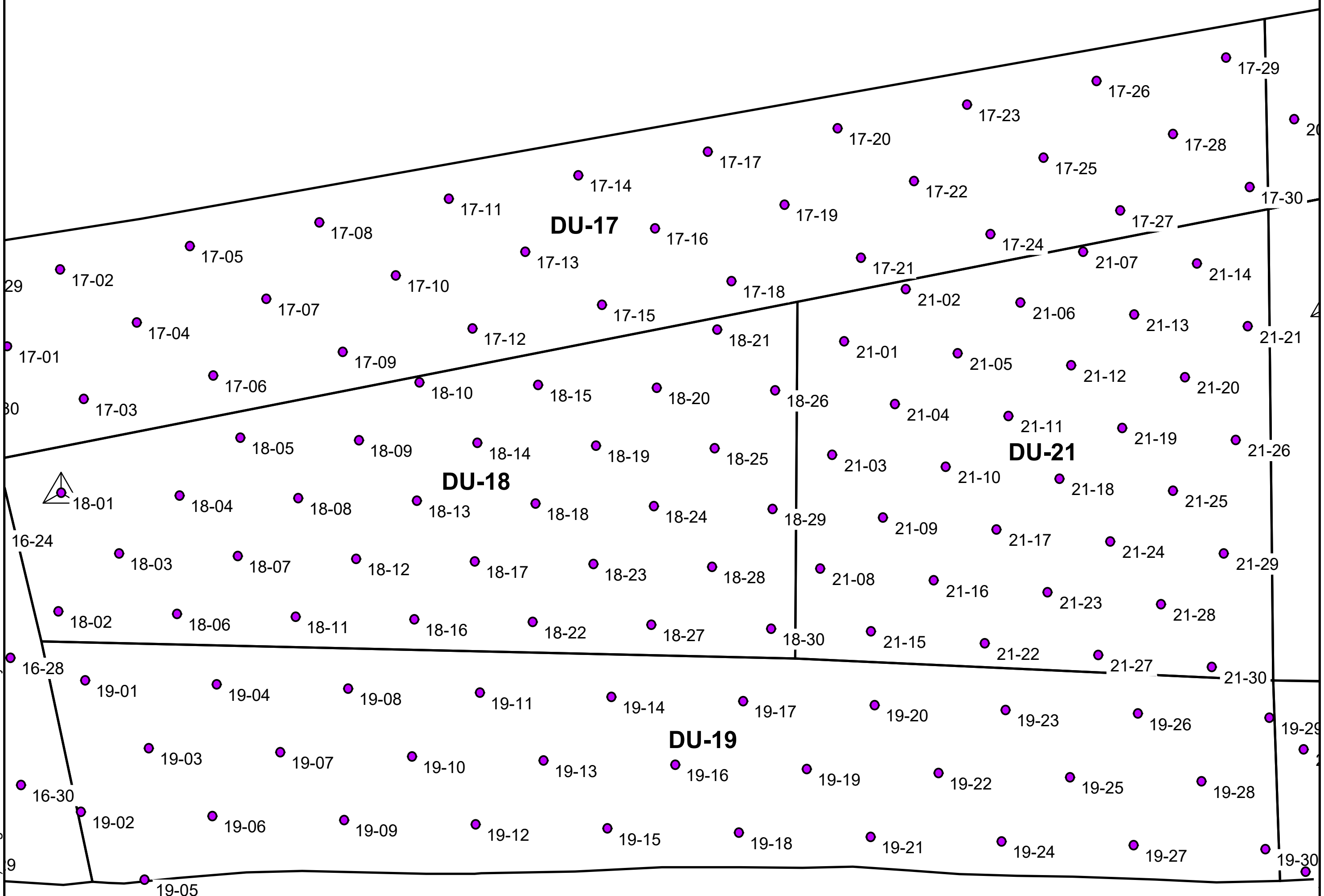
Offset Sample Location

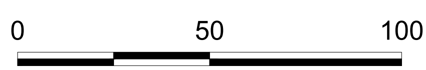
DU-18 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C18**
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore





Legend:

● Increment Sample Location

DU-19 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC
		July 2022		

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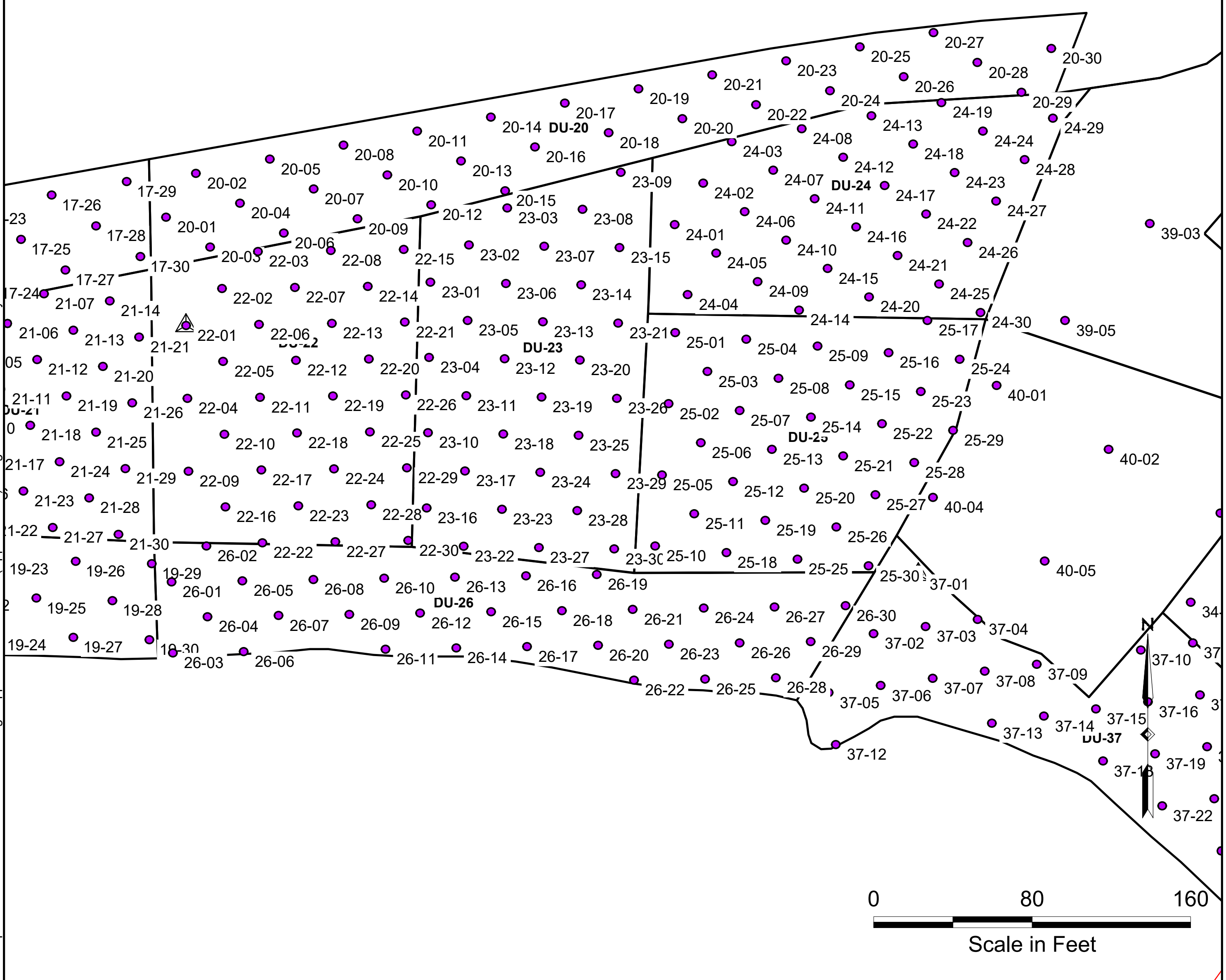
C19

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

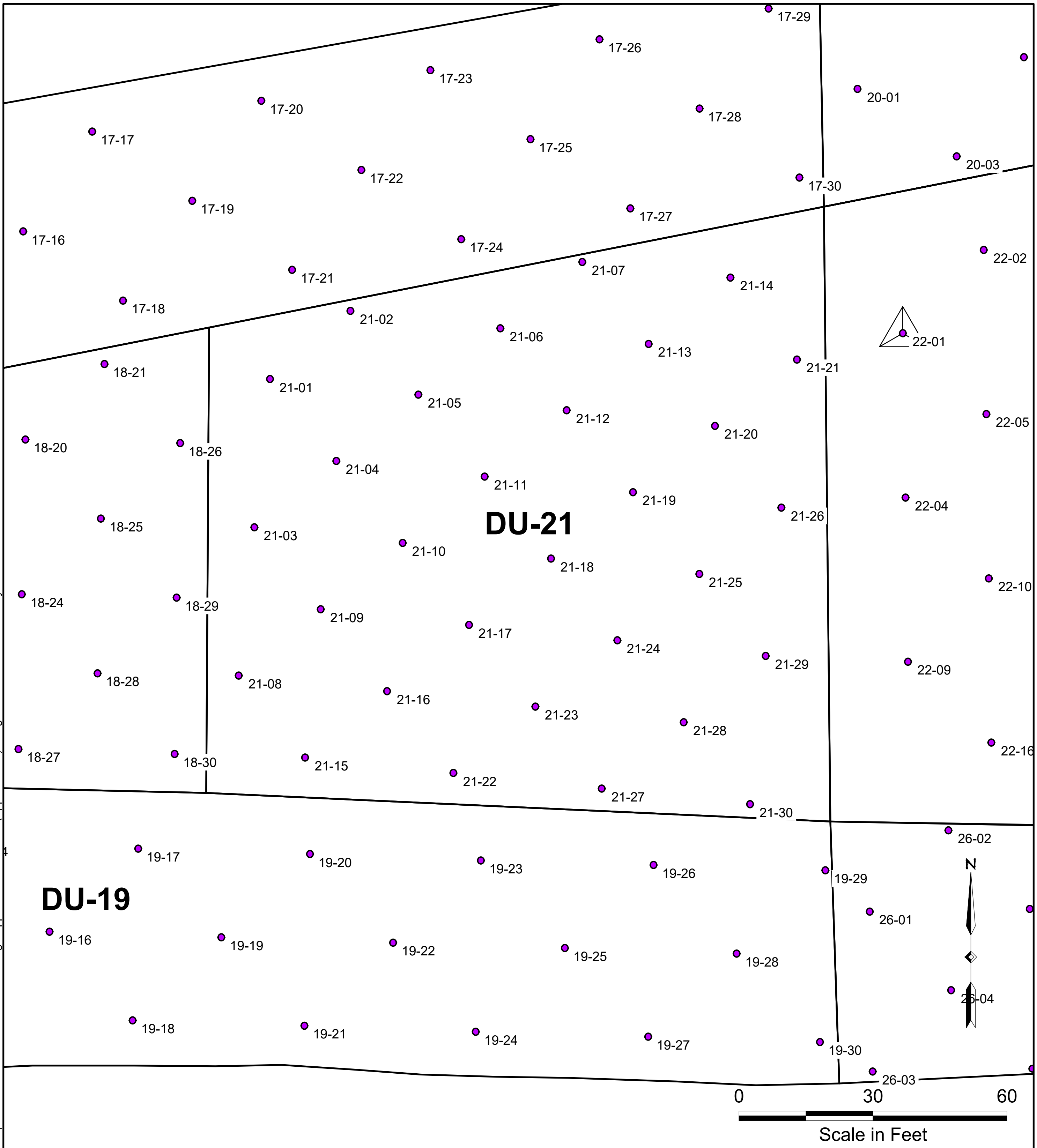
● Increment Sample Location

DU-20 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C20**
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

Increment Sample Location

DU-21 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

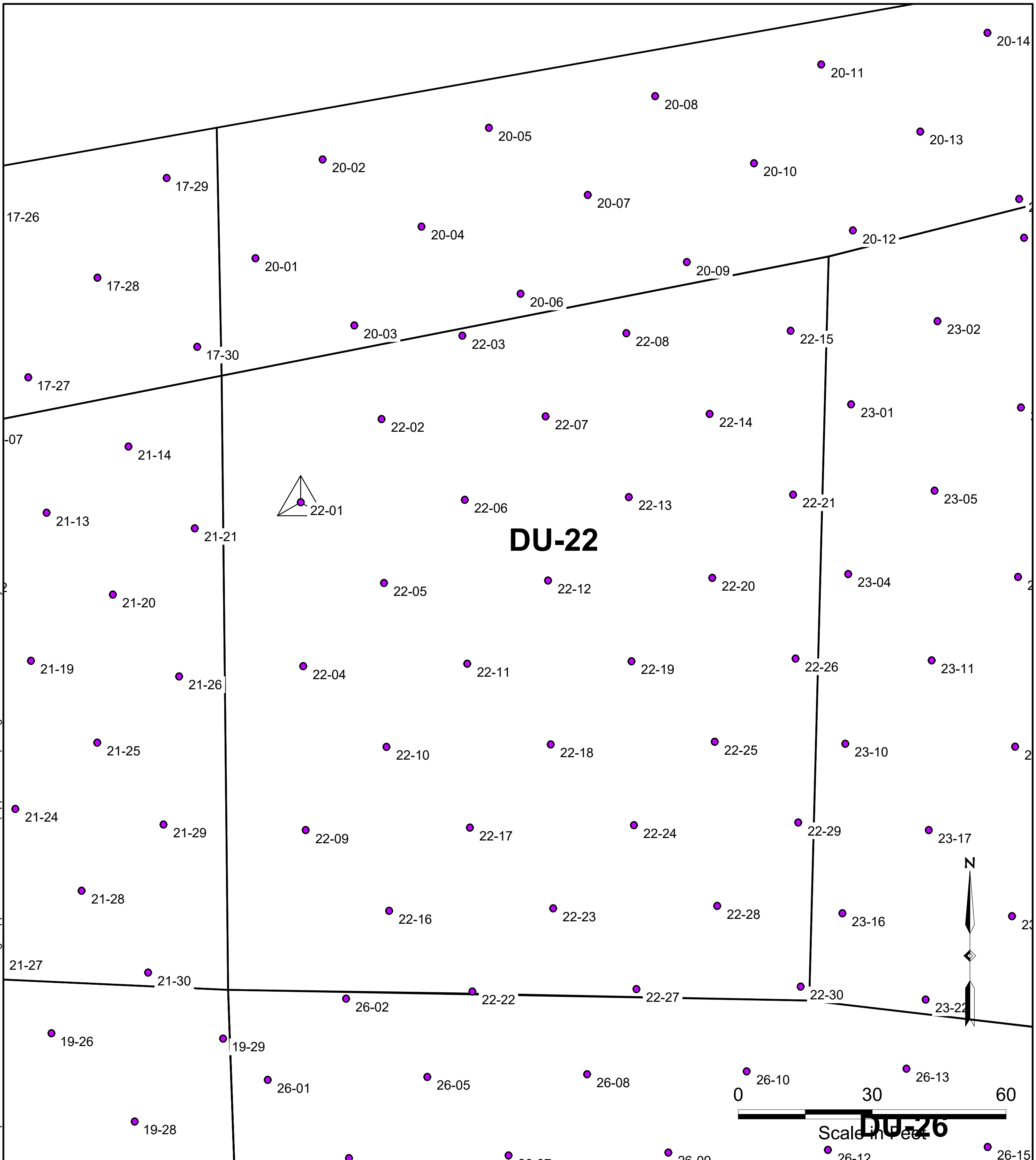
APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC
		July 2022		

Appendix

C21

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

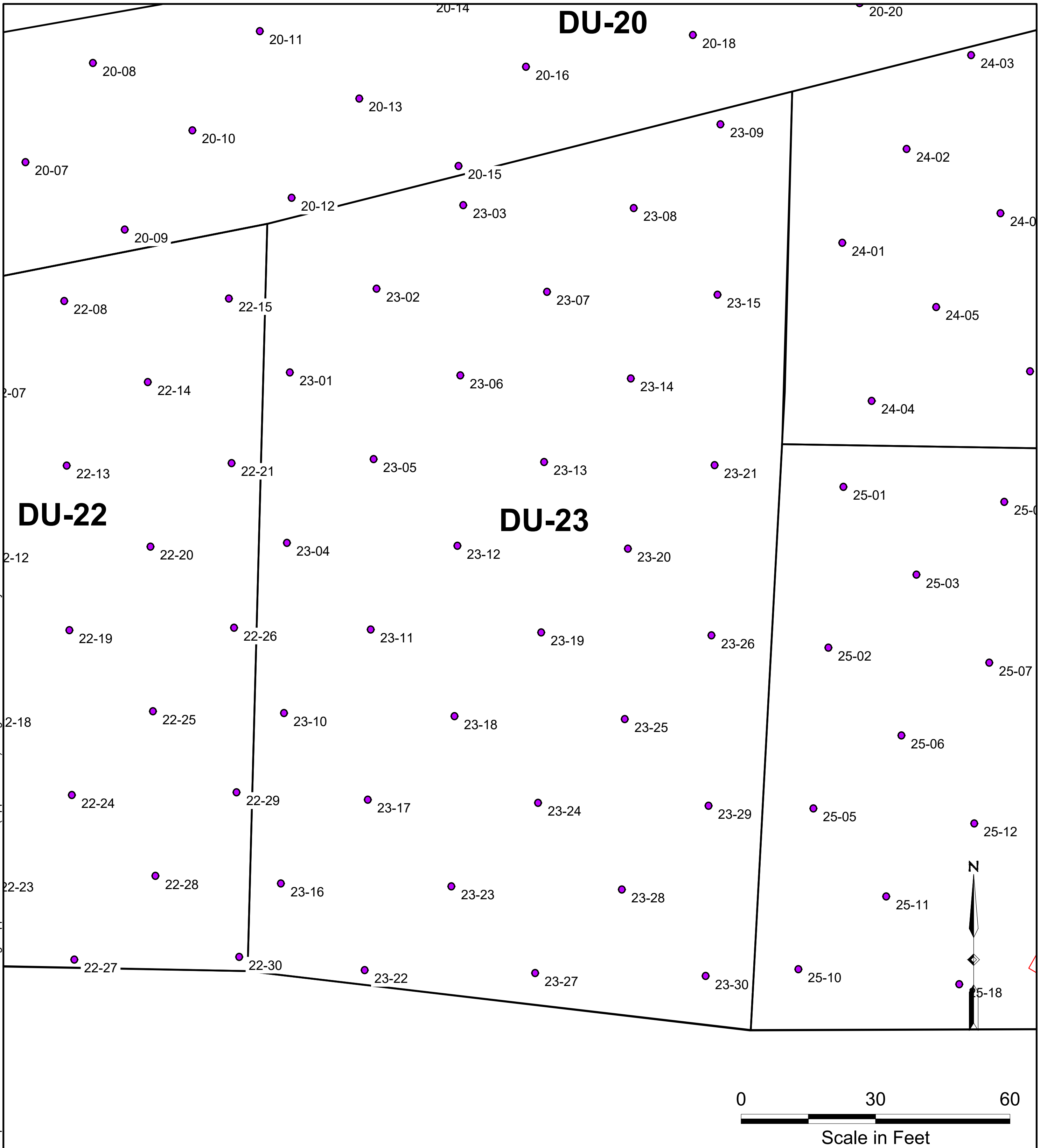
Increment Sample Location

Offset Sample Location

DU-22 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX — Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C22**
	July 2022			



Legend:

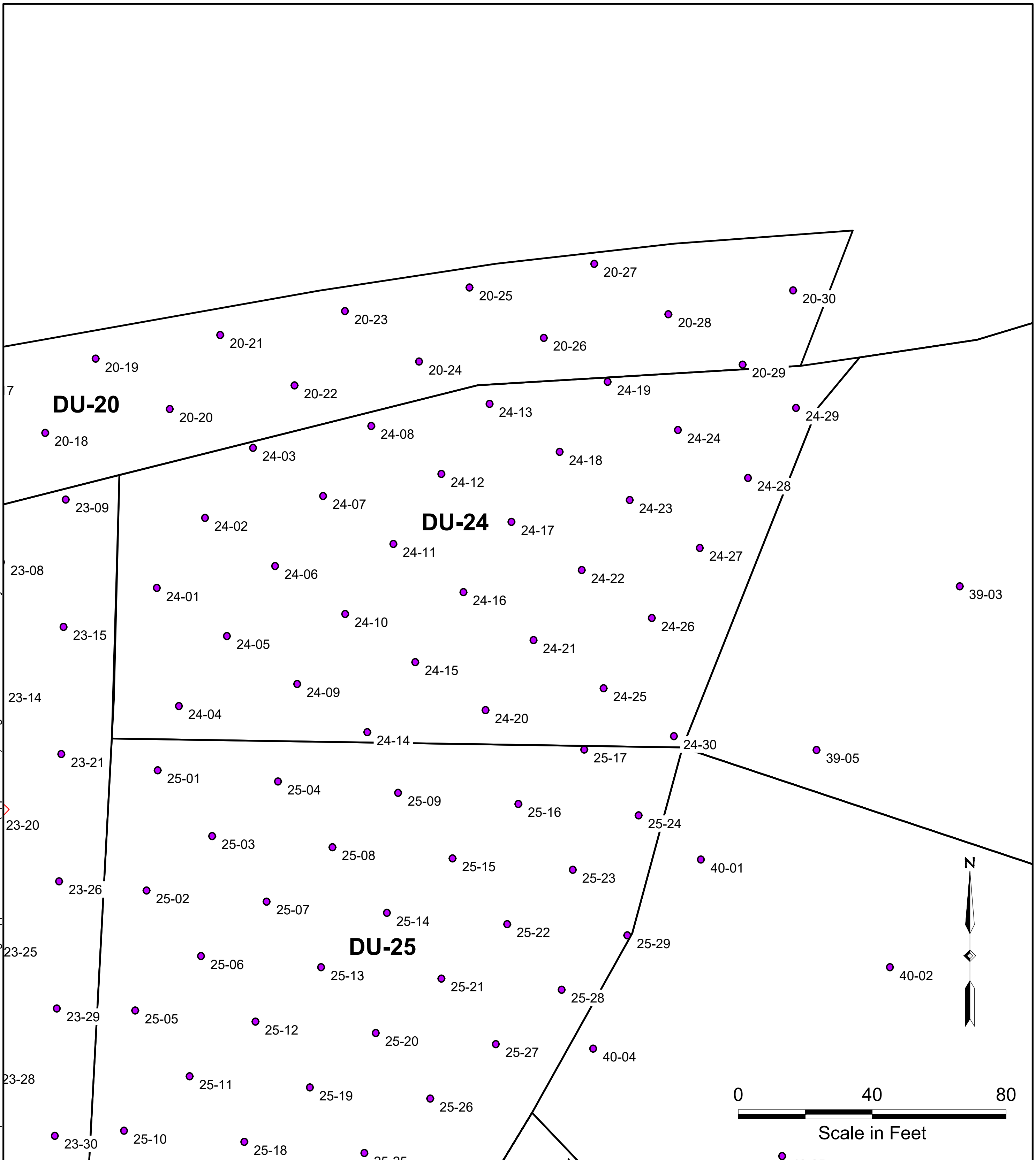
● Increment Sample Location

DU-23 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX — Apex Companies, LLC, 3015 SW First Avenue, Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix C23
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

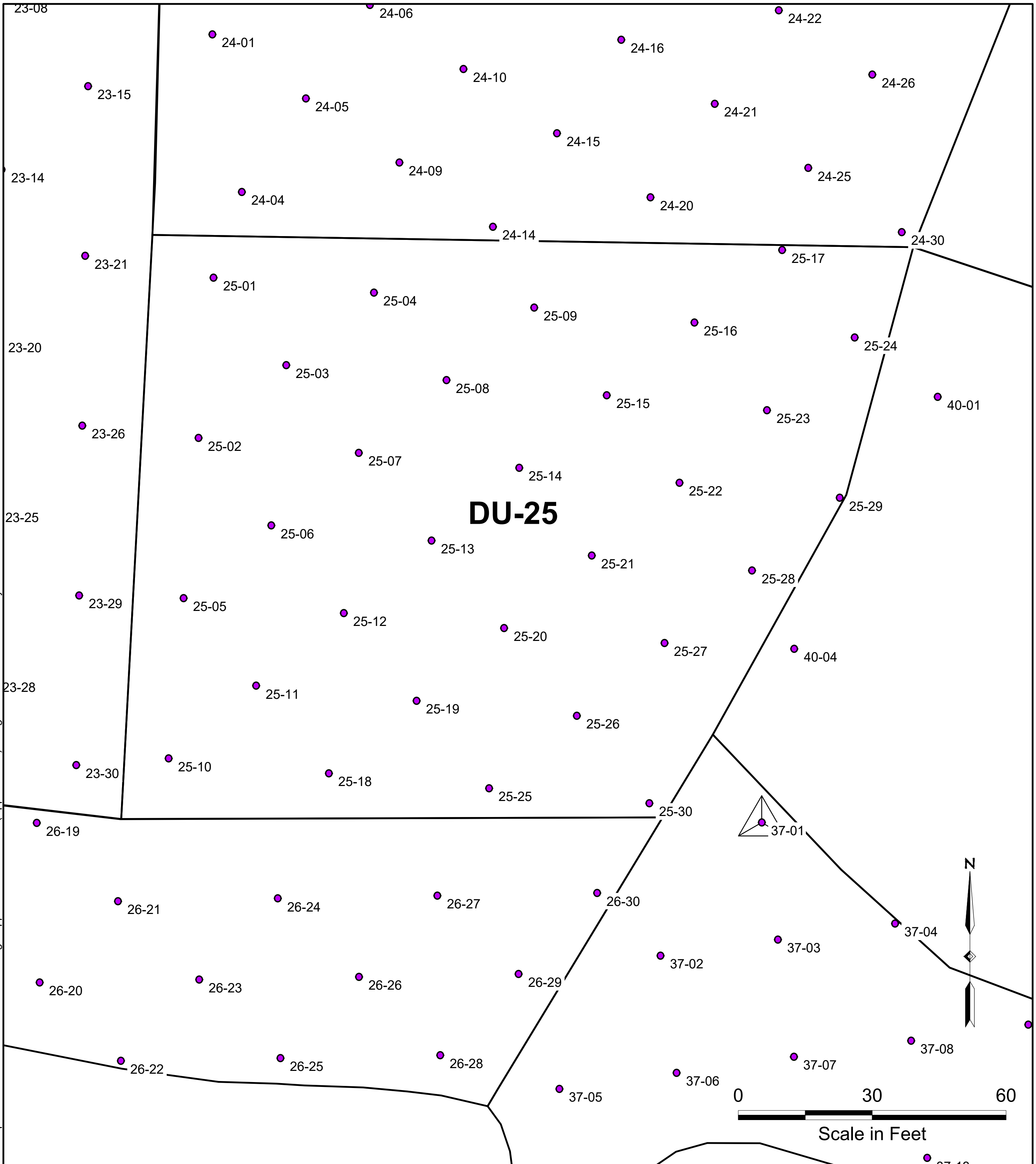
Increment Sample Location

DU-24 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix
	July 2022			C24

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

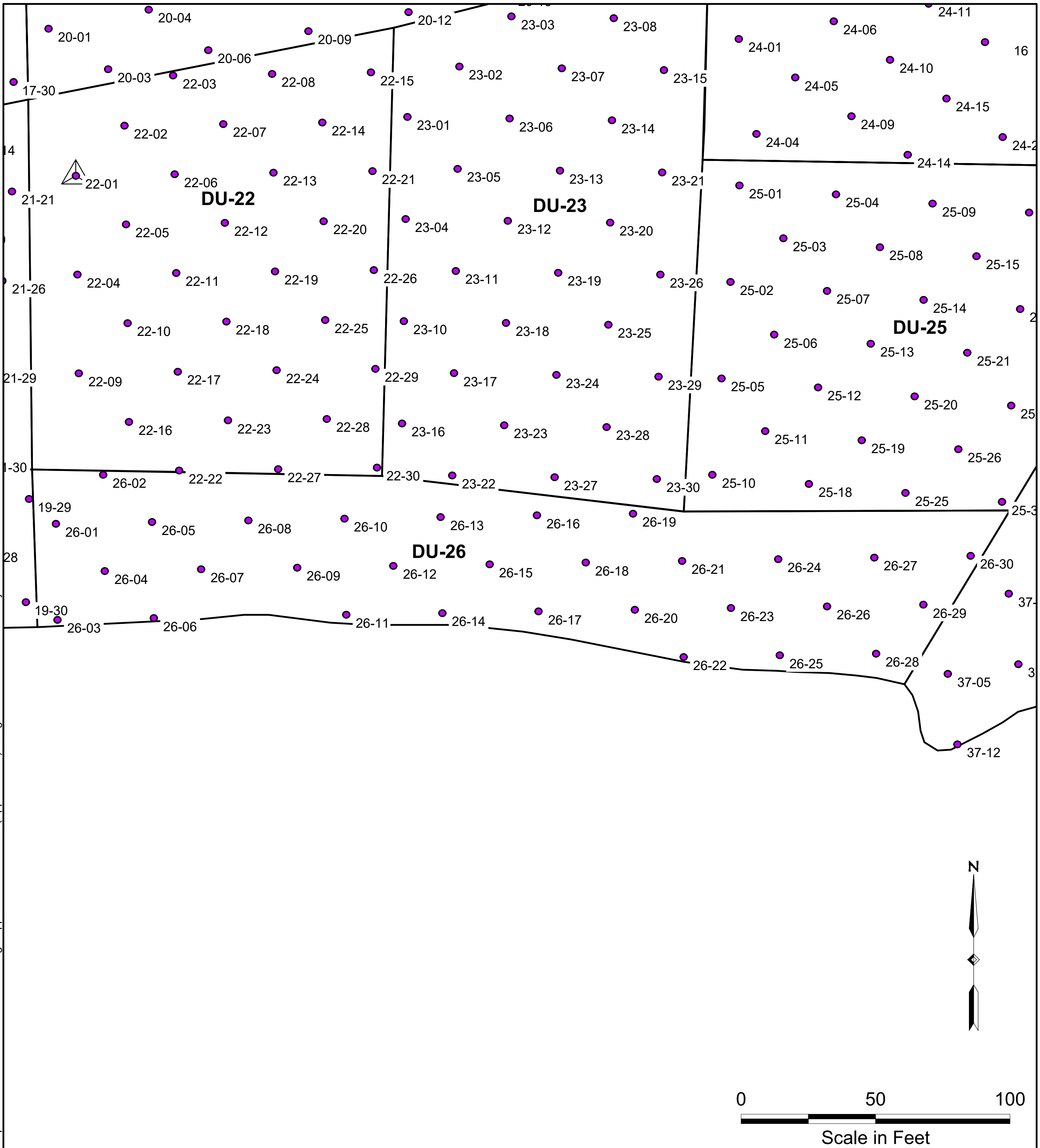
Increment Sample Location

DU-25 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix
	July 2022			C25

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



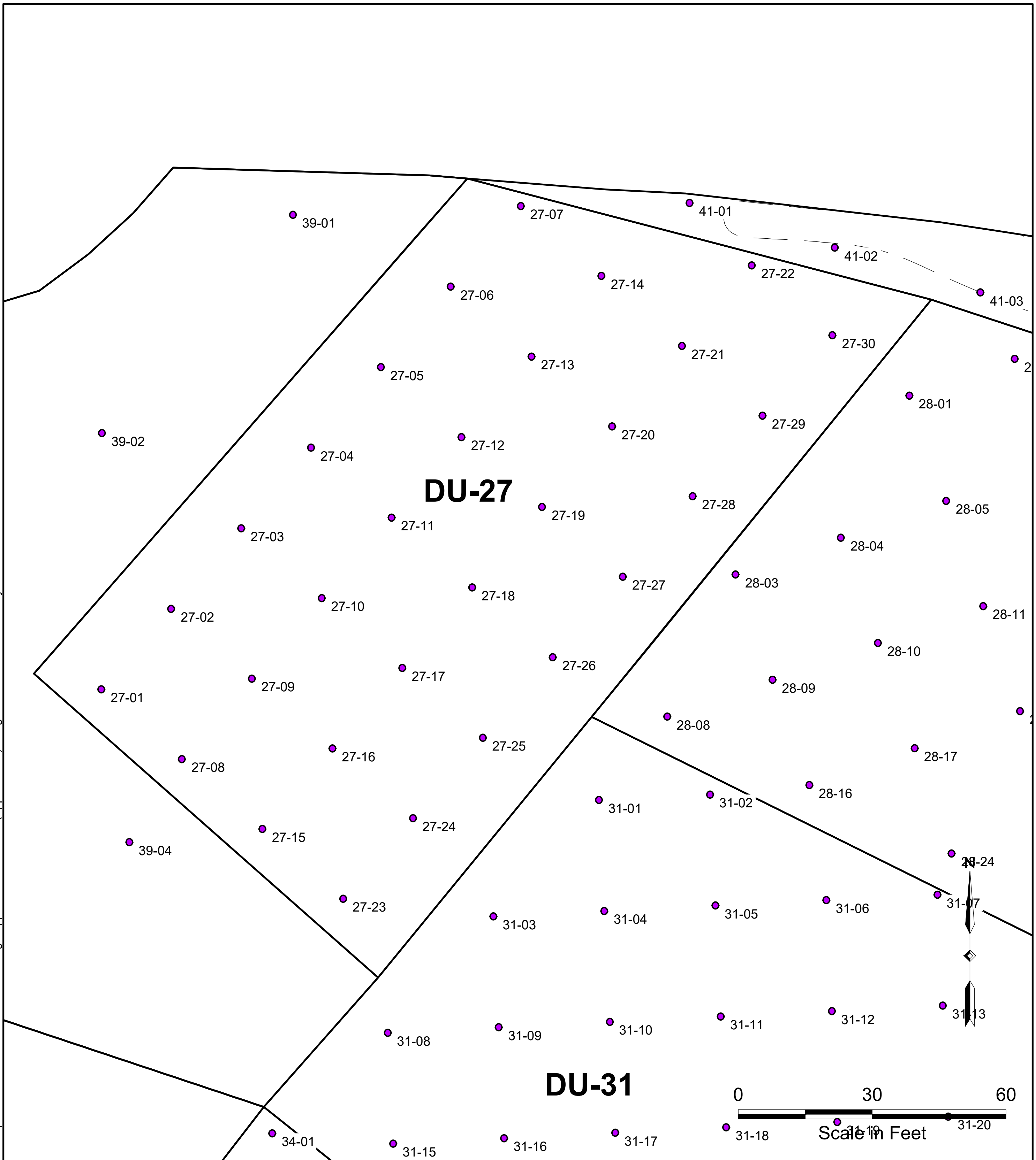
Legend:

Increment Sample Location

DU-26 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX — Apex Companies, LLC, 3015 SW First Avenue, Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix C26
	July 2022			



Legend:

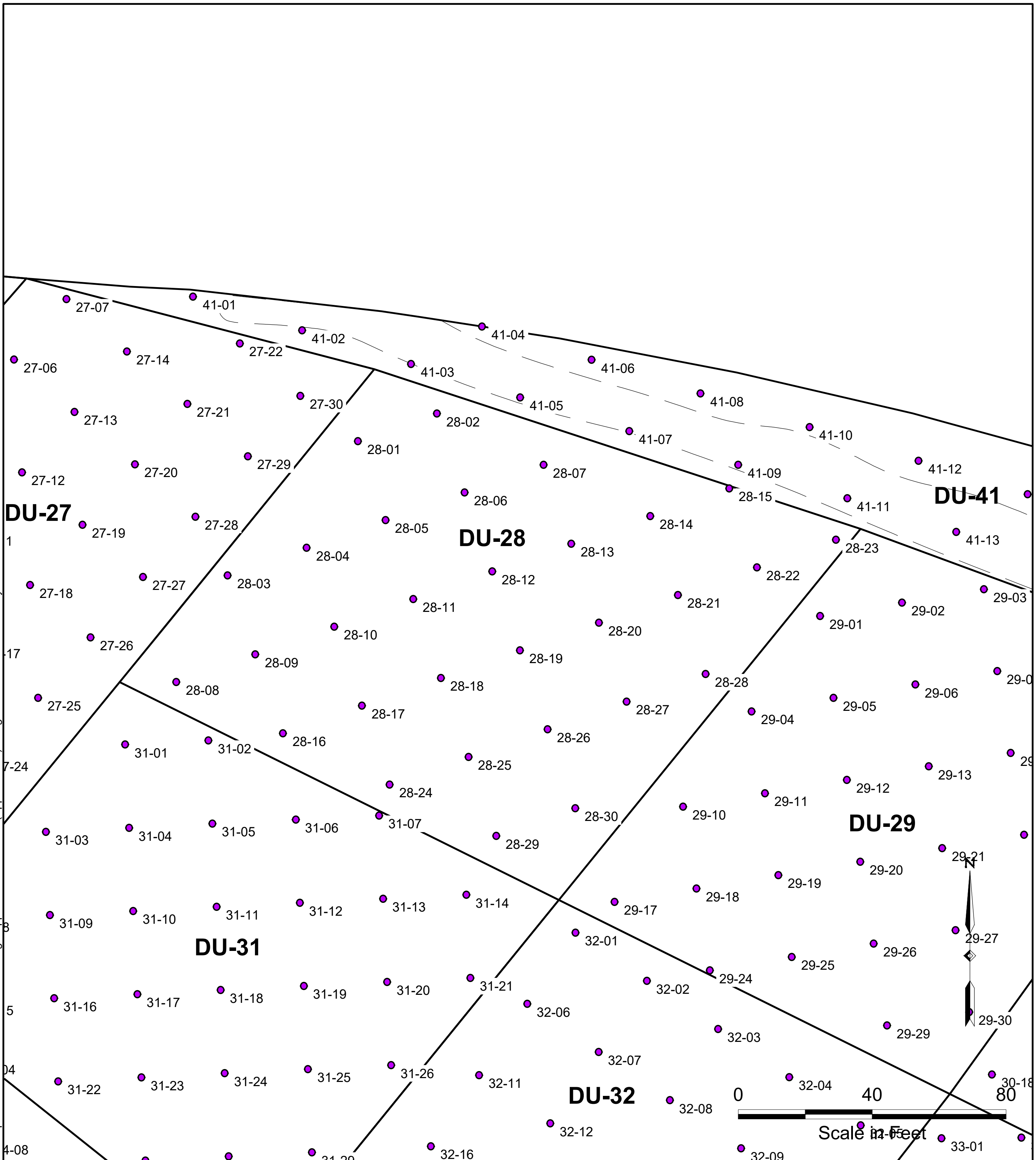
Increment Sample Location

DU-27 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix
	July 2022			C27

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

● Increment Sample Location

DU-28 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC
		July 2022		

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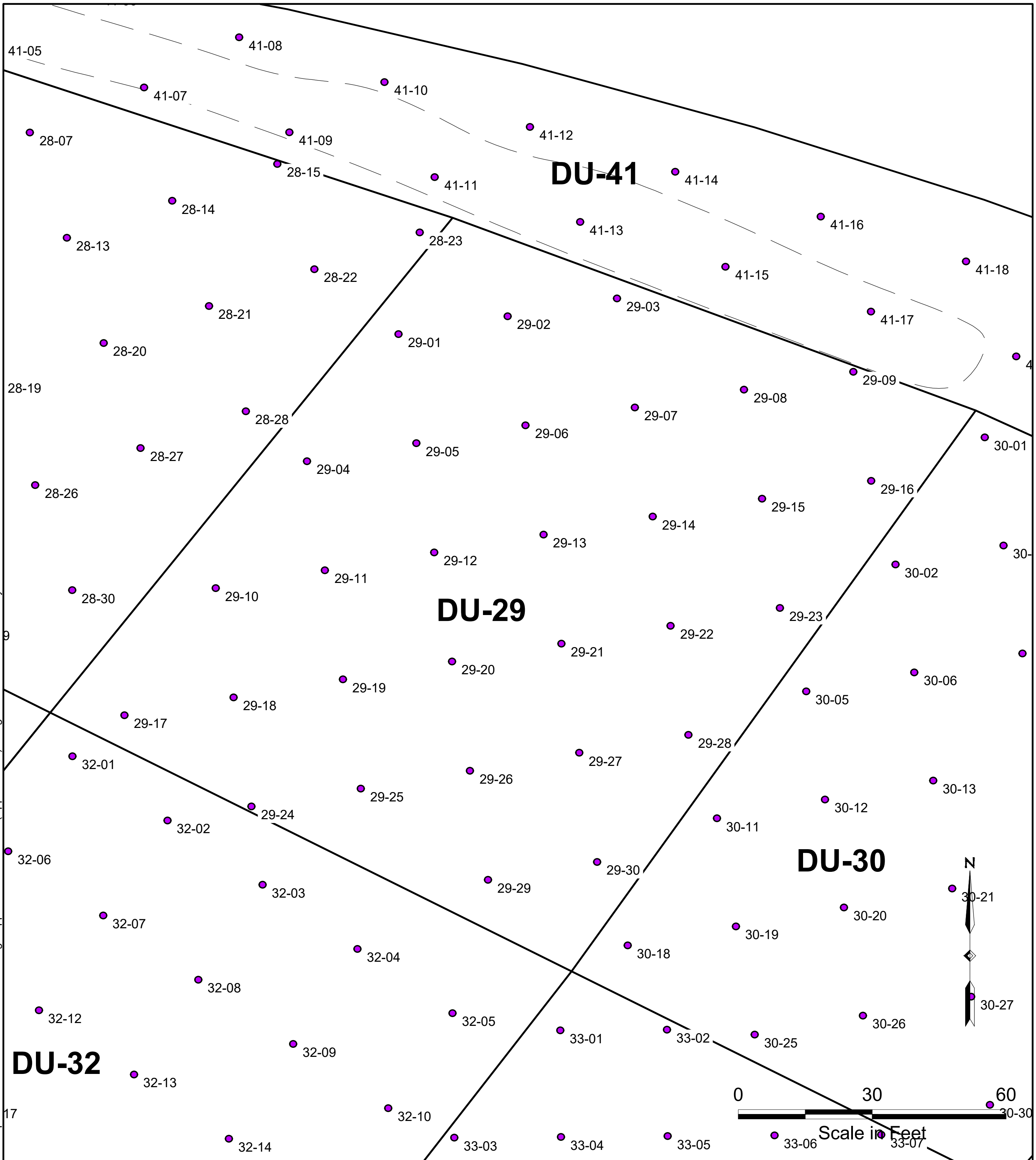
C28

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg   Modified 6/27/2022 by JPoore



Legend:

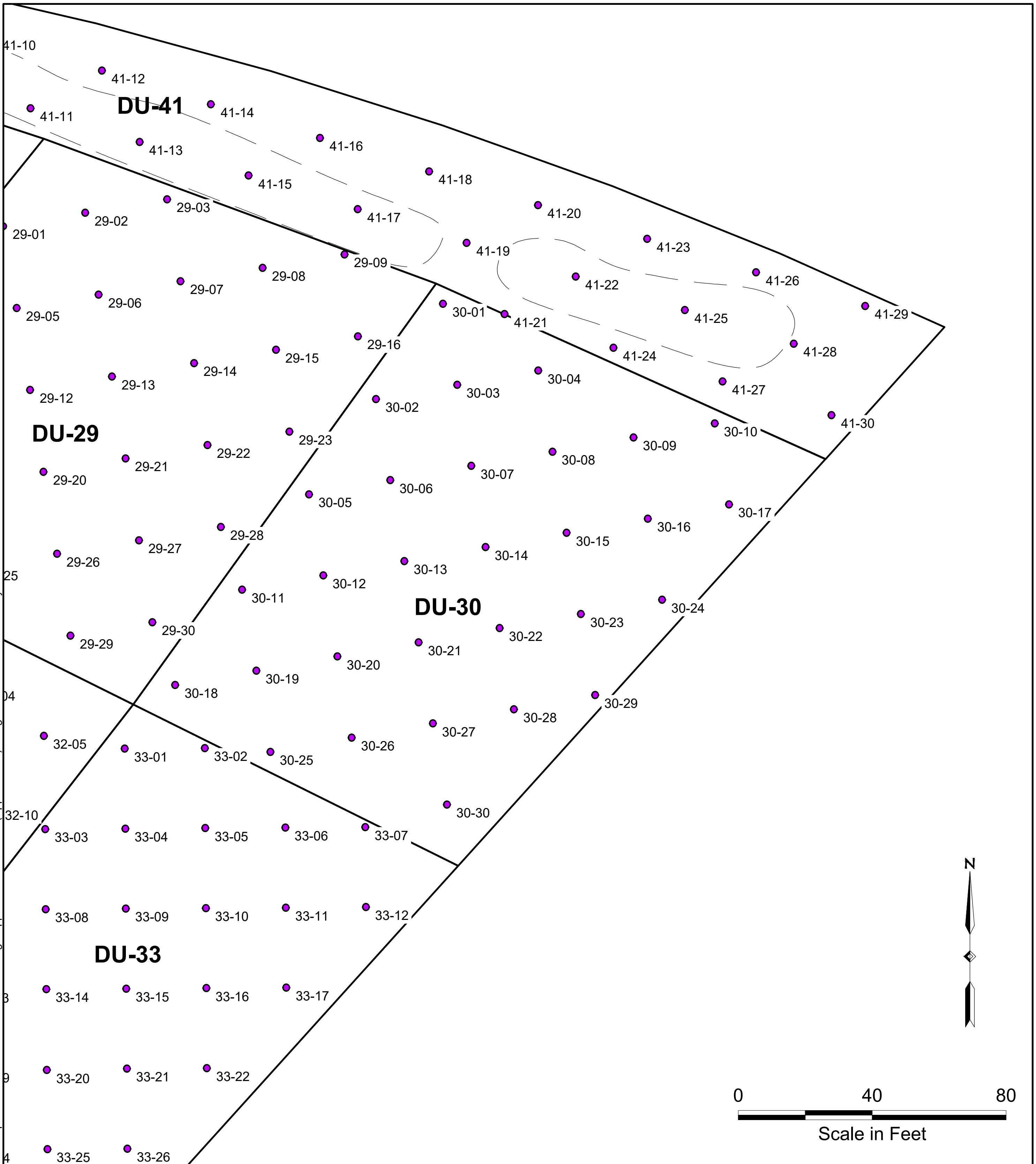
- Increment Sample Location

DU-29 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix C29
	July 2022			

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore



Legend:

Increment Sample Location

I:\Client\Port of Portland\00-PH905\05 WC\01 Repts and Wk Plans\26 Remedial Design\App. C\320001056-18 (App. C Grids)2.dwg Modified 6/27/2022 by JPoore

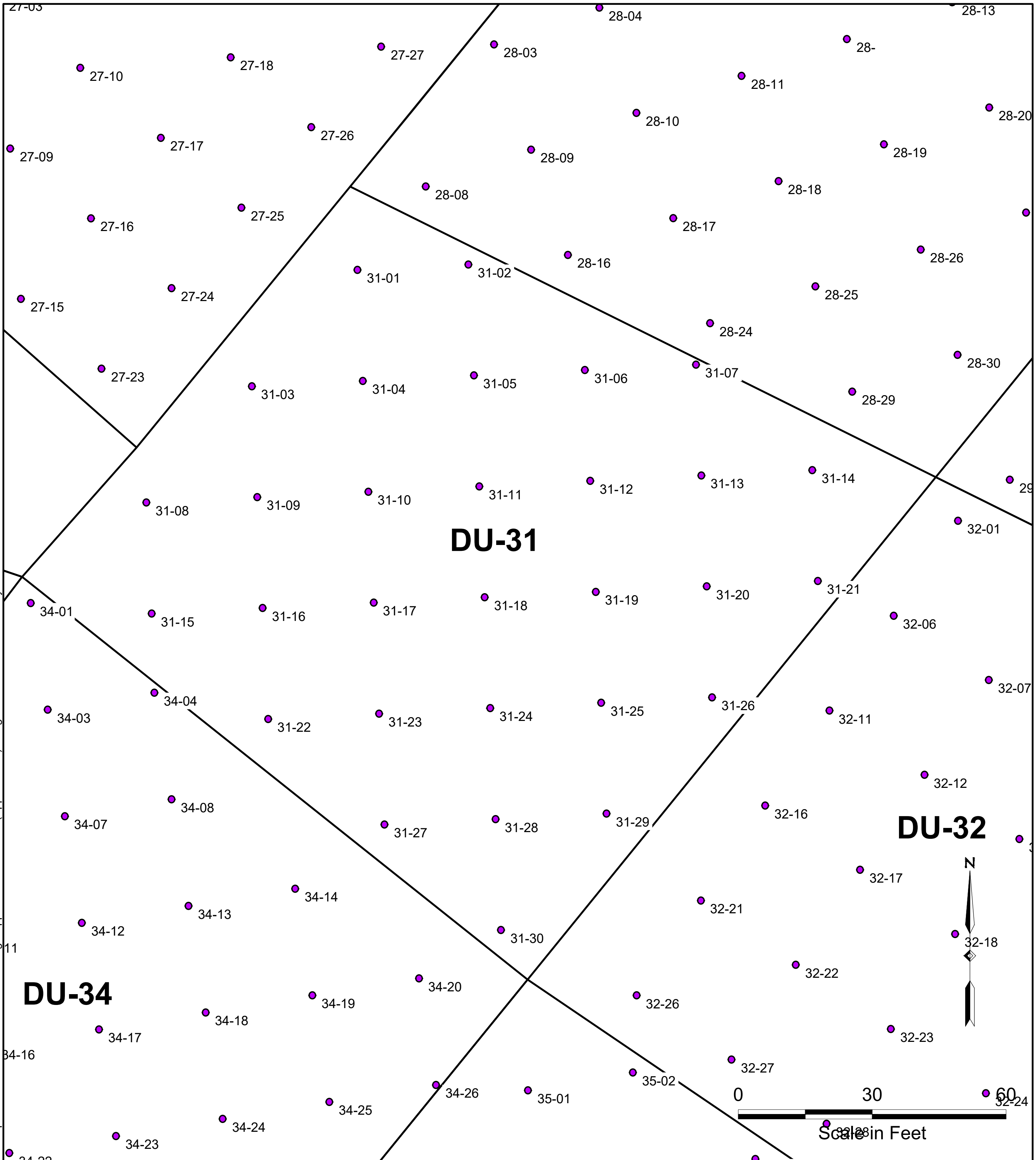
DU-30 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number:	Drawn:	Approved:	Appendix
320001056-18	JP	HC	C30
July 2022			



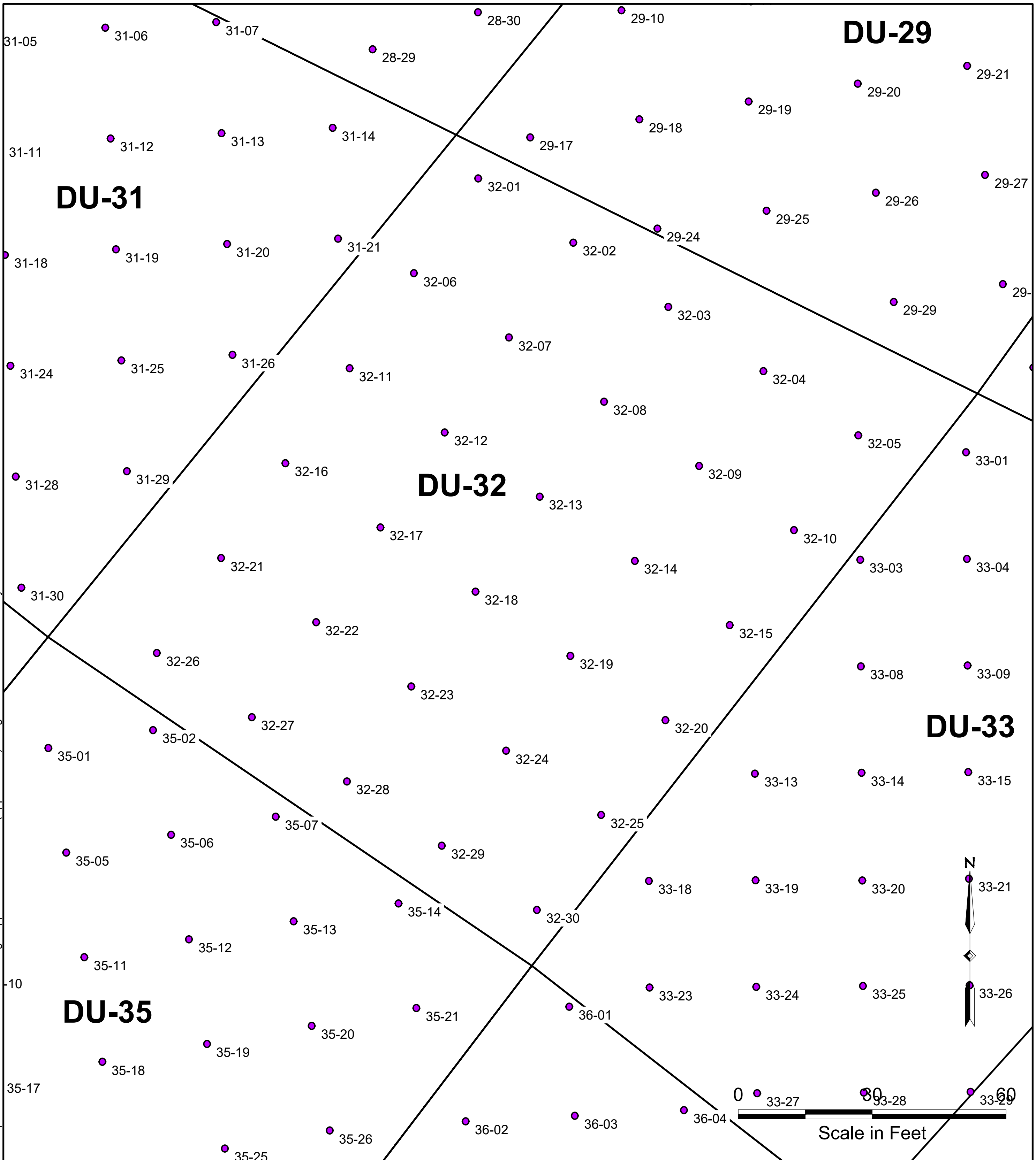
Legend:

- Increment Sample Location

DU-31 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix
	July 2022			C31



Legend:

● Increment Sample Location

DU-32 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX — Apex Companies, LLC, 3015 SW First Avenue, Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix
	July 2022			C32

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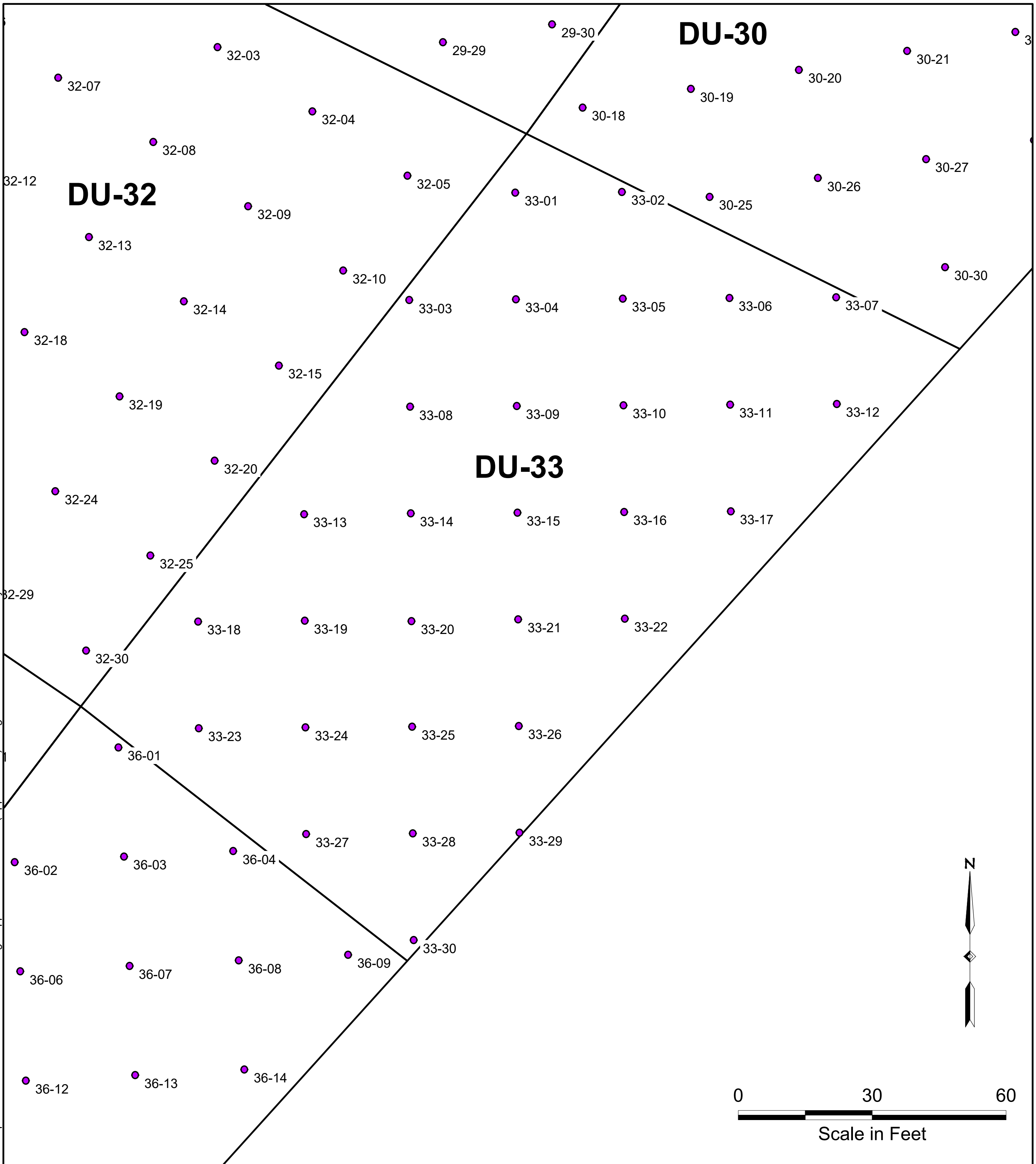


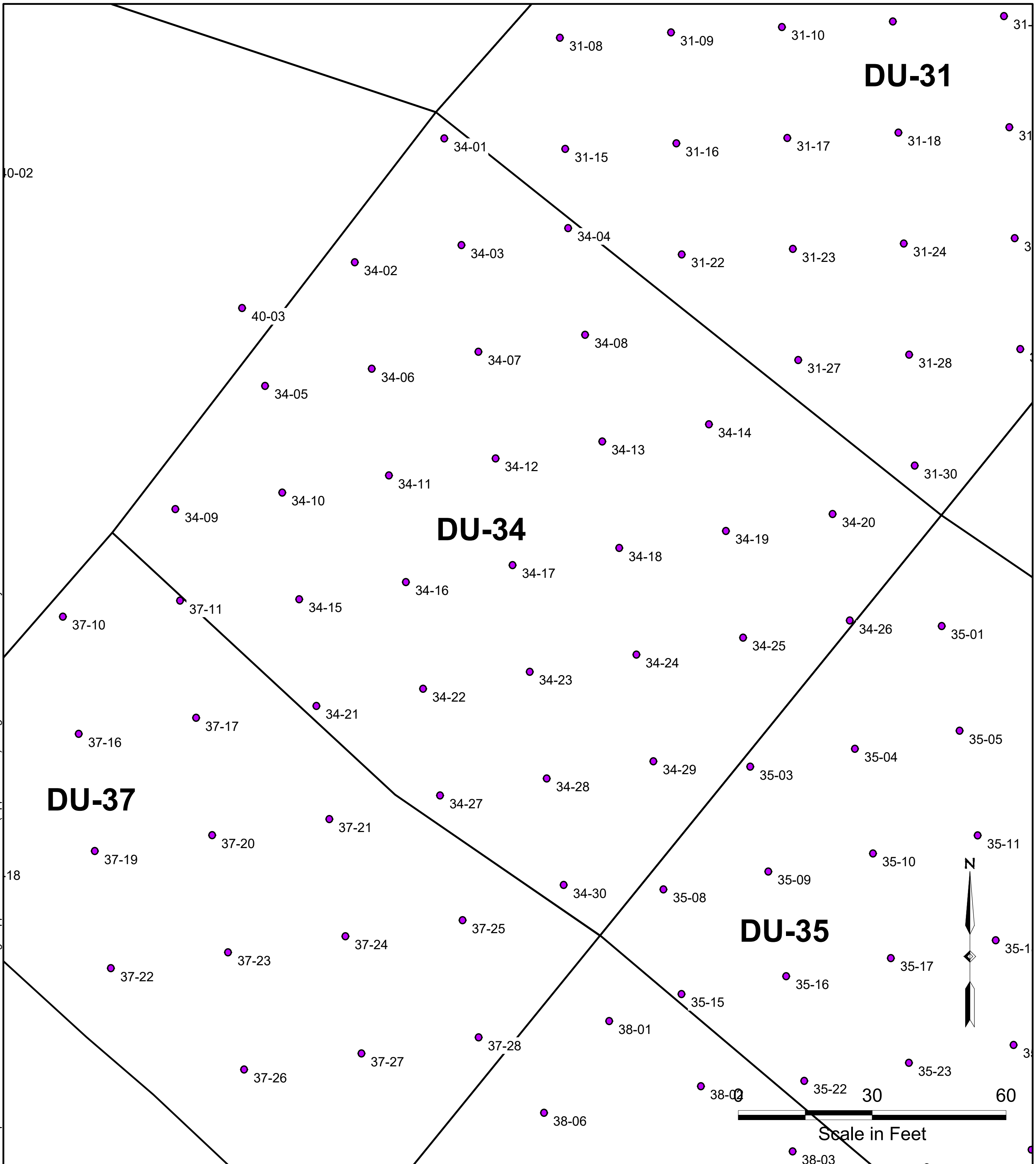
Legend:

Increment Sample Location

DU-33 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C33**
	July 2022			



Legend:

Increment Sample Location

DU-34 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX — Apex Companies, LLC, 3015 SW First Avenue, Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix
	July 2022			C34

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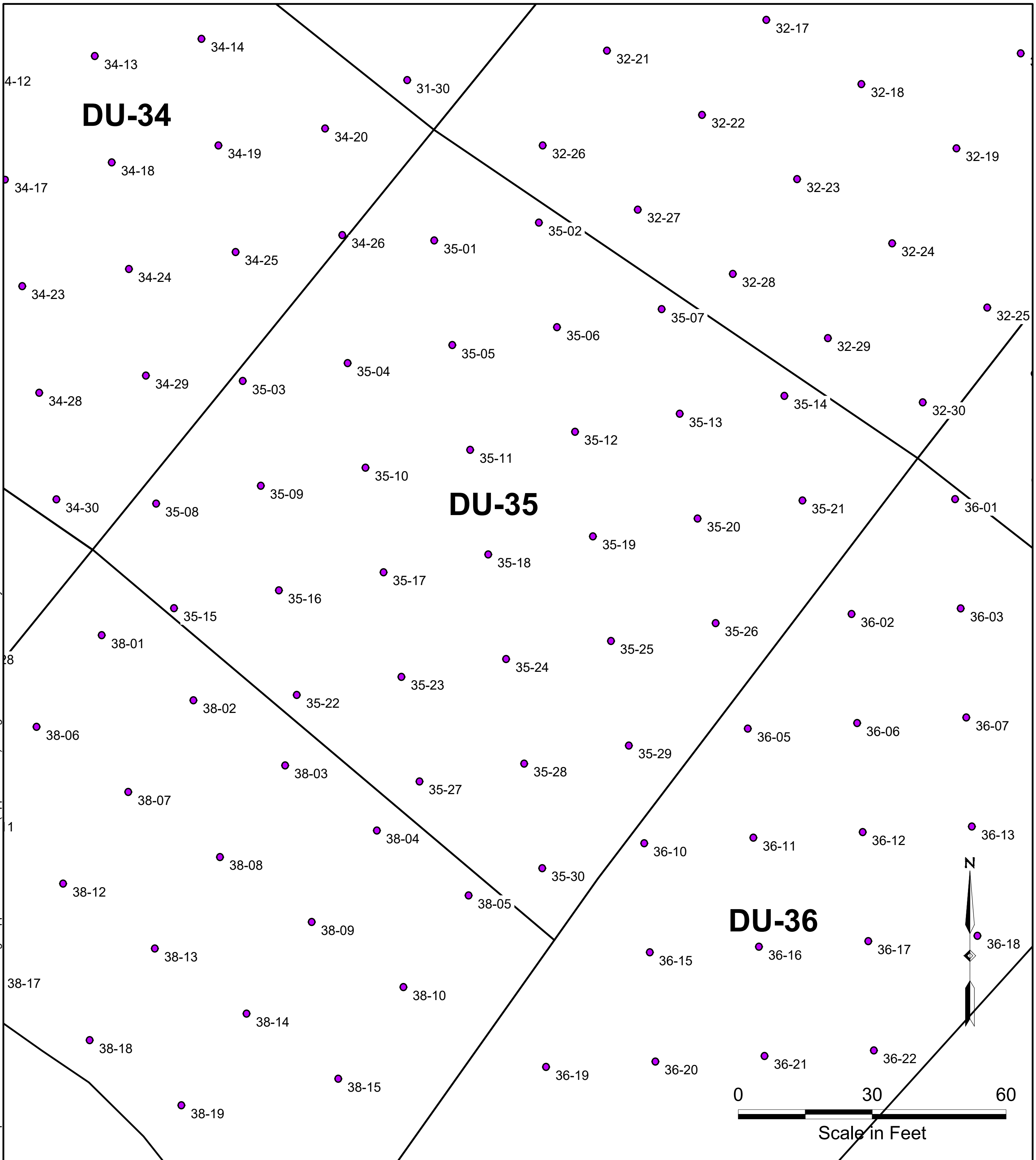

Legend:

● Increment Sample Location

DU-35 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX — Apex Companies, LLC, 3015 SW First Avenue, Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix C35
	July 2022			

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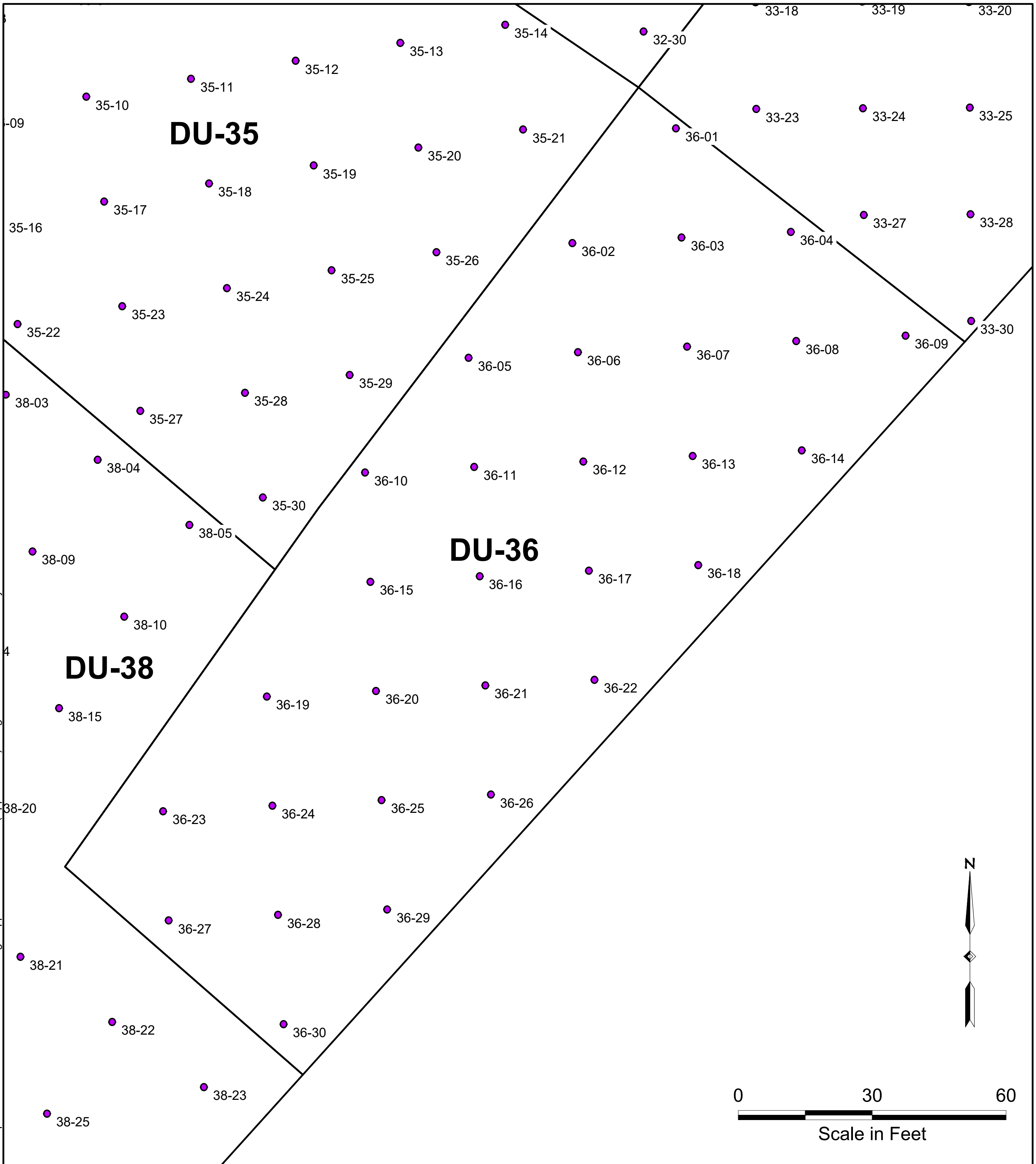

Legend:

Increment Sample Location

DU-36 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix C36
	July 2022			

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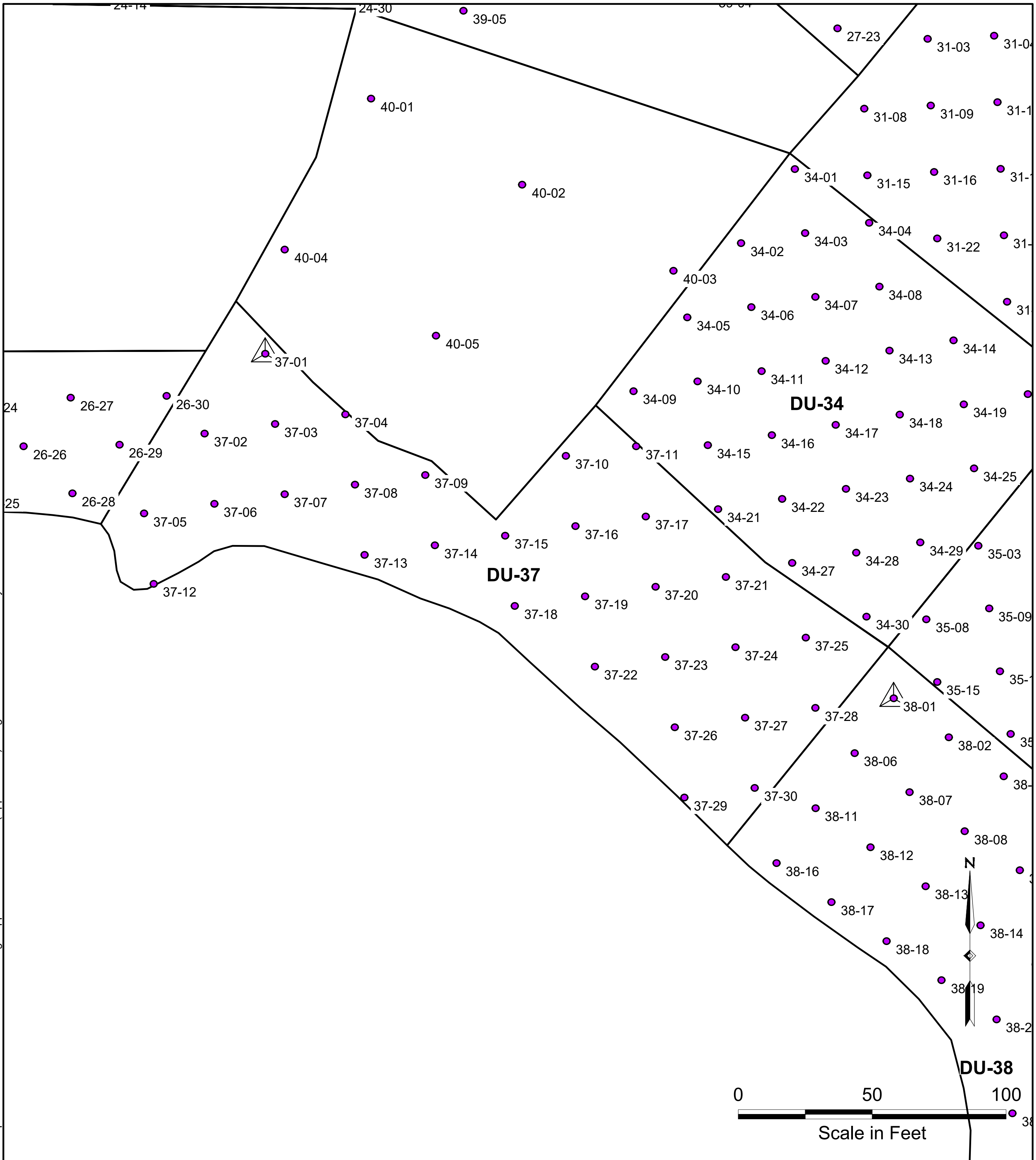

Legend:

- Increment Sample Location
- Offset Sample Location

DU-37 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix C37
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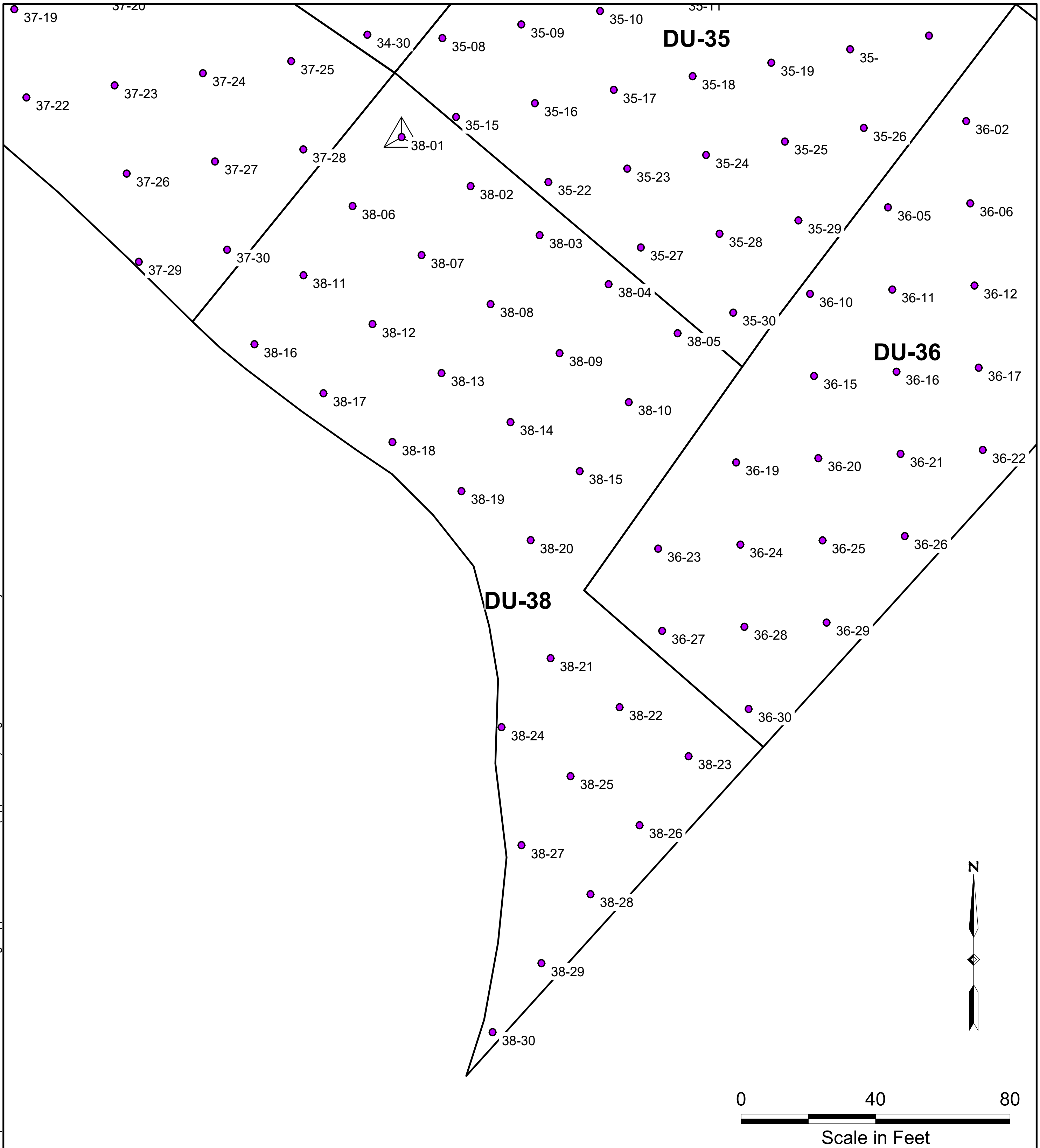

Legend:

Increment Sample Location

Offset Sample Location

DU-38 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC
		July 2022		Appendix **C38**

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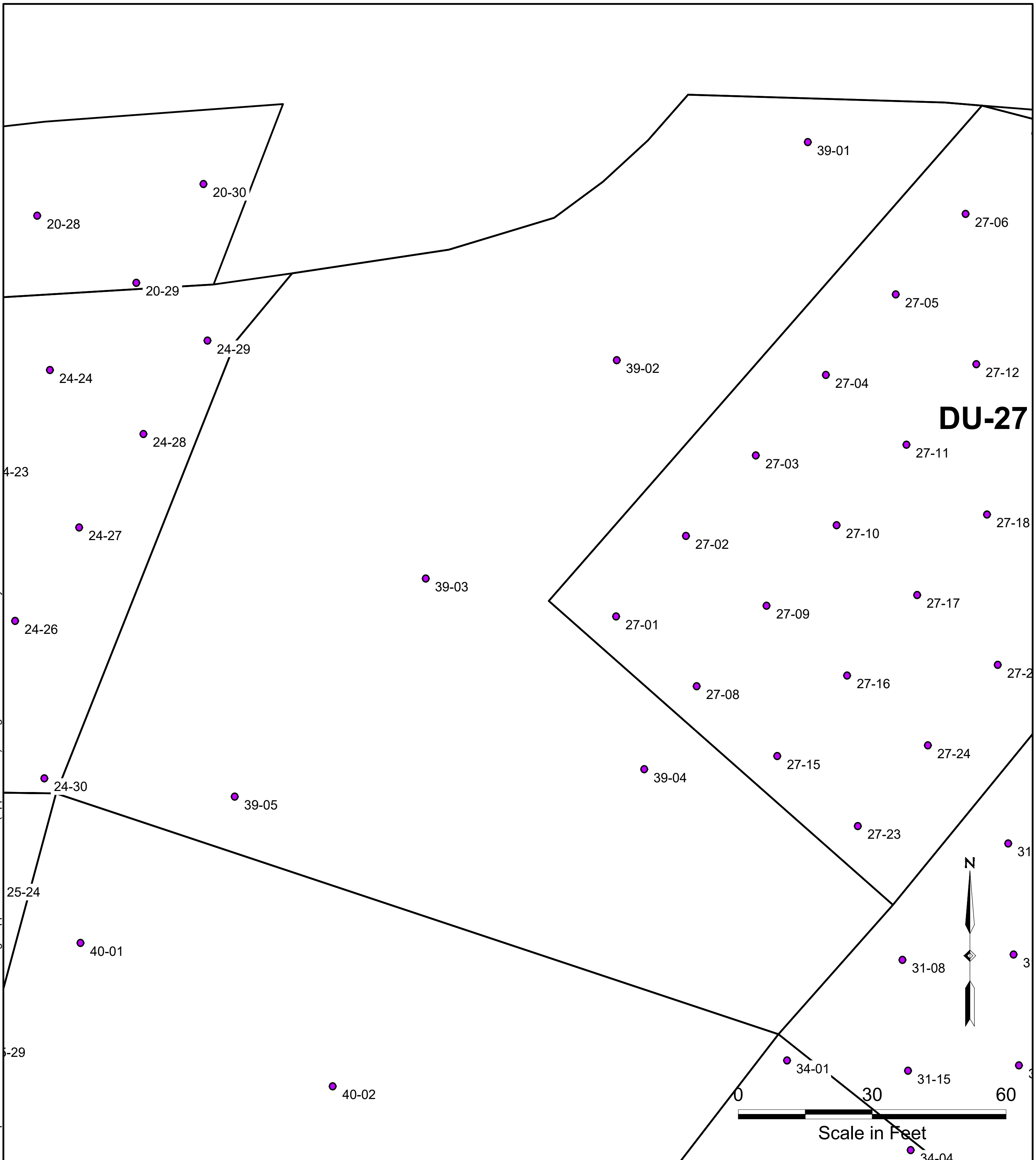

Legend:

Increment Sample Location

DU-39 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC
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C39

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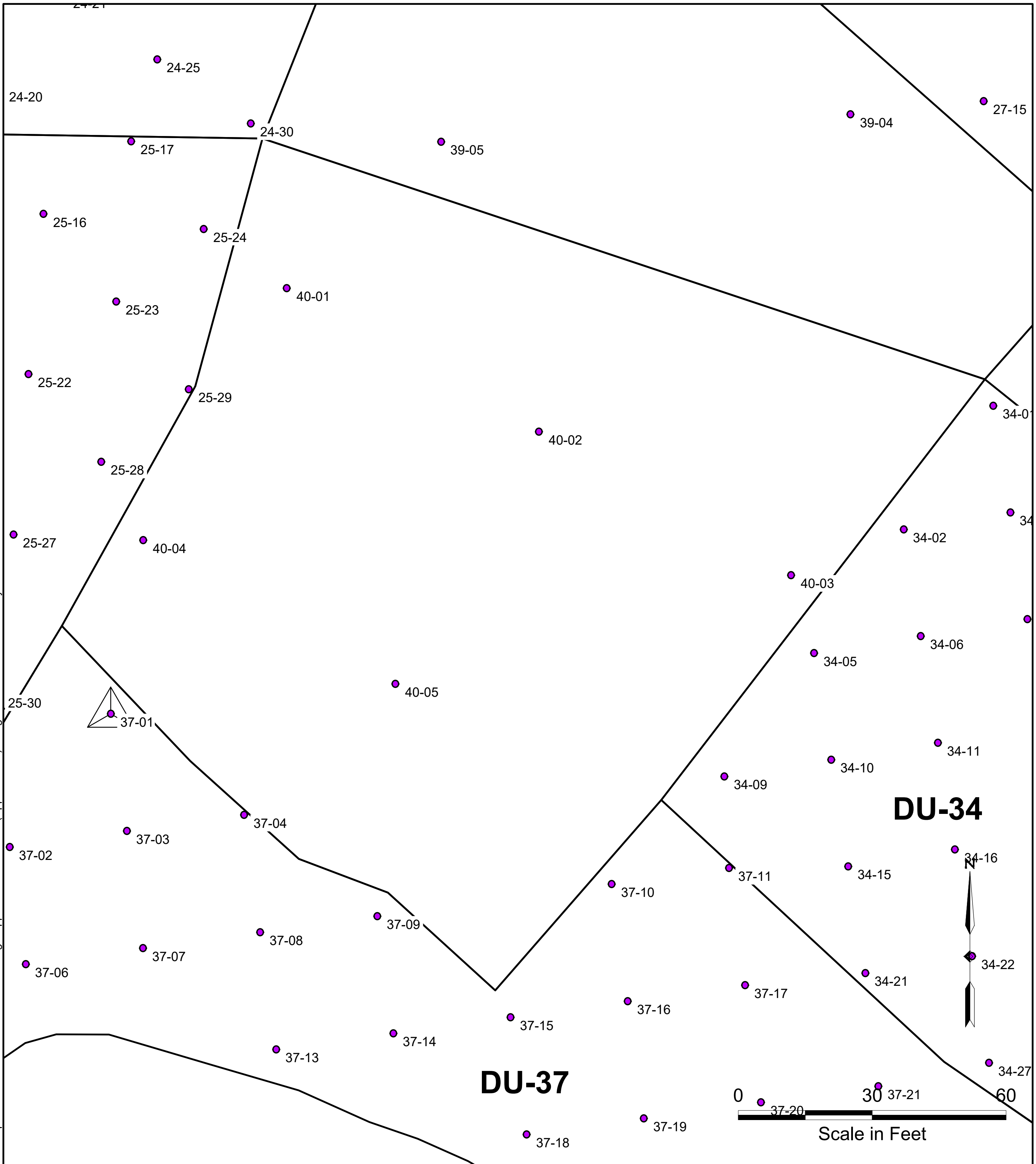

Legend:

Increment Sample Location

DU-40 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number: 320001056-18	Drawn: JP	Approved: HC	Appendix **C40**
	July 2022			

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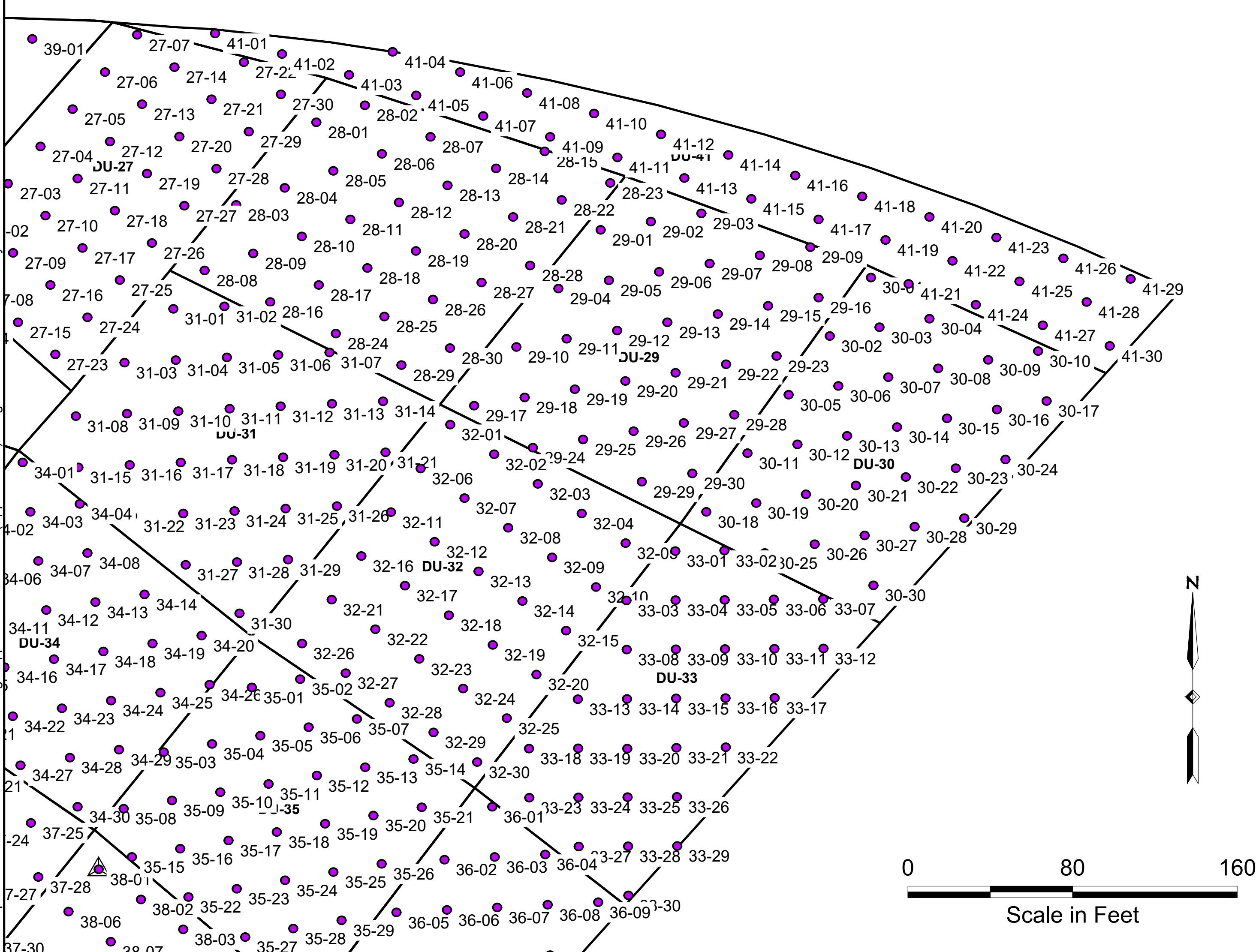

Legend:

Increment Sample Location

DU-41 Sampling Grid

Remedial Design Investigation
Willamette Cove Upland Facility
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number:	Drawn:	Approved:	Appendix
320001056-18	JP	HC	C41
July 2022			

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Appendix D

Health and Safety Plan

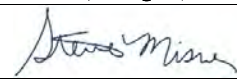
TABLE OF CONTENTS

Section 1.0 - Project information

Project Number	1056-18	
Site Number	Willamette Cove Upland Facility	
Site Owner/Representative: Port of Portland		Contact Information: Dwight Leisle
Site Address/Location: South end of North Edgewater Street, Portland, Oregon		
Starting Work Date: Spring 2022		Ending Work Date: Summer 2022
HASP Prepared By: Steve Misner and Heather Gosack		HASP Reviewed By: Steve Misner

Site Description: Willamette Cove Natural Area – Vacant, Vegetated
Site History: Former Industrial Site, Primarily Wood Products Manufacturing
Proposed Onsite Activities: Collect incremental sampling methods (ISM) soil samples from 35 pre-determined sampling units across the Site. Sampling will consist of collecting soil samples from depths 0-1 foot, 1-2 feet, and 2-3 feet below the ground surface (bgs) using a combination of mechanical equipment (mini-excavator and vacuum), and hand tools (shovel and hand auger).

Section 2.0 - EMERGENCY INFORMATION AND TELEPHONE NUMBERS

Ambulance Company or Public EMS	Portland Fire Department
Hospital/Emergency Room Name and Address	Legacy Emanuel Hospital 2801 N. Gantenbein Portland, Oregon, 97227
Signature from individual who verified Hospital Services	
Local Police Number	911
Local Fire Dept Number	911
Poison Control Center	1-800-222-1222
WorkCare	1-888-449-7787

2.1 Hospital Directions

See attached figure. Hospital is approximately a 17 minute drive southeast of the Site.

2.2 Emergency Procedures

The following standard emergency procedures will be used by onsite personnel. While onsite, the site health and safety coordinator shall be notified of any onsite emergency and shall be responsible for ensuring that the appropriate procedures are followed. If a medical emergency occurs, Apex field staff will call 911, WorkCare, and the Apex project manager. If another Site emergency is observed (such as fire, flood, etc.), field staff will evacuate the Site and call the Apex project manager (and 911, if necessary) once at a safe location.

2.3 Active Facility Emergency Action Plan

If the site is an active facility, Apex will follow established onsite evacuation procedures. Facility evacuation procedures have been reviewed (if applicable)

☐ Reviewed

☒ Not Applicable

Verification initials (by a person assigned to the project): HG

(No review means no work can be conducted)

The Site is inactive; therefore, it is the sole responsibility of Apex Management to have an evacuation procedure/plan in place and cover it daily during the Tailgate Safety Meetings.

In the event an emergency evacuation should take place Apex Management can use the daily Tailgate Safety Meeting for a headcount.

2.4 Air Release or Fire/Explosion

On notification of an air release or a fire/explosion, all personnel will travel in the upwind direction. The site health and safety officer will then account for all personnel and notify the proper emergency agencies. If the site health and safety officer is not available, the task manager or appropriate field personnel will assume these responsibilities.

In the event an emergency evacuation should take place Apex Management can use the daily Tailgate Safety Meeting for a headcount.

Section 3.0 - First Aid/CPR

ALL FIELD STAFF WORKING UNDER THIS HASP WILL HAVE THE FOLLOWING TRAINING BEFORE CONDUCTING FIELD ASSIGNMENTS	▪ First-aid/CPR

3.1 First Aid Kit Components:

At least 1 Apex employee on site must have a First Aid Kit	Minimum Contents: • 1 Absorbent compress, 32 square inches (sq. in.) (81.3 sq. centimeters [cm]) with no side smaller than 4 in. (10 cm) • 16 Adhesive bandages, 1 in. x 3 in. (2.5 cm x 7.5 cm) • 1 Adhesive tape, 5 yd. (457.2 cm) total • 10 Antiseptic, 0.5g (0.14 fluid ounce [fl oz.]) applications • 6 Burn treatment, 0.5 g (0.14 fl. oz.) applications • 4 Sterile pads, 3 in. x 3 in. (7.5 x 7.5 cm) • 1 Triangular bandage, 40 in. x 40 in. x 56 in. (101 cmx 101 cm x 142 cm)

3.2 Basic First Aid Procedures:

Skin Contact	Remove any contaminated clothing. Wash immediately with water for at least 15 minutes. If needed call 911
Inhalation	Remove from contaminated atmosphere. Call 911
Ingestion	Never induce vomiting on an unconscious person. Never induce vomiting when acids, alkalis, or petroleum products are suspected. Call 911

Section 4.0 - Personnel and Responsibility

Personnel	Responsibility
Herb Clough	Program Manager
Steve Misner	Project Manager
Steve Misner	Site Health and Safety Coordinator (SHSC)
Megan Masterson	Field Supervisor
To Be Determined	Field Staff
TBD	Field Staff
TBD	Field Staff
TBD	Field Staff

4.1 Personnel and Responsibility Roles

See Appendix A for full description of Personnel and Responsibility Roles.

4.2 Onsite Control

Tailgate safety meetings will be conducted at the start of each working day and recorded on the Daily Tailgate Safety Meeting form in Appendix B. Forecasted wind and weather conditions should be discussed during the Tailgate Safety Meeting.

All Apex employees are responsible for onsite control. During work activities, the following zones will be established:

Field staff will place cones and/or construction tape as needed to delineate the work zone. A 10-foot exclusion zone will be formed around subcontractors operating heavy equipment, if applicable. Apex will intercept any visitors and direct them away from the exclusion zone.

Decontamination procedures will generally be conducted near each sample unit, before moving to the next sample unit.

Generally, the support zone will be near the work vehicle. In addition, a job site trailer may be employed as part of the support zone.

The Site is secured, and Apex will be provided a key or code for the security gate. In addition, temporary fencing will be erected surrounding the job trailer.

Section 5.0 - Safety Training

ALL FIELD STAFF WORKING UNDER THIS HASP WILL HAVE THE FOLLOWING MINIMUM TRAINING BEFORE CONDUCTING FIELD ASSIGNMENTS:

- First-aid/CPR
- Hearing conservation
- PPE
- Utility clearance
- Recognition and Prevention of Slips Trips and Falls

Review and mark the following additional training required for the tasks included in this site-specific HASP.

Training	Req*	Rec*	NA*	Training	Req*	Rec*	NA*
40 Hour Hazwoper	☒	☐	☐	Lead Exposure	☐	☒	☐
Current 8 Hour Hazwoper	☒	☐	☐	Benzene Exposure	☐	☐	☒
24 Hour Hazwoper	☐	☐	☒	Hydrogen Sulfide Exposure	☐	☐	☐
10 Hour Construction	☐	☐	☒	Fall Protection	☐	☐	☒
Respiratory Protection	☐	☐	☒	LOTO/Electrical	☐	☐	☒
Confined Space Entry	☐	☐	☒	Hand/Power Tools	☒	☐	☐
Cold/Heat Stress	☒	☐	☐	Other	☐	☐	☒
Bloodborne Pathogens	☐	☒	☐	Other	☐	☐	☐

At no time will employees or Work Directed Subs (WDS) perform activities that they have not been properly trained to perform. It is the Hiring Managers responsibility to ensure that the appropriate training has been provided to new employees and WDSs prior to the start of their roles. It is the Project/Program/Field Manager's responsibility to ensure new hires and WDS are performing their job duties according to the training requirements.

Section 6.0 - Personal Protective Equipment (PPE)

The level of PPE selected for a task is based on the following:

- Administrative and engineering controls currently in place
- Potential physical hazards that may be encountered while completing the task
- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity
- Potential for exposure to substances in air, splashes of liquids, or other direct contact with material due to work being done
- Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgment until the hazards can be better identified.

PPE	Req*	Rec*	NA*	PPE	Req*	Rec*	NA*
Steel Toed Boots	☒	☐	☐	Work Gloves (mechanical/leather gloves)	☒	☐	☐
Safety Glasses	☒	☐	☐	Indirect Vented Goggles	☐	☐	☒
Face Shield	☐	☐	☒	Fire Resistant Clothing (FRC)	☐	☒	☒
Hard Hat	☒	☐	☐	Outer Chemical Resistant Gloves	☐	☐	☒
Hi Vis Vest/Shirt	☒	☐	☐	Chemical Resistant Suit	☐	☐	☒
Hearing Protection	☒	☐	☐	Tyvek Suit	☐	☐	☒
Respiratory Protection	☐	☐	☒	Poly-Coated Tyvek	☐	☐	☒
Work Gloves (Nitrile gloves)	☒	☐	☐	Fire Extinguisher	☒	☐	☐
Dust Mask	☐	☒	☐	Other: Tecnu skin cleanser, face mask, hand sanitizer	☒	☐	☐
Half-Face Respirator	☐	☐	☒	Long pants and long sleeves	☒	☐	☐
Full-Face Respirator	☐	☐	☒	Other	☐	☐	☒

6.1 PERSONAL PROTECTIVE EQUIPMENT PRECAUTIONS

The following work practices **<u>must be observed</u>** during Site activities:

- Avoid contact with debris of unknown origins.
- Wear appropriate personal protective equipment (PPE); gloves, ear plugs, disposable boot covers, Tyvek, etc., in specified areas and during specified tasks as defined in this HASP and the JSAs.
- Practice hazardous material avoidance - soil and liquid samples should be collected in such a manner as to minimize contact with the material.

- Exercise caution when handling sample bottles, as the lids may not be properly sealed.
- Chemicals of Concern can be listed on chart found in Appendix C*

6.2 Personal Protective Equipment Failure

If any worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his or her buddy shall immediately leave the exclusion zone. Reentry shall not be permitted until the equipment has been replaced or repaired.

6.3 Monitoring Requirements

Air monitoring is not required during the proposed Site activities, as field staff are not expected to encounter volatile dust or volatile chemicals. Potentially encountered materials in soil include petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), dioxins/furans, and polychlorinated biphenyls (PCBs) (see Appendix C).

6.4 Decontamination Procedures

In the event that an exposure/contamination should occur, follow the guidelines below. Level D contamination procedures will be used at the Site during the sampling event.

PPE	Detergent and water will be used as the decontamination solution unless otherwise specified. Decontamination procedures will include the following (describe onsite decon procedures for PPE and personnel; for example [e.g., boot wash]):
Equipment	Decontamination Procedures will be conducted in accordance with Apex's Standard Operating Procedures

Section 7.0 - Site Conditions/Additional Factors

Although this list is not all encompassing the purpose to help identify hazards present on the job site(s).

Slips, Trips, Falls☒	Cold Stress☐	Heat Stress ☒	Buried or Overhead Utilities ☒
Biological ☒	Organic/Inorganic Chemicals ☒	High Noise ☒	Aerial Lift ☐
Vehicular Traffic ☐	Respirable Particles☐	Excavations ☐	Construction ☐
Non-Ionizing Radiation☐	Security ☒	UTVs/Side by Sides☐	Chemical Mixing ☐
Work Over 6ft High☐	Hand/Portable Power Tools☒	Oxygen Deficiency ☐	Drone Operation ☐
Blasting Agents☐	Confined Space☐	Welding/Hot Work ☐	Other ☐
Lock Out Tag Out☐	Forklifts☐	Extreme Weather ☒	Other☐
Scaffolding ☐	Portable Ladders ☐	Construction Traffic ☐	Other☐

Due to the nature of the Site, Apex field staff may encounter poison oak or other poisonous plants at the Site. Workers can prevent contact with poisonous plants by taking the following steps:

- Wear long sleeves, long pants, boots, and gloves.
- Wash exposed clothing separately in hot water with detergent.
- Barrier skin creams, such as a lotion containing bentoquatum, may offer some protection before contact.
- Barrier creams should be washed off and reapplied twice a day.

- After use, clean tools with rubbing alcohol (isopropanol or isopropyl alcohol) or soap and lots of water. Urushiol can remain active on the surface of objects for up to 5 years.
- Wear disposable gloves during this process.

Workers who have come in contact with poisonous plants should:

- Immediately rinse skin with rubbing alcohol, specialized poison plant washes, degreasing soap (such as dishwashing soap or Technu) or detergent, and lots of water.
- Rinse frequently so that wash solutions do not dry on the skin and further spread the urushiol.
- Scrub under nails with a brush.

In addition, thick vegetation may have ticks. Workers will take precautions to prevent tick bite by wearing long sleeves and long pants, and using insect spray or cream. Workers may also consider wearing Tyvek if vegetation is thick, and/or taping sleeves and pants down around the wrists and ankles to prevent entry to the skin via clothing openings. Following fieldwork, all workers will inspect their person for ticks.

Potential for heat related illness will be of concern during the project. Workers can prevent heat related illness through the following measures:

- Drink plenty of fluids. Water and electrolyte containing beverages will be made available to all workers on site.
- Wear light colored clothing that is loose and lightweight.
- Monitor weather forecasts and adjust work schedule accordingly.
- Provide shade or climate-controlled rest area.
- Take frequent breaks.
- Use the buddy system.

Additional heat illness prevention information is provided in Appendix D.

Section 8.0 - Communication Procedures

All onsite personnel will practice constant communication with other Apex personnel, subcontractors, and facility personnel during active work. Generally, verbal and/or cellular telephone communication will be used while onsite. Additional communication devices such as air horns can be used in loud environments or when confined space entry is being conducted.

Under special circumstances it is permissible to use Special Communication Procedures (e.g., two-way radios for large sites with multiple workers).

Field staff will check in with the project manager daily by 11:00 and again by 16:00 (or before leaving the Site). If the project manager does not hear from field staff by the designated times, the project manager will call the field staff. In the case of no answer, project manager will consult with the Division Health and Safety Contact and may elect to travel to the Site.

8.1 Lone Working Communication Procedures

No lone working will be permitted at the Site due to the isolated nature of the Site and the potential to encounter persons experiencing homelessness at the Site. A minimum of two field staff is required at all times. Apex staff will not approach camps or singular living spaces of persons experiencing homelessness. This may mean re-locating a sample position or abandoning a sampling area. If a camp is prohibiting access to locations on the other side of the camp, Apex will attempt to find an alternative safe access route. If no other route is identified, Apex field staff will contact the project manager to discuss the situation. This may mean abandoning a sampling area.

8.2 Emergency Hand Signals

The following standard hand signals will be used in case injury or circumstance does not allow for verbal or other communication:

- Hand gripping throat = Out of air, can't breathe
- Grip partner's wrist or both hands around waist = Leave area immediately
- Hands on top of head = Need assistance
- Thumbs up = Ok, I'm all right, I understand
- Thumbs down = No, negative

Section 9.0 - Standard Operating Procedures

- Whenever possible, use the buddy system.
- Conduct a daily tailgate meeting before beginning site activities each day and record in field book
- Practice good work practice controls:
  - Never sit down or kneel in contaminated areas
  - Never lay equipment on the ground where contaminated groundwater or soil may be present
  - Avoid unnecessary contact with onsite contaminated objects.
- Do not eat, drink, or use tobacco products outside the designated support zone(s).
- Whenever possible, do not use contact lenses while onsite.
- Thoroughly wash hands and face before eating, drinking, etc.
- Keep copies of the HASP available in the support zone.
- In the event PPE is ripped or torn, stop work and remove and replace PPE as soon as possible.
- In the event of direct skin contact, immediately wash the affected area with soap and water.
- If contaminated media comes in contact with eyes flush with clean water for 15 minutes.
- Ensure that all subcontractors have their own site-specific HASP that is maintained onsite
- Report all accidents, injuries, and environmental releases to the project/program manager.

Specific Job Safety Analysis are included in Appendix E. In addition, Appendix E contains a letter from the Port regarding COVID-19 protocols.

Section 10.0 - Personal Injury in the Work/Exclusion Zone with Buddy System/Onsite Contractor

Only persons directly involved with the soil sampling work will be permitted to enter the Exclusion Zone.

If onsite personnel require emergency medical treatment, and the buddy system is used, the following steps will be taken:

- Evaluate the nature of the injury and obtain the onsite copy of this HASP
- Contact local emergency service
- Decontaminate to the extent possible before administration of first aid
- Stay with the injured person.

All work-related incidents must be reported. For all medical emergencies, call 911 or the local emergency number. For non-emergency incidents, you must:

- Give appropriate first aid care to the injured or ill individual and secure the scene.
- Immediately call WorkCare at (888) 449-7787 (available 24 hours/7 days per week) if the injured person is an Apex employee.
- Notify the Project Manager and/or SSO after calling WorkCare.
- Enter the safety incident into the Apex Incident Report and submit to incidents@apexcos.com within 24 hours.

In the event of an emergency that necessitates evacuation of the work task area or the entire site, the following procedures shall occur:

- The Apex site supervisor or Project Manager will contact all nearby personnel using the onsite communications system to advise of the emergency.
- Personnel will proceed along site roads to a safe distance upwind from the hazard source to a pre-determined assembly area.
- Call 911
- Personnel will remain in that area until the site supervisor or Project Manager or other authorized individual provides further instruction.

In the event of a severe spill or leak, site personnel will follow the procedures listed below:

- Evacuate the affected area and relocate personnel to an upwind, pre-determined assembly area.
- Inform the Apex site supervisor or Project Manager, an Apex office, and a site representative immediately.
- Locate the source of the spill or leak and stop the source if it is safe to do so until appropriately trained personnel are onsite to do so.
- Begin containment of spilled or leaked materials. If a spill is 1 gallon or less Apex employees can contain and clean up the spill. If spill is larger a contractor may be called in to conduct containment and clean up services. If a contractor is on site containment and clean-up is their responsibility. If there is no contractor on site it will be the responsibility of Apex management to call in a contractor to provide containment and clean up services.
- Notify appropriate local, state, and federal agencies after obtaining client consent to do so.

In the event of severe weather, site personnel will follow the procedures listed below:

- Site work shall not be conducted during severe weather, including high winds and lightning.
- In the event of severe weather, stop work, lower any equipment (drill rigs), and evacuate the affected area.
- Monitor internet or other sources for sever weather alerts before resuming work.

- In the event of lightning, outdoor work must be halted for a minimum of 30 minutes from the last lightening observation.
- Ensure cell phones have Alert Media install along with an additional weather app

Apex personnel will also follow the Employee Incident Intervention Procedures in Appendix F.

10.1 Personal Injury in the Work/Exclusion Zone

The following steps will be taken before beginning work each day:

- The following communication procedures MUST BE COMPLETED
- The employee MUST always keep a cellular telephone with them (before starting work, ensure that there is emergency service at a minimum)
- Inform an onsite contact (if they will be present throughout all active work activities) or senior member of Apex of your plans for the day and your expected active work schedule.

If an injury has occurred:

- Evaluate the injury and decide whether emergency services are required
- Contact emergency services, if necessary, with cell phone
- If emergency services are not necessary, attempt first aid alone or contact an onsite contact or Apex contact for assistance.
- Contact supervisor to determine need to contact WorkCare

Section 11.0 - Medical Surveillance

All employees, regardless of the exposure involved, are required to participate in the medical monitoring program established by Apex. OSHA regulations state that employees involved in certain activities that may expose them to hazardous materials at or above permissible exposure limits (PELs) or above the published exposure limit for greater than 30 days per year, or all employees who wear a respirator are required to participate in the monitoring program. The purposes of the medical monitoring program are to identify any illness or condition that might be aggravated by exposure to hazardous materials or work conditions; to certify that each employee can use negative-pressure respirators as required by OSHA and withstand heat or cold stress; to ensure that employees are able to physically perform their assigned tasks and to establish and maintain a medical record to monitor for abnormalities that may be related to work exposure that could increase injury risk for the employee. Apex's medical monitoring program includes the following:

- a baseline physical examination
- annual physical examination
- a medical determination of fitness for duty, including work restrictions after any injury or illness that may affect employee safety
- a review of potential exposures to determine the need for specific biological and medical monitoring

Section 12.0 - Certification and Signatures

All site personnel MUST sign this page to acknowledge the requirements of this HASP.

Signature	Date	Print Name	Title/Project Role

Appendix A – Personnel and Responsibility Roles

OSHA requires that a chain of command with lines of authority, responsibility, and communication is established for each project with a HASP. Therefore, APEX will establish a chain of command that ensures that all site operations will be conducted safely.

Project/Task Manager: (also referred to as the General Supervisor). This person is the project director who is ultimately responsible for the overall implementation of the project. This individual is responsible for the proper implementation of the comprehensive work plan. In all cases, the project director will ensure that the site work is staffed appropriately to safely and effectively implement the work plan. They will also ensure that company funds are available for the site project/task manager to provide appropriate personal protective equipment (PPE) and monitoring equipment to safely implement this HASP. The Site project/task manager will be responsible for the safe and proper implementation of the work plan. They will have the authority to expend company resources to ensure that PPE and other safety equipment are available and in good working order. They will communicate with the Program Manager regarding implementation of the work plan

Site Health and Safety Coordinator: (SHSC) has the responsibility and authority to implement the site HASP and verify compliance with the plan. Additionally, other personnel that are needed to conduct the proposed work will be assigned. The site health and safety coordinator (SHSC) is responsible for the implementation of this HASP. The SHSC will communicate any issues with changing site conditions, upgrades in PPE, decontamination procedures and needs for monitoring equipment with the site project/task manager. The SHSC will ensure that other workers assigned to the project are following the HASP. It is expected that all other employees assigned to the project will follow the HASP and report any and all potential safety concerns to the SHSC.

Visitors: **Authorized visitors** (e.g., client representatives, regulators, management or subcontractor management staff, etc.) requiring entry to any work location on the site will be briefed by the PM on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these requirements at all times. **Unauthorized visitors, and visitors not meeting the specified qualifications or not wearing the PPE outlined in the HASP, will not be permitted within established controlled work areas.**

Example of Authorized vs Unauthorized Worker:

Unauthorized Worker has completed OSHA 24 Hour Training which allows them to be on site conducting tasks that will not allow them to come directly in contact with hazardous materials.

Authorized Worker has completed the OSHA 40 Hour Training requirement which allows them to be on site conducting tasks where they may come in direct contact with hazardous materials.

Some site examples where this type of work may take place can be abandoned such as Superfund sites OR they could be at an existing facility where they fall under a RCRA Corrective Action.

Appendix B – Daily Tailgate Form

APEX

DAILY TAILGATE MEETING FORM

Instructions: *Field completion of a tailgate meeting form is required daily prior to starting ANY field activities. All field personnel, including work-directed subs and subcontractors, involved in the day's activities must be present for the meeting or presented with the information discussed in the meeting. Keep forms with the project files.*

DATE:	**TIME:**	**PROJECT NO:**	**CLIENT:**
PROJECT SITE:		**MEETING CONDUCTED BY:**	**SIGNATURE:**
LIST ALL PROJECT TASKS IN BOXES BELOW:			
1.		3.	5.
2.		4.	6.

SUPPLIES AND MATERIALS NEEDED FOR PROJECT – ADD SPECIFICS		**EQUIPMENT NEEDED FOR PROJECT – ADD SPECIFICS**	
☐ Fuel:	☐ Contech Filter:	☐ Chain saw:	☐ String trimmer
☐ Cones:	☐ Catch Basin Box:	☐ Ride-on mower:	☐ Lid/Cover puller:
☐ Barricade:	☐ Other:	☐ Stand-on mower:	☐ Other:
☐ Fall Protection:	☐ Other:	☐ Slope mower:	☒ Other:

Apex Companies COVID-19 AHA Notice

- If you are sick, you must stay home. Avoid close contact with people who are sick. If you were in contact with a confirmed or suspected COVID-19 individual, you must immediately report it to your supervisor.
- If you become ill while on the jobsite, you will immediately contact your supervisor who will then notify the project supervisor. The employee will also immediately provide any potential staff and equipment exposures to his supervisor.
- Frequently wash your hands with soap and water for at least 20 seconds. When soap and running water are unavailable, use an alcohol-based hand rub with at least 60% alcohol. Always wash hands that are visibly soiled.
- Ensure that you have, hand sanitizer, soap/water, wipes, etc, so it will available onsite where the hand washing stations are not present.
- Wear nitrile gloves when operating any equipment and wipe down equipment with sanitizing towels at the beginning and end of every shift. This includes hand tools, power tools, etc. The key is to avoid multiple use of the single hand tool by others when it hasn't been cleaned first.
- Use proper hygiene practices: keep your hands clean, do not touch your face, and if you must use your cell phone, two-way radio or other devices, please sanitize and sterilize them as frequently as possible. Avoid touching your eyes, nose, or mouth with unwashed hands.
- Personnel in job trailers will be restricted.
- JSAs and Stretch and Flex exercises will be conducted outside.
- No handshaking. Please avoid any personal contact and be aware of the 6-foot separation rule.
- Food preparation will require extra cleaning and sanitizing of surfaces and appliances.

If you need anything or have any questions, don't hesitate to reach out to me, John Strecker, at (703)-898-0825.

MANDATORY SAFETY TOPICS – ALL PROJECTS	**SWPs / PERMITS / PLANS REQUIRED**		**DAILY WEATHER CONDITIONS**
☐ Emergency Contacts & Procedures (muster points)	☐ JSA Review		☐ Current temperature: __ °F
☐ GOAL – Get Out And Look	☐ HASP Review		☐ Forecast high temperature:__ °F
☐ Stop Work Authority	☐ Site-specific PPE	☐ NA	☐ Heat Index/Feels like high:__ °F
☐ 4Sigtht 4Safety	☐ Manual lifting plan	☐ NA	☐ Relative humidity:__ %
☐ Incident Intervention Procedures (WorkCare)	☐ Housekeeping	☐ NA	☐ Forecast Precipitation/Storms: ____________

☐ First Aid Kit & Eye Wash / Station Location
☐ Heat/cold stress
☐ Fire Extinguisher Location
☐ Safety Data Sheets (SDSs) and chemical hazards
☐ Minimum PPE (safety boots, safety glasses)
☐ Medical & Training Requirements
	☐ Noise
	☐ Utility Clearance/GDP
	☐ Fall protection plan
	☐ Silica Exposure Control Plan
	☐ LOTO/machine-specific
	☐ Hot Work Permit
	☐ Confined space entry permit
	☐ Excavation/trenching plan
	☐ Traffic control plan
	☐ Breathing zone monitoring plan
		☐ NA
		☐ NA
		☐ NA
		☐ NA
		☐ NA
		☐ NA
		☐ NA
		☐ NA
		☐ NA
		☐ NA
			KEY REMINDERS:
			• **WATER**:
			  • **1 QT / employee / hr** & **increase by 1 GALLON** at **80°F**
			  • Replenish when supply drops to 50%
			• **SHADE**: required at **85°F** or hotter
			• Review procedures & importance of rest breaks & water
			  • Set alarms to take breaks & drink water
			  • **NIOSH work**-rest tables
			• Monitor employees for alertness, dizziness, nausea, weakness, clumsiness, unsteady walk, muscle cramps, headaches
			• Record employees rest periods and water inta

STOP WORK AUTHORITY	**4SIGHT 4SAFETY**		
I will **STOP** the job any time anyone is concerned or uncertain about safety. I will **STOP** the project if anyone identifies a hazard or additional mitigation not already presented. If it is necessary to **STOP WORK**, I will reassess the task, hazards, and mitigations, and amend documentation.	1. **What am I about to do?** 2. **What could go wrong?** 3. **What could be done to make it safe?** 4. **What have I done to communicate the hazard?**		

PRINT NAME / COMPANY	SIGNATURE	PRINT NAME / COMPANY	SIGNATURE

RECORD ANY ADDITIONAL NOTES IN THIS SECTION (OR ADDITIONAL PAGES IF NECESSARY)

Appendix C – Hazardous Chemicals of Concern

Materials Present or Suspected at Site	Highest Reported Concentration (specify units and sample medium	Exposure Limit (specify ppm or mg/m3)	IDLH Level (specify ppm or mg/m3)	Primary Hazards of the Material (explosive, flammable, corrosive, toxic, volatile, radioactive, biohazard, oxidizer, or other)	Symptoms and Effects of Acute Exposure	Ionization Potential (eV)
Petroleum Hydrocarbons	1,340 mg/kg	PEL = 500 REL = 350 TLV = Skin Hazard☐	1,100 ppm	Flammable	Fatigue, headache, nausea, dizziness. Exposure to high levels can lead to coma or death	
PAHs (BaP Eq)	63.6 mg/kg	PEL = 0.2 mg/m3 REL = TLV = Skin Hazard☐		Flammable	Eye irritation, nausea and vomiting, diarrhea, confusion	
Dioxins/furans TEQ	0.0057 mg/kg	PEL = REL = TLV = Skin Hazard☐		Carcinogen	Skin irritation, red skin rashes or discoloration, liver damage, reproductive effects, organ failure	
PCBs	1.85 mg/kg	PEL = 0.5 mg/m3 REL = 0.001 TLV = 0.5 Skin Hazard☐	5 mg/m3	Toxic	Eye irritation, chloracne, liver damage, reproductive effects, potential occupational carcinogen	

Appendix D – Heat Illness Prevention Program

Apex Companies

Heat Illness Prevention Program (HIPP)

Last Revised July 2018

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APPENDICES

1.0 BACKGROUND

1.1 Apex Safety Policy – Code of Safe Conduct

At Apex, safety is not only a part of our business, it is foundational to our culture. We understand that in order to protect our staff and stakeholders from injury, illness or other loss, safety and security must be valued as much as all of our other core values. Apex is committed to providing a safe, healthy and secure work environment for our employees, clients, subcontractors and visitors through our WorkSafe program. We achieve our WorkSafe goals through partnership with our leadership, managers, and staff. We collaborate to ensure that our overall commitment to safety is translated in a way that can easily be applied to our day-to-day working activities. Apex's WorkSafe program is based upon the following principles. At Apex we:

- Identify and communicate hazards
- Conduct training and generate awareness
- Consider the potential consequences of our actions and plan accordingly
- Seek and apply the tools and training we need to prevent any incidents or accidents
- Think and act responsibly

The integrity of our WorkSafe program is ensured through sensible hiring and employment practices including pre-employment background screening, medical monitoring, and comprehensive on-going safety training that begins on every employee's first day with Apex.

1.2 Heat Illness and Prevention Program Integration

Apex has several programs designed to provide guidance and structure for awareness, prevention, roles and responsibilities for safe work practices for specific hazards, including, but not limited to confined space entry, exposure to hazardous materials, and use of personal protective equipment.

2.0 HEAT ILLNESS SYMPTOMS

The four forms of heat stress include heat rash, heat cramps, heat exhaustion and heat stroke. It is important to be able to recognize symptoms associated with the various forms of heat stress and to know first aid measures. A summary of heat stress symptoms is presented below.

FORMS AND SYMPTOMS OF HEAT STRESS

FORM	SYMPTOMS	FIRST AID MEASURES
Heat Rash	• Prickly heat • Slight to extensive skin irritation could occur	• Keep skin clean and dry for at least 12 hours per day • Change wet clothing
Heat Cramps	• Skin is sweaty • Painful muscle spasms • Body temperature is normal	• Provide fluids • Gently massage cramped muscles
Heat Exhaustion	• Clammy or pale skin • Weakness and fatigue • Profuse sweating • Nausea, vomiting • Disorientation • Headache • Normal or slightly elevated body temperature	• Remove from heat • Loosen clothing • Sponge skin with cool water • Fan victim; stop if victim shivers or develops goose bumps • Give fluids; give victim a drink solution of one pint water and one teaspoon salt every 30 minutes until recovers • Obtain medical help if victim does not improve
Heat Stroke	• Unconsciousness or mental confusion • Dizziness • Staggered walk • Appears to be agitated • Hot, dry skin • Extremely high body temperature; could reach 105° F	• Get emergency medical aid immediately • Remove victim from heat • Remove clothing, place victim in a cool bath, or apply cool compresses • Do not give any fluids • Do not leave victim alone • Do not allow victim to become so cold that victim shivers • Do not give aspirin or other medication in an attempt to lower fever

More specific information on heat stress from the Occupational Safety and Health Administration (OSHA) is included in Appendix A for reference.

3.0 HEAT ILLNESS PREVENTION

3.1 Recognition of Heat Danger

When working outdoors all Apex employees must be aware of the dangers of heat and local climate changes. This requires the project team to review forecasted climate reports during project planning as well as during every daily tailgate briefing. These reviews will determine the need to implement work/rest break schedules beyond the normal expected breaks of 1 break approximately every 2 hours. Apex will implement the National Institute of Occupational Safety and Health- (NIOSH-) recommended work/rest schedule to evaluate the need to increase breaks during high heat days. The recommended schedule is included in Appendix B.

3.2 Provision of Water

The availability and use of potable and suitably cool (i.e., 59 degrees Fahrenheit or less) drinking water at a project site is required and is a critical factor in preventing heat stress. This is especially important for construction and environmental investigation/remediation projects that require physical labor outdoors, frequently in locations without an available on-site break room.

Drinking plenty of water frequently is vital to workers exposed to the heat. To stay appropriately hydrated, workers should drink 3 to 4 6-ounce cups of water every hour starting at the beginning of your shift. During prolonged exposure to heat, workers should also have access to drinks containing electrolytes (e.g., sports drinks). Therefore, for field projects involving physical labor and scheduled for a duration of more than two hours, the following procedures will be followed.

- The Field Supervisor is responsible for bringing to the project site, or arranging to have delivered, a minimum of 1 quart of potable water per field employee per hour for projects scheduled for more than 2 hours.

- The amount of water will be increased to a minimum of 1 gallon per person whenever the temperature equals or exceeds 80 degrees Fahrenheit.

- All workers whether working individually or in smaller crews, will have access to potable and suitably cool drinking water. When working individually, the employee is the Supervisor.

- The Field Supervisor shall implement appropriate measures to ensure that the potable water is maintained at a temperature of 59 degrees Fahrenheit or less, which may require the use of an insulated cooler and/or ice.

- All water containers will be kept in sanitary condition. The Supervisor is also responsible for providing clean, individual drinking vessels, which may range from disposable paper or plastic cups (in an appropriate dispenser), individual water bottles, or comparable means to ensure potable water for each employee.

- Water containers will be staged at one or more conveniently accessible locations as close as practicable to where employees are working. If the crew moves during the day (such as on a pipeline project or series of small projects), the water will be restaged to remain as close as practicable to the crew.

- At a minimum, the Field Supervisor will check the remaining quantity of drinking water at the lunch break and replenish the available water at the project site to ensure that there is sufficient fresh, pure and suitably cool drinking water for field staff for the remainder of the day. The project drinking water supply will be refilled with cool water whenever the supply drops below 50%.

- During heat waves (i.e., when predicted high temperature for the day will be 80 degrees Fahrenheit or at least 10 degrees Fahrenheit higher than the average high daily temperature in the preceding five days) or during high heat conditions (i.e., when the temperature exceeds or is expected to exceed 95 degrees Fahrenheit), the Field Supervisor or his/her designee shall check the job site drinking water supply no less than once every hour.

- The Field Supervisor will include the importance of frequent drinking of water, as well as remind employees that he/she has provided drinking water and the location of the drinking water during daily tailgate safety meetings.

- When performing physically demanding work during heat waves (in California defined as any day in which the predicted high temperature for the day will be at least 80 degrees Fahrenheit or at least 10 degrees Fahrenheit higher than the average high daily temperature in the preceding five days) or during all high heat conditions (in California defined as when the temperature exceeds or is expected to exceed 95 degrees Fahrenheit):

    - The daily safety tailgate meetings will specifically emphasize the importance of drinking water, the number and schedule of water and rest breaks and the signs and symptoms of heat illness.

    - Audible devices (such as whistles or air horns) will be used to remind employees to drink water when the temperature equals or exceeds or is expected to exceed 95 degrees Fahrenheit.

- The number of water breaks and the length of the breaks will be increased, and workers will be reminded throughout the work shift to drink water.

- Avoid or limit the use of alcohol and caffeine as both dehydrate the body.

3.2 Access to Shade

Taking breaks in a cool shaded area and allowing time for recovery from the heat during the day are effective ways to avoid heat illness. Whenever possible, wear clothing that provides protection from the sun but allows airflow to the body. Protect your head and shade your eyes if working outdoors. Apex has also established the following procedures to provide for adequate shade for field projects involving physical labor and scheduled for a duration of more than two hours.

- Discussion of the availability and location of shade for relief from heat will be included in daily safety tailgate meetings. At a minimum, workers will be required to take a five minute cool-down rest in the shade. These lengths will be adjusted as needed based on the intensity of the heat. Refer to Appendix B for further guidance. However, no break will ever be shorter than 5 minutes and always in a shaded area or the interior of a building or vehicle.

- Shade structures will be opened and placed as close as practical to the workers when the temperature equals or exceeds 80 degrees Fahrenheit. When the temperature is below 80 degrees Fahrenheit, access to shade will be provided when requested by an employee.[2]

- Shade shall be provided in a location that does not deter or discourage access or use (i.e., shade should not be located next to portable toilet facilities or where employees would sit on wet or muddy ground or come in contact with branches, brush, and thorns).

- Because of the variety of Apex's work and project locations, arrangements for job-specific shade will vary significantly and include, but not be limited to use of: site structures (e.g., canopies, building shade, dedicated break rooms); air-conditioned work vehicles;

- Sufficient shade shall be provided to accommodate all of the employees on a recovery or rest period and those onsite taking meal periods at any one time such that each employee can sit in a normal posture fully in the shade without having to be in physical contact with each other.

[2] The interior of a vehicle may be used to provide shade if the vehicle is air-conditioned and the air conditioner is on.

- This shade shall be located in a safe (i.e., not in a hot zone) and practical location to afford reasonable access to site workers, such that employees do not have to cross traffic or waterways to reach the shade.

- Each employee taking a preventative cool-down rest period must be monitored for symptoms of heat illness and encouraged to remain in the shade.

- Any employee presenting any symptom of heat illness shall immediately cease activities, seek shade and sip water slowly

- Emergency medical attention may be necessary depending on the severity of the workers' symptoms. Due to the effect heat illness has on the ability to determine self-care, SSCs, project managers, task managers, or other onsite resources will be used to determine the need to call emergency services or WorkCare.

- No employee shall be ordered back to or permitted to return to active work while presenting symptoms of heat illness. Once all symptoms of heat illness have abated (i.e., are gone) an employee may return to active work after an additional 5 minutes of rest plus the time it takes to access the shade.

- In situations where it is not safe or feasible to provide access to shade (e.g., during high winds), a note will be made of these unsafe or unfeasible conditions, and of work-around accommodations, including but not limited to increased use of company vehicles, increased off-site rest periods allowing employees to take advantage of off-site shade/air-conditioned facilities, or other alternative accommodations. However, under no circumstances will the feasibility of onsite shade decrease the number or length of breaks and all available resources will be used to get workers into a cooler environment than direct sun.

3.3 Monitoring Weather

- The work schedule will be planned in advance, taking into consideration whether high temperatures or a heat wave is expected. This type of advance planning should take place for all projects between the months of April and October.

- Prior to each workday, the forecasted temperature and humidity for the worksite will be reviewed and will be compared against the National Weather Service Heat Index to evaluate the risk level for heat illness. Determination will be made of whether or not workers will be exposed at a temperature and humidity characterized as either "danger" or "extreme danger" for heat illnesses.[3]

- Weather forecasts can be checked with the aid of the internet: http://www.nws.noaa.gov/, by calling the National Weather Service phone numbers; by checking the Weather Channel TV Network, or by checking a weather APP on your mobile device or computer.

- Prior to each workday, the supervisor will monitor the weather at the worksite (using http://www.nws.noaa.gov/ or with the aid of a simple thermometer). The current weather information will be taken into consideration to determine when it will be necessary to make modifications to the work schedule (such as stopping work early, rescheduling the job, working at night or during the cooler hours of the day, increasing the number of water and rest breaks).

- A thermometer will be used at the jobsite to monitor for sudden increases in temperature and to ensure that once the temperature equals or exceeds 80 degrees Fahrenheit, shade structures will be opened and made available to the workers. In addition, when the temperature equals or exceeds 95 degrees Fahrenheit, additional preventive measures such as the High Heat Procedures will be implemented.

3.4 Performing Physically Demanding Tasks During a Heat Wave & All High Heat Work

Apex has adopted the following additional procedures to provide extra protection to employees scheduled to perform physically demanding tasks outdoors during heat waves (i.e., any day in which the predicted high temperature for the day will be at least 80 degrees Fahrenheit or at least 10 degrees Fahrenheit higher than the average high daily temperature in the preceding five days) and for all work performed during high heat conditions (i.e., when the temperature equals or exceeds 95 degrees Fahrenheit).

- The Project Manager and Field Supervisor will consult and evaluate whether an alternative schedule for the project can be arranged to avoid the worst of the high heat conditions, such as performing the scheduled task(s) during the cooler evening hours, a through a split

3 It is important to note that the temperature at which these warnings occur must be lowered as much as 15 degrees if the workers under consideration are in direct sunlight.

shift, or changing the sequencing of a larger project.

- Daily tailgate meetings during these conditions will emphasize the heat stress conditions and include discussion of the weather forecast, and the requirement for rest breaks that includes water intake. The OSHA "Heat Stress Awareness Card" (See Appendix C) will be reviewed during the tailgate meeting and will be physically available for reading and reviewing onsite to refresh employees' ability to readily observe signs of heat stress. Electronic versions are acceptable if saved on a local hard disk drive or mobile device; however, the reliance on internet or cell service is not an acceptable alternative.

- Employees will, at a minimum, take a 10-minute rest break and consume at least 6-ounces of water every 2 hours when site conditions are less than 80 degrees in warmer months. These frequency and length of breaks will be increased as the heat increases. Lone workers are required to contact their Supervisor to verify his or her safe condition.

- The Supervisor will communicate the required break schedule during the tailgate briefing and continue communication throughout the day by way of audible alerts that can be heard by all site workers (such as through a speaker system, two-way radio, or pre-arranged alarm system discussed during the tailgate meeting).

- Apex staff will ensure effective observation and monitoring of all employees which shall, at a minimum, include:

  - having a supervisor responsible for monitoring no more than 20 individuals;

  - prior to starting work, having the supervisor interview each employee to determine if any have worked in excessive heat, was able to rest before the work day, and/or experienced recent heat illness – those who have shall be more closely monitored;

  - having the supervisor and/or colleagues ask each employee if they are experiencing any symptoms of heat illness;

  - having the supervisor and/or colleagues monitor employees for alertness and signs of dizziness, nausea, weakness, clumsiness or unsteady walk, muscle cramps, and headaches;

  - having the supervisor record each employee's rest periods and hydration status (i.e., water intake) on the Rest and Water Intake Record form in Appendix D to ensure they are taking breaks and drinking water in accordance with the prescribed frequency above; and,

- o having the supervisor periodically (no less than once every 2 hours) monitor air temperature and humidity by calling the National Weather Service (numbers provided above in Section 3.3), checking the Weather Channel TV Network, or checking a weather internet website or APP on a mobile device or computer which will then been compared to the National Weather Service Heat Index, and recording the information on the Heat Index Record form in Appendix E.

- The Supervisor will be authorized to make additional precautionary decisions to aid in proactively avoiding heat stress among Site workers, including, but not limited to terminating work early for the day.

3.5 Procedures for Working Alone

Apex staff routinely perform non-construction activities outdoors including, but not limited to inspections, valve exercising, and routine maintenance activities alone (i.e., as a sole individual). During high heat conditions, for new employees during the first 2 weeks of work, or staff that have not had at least 5 days to acclimatize , Apex will restrict 1-person field crews using a combination of the following methods to provide for additional protection against the heat:

- If feasible, the tasks will be rescheduled to be performed during the cooler morning or evening hours, or after the heat wave has passed;

- Staff the task to provide for a minimum 2-person crew to provide for a “buddy system”. When a buddy system is not feasible, a 1-person crew can proceed with work during high heat conditions only after ENSURING they can remain in effective communication by voice, observation or electronic means with a supervisor. A cell phone for calling or text messaging can only be relied upon as effective communication in areas with reliable reception. High heat condition work for a 1-person crew (i.e., a sole individual) is only permissible after CONFIRMING effective communication with a supervisor (i.e., performing a test communication contact prior to beginning work).

- The use of a 1-person crew during high heat conditions is only permissible for light to moderate effort tasks (i.e., not physically demanding work) at locations frequented by other persons or in close proximity to local emergency response (e.g., housing communities, retail shops, professional buildings, operational industrial facilities, commercial properties).

- During high heat conditions, Apex does not permit a 1-person crew to work in remote, isolated locations that are not frequented by other persons (e.g., back country, rural desolate facilities, uninhabited terrain, and abandoned facilities).

3.5 Acclimatization

Acclimatization is the temporary and gradual physiological change in the body that occurs when the environmentally induced heat load to which the body is accustomed is significantly and suddenly exceeded by sudden environmental changes.

In more common terms, the body needs time to adapt when temperatures rise suddenly, and an employee risks heat illness by not taking it easy when a heat wave strikes or when starting a new job that exposes the employee to heat to which the employee's body hasn't yet adjusted. Inadequate acclimatization can be significantly more perilous in conditions of high heat and physical stress.

- The supervisor will monitor weather at the jobsite daily and will be on the lookout for sudden heat wave(s), or increases in temperatures to which employees haven't been exposed to for several weeks or longer. If such changes in weather conditions are observed, the Supervisor will implement the additional procedures described in Section 3.4.

- The supervisor will closely monitor all employees for signs and symptoms of heat illness during work performed during a heat wave - any day in which the predicted high temperature for the day will be at least 80 degrees Fahrenheit or at least ten degrees Fahrenheit higher than the average high daily temperature in the preceding five days.

- The supervisor will be extra-vigilant with new employees (at least during their first 2 weeks of work) and stay alert to the presence of heat related symptoms. For new employees, the intensity of the work will be lessened during a break-in period (such as scheduling slower paced, less physically demanding work during the hot parts of the day and the heaviest work activities during the cooler parts of the day [e.g., early-morning or evening]). New employees (during their first 2 weeks of work) will be assigned a "buddy" or experienced coworker to watch each other closely for discomfort or signs and symptoms of heat illness.

- Let your supervisor know you are not used to the heat. If you are coming back to work from an illness or an extended break or you are just starting a job working in the heat, it is important to be aware that you are more vulnerable to heat stress until your body has time to adjust. It takes about 5-7 days for your body to adjust.

3.6 Handling a Sick Employee / Emergency Response

Apex has a company-wide established procedure for handling notification or observation of a potential workplace illness or injury. This procedure is summarized in Appendix F. The following procedures for preventing, identifying, and responding to heat illness symptoms potentially encountered on the job provide additional guidance with specific respect to heat stress.

3.6.1 Prevention

- All work will have scheduled rest breaks clearly communicated to the staff. No work in any heat will be conducted with fewer than one 10-minute break every 2-hours.

- All work sites, including those with a single individual, will have at least one person assigned to the site that is qualified and appropriately trained to render first aid and CPR if necessary.

- Prior to assigning a crew to a particular worksite, workers and the foreman will be provided a map of the site, along with clear and precise directions (such as streets or road names, distinguishing features and distances to major roads), to avoid a delay of emergency medical services.

- Apex provides cell phones with phone, texting and internet service to all field staff, in part to ensure that emergency medical services can be called. In addition, many of our field staff are equipped with web-enabled tablets. Each employee is responsible for reporting any damage to his/her company-provided mobile device.

- Apex has specific additional procedures described in Section 3.5 of this HIPP that are implemented when performing physically demanding work during heat waves and all high heat conditions to provide additional protection to field employees against heat-related illness.

3.6.2 Response

- When working in the heat be sure to pay extra attention to your co-workers. Always let your supervisor know if you or a co-worker start to feel symptoms such as nausea, dizziness, weakness or unusual fatigue, and rest in a cool shaded area. During a heat wave or hot temperatures, workers will be reminded and encouraged to immediately report to their supervisor any signs or symptoms they are experiencing.

- When an employee displays possible signs or symptoms of heat illness, a trained first aid worker or supervisor will check the sick employee and determine whether resting in the shade and drinking cool water will suffice or if emergency service providers will need to be called. A sick worker will not be left alone, as he or she can take a turn for the worse!

- Emergency Services will be called whenever[4]:

  - An employee displays possible signs or symptoms of heat illness that resemble or are approaching heat stroke (See Section 2.0).

  - An employee displays signs or symptoms of severe heat illness (such as, but not limited to, incoherent speech, decreased level of consciousness, staggering, vomiting, disorientation, irrational behavior or convulsions, red and hot face), does not look OK or does not get better after drinking cool water and resting in the shade

    - While the ambulance is in route, first aid will be initiated (cool the worker: place the worker in the shade, remove excess layers of clothing, place ice pack in the armpits and groin area, mist or sponge the victim with cool water, and fan the victim).

    - If the worksite is located more than 20 minutes away from a hospital, call emergency service providers, communicate the signs and symptoms of the victim and request Air Ambulance.

    - A sick worker will not be left alone or allowed to leave the site unattended, as he/she can get lost or die before reaching a hospital!

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[4] At remote locations such as rural farms, lots or undeveloped areas, the supervisor will designate an employee or employees to physically go to the nearest road or highway where emergency responders can see them. If daylight is diminished, the designated employee(s) shall be given reflective vest or flashlights in order to direct emergency personnel to the location of the worksite, which may not be visible form the road or highway.

4.0 TRAINING

- Supervisors will be trained prior to being assigned to supervise other workers. Training will include this company's written procedures and the steps supervisors will follow when employees' exhibit symptoms consistent with heat illness.

- Supervisors will be trained on how to track the weather at the job site (by monitoring predicted temperature highs and periodically using a thermometer). Supervisors will be instructed on how weather information will be used to modify work schedules and to increase number of water and rest breaks or cease work early if necessary.

- All employees and supervisors will be trained prior to working outside. Training will include the company's written prevention procedures.

- Employees will be trained on the steps that will be followed for contacting emergency medical services, including how they are to proceed when there are non-English speaking workers, how clear and precise directions to the site will be provided and the importance of making visual contact with emergency responders at the nearest road or landmark to direct them to their worksite.

- When the temperature exceeds 80degrees Fahrenheit, safety tailgate meetings will include review of the weather report, reinforce heat illness prevention with all workers, provide reminders to drink water frequently, inform them that shade can be made available upon request and remind them to be on the lookout for signs and symptoms of heat illness.

- During their first 2 weeks, new employees will be assigned a "buddy" or experienced coworker to ensure that they understand the training and follow company procedures.

- Supervisors and Managers will be trained to check in advance the extended weather forecast

- All employees will be trained in the importance of acclimatization, how it is developed and how these company procedures address it.

- All employees will be trained in the details of these written emergency procedures

5.0 RESPONSIBILITIES

Apex's Director of Corporate Health and Safety is responsible for administering Apex's overall safety program, which includes chairing our Central Safety Committee, managing our internal corporate safety training and educational network, and providing technical guidance and oversight to regional safety programs.

Apex's Regional Manager is responsible for regional adherence to Apex's safety programs; sponsoring and supporting regional representation in Apex's Central Safety Committee; ensuring that all regional staff, including managers, supervisors, laborers and office personnel compiles with Apex's comprehensive safety program; and receive annual performance reviews that include evaluation of their adherence to safety programs.

Each Project Manager is responsible for implementing the appropriate and relevant health and safety provisions for each project and assigning responsibility for implementation of the HIPP procedures documented herein. This individual has full authority within Apex to make decisions in the field to implement the policies and procedures documented in this HIPP.

Each staff member is responsible for following all requirements of this HIPP, the IIPP, and all applicable Apex health and safety programs, protocols, and plans. Additionally, each individual is responsible for the safety of themselves and their colleagues. It is unacceptable for an individual to decide to "work through" or "deal with" heat-related symptoms. All staff members are also responsible for taking scheduled rest breaks and consuming the recommended amount of water or sports drinks.

APPENDIX A
OSHA HEAT-RELATED ILLNESS SAFETY BULLETIN

SAFETY BULLETIN 46
Heat-Related Illnesses
Heat Cramps, Heat Exhaustion and Heat Stroke

When the weather is hot, your body works overtime trying to keep cool. Excess heat escapes through sweating, exhalation of warmed air, and increased blood flow to the skin. However, hot weather can overwhelm those cooling mechanisms leading to a wide array of uncomfortable symptoms.

Sweating is your body's main method of ridding itself of extra heat. Water evaporates from your skin when you sweat. The heat that evaporates the sweat comes mainly from your skin. As long as blood is flowing properly to your skin, extra heat from the core of your body is pumped to the skin and removed by sweat evaporation. Therefore, you cannot get rid of the extra heat effectively if you do not sweat enough or if the blood is not flowing to the skin. Moreover, dehydration may lead to heat-related illness because you won't sweat as much and your body will also try to keep blood away from the skin to keep your blood pressure at the right level in the core of your body. Therefore, dehydration avoidance is a primary method to prevent heat-related illness.

The rate of sweating is higher in humid conditions; however, humidity diminishes the body's ability to cool itself. This is because air is already very saturated with water, so sweat cannot evaporate. Sweat that beads up and rolls off does not function in the cooling process; however, this "futile sweat" does deplete the body of vital water and salt. As the dehydration progresses, cooling the body becomes more difficult.

The Three Stages of Heat Illness:

1. **Heat Cramps** - these are due to muscle spasms and often occur in the arms, legs or abdomen. They are thought to be caused by heat, dehydration and loss of salt and other electrolytes. Heat cramps usually improve with rest, drinking water, eating salty foods and moving the person to a cooler environment.
2. **Heat Exhaustion** - this is due to more profound loss of water and electrolytes. It is characterized by generalized weakness, headaches, dizziness, low blood pressure, elevated pulse, paleness, vomiting, fainting and a moderately increased body temperature (101° – 102°F) which, in this case, is not truly a fever, but is caused by the heat. Rest and water may help in mild heat exhaustion, ice packs and moving the person to a cool environment (with a fan blowing at the person) may also help. More severely heat-exhausted patients may need IV fluids.

3. **Heatstroke** - this is a life-threatening condition and the most severe form of heat illness. Severe dehydration, high body temperature, and a shut-down of the cooling systems occur. The person may be delirious or comatose, have flushed skin, be unconscious, and have seizures. Half of the victims will have stopped sweating. By now, the victim's pulse is rapid and weak, the blood pressure is low, and the body temperature is greater than 105°F and may reach as high as 110°F *(the oral temperature is notoriously inaccurate in these circumstances).* Damage to the brain, heart, lungs, kidneys and other organs may occur. Sometimes despite the best medical care, **DEATH IS THE END RESULT**.

People suffering from heatstroke need to have their temperature reduced quickly (often with ice packs) and must also be given IV fluids for re-hydration. The victim must be taken to the hospital *as quickly as possible* (Call 911) and may have to stay in the hospital for observation since many different body organs can fail due to heatstroke.

Avoiding Heat Related Illness

The environmental conditions that lead to dehydration and heat illness are out of our control, but the following are things that we can do to help prevent dehydration and subsequent heat illness:

- **Drink plenty of fluids**. The best fluid to drink when you are sweating is water. Although there is a small amount of salt in your sweat, you do not really lose that much salt with your sweat except in special circumstances. Therefore, be careful when taking salt tablets because there is the risk that you could raise your body's sodium level to hazardous levels. "Sports drinks" such as Gatorade® are acceptable, but water should be the main fluid used for re-hydration. Do **NOT** drink beverages with caffeine or alcohol because they are diuretics and cause your body to lose fluid. **Drink before, during and after the physical work activities**. How do you know if you are drinking enough? A good sign of hydration is the output of large volumes of clear, dilute urine. Drinking a minimum of 13 – 20 ounces of cold water or an electrolyte solution per hour will surely help delay the process of dehydration in most hot situations. <u>If you are thirsty you are dehydrated, do not wait until you want a drink of water before you decide to dig the well!</u>

- **The clothing you wear makes a difference**. The less clothing we have on and the lighter the clothing is, the easier it will be to cool off. Light-colored clothing reflects light and therefore is cooler than dark clothing. Loose, lightweight material allows for better air circulation and facilitates the evaporation of sweat. Clothing that is dry slows down evaporation of sweat, but once wet, cooling continues.

- **Adapt to the heat**. Heat acclimatization is a process by which the body makes adjustments to promote better cooling in hot environments. Sweat becomes more diluted and the threshold at which sweating begins is lowered as the sweat rate is increased. These and other changes take time to fully complete (about ten days of work in the heat). You must also be well hydrated for acclimatization to work.
- **Avoid taking medications**. Some medications interfere with cooling by inadvertently promoting dehydration or hindering sweating. Antihistamines and some blood pressure medications decrease sweating. **PLEASE** inform your project manager, your H&S representative, and/or Human Resources if you are currently taking these types of medications when working on projects when there is the potential of experiencing dehydration or heat illness.
- **Physical condition.** The better your physical condition = the better your body functions. If you are experiencing some type of illness do not engage in strenuous work activities that can increase your chances of suffering from dehydration and heat illness. Do not take a risk, contact your project manager, your H&S representative, and/or Human Resources prior to engaging in work if this applies.
- **Diet**. The digestive process creates heat within the body and the lighter the meal the less time required for digestion. Additionally, fruits and vegetables are the best source of both nourishment and liquids in hot weather. Each serving typically provides approximately one-third of a cup of water, which far outweighs the liquid contributions from any other food group. Avoid foods high in sugar or "bad" carbohydrates.
- **Schedule physical work activities during the cooler parts of the day**. When possible avoid working between the times of 11:00 AM and 3:00 PM. When this is not possible try to take frequent short breaks in lieu of one long break. Breaks should be taken in cool or shady environments where you can consume fluids, sit and relax.
- **Medical monitoring**. Chemical suits or other types of PPE that we may be required to wear can inhibit the body's cooling process. Medical monitoring should always be conducted in these conditions. The monitoring should include blood pressure and pulse rate. When the blood pressure (normal rate 120/80) and pulse rate (normal rate: resting 90 Beats Per Minute (BPM), Strenuous Exercise 200 -220 BPM) are above normal limits the worker should be removed from work activities until theses readings are back to normal for approximately 30 minutes.
- **Use the buddy system**. When there is the potential for exposure to hazardous materials or our health and safety could potentially be compromised we should always make sure that at least two people are working together. However, keep in mind that chemical suits also promote body heat. We can experience high ambient temperatures and humidity within this environment even when the outside environment is cooler. Workers should be watching each other to look for the symptoms of dehydration, heat illness, and/or signs of over-exposures to hazardous materials.

Be smart and anticipate what will be needed to avoid problems when working under hot and humid conditions.

Keep in mind, the higher the intensity of the physical work, the greater the heat production by the body's muscles. Overheating causes more sweat production. Never forget that how hard you push yourself during the physical work activities is under ***your*** control. *<u>You have a choice</u>*: Over-work yourself, dehydrate and hurt yourself <u>OR</u> **slow down, take a little longer to finish the work and <u>survive</u>**. It is important to be sensible about how much you exert yourself in hot weather. The hotter and more humid it is, the harder it will be for you to get rid of excess body heat. This is especially applicable when wearing PPE.

APPENDIX B

NIOSH Recommended Work/Rest Schedule

HEAT STRESS

Work/Rest Schedules

Using work/rest schedules can decrease the risk of heat illness

Sample Work/Rest Schedule for Workers Wearing Normal Clothing*

The NIOSH work/rest schedule is based on air temperature, with adjustments for direct sunlight and humidity. It may not be applicable to all worksites. Other work/rest schedules are available, some of which are based on Wet Bulb Globe Temperature.

See reverse for temperature adjustments for the NIOSH work/rest schedule and examples of light, moderate, and heavy work.

Temperature (°F)	**Light Work** Minutes Work/Rest	**Moderate Work** Minutes Work/Rest	**Heavy Work** Minutes Work/Rest
90	Normal	Normal	Normal
91	Normal	Normal	Normal
92	Normal	Normal	Normal
93	Normal	Normal	Normal
94	Normal	Normal	Normal
95	Normal	Normal	45/15
96	Normal	Normal	45/15
97	Normal	Normal	40/20
98	Normal	Normal	35/25
99	Normal	Normal	35/25
100	Normal	45/15	30/30
101	Normal	40/20	30/30
102	Normal	35/25	25/35
103	Normal	30/30	20/40
104	**Normal**	**30/30**	**20/40**
105	Normal	25/35	15/45
106	45/15	20/40	Caution
107	40/20	15/45	Caution
108	**35/25**	**Caution**	**Caution**
109	30/30	Caution	Caution
110	15/45	Caution	Caution
111	Caution	Caution	Caution
112	Caution	Caution	Caution

Example

A worker performing heavy work in 104 °F temperatures should work for 20 minutes and rest for 40 minutes.

Example

A worker performing moderate work at 108 °F should use extreme caution! The risk for heat injury is high in this situation.

Things you need to know:

- Continuous work in the heat is not advisable—you must take rest breaks periodically to allow your body to cool down.
- A variety of work/rest schedules are available that can be adapted to your worksite. Relying on self-pacing alone may not be sufficient.

* From NIOSH Criteria for a Recommended Standard, Occupational Exposure to Heat and Hot Environments, https://www.cdc.gov/niosh/docs/2016-106/pdfs/2016-106.pdf. **Assumptions:** workers are physically fit, well-rested, fully hydrated, under age 40, and environment has 30% humidity and perceptible air movement.

HEAT STRESS **Work/Rest Schedules**

Temperature Adjustments for this Work/Rest Schedule

Adjust the temperature in the table based on:

Environmental conditions **AND** **Humidity**

- Full sun (no clouds): Add 13 °F
- Partly cloudy/overcast: Add 7 °F
- No shadows visible, in the shade, or at night: No adjustment

- 40% humidity: Add 3 °F
- 50% humidity: Add 6 °F
- 60% humidity or more: Add 9 °F

Example Adjustment

Conditions at a mine are 90 °F, with partly cloudy skies and 50% humidity. Adjust the table as follows:

Add 7 °F for partly cloudy skies and 6 °F for 50% humidity, to arrive at 103 °F.

Examples of Work at Different Intensity Levels

Light work

- Operating equipment
- Inspection work
- Walking on flat, level ground
- Using light hand tools (wrench, pliers, etc.). However, this may be moderate work depending on the task
- Travel by conveyance

Moderate work

- Jack-leg drilling
- Installing ground support
- Loading explosives
- Carrying equipment/supplies weighing 20–40 pounds
- Using hand tools (shovel, fin-hoe, scaling bar) for short periods

Heavy work

- Climbing
- Carrying equipment/supplies weighing 40 pounds or more
- Installing utilities
- Using hand tools (shovel, fin-hoe, scaling bar) for extended periods

Case Study: Use of Work/Rest Schedule

A crew was shoveling ore out from under the primary conveyor at a surface mine in Arizona in August. The high temperature that day was 113 °F. The crew was rotating in 10-minute shifts and hydrating between shifts. Coworkers noticed signs of heat illness in two employees, and they were transferred to the medical station for evaluation. From there they were sent to the hospital, where they were given IV saline and released home. Both employees recovered after rehydration at the hospital.

Lessons Learned

In extreme heat, even a work/rest schedule may not eliminate the risk of heat illness. In this case, use of work/rest schedules, frequent hydration, and team monitoring helped keep this situation from becoming even more serious. Without those safety precautions the workers could have potentially suffered more severe heat illness, possibly including heat stroke, which is life threatening.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

DHHS (NIOSH) Publication No. 2017-127

APPENDIX C
OSHA QUICK CARD FOR HEAT-RELATED ILLNESS SAFETY

OSHA QUICK CARD™

Protect Yourself
Heat Stress

When the body is unable to cool itself by sweating, several heat-induced illnesses such as heat stress or heat exhaustion and the more severe heat stroke can occur, and can result in death.

Factors Leading to Heat Stress
High temperature and humidity; direct sun or heat; limited air movement; physical exertion; poor physical condition; some medicines; and inadequate tolerance for hot workplaces.

Symptoms of Heat Exhaustion
- Headaches, dizziness, lightheadedness or fainting.
- Weakness and moist skin.
- Mood changes such as irritability or confusion.
- Upset stomach or vomiting.

Symptoms of Heat Stroke
- Dry, hot skin with no sweating.
- Mental confusion or losing consciousness.
- Seizures or fits.

Preventing Heat Stress
- Know signs/symptoms of heat-related illnesses; monitor yourself and coworkers.
- Block out direct sun or other heat sources.
- Use cooling fans/air-conditioning; rest regularly.
- Drink lots of water; about 1 cup every 15 minutes.
- Wear lightweight, light colored, loose-fitting clothes.
- Avoid alcohol, caffeinated drinks, or heavy meals.

What to Do for Heat-Related Illness
- Call 911 (or local emergency number) at once.

While waiting for help to arrive:
- Move the worker to a cool, shaded area.
- Loosen or remove heavy clothing.
- Provide cool drinking water.
- Fan and mist the person with water.

For more complete information:

OSHA Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA

OSHA 3154-07R-05

APPENDIX D
APEX HIPP REST & WATER INTAKE RECORD

DATE:		PROJECT:	
Employee Name	**Rest Period (record time)**	**Water Intake (record ounces)**	**Comments**

APPENDIX E
APEX HIPP HEAT INDEX RECORD

DATE:			PROJECT:		
Time	**Air Temp (°F)**	**Relative Humidity (%)**	**Temp & Humidity Source**	**Heat Index Temp (°F)**	**Caution/Danger Rating**

Note: temperature at which these warnings occur must be lowered by 15°F if the workers under consideration are in direct sunlight.

National Weather Service Heat Index Chart

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure and/or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Appendix E – Job Safety Analysis and Port of Portland Letter Regarding COVID-19 Protocols

APEX

Soil Sampling Job Safety Analysis (JSA)			
Project Number:	**1056-18**	Project/Client Name:	**RDI /Port of Portland**
Project Manager:	**Steve Misner**	Project Location:	**Willamette Cove**
Specific Task:	**Soil Sampling for Remedial Design Investigation**		
Minimum Required PPE for Task:	☑ Hard Hat ☑ Safety Toed Boots ☑ Safety Glasses ☐ Hearing Protection ☐ Long Sleeved Shirt ☐ Fire Resistant Clothing ☑ Hi-Vis Shirt ☐ Hi-Vis Vests Class 2 ☐ Hi-Vis Vests Class 3 ☐ Coverall ☑ Gloves ☐ Respirator Nitrile <type and cartridge> ☐ Face Shield ☐ Other (specify):		
Additional Task-Step Specific PPE: (as indicated below under controls)		**Equipment/Tools Required:**	**Vehicle, hand tools**
Training Required for this Task:	**HAZWOPER**	**Permits Required for this Task: (e.g. confined space, LOTO)**	
Forms Associated with this Task:			

JSA Developed/Reviewed By:			Date and Revision Number: 1/18/2022
Employee Name/Job Title	Employee Name/Job Title	Employee Name/Job Title	H&S Team Leader to ensure all personnel performing this task have reviewed JSA and agree to follow it. Site specific changes to this JSA have been made as warranted based on this review. H&S Team Leader Signature/Date:
Megan Masterson			

Task Steps	Potential Hazards and Consequences	Likelihood	Severity	Risk	Controls to Eliminated/Reduce Risks
Load tools in truck	slips, trips, falls and back injuries	3	2	6	Proper lifting and pay attention while walking/loading
Travelling to/from the Site	Traffic accident - Injury	1	4	4	Follow posted speed limits and traffic signs. Stay alert to other vehicles, cyclists, pedestrians and be a defensive driver by maintaining a safe distance with other vehicles on the road.
Mobilize to sample location	Uneven terrain, trip hazards	3	2	6	Carry equipment in multiple small loads, wear a backpack for smaller equipment, move slowly, do not sample without sturdy footing
Mobilize to sample location	Encounters with transient populations	3	2	6	Apex will sample in teams of at least two people. If one of the sample locations is in the vicinity of a camp, Apex staff will relocate the sampling point and notify the proper people of the change in scope. Staff are not to engage or impede upon homeless camps.
Sample Collection Preparation	Striking underground lines or objects	1	4	4	A public and private locator will identify active utilities entering the site and the private locator will trace those utilities throughout the Site.
Sample Collection	Contact with potentially contaminated soil or with poison oak - Exposure	2	2	4	Wear disposable gloves and safety glasses when collecting samples to minimize contact with soil. Wash exposed skin thoroughly with Tecnu following sampling activities.
Sample Collection	Contact with broken sample containers - Hand laceration.	2	3	6	Wear gloves and check containers in cooler before grabbing them
Sample Collection	Filling and carrying soil buckets - back and muscle injury	5	1	5	Use proper lifting techniques.
Load tools and samples in truck	Moving equipment or sample coolers - Back or muscle injury	3	2	6	Ensure proper lifting techniques. Do not attempt to bodily move large equipment. Use the buddy lift to move heavy coolers.
Site wide Activities	Slip/trips/falls - Injury	2	3	6	Maintain good housekeeping. Inspect the area of tripping hazards. Sturdy work boot required. Maintain 3-points of contact when using stairways.
Travelling to/from the Site	Traffic accident - Injury	1	4	4	Follow posted speed limits and traffic signs. Stay alert to other vehicles, cyclists, pedestrians and be a defensive driver by maintaining a safe distance with other vehicles on the road.
				0	

APEX

Apex Companies, LLC - Job Safety Analysis (JSA) - COVID-19 Awareness - Site Work				
COVID-19 Awareness for Site Work				
Project Number:	1056-18	**Project/Client Name:**	RDI / Port of Portland	**Date:** 1/18/2022
Project Manager:	Steve Misner	**Project Location:**	Willamette Cove	
Specific Task:				
Minimum Required PPE for Task:	**Safety Boots, Fabric Face Covering, Nitrile Gloves, Alcohol-based hand sanitizer, disinfectant wipes and spray**			
Additional Task-Step Specific PPE: (as indicated below under controls)		**Equipment/Tools Required:**		
Training Required for this Task:		**Permits Required for this Task: (e.g. confined space, LOTO)**		

JSA Developed By:		**JSA Reviewed By (must have experience w/task):**		**H&S Team Leader to ensure all personnel performing this task have reviewed JSA and agree to follow it. Site specific changes to this JSA have been made as warranted based on this review.**	
Employee Name/Job Title	Employee Name/Job Title	Employee Name/Job Title	Employee Name/Job Title		
				H&S Team Leader Name:	
				H&S Team Leader Signature:	

Task Steps	Potential Hazards and Consequences	Likelihood	Severity	Risk	Controls to Eliminated/Reduce Risks	Likelihood	Severity	Risk
1. All Activities	1.Transmittal/exposure of COVID-19			0	1.Ask yourself and your managers – is this work essential? Can this be done remotely? 2.Stay home if sick or showing symptoms of COVID-19 (e.g. fever, cough, etc.). 3.Carry nitrile gloves, alcohol-based hand sanitizer, and disinfectant wipes/spray during field work. 4.Check federal, state, and/or local travel restrictions prior to travel. Many states, counties, and cities are passing strict "shelter-in-place" or business restrictions in response to COVID-19. 5.Immediately notify supervisor if you display symptoms of COVID-19. Symptoms include fever (over 100.4 F), cough, and shortness of breath. 6. Communicate with your colleagues using two way radios in leu of close contact meetings to avoid potential exposure 7.Notify supervisor if you had close contact with an individual who tested positive or displayed symptoms of COVID-19. 8.Do not touch your face, to the extent possible. 9.Practice social distancing, maintaining at least 6 feet of distance between yourself and others. Avoid gatherings of more than 10 people. Limit, to the extent possible, contact with public items/objects. 10.Clean your hands frequently with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, sneezing, or using the rest room. 11.If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands and rub them together until they feel dry. 12.Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. 13.Clean and disinfect frequently touched surfaces daily, for example, cell phones, computer equipment, headsets, tables, doorknobs, light switches, countertops, handles, desks, toilets, faucets, and sinks. 14.If you must work in close proximity (<6 feet away) use N-95 Mask			0

APEX

Apex Companies, LLC - Job Safety Analysis (JSA) - COVID-19 Awareness - Site Work								
COVID-19 Awareness for Site Work								
Project Number:	1056-18	**Project/Client Name:**	RDI / Port of Portland			**Date:**	1/18/2022	
Project Manager:	Steve Misner	**Project Location:**	Willamette Cove					
Specific Task:								
2. Travel to Jobsite	1.Transmittal/exposure of COVID-19 between passengers 2.Transmittal/exposure of COVID-19 from previous occupants (rental and fleet vehicles) 3.Transmittal/exposure of COVID-19 while refueling			0	1.Limit the number of occupants to each vehicle to 2 people. Employees should sit as far away from each other as possible. 2.Disinfect high “hand-traffic” areas of the vehicle: Door handles, steering wheel, turn signal and control rods, dashboard controls, seatbelts, armrests, etc. To the extent possible, do not use recycled air for heat/AC and travel with the windows open. 3.Use hand sanitizer before and after pumping gas and only return to the inside of the vehicle after refueling is complete. 4.Wear nitrile gloves if available or disinfect the key pad, pump handle, and fuel grade button prior to use.			0
3.Conduct Tailgate Safety Meeting & Complete H&S Paperwork	1. Transmittal/exposure of COVID-19 between meeting participants			0	1.Practice social distancing, maintaining at least 6 feet of distance between yourself and others. 2.Hold meetings outside and keep in mind wind direction. To the extent possible, remain cross-wind from other people. 3.Designate a single person to maintain sign-in sheets/permits throughout the day to limit the passing of pens/clipboards between people. 4.Each person should complete their own JSA, even if they are completing similar tasks as others in order to limit the passing of paper/pens/clipboards between people. 5.Include COVID-19 topics and prevention measures in safety meetings.			0
4. Conduct Site Work	1.Transmittal/exposure of COVID-19 between site workers and public.			0	1.Practice social distancing maintaining 6 feet of distance between yourself and others. 2.To the extent possible, do not interact with the public. If it is necessary, politely explain you are practicing social distance and request they stay at least 6 feet away and they do not attempt to pass objects to you. 3.Wear nitrile gloves during site work underneath the appropriate gloves for your task. Utilize appropriate decontamination procedures, securely bag all waste (including nitrile gloves) generated during site work and dispose of. 4.Do not share tools. Each person should be equipped with the tools to complete their task or tasks should be divided to remove the need to share tools. If tools must be shared, surfaces should be disinfected. 5.Clean and disinfect surfaces of rental tools and equipment upon receipt. To the extent possible rent equipment from Apex internal equipment reservation center, where cleaning/disinfecting procedures can be verified.			0
5. Use of Construction Trailers	1. Transmittal/exposure of COVID-19 between site workers and others.			0	1.Avoid use of shared trailers, if possible. Minimize trailer use to essential personnel. 2.Practice social distancing; maintaining 6 feet of distance between yourself and others in trailer. 3.Clean and disinfect areas including desks, phones, chairs and other common areas, before and after use.			0
6. Purchasing Food from a Restaurant	1.Transmittal/exposure of COVID-19 from other customers, staff, surfaces.			0	1.To the extent possible, bring your own food. 2.If you must visit a restaurant, call ahead for take-out or “contactless delivery”. Do not dine in. When picking up food, follow guidelines for Job Step #8: Purchasing Supplies at Retail/Shipping Centers. 3.Wash hands before and after eating.			0

Apex Companies, LLC - Job Safety Analysis (JSA) - COVID-19 Awareness - Site Work

COVID-19 Awareness for Site Work

Project Number:	1056-18	**Project/Client Name:**	RDI / Port of Portland	**Date:**	1/18/2022
Project Manager:	Steve Misner	**Project Location:**	Willamette Cove		
Specific Task:					

7. Smoking Cigarettes	1.Transmittal/exposure of COVID-19 by touching mouth with hands			**0**	1.Cigarette smokers maybe at greater risk of complications arising from COVID-19. Nicotine patches/lozenges/gum, smoking cessation programs, and prescription medications may aid in “kicking the habit” if you decide to quit. 2.Wash hands thoroughly before and after smoking. 3.Discard cigarette butts properly. Do not light cigarettes from others and do not give cigarettes to others.			**0**
8. Hotel Stay	1.Transmittal/exposure of COVID-19 from previous occupants, hotel staff, common areas.			**0**	1.Verify the hotel chain/brand has modified cleaning procedures to reflect risk of COVID-19. Most hotel companies have issued statements on their websites and in email blasts reflecting these new procedures. 2.Use the front door, and not peripheral entrances. Front doors of hotels are generally automatic. 3.Request ground floor room to avoid elevator use. 4.If elevator use is required, do not directly touch elevator buttons with your hands. Do not ride elevators with other people, to the extent possible. 5.Bring disinfecting wipes or sanitizing spray. Upon arrival, disinfect high “hand-traffic” areas of the hotel room: Door handles, light switches, shower/sink faucet handles, TV remote, curtain/blind handles. Clean these surfaces daily. 6.Place the “Do Not Disturb” Sign on your door to prevent people (housekeeping) from entering your room. 7.Avoid common spaces and hotel sponsored events where crowds will be present. 8.Confirm hotel cleaning procedures have been modified to address COVID-19. Confirm no COVID-19 cases have occurred in hotel			**0**
9. Purchasing Supplies at Retail/Shipping Centers	1.Transmittal/exposure of COVID-19 from other customers, staff, surfaces.			**0**	1.Plan your travel to limit the need to visit retail/shipping centers. 2.Practice social distancing, maintaining at least 6 feet of distance between yourself and others. If the store is too crowded/small, consider visiting another store or returning at a different time. 3.Avoid high “hand-traffic” items/areas like door handles (i.e. use your shoulder, hip/butt, or open with a disposable napkin/paper towel), credit cards terminals (i.e. use Apple/Android pay if available), shopping carts/baskets (i.e. bring your own shopping bags), counter tops (i.e. ask clerk if you can hold the items while they are scanned) and bulk/buffet items (i.e. just avoid them). 4.Disinfect your hands before and after visiting a retail/shipping center.			**0**
10. Self Health Check and Potential Exposure Awareness	1.Transmittal/exposure of COVID-19			**0**	1. A potential exposure means being a household contact or having close contact within 6 feet of an individual with confirmed or suspected COVID-19. The timeframe for having contact with an individual includes the period of time of 48 hours before the individual became symptomatic. IF YOU FEEL YOU WERE EXPOSED, IMMEDIATELY CONTACT YOUR MANAGER, and H&S DIRECTOR for CDC direction. 2. Pre-Screen: Staff should measure temperature and assess symptoms prior to them starting work. Temperature checks should happen before the individual enters a project site.			**0**
11. Use of Subcontractors	1.Transmittal/exposure of COVID-19			**0**	1. Subcontractors will prescreen and closely monitor their health and symptoms before coming on site, and follow all Apex COVID-19 guidelines			**0**

Apex Companies, LLC - Job Safety Analysis (JSA) - COVID-19 Awareness - Site Work								
COVID-19 Awareness for Site Work								
Project Number:	1056-18	**Project/Client Name:**		RDI / Port of Portland		**Date:**	1/18/2022	
Project Manager:	Steve Misner	**Project Location:**		Willamette Cove				
Specific Task:								
				0				0
				0				0
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March 31, 2020

PORT OF PORTLAND COVID-19 REQUIREMENTS

To ensure compliance with the Oregon Governor's Executive Order 20-12[1], the Port of Portland is notifying all contractors and consultants working on Port property of the following requirements to address the COVID-19 pandemic.

1) If any worker or service provider to a Port jobsite reports a confirmed case or presumed case (diagnosed by a healthcare provider) of COVID-19 to their employer, the Port of Portland must be notified via Dave Stanton, the Port's Construction Safety Manager. Contact information is provided at the conclusion of this letter. The Port will maintain confidentiality of individuals while addressing health and safety protocols for the site.

2) If a worker is exhibiting or complaining about COVID-like symptoms, they must be asked to leave the project site immediately and consult with their healthcare provider. Symptoms that are consistent with COVID-19 as defined by the Centers for Disease Control (CDC), include chronic coughing, shortness of breath, sore throat, fever, chills and other flu-like symptoms. Employees should not return to work until the CDC's criteria to discontinue home isolation[2] are met (at least 3 days without fever and cough), in consultation with healthcare providers.

3) Implement appropriate strategies for supporting crews to follow the CDC's COVID19 Guidance for Businesses and Employers[3].

   Such strategies include:

   - maintaining social distancing (spacing 6' apart) during the workday, at lunch, and while traversing through Port facilities
   - reduce the size of group gatherings (e.g., stretch and flex) and provide 6' of space between employees during gatherings
   - stagger start times, lunches, and other group gathering times
   - enhance daily cleaning of common areas and encourage clean as you go
   - provide hand sanitizer and hand wash stations, and encourage regular hand cleaning

[1] https://www.oregon.gov/gov/Documents/executive_orders/eo_20-12.pdf
[2] https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in-home-patients.html
[3] https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html

7200 NE Airport Way Portland OR 97218
Box 3529 Portland OR 97208
503 415 6000

4) Abide with the Governor's Executive Order 20-12[1] Workspace Restrictions to include designating an employee to establish, implement, and enforce social distancing policies consistent with guidance from the Oregon Health Authority[4] and Center for Disease Control (CDC).

5) Update project Safety Plans to address COVID-19 requirements in this letter and submit to the Port.

Please understand, this is a zero-tolerance policy that we are enforcing on all Port of Portland jobsites for the good of the community and everyone working on the project. We appreciate your cooperation during these challenging times. Please provide this information to all relevant employees in your company.

We are all working together in fighting the further spread of this virus and we each have a part in keeping our projects running safely and smoothly so that we continue to provide employment opportunities for the people that work for us all.

For COVID-related issues at Port of Portland jobsites, contact:

Dave Stanton
Tel: (503) 530-0541
E-mail: David.Stanton@portofportland.com

The Port appreciates your leadership in response to this pandemic. Your cooperation with these requirements will help our projects continue to move forward.

Respectfully,

Jennifer Belknap Williamson
Director, Engineering

[4] https://sharedsystems.dhsoha.state.or.us/DHSForms/Served/le2268.pdf

Appendix F – Employee Incident Intervention Procedures

Employee Incident Intervention Procedures

Employee reports injury, illness, pain or symptoms

Is the condition life threatening?

YES

Call 911

NO

Employee notifies supervisor to discuss need for medical treatment

Supervisor/Employee <u>immediately</u> contacts WorkCare (1 888 449-7787)

Does the condition require medical treatment beyond on-site first aid?

NO

<u>Supervisor Responsibilities</u>

- Completes Apex Incident Report within 24 hours or sooner
- Emails report to incidents@apexcos.com

YES

WorkCare will assist the employee in obtaining medical treatment at an Apex occupational medical service provider

Supervisor (or trained designee) accompanies employee to medical provider if possible

<u>Supervisor Responsibilities</u>

- Provide the physician a completed Apex Job Analysis form
- Physician Analysis Form
- Understand all follow-up requirements
- Completes Apex Incident Report within 24 hours or sooner
- Email report to incidents@apexcos.com

Additional details may be added when available

If restrictions are imposed, supervisor discusses light duty options with employee and HR's Risk Management Specialist.

HR's Case Manager will be actively involved in injury follow up to include investigations as well as follow-up with supervisors, the employees, the physician, etc. **<u>until the employee is back to work to minimize any lost work days as well as restricted work days.</u>**

<u>Contact Information</u>

WorkCare 1-888-449-7787

Joe Schmids, Manager Corp. H&S: 610-722-9050 x5207 cell 484-467-9333