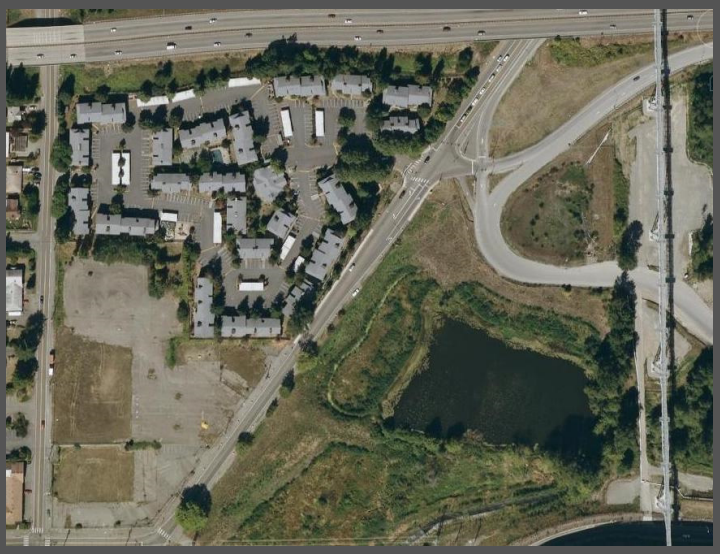
Port of Seattle
Lora Lake Apartments Site



Compliance Monitoring Plan

Prepared for

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LIMITATIONS

This report has been prepared for the exclusive use of Port of Seattle and their authorized agents, and regulatory agencies. It has been prepared following the described methods and information available at the time of the work. No other party should use this report for any purpose other than that originally intended, unless Floyd|Snider agrees in advance to such reliance in writing. The information contained herein should not be utilized for any purpose or project except the one originally intended. Under no circumstances shall this document be altered, updated, or revised without written authorization of Floyd|Snider.

The interpretations and conclusions contained in this report are based in part on site characterization data collected by others and provided by Port of Seattle. Floyd|Snider cannot assure the accuracy of this information.

Lora Lake Apartments Site Compliance Monitoring Plan Revision Log

All revisions related to the Compliance Monitoring Plan for the Lora Lake Apartments Site are documented below.

Date	Revision	Reason for Revision
May 2020	Figure 6.1 was updated to include the bio-filtration swale and catch basin feature.	The bio-infiltration swale and catch basin feature will be observed as part of the wildlife barrier inspection.
	Figure 6.1 was revised to update the extent of the wildlife barrier to the Lora Lake Apartments Parcel only.	The extent was modified to match the Port-owned property boundary (subsequently modified to original boundary as described below).
	Figure 6.1 was revised to present the planted filter strip on the 1982 Dredged Material Containment Area (DMCA) and update the associated wildlife barrier inspection locations.	A planted filter strip was installed along the east side of the DMCA to provide compensatory flood plain storage and improve the water quality of runoff entering the wetland. The planted filter strip is not within the wildlife barrier area, and therefore, ongoing inspection is not required.
	Figure 7.1 was revised to update the compliance monitoring well network.	The monitoring well network configuration was revised during construction; Figure 7.1 was revised to reflect the monitoring well network post-construction completion.
January 2022	Figure 6.1 was revised to update the extent of the wildlife barrier to include the area of the Site sold by the Port of Seattle to the Washington State Department of Transportation (WSDOT) in May 2017.	WSDOT will enter into a separate environmental covenant with Ecology for the property. However, the WSDOT property remains within the Site extent and, therefore, shall be included in the annual wildlife barrier inspection area.
	Figure 6.1 was revised to include an additional wildlife barrier inspection location for the WSDOT property. The location is identified as WSDOT-01.	Monitoring of this area was not included in annual monitoring events conducted in 2018 through 2021 but shall be included in annual events commencing in 2022.
	All figures have been updated with the label “WSDOT PROPERTY” to the northeast of the Lora Lake Apartments Parcel.	Figures have been updated to reflect the WSDOT property transaction.

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List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
AO	Agreed Order (AO) No. DE 6703
ARI	Analytical Resources Inc.
bgs	Below ground surface
BMP	Best management practice
CAP	Cleanup Action Plan
CD	Consent Decree
CESCL	Certified Erosion and Sediment Control Lead
CMP	Compliance Monitoring Plan

Acronym/ Abbreviation	Definition
COC	Contaminant of concern
cPAH	Carcinogenic polycyclic aromatic hydrocarbon
CSWGP	Construction Stormwater General Permit
DMCA	Dredged Material Containment Area
EDR	Engineering Design Report
FAA	Federal Aviation Administration
LL	Lora Lake
LL Apartments Parcel	Lora Lake Apartments Parcel
LL Apartments Site	Lora Lake Apartments Site
LL Parcel	Lora Lake Parcel
MTCA	Model Toxics Control Act
mg/kg	Milligrams per kilogram
NAVD 88	North American Vertical Datum of 1988
NRMP	Natural Resources Mitigation Plan
pg/g	Picograms per gram
pg/L	Picograms per liter
PCP	Pentachlorophenol
POC	Point of compliance
Port	Port of Seattle
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
RI/FS	Remedial Investigation and Feasibility Study
SAP	Sampling and Analysis Plan
Site	Lora Lake Apartments Site
STIA	Seattle-Tacoma International Airport
SWPPP	Stormwater Pollution Prevention Plan
TEE	Terrestrial ecological evaluation
TEQ	Toxicity equivalent
TPH	Total petroleum hydrocarbons

Acronym/ Abbreviation	Definition
UCL	Upper confidence limit
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code
WSDOE	Washington State Department of Ecology

1.0 Introduction

1.1 SITE BACKGROUND

The Port of Seattle (Port) and the Washington State Department of Ecology (WSDOE) entered into Agreed Order (AO) No. DE 6703 for the Lora Lake Apartments Site (LL Apartments Site) on July 10, 2009 (WSDOE 2009; refer to Figure 1.1 for the vicinity map). The AO Scope of Work required the Port to prepare a Remedial Investigation/Feasibility Study (RI/FS) Work Plan, conduct an RI/FS, and prepare an RI/FS Report pursuant to Washington Administrative Code (WAC) 173-340-350 and in a manner that complies with requirements of the Model Toxics Control Act (MTCA) cleanup regulation, Chapter 173-340 WAC (WSDOE 2007). The objective of the RI/FS process for the Site was to complete a comprehensive site-wide evaluation to support recommendation of a cleanup alternative to meet MTCA criteria and be consistent with the Port's future land use goals.

To meet the requirements of the AO, the Port prepared the *Lora Lake Apartments Site Remedial Investigation/Feasibility Study* (Floyd|Snider 2015a). The RI/FS Report presented RI data and evaluations that defined the nature and extent of contamination at the Site, which was divided into three parcels: the Lora Lake Apartments Parcel (LL Apartments Parcel), the Lora Lake Parcel (LL Parcel), and the 1982 Dredged Material Containment Area (DMCA). The configuration of the Site is presented in Figure 1.2. The RI/FS Report then presented a feasibility study evaluation of remedial alternatives for cleanup actions and proposed preferred cleanup actions for the Site.

A Cleanup Action Plan (CAP) was developed using information presented in the RI/FS for the Site (WSDOE 2015a). The Port and WSDOE entered into a Consent Decree (CD; No. 15-2-21413-6) on September 9, 2015, that describes the cleanup action selected by WSDOE for the Site. Remedial construction is expected to be conducted at the LL Apartments Parcel in 2017, and at the LL Parcel between 2017 and 2018. The selected remedy for the DMCA (surface land improvements and institutional controls consistent with industrial land use), is expected to be conducted following completion of the LL Apartments Parcel action, in 2017 or 2018. As allowed by the CD, construction may be phased or may be conducted concurrently at the three parcels. Phasing will be conducted within the schedule presented in Exhibit C of the CD. Any projects planned for completion within the LL Apartments Site, including those not associated with cleanup actions by the Port, will require coordination and approval from WSDOE prior to implementation.

This Compliance Monitoring Plan (CMP) pertains to all three parcels of the LL Apartments Site and has been prepared as required by WAC 173-340-410. The CMP describes protection monitoring, performance monitoring, and confirmation monitoring methods to be implemented with the remedy to comply with the requirements of WAC 173-340-410. The CMP includes description of contingency actions to be taken if monitoring indicates cleanup standards have not been attained following remedy construction. This CMP also includes procedures for the acquisition of soil performance monitoring data at the LL Apartments Parcel, prior to remedial construction, which will be used to determine the extent of soil excavation.

For the LL Apartments Parcel, the sampling scheme described in this CMP is designed to confirm the extent of excavation and is based on the results of the MTCA alternatives analysis in the RI/FS, which identified the preferred remedy for the LL Apartments Parcel. The Port will excavate all contaminated soil with dioxins/furans toxicity equivalent (TEQ) concentrations greater than 100 picograms per gram (pg/g) TEQ (approximately 20,000 cubic yards) for off-site disposal at a properly permitted facility. Excavations will be backfilled to final grade with soil from within the LL Apartments Parcel boundary with dioxins/furans TEQ concentrations less than 100 pg/g. The entire LL Apartments Parcel will then be graded to a final elevation to be determined based on the Port's construction needs for redevelopment, and a barrier to wildlife will be constructed over the entire property. The excess materials not required to grade the LL Apartments Parcel to its final elevation will be excavated, transported to the DMCA, consolidated, and contained beneath an engineered wildlife barrier and associated institutional controls.

WSDOE's selected remedy for the LL Parcel addresses both sediment and soil contamination. For the lake portion of the LL Parcel, the remedy includes capping of the contaminated sediment, then filling the lake to convert the existing open water and benthic sediment conditions of the lake to a palustrine scrub-shrub wetland that existed prior to peat mining. Contaminated lake sediment will be contained in place using an amended sand cap designed to immobilize contaminants of concern (COCs) in the sediment. For soil at the LL Parcel in exceedance of site cleanup levels, the selected remedy provides for excavation of contaminated soil and restoration and replanting of the excavated area in accordance with the Natural Resources Mitigation Plan (NRMP). The current available sample data are considered adequate to identify the shallow soil that is required to be excavated in this area in order to achieve a mean soil dioxins/furans TEQ concentration less than the cleanup level. Therefore, no additional soil sampling prior to construction at the LL Parcel is proposed in this CMP.

WSDOE's selected remedy for the DMCA is placing institutional controls on the area. Institutional controls are required when soil cleanup levels are based on industrial land use. As industrial land, the DMCA also qualifies for an exclusion from a terrestrial ecological evaluation (TEE) if the required institutional controls are implemented to prevent plant and wildlife exposure pathways. The Port plans to make land use improvements at the DMCA to allow for its future use as a temporary construction laydown or equipment storage area. The improvements will consist of surface improvements (e.g., placement of a compacted gravel or engineered surface) that will function as a wildlife barrier to prevent plant and wildlife exposure pathways.

This CMP includes the means and methods for data collection and monitoring to confirm the protection of human health and the environment during construction, and following remedy completion for all impacted media, throughout the Site. The data collected through implementation of this plan will be used both for development of the Engineering Design Report(s) (EDR[s]) for the Site and documentation of successful remedy completion in a Construction Completion Report. This CMP also describes the long-term monitoring that will be conducted following remedy construction to confirm ongoing compliance with cleanup standards.

1.2 COMPLIANCE MONITORING PLAN ORGANIZATION

This CMP is organized as described below:

- **Section 2.0—Cleanup Standards and Points of Compliance.** This section presents site cleanup and remediation levels, and points of compliance (POCs; locations where the cleanup levels shall be achieved) for impacted media.
- **Section 3.0—Nature and Extent of Contamination.** This section provides a brief summary of the COCs and a general description of contamination extent at the Site.
- **Section 4.0—Selected Remedial Actions.** This section presents a brief summary of the selected site remedial actions.
- **Section 5.0—Lora Lake Apartments Parcel Soil Performance Monitoring.** This section details the sampling methodology for collecting supplemental data to define the horizontal and vertical contamination extents at the LL Apartments Parcel to inform remedial design and establish the boundaries of excavation prior to construction.
- **Section 6.0—Lora Lake Apartments Parcel Confirmation Monitoring and Contingency Actions.** This section details the approach for performance monitoring to ensure the LL Apartments Parcel is in compliance with cleanup standards following remedy construction, and remains in compliance including institutional control maintenance and contingency actions to be considered if remedy failure occurs.
- **Section 7.0—Groundwater Performance and Confirmation Monitoring and Contingency Actions.** This section details the approach for demonstrating that the Site groundwater is in compliance with cleanup standards following remedy construction and confirming the long-term effectiveness of the remedy once cleanup standards are met. This includes a description of the monitoring well network, monitoring frequency and duration, and the data analysis and evaluation procedures that will be used to demonstrate groundwater cleanup standard compliance. This section also discusses contingency actions to be evaluated if compliance with cleanup standards is not demonstrated by confirmation monitoring.
- **Section 8.0—Lora Lake Parcel Sediment Cap Performance and Confirmation Monitoring and Contingency Actions.** This section details the approach for ensuring that the LL Parcel Sediment Cleanup Area is installed and functioning as designed to comply with remedial design criteria following remedy construction. This includes a description of the monitoring methods, network, and data analysis and evaluation procedures that will be used to demonstrate sediment cap performance and long-term effectiveness. This section also describes contingency actions to be evaluated if monitoring indicates the remedy is not performing as designed.

- **Section 9.0—Lora Lake Parcel Shallow Soil Cleanup Area Performance Monitoring.** This section details the approach for ensuring that the LL Parcel is in compliance with cleanup standards following remedy construction, as well as institutional control maintenance.
- **Section 10.0—DMCA Wildlife Barrier Confirmation Monitoring and Contingency Actions.** This section details the approach for ensuring that the DMCA wildlife barrier is maintained, including institutional control maintenance and contingency actions to be evaluated if monitoring indicates the barrier is not performing as designed.
- **Section 11.0—Protection Monitoring During Remedy Implementation.** This section details how protection monitoring will be conducted site-wide during remedy construction. This includes health and safety procedures for protection of human health and the environment, and erosion and fugitive dust control measures.
- **Section 12.0—Compliance Monitoring Schedule and Reporting.** This section defines the specific tasks of the CMP that will be completed and presents the anticipated schedule for field activities and WSDOE review and approvals.
- **Section 13.0—References.** This section provides a list of documents cited in this CMP.

2.0 Cleanup Standards and Points of Compliance

2.1 CLEANUP LEVELS

Cleanup standards have been established for the Site, including both cleanup levels and POCs for each media. Since dioxins/furans contamination defines the extent of cleanup at the Site, only cleanup standards for dioxins/furans TEQ are presented in this section. Cleanup standards for the remaining site COCs are presented in the CAP.

Current and future uses and associated exposure pathways are different for each of the three parcels at the LL Apartments Site, resulting in different soil cleanup levels for each parcel. Groundwater cleanup levels apply site-wide as demonstrated in the RI/FS and the *Demonstration of Groundwater Protection of Surface Water Beneficial Uses* technical memorandum (Floyd|Snider 2015b). Sediment cleanup standards for protection of surface water are used only as sediment cap design criteria as described in the *Protection of Surface Water Beneficial Uses* technical memorandum (Floyd Snider 2015b). These criteria are outlined in Table 2.1.

Table 2.1
Soil and Groundwater Contaminants of Concern Cleanup Levels

Site Area	COC	Cleanup Level	Criteria
Soil			
LL Apartments Parcel	Dioxins/Furans TEQ	13 pg/g	MTCA Method A Residential
LL Parcel		5.2 pg/g	Terrestrial Protection
DMCA		1700 pg/g	MTCA Method A Industrial
Groundwater			
Site-Wide	Dioxins/Furans TEQ	6.7 pg/L	MTCA Method A Protection of Drinking Water

Abbreviation:
pg/L Picograms per liter

The applicable soil cleanup levels for the LL Apartments Parcel are the MTCA Method B cleanup levels protective of direct contact (or MTCA Method A where MTCA Method B is not available); for the DMCA, the MTCA Method C industrial cleanup levels protective of worker direct contact is applicable.

2.1.1 Lora Lake Apartments Parcel Soil Remediation Level

At the LL Apartments Parcel, a more aggressive cleanup action will be taken where contaminant concentrations are greater than the remediation level. The remediation level for dioxins/furans at the LL Apartments Parcel is 100 pg/g dioxins/furans TEQ.

2.1.2 Lora Lake Parcel Sediment Cap Design Criteria

The remedial action to be implemented to address Lora Lake sediment contamination includes capping and the filling of the open water to rehabilitate Lora Lake to an uplands wetland system. The scope of the Lora Lake sediment remedy will be based on the current extent of open water and lake sediments. Once implemented, the remedy will result in a contiguous wetland on the LL Parcel. The wetland will be designed so that open water does not occur more than 6 consecutive weeks per year, and, hence, the wetland surface will be classified as soil as it will not meet the definition of sediment in the Sediment Management Standards (refer to WAC 173-204-505(22)). Following remedy implementation, soil and groundwater cleanup levels, as presented in Table 2.1, and associated MTCA regulations will be applicable to the entire LL Parcel, rather than sediment-based cleanup levels.

Monitoring described in this plan will be conducted to confirm compliance with sediment cap design criteria, which will be included in the EDR.

The soil cleanup level established for the both the constructed wetland and Shallow Soil Cleanup Area along the western edge of the LL Parcel is 5.2 pg/g for protection of wildlife (refer to Section 3.2.4).

2.2 POINTS OF COMPLIANCE

POCs (i.e., locations where the cleanup levels shall be achieved) have been established for soil, groundwater, and sediment throughout the Site.

2.2.1 Soil Points of Compliance

The POCs for each of the Site parcels are described below.

2.2.1.1 Lora Lake Apartments Parcel

- **Soil direct contact.** The POC for the soil cleanup level is based on the direct contact exposure pathway. The MTCA standard POC for soil direct contact is throughout the LL Apartments Parcel, from the ground surface to a depth of 15 feet below ground surface (bgs; WAC 173-340-740(6)(d); WSDOE 2007). However, the soil cleanup levels for direct contact to a depth of 15 feet bgs will not typically be met in portions of the site that use containment. Therefore, the cleanup action may be determined to comply with cleanup standards, provided the selected remedy is permanent to the maximum extent practicable and is protective of human health. All soil with dioxins/furans TEQ concentrations exceeding 13 pg/g within the POC must

be contained or excavated. The POC is the LL Apartments Parcel property boundary, and a zone of the former Seattle City Light Sunnydale Substation, as shown in Figure 2.1. This POC also establishes the area that must be covered by a barrier to wildlife.

- **Protection of groundwater.** The POC for soil to protect groundwater is throughout the Site. Groundwater sampling has empirically demonstrated that groundwater contamination is limited to areas where soil dioxins/furans TEQ exceedances are greater than 80 times the cleanup level (1,000 pg/g). The soil POC for protecting groundwater will be the limits of soil with dioxins/furans TEQ concentrations exceeding approximately 10 times the cleanup level. This is the area where soil exceeds 100 pg/g, the remediation level. All soil exceeding the 100 pg/g dioxins/furans remediation level must be excavated and disposed of off-site at a properly permitted facility.
- **Protection of wildlife.** The LL Apartments Parcel qualifies for an exclusion from TEE assessment because its future use is commercial and it will have a barrier to wildlife exposure. This exclusion requires an institutional control to ensure the excluded area is covered by barriers that will prevent wildlife from being exposed to the soil that contains dioxins/furans TEQ concentrations greater than the TEE-based cleanup level of 5.2 pg/g and less than the 100 pg/g dioxins/furans remediation level. The institutional control will apply to the entire LL Apartments Parcel property.

2.2.1.2 Lora Lake Parcel

The soil POC bounds the areas of soil in the LL Parcel where soil dioxins/furans TEQ concentrations exceed the TEE cleanup level of 5.2 pg/g TEQ. This POC is shown on Figure 2.1. The dioxins/furans concentrations in shallow soils extend to the Seattle-Tacoma International Airport (STIA) security fencing to the north to the paved sidewalk along Des Moines Memorial Drive S.

2.2.1.3 DMCA

The DMCA is an industrial area. Therefore, industrial soil cleanup levels were used for comparison to detected concentrations of COCs, and no exceedances of COCs were detected in soil at the DMCA. An institutional control is required when industrial cleanup levels are used (WAC 173-340-440(4)(c)). The POC where the institutional control will apply is the entire extent of the DMCA.

2.2.2 Groundwater Point of Compliance

The standard POC for groundwater under MTCA is “throughout the site from the uppermost level of the saturated zone extending vertically to the lowest depth which could potentially be affected by the site” (WAC 173-340-720(8)(b)). At the LL Apartments Site (including the future post-remedy conditions of Lora Lake), the standard POC for groundwater applies, and cleanup levels will be met by the proposed cleanup action throughout the Site. The groundwater POC is shown on Figure 2.1.

2.2.3 Lora Lake Sediment Point of Compliance

Modeling has indicated surface sediment COC concentrations in Lora Lake may cause exceedances of surface water quality standards for dioxins/furans unless a remedial action is performed. The POC for the existing sediment, the area exceeding sediment cleanup standards within Lora Lake, is shown on Figure 2.1. This area must be remediated in a manner to address surface sediment COC concentrations and prevent leaching of COCs to surface water.

3.0 Nature and Extent of Contamination

The following sections summarize the current extent of site COCs in impacted media as identified by the RI/FS, including soil, groundwater, and sediment. They also describe the current contaminant distribution in all media. Figure 3.1 presents a summary of the distribution of all contaminants exceeding site cleanup levels. Detailed descriptions of each area of contamination are provided in Section 3.2.

3.1 FINAL CONTAMINANTS OF CONCERN

The LL Apartments RI/FS identified the following COCs for the Site:

Contaminant	Soil	Groundwater	Sediment
Arsenic	✓	✓	✓
Carcinogenic polycyclic aromatic hydrocarbons (cPAH)	✓	✓	✓
Pentachlorophenol (PCP)	✓	✓	✓
Dioxins/furans	✓	✓	✓
Total petroleum hydrocarbons (TPH; (gasoline, diesel, and heavy oil ranges)	✓	✓	
Lead	✓		
Toluene	✓		
Ethylbenzene	✓		

Dioxins/furans are the most widespread COC at the LL Apartments Site, present in the primary source areas and at low levels in shallow soil throughout a large portion of the LL Apartments Parcel, and at low levels in shallow soil and sediments located within the LL Parcel.

At the DMCA, reported concentrations of site COCs are less than the applicable Industrial Cleanup Standards.

3.2 AREAS OF CONTAMINATION

3.2.1 Cleanup Area A: Lora Lake Apartments Parcel Central and Eastern Source Areas Soil

The soil in the Central and Eastern Source Areas of the LL Apartments Parcel (Cleanup Area A, presented in Figure 3.2) is currently assumed, based on the RI data, to be contaminated from the ground surface to a depth of approximately 15 to 20 feet bgs from past releases associated with historical barrel-washing operations, auto-wrecking operations, and soil relocation during apartment construction and landscaping. The vertical extent of contamination will be determined during soil performance monitoring at the LL Apartments Parcel, described further in Section 5.0. The Central Source Area, which is the location of the historical barrel-washing drum cleanout

pond, is approximately 0.4 acres. The Eastern Source Area, located along the eastern property line in the vicinity of Monitoring Wells MW-4 and MW-5, is approximately 0.3 acres. It is thought that during historical barrel-washing operations, barrels and drums brought to the property were rinsed and the wash water discharged to the ground in the vicinity of the Central Source Area, either directly to the ground or to sump/pond structures. Subsurface soil was likely contaminated via downward lateral contaminant migration through the vadose zone and groundwater table. These operations are thought to be the main source of soil contamination within the Central and Eastern Source Areas. COCs in the Central and Eastern Source Areas include: dioxins/furans, cPAHs, PCP, TPH, and lead. Outside these source areas, soil contamination generally does not exceed 2 to 4 feet in depth. In the Central Source Area, the RI did not fully delineate the vertical extent of contamination. The deepest existing sample was collected at boring location PSB-11 from 14 to 16 feet bgs and has a dioxins/furans TEQ concentration of 2,050 pg/g.

3.2.2 Cleanup Areas B and C: Lora Lake Apartments Parcel Shallow Soil

3.2.2.1 Cleanup Area B

Cleanup Area B generally includes the area within the LL Apartments Parcel where dioxins/furans contamination is present in soil shallower than 2 to 4 feet bgs, beyond the extent of the LL Apartments Parcel Cleanup Area A. In the Western Source Area near the property boundary adjacent to the Former Seattle City Light Sunnydale Substation, cPAH contamination is also present to a depth of 4 feet bgs. Site regrading activities are likely responsible for the widespread presence of dioxins/furans across the shallow surface soil at the LL Apartments Parcel. Substantial regrading activities occurred during construction of the apartment complex in the mid-1980s. The characteristics of the shallow surface soil contamination are indicative of reworked site soil rather than migration of contamination through the soil, as the concentrations of dioxins/furans (as well as other COCs) show variation in vertical and horizontal extent. In addition, the magnitude of chemical concentrations do not consistently decrease with increasing distance away from the source areas, and the location of contamination is not centered around the source areas as would be expected if the contamination was resulting from plume migration away from a source area.

Cleanup Area B includes all locations within the LL Apartments Parcel where the maximum detected dioxins/furans TEQ concentration in soil at any depth is between 100 pg/g and 1,000 pg/g. The total acreage of Cleanup Area B is approximately 2.2 acres and consists of the following specific locations, identified on Figure 3.2:

- A zone along the southeastern property line, east of the Eastern Source Area. Much of this area is outside the property fence, along Des Moines Memorial Drive S. at the foot of the topographic slope.
- The right-of-way along Des Moines Memorial Drive S. extending to the paved edge.
- A zone between the Central Source Area and the Eastern Source Area.
- The west-central portion of the LL Apartments Parcel.

- The Western Source Area near the LL Apartments Parcel property boundary adjacent to the Former Seattle City Light Sunnydale Substation.

3.2.2.2 Cleanup Area C

Cleanup Area C as depicted on Figure 3.2 encompasses all locations (other than those in Cleanup Areas A and B) where the maximum detected dioxins/furans TEQ concentration in soil at any depth is between 13 pg/g and 100 pg/g. As described in Section 1.0, the entire LL Apartments Parcel, including Cleanup Area C, will be re-graded, with the materials not required to grade the LL Apartments Parcel to its final elevation to be consolidated on the DMCA.

3.2.3 Lora Lake Apartments Groundwater

Groundwater contamination is limited to the LL Apartments Parcel. Groundwater downgradient of the LL Apartments Parcel, beneath the LL Parcel, and beneath and downgradient of the DMCA has not been impacted by site contamination. Dioxins/furans concentrations are present in groundwater at concentrations less than the site cleanup level, including in wells cross-gradient and upgradient of the Site, and is attributed to ubiquitous urban contamination.

There is one well on-site where groundwater dioxins/furans TEQ concentrations exceed the cleanup level; it is located in the Central Source Area (MW-1) where barrel-washing activities occurred and dioxins/furans TEQ soil concentrations are greatest. Dioxins/furans TEQ concentrations in groundwater attenuate rapidly due to their strong tendency to sorb to soil, and the wells downgradient of the Central Source Area do not have dioxins/furans TEQ concentrations exceeding their cleanup level. In MW-1, the greatest dioxins/furans TEQ groundwater concentration is approximately 5.7 times its cleanup level. Arsenic also exceeds its cleanup level by almost 3 times at this location (Figure 3.1).

Arsenic and PCP exceed their respective cleanup levels in groundwater in one well on the eastern boundary of the LL Apartments Parcel (MW-5). This well is downgradient of the concrete sump area where barrel-washing activities occurred.

3.2.4 Lora Lake Parcel Shallow Soil

Shallow soil at the LL Parcel is contaminated with dioxins/furans at concentrations that exceed the natural background-based cleanup level of 5.2 pg/g TEQ for protection of ecological receptors. Soil contamination exists along the western property boundary at depths ranging from 0 to 5 feet bgs. The dioxins/furans TEQ concentrations in shallow soils extend to the paved sidewalk along Des Moines Memorial Drive S. to the west. Lead also exceeds its cleanup level of 50 milligrams per kilogram (mg/kg) in 2 of the 19 soil samples collected in which lead was measured, at concentrations of 58 and 64 mg/kg. These concentrations are present in the surface soil. The cleanup area is composed of two separate areas, covering approximately 0.2 acres. The LL Parcel Shallow Soil Cleanup Area is presented in Figure 3.3.

3.2.5 Lora Lake Parcel Sediment

The LL Parcel Sediment Cleanup Area encompasses sediments within the entire footprint of Lora Lake, approximately 3 acres, as presented in Figure 3.3. As described in Appendix P of the RI/FS, the results of the numerical modeling evaluation indicated that the necessary sand cap thickness to effectively attenuate and isolate the surface sediment COC concentrations of 18 inches with a 0.06 percent organic carbon content is driven by arsenic and dioxins/furans. Dioxins/furans are present at concentrations ranging from 7.55 pg/g TEQ to 217 pg/g TEQ in surface sediments. Arsenic is present at concentrations ranging from 7 mg/kg to 70 mg/kg in surface sediments.

The results of the numerical modeling evaluation also indicate that a sand cap thickness of 6 inches with 0.06 percent organic carbon content would effectively isolate the surface sediment concentrations on lead, cPAHs, and PCP; therefore, the sediment cap to be constructed will also be protective of these COCs.

3.2.6 1982 Dredged Material Containment Area

At the DMCA, reported concentrations of site COCs are less than the applicable Industrial Cleanup Standards. Port future land use plans consist of surface improvements (e.g., placement of a compacted gravel or engineered surface), which will eliminate potential wildlife exposure pathways and allow for an exclusion from the TEE and application of cleanup standards for terrestrial and ecological protection. Institutional controls will be placed on the DMCA to ensure barriers to wildlife are maintained in the future.[1]

[1] The TEE COCs are dioxins/furans. Dioxins/furans do not have cleanup levels applicable to plants or soil biota. There are cleanup standards for wildlife. Hence, the wildlife barrier needs to prevent exposure of wildlife to soil.

4.0 Selected Remedial Actions

4.1 LORA LAKE APARTMENTS SITE REMEDIAL ACTIONS

The Port's proposed Preferred Remedial Alternative for the LL Apartments Site is discussed in detail in Section 5.0 of the CAP. The remedy is a comprehensive final remedy for the Site that is compliant with all the applicable remedy selection requirements under MTCA. The remedy includes the following: stormwater system improvements, contaminant mass removal, contaminant mass isolation and containment, and institutional controls where required.[2]

The following sections summarize the soil-, groundwater-, and sediment-related components of the remedy. Figure 4.1 presents a conceptual cross section of the LL Apartments Site remedy. Stormwater conveyance system improvements will be detailed in the EDR, and are summarized in this section.

4.1.1 Lora Lake Apartments Parcel Soil Excavation and Containment

The Port will excavate all contaminated soil with dioxins/furans TEQ concentrations greater than 100 pg/g TEQ (about 20,000 cubic yards) for off-site disposal at a properly permitted facility. This excavation will also remove from the LL Apartments Parcel the full extent of all other COC (lead, PCP, gasoline-range TPH, diesel-range TPH, and heavy oil-range TPH) soil contamination at concentrations greater than cleanup levels.

LL Apartments Parcel soil excavations will be backfilled to final grade with on-site soils whose dioxins/furans TEQ concentrations do not exceed the remediation level of 100 pg/g. Backfilling will be considered complete when excavations have been backfilled and compacted to design grade, which will be determined in the EDR. The final site grading and elevation plan will be determined based on the Port's construction needs for redevelopment. Thus, during re-grading, soil with dioxins/furans TEQ concentrations up to 100 pg/g will remain on the LL Apartments Parcel as needed to reach the proposed final elevation. The RI analysis indicates that up to approximately 30,000 cubic yards of soil will be required to backfill the source area excavations to final grade, and re-grade the remainder of the LL Apartments Parcel. The excess materials not required to re-grade the LL Apartments Parcel to its final elevation will be excavated, transported to the DMCA portion of the Site, consolidated, and contained beneath an engineered wildlife barrier. The final elevation for the LL Apartments Parcel will be determined during the engineering design process.

When the LL Apartments Parcel grading to the final elevation has been completed, a barrier to wildlife will be established within 4 years. This allows the Port 4 years to identify the commercial

[2] Institutional controls are required to control contamination remaining on the LL Apartments Parcel at concentrations greater than the dioxins/furans TEQ cleanup level of 13 pg/g. An institutional control will be placed on the LL Apartments Parcel to require that surface improvements provide a barrier to wildlife and to keep the area in commercial use, excluding the property from application of a TEE per WAC 173-340-7491.

use of the property and integrate the barrier to wildlife with property development. The barrier design requires WSDOE approval. Prior to construction of the final wildlife barrier surface, the LL Apartments Parcel will be stabilized to control erosion, stormwater runoff, and dust generation.

The excess material to be excavated and consolidated within the DMCA is expected to be up to 10,000 cubic yards, and is dependent on redevelopment plans for the property. The DMCA is within the Federal Aviation Administration (FAA) Runway Protection Zone Extended Runway Object Free Area (FAA 2008). The DMCA is expected to remain in Port ownership in perpetuity, and already is subject to deed restrictions, access restrictions, and institutional controls for FAA and airport operational purposes. Both existing dioxins/furans TEQ concentrations at the DMCA and concentrations of soil to be removed to the DMCA from the LL Apartments Parcel are less than the applicable DMCA MTCA soil cleanup level. Therefore, capping this material is not required for protection of Port workers. However, as previously described, the Port will construct an engineered surface to provide a barrier to terrestrial growth and ecological exposure, as well as to direct contact to workers, and to improve the area for Port uses. Because the DMCA is located in a Port-secured area, there is no public access.

After excavation, backfilling, and re-grading have been completed stormwater and erosion control measures will be implemented and maintained. These measures will also control dust generation.

4.1.2 Groundwater

The soil excavation of the LL Apartments Parcel source area is expected to remove the contaminant mass above, and in contact with, contaminated groundwater. Following removal of this saturated soil source, confirmation groundwater sampling will be conducted until groundwater concentrations are in compliance with cleanup levels, described in further detail in Section 7.0. Groundwater encountered during excavation and removed from the subsurface for excavation dewatering will be either treated as needed and discharged to the sanitary sewer under a discharge authorization, or collected for off-site disposal at a properly permitted facility.

All existing groundwater monitoring wells within the LL Apartments Parcel will be abandoned in accordance with applicable regulations (WAC 173-160) prior to the start of excavation and re-installed when the excavation and LL Apartments Parcel re-grading is complete.

4.1.3 Lora Lake Parcel Lake Capping and Filling for Wetland Rehabilitation

The sediment remedy for Lora Lake results in the conversion of the existing open water and benthic sediment conditions of the lake to a palustrine scrub-shrub wetland. Contaminated lake sediment will be contained in place by a carbon-containing sand cap. The wetland will be designed so that it does not adversely impact the functioning of the Port's mitigation areas covered by the NRMP. This includes not adversely impacting flood frequencies in Miller Creek. The wetland design and construction will also comply with all applicable permits and resource agency requirements. The sand cap implemented during remedial actions will be designed to

immobilize the current sediment COCs in place, which will prevent leaching of COCs to surface water. Based on the modeling results, the placement of a cap with the isolation capacity of an 18-inch sand cap with a minimum 0.06 percent organic carbon content on top of the Lora Lake sediments would be protective of the surface water human health pathway via fish and water consumption for all COCs. The remedy includes placement of a fill layer and wetland soil over the isolated sediment contamination, restoring the lake to pre-peat mining wetland conditions.

For areas where contaminated sediments are shallower than the 6-foot conditional POC protective of ecological receptors in soil, a barrier to wildlife will be established that may include but is not limited to geotextile fabric. The 6-foot depth is established based on the depth of the biologically active zone in soil. Placement of the wildlife barrier is consistent with WAC 173-340-7490(4)(a) and with the existence of institutional controls to prevent excavation of the deeper soil in these areas (refer to Figure 4.1). The barrier design requires WSDOE approval.

4.1.4 Lora Lake Parcel Soil Excavation and Off-Site Disposal

The remedy for the soil portion of the LL Parcel provides for excavation of contaminated soil and restoration and replanting of the excavated area in accordance with the NRMP. Excavation and containment at the DMCA or off-site disposal of soil from the LL Parcel Shallow Soil Cleanup Area will result in compliance with the applicable LL Parcel soil cleanup level of 5.2 pg/g TEQ dioxins/furans, which is protective of terrestrial exposure at the LL Parcel. Following excavation, the area will be backfilled and replanted, and managed in accordance with the requirements and management goals of the NRMP.

4.1.5 1982 Dredged Material Containment Area Remedial Actions

The remedy for the DMCA is placing institutional controls on the area. Institutional controls are required when soil cleanup levels are based on industrial land use. The Port plans to make land use improvements at the DMCA to allow for its future use as a temporary construction laydown or equipment storage area. The improvements will consist of placement of a wildlife barrier (e.g., placement of a compacted gravel or engineered surface) that will be maintained to prevent plant and wildlife exposure pathways.

The DMCA consolidation area will be constructed in a manner that protects against contaminant migration, including during flood events. The boundary of the 100-year floodplain will be surveyed as part of the design process. Fill will not be placed in the 100-year floodplain, and the construction of filled areas will protect the material from erosion with slope stabilization construction techniques.

5.0 Lora Lake Apartments Parcel Soil Performance Monitoring

The performance monitoring scope of this CMP has been developed to provide the necessary data to comply with the MTCA requirements for remedy performance monitoring in a constructible and implementable manner. During the implementation of remedial actions at the LL Apartments Parcel, contaminated soil will be excavated to survey coordinates (northing, easting, and elevation) established from the surveyed performance monitoring samples collected prior to initiation of excavation. The standard laboratory turn-around time for dioxins/furans analysis is 15 days, and expedited turnaround time is at the least 5 days. This duration is not an acceptable amount of time for an excavation to be left open on-site while awaiting laboratory analytical results to verify that the cleanup standards have been met due to the expense of contractor stand-by, excavation stability, and public safety concerns if there are trespassers on the LL Apartments Parcel. Because of this, performance monitoring samples will be collected prior to start of excavation activities, and excavation extent will be designed based on the results of those data and confirmed in the field using surveying.

The location of samples to be collected is based on existing data, and includes sampling in areas beyond the anticipated extent of contamination to ensure the data are sufficient to identify the extent of soil requiring removal. In some cases, existing data will be used to determine the extent of excavation. In other cases new data will be generated by collection of performance monitoring samples defined in this CMP.

During construction, additional data collection may be needed in areas where the pre-construction performance monitoring samples do not adequately delineate the extent of soil exceeding the 100 pg/g TEQ remediation level. Any additional sampling locations needed during construction will be determined in coordination with WSDOE as part of the remedial design, following the receipt of data from performance monitoring sampling.

The overall sampling methodology for the LL Apartments Parcel soil performance monitoring is presented in the following sections.

5.1 SAMPLING FIELD PROCEDURES, NAMING, AND QUALITY ASSURANCE

Field activities and sample collection will be conducted in general accordance with procedures described in Appendix B of the RI/FS Work Plan(Sampling and Analysis Plan/Quality Assurance Project Plan [SAP/QAPP; Floyd|Snider 2010]) and Appendix C of the RI/FS Work Plan (Health and Safety Plan; Floyd|Snider 2010). This includes the same analytical methods, reporting limits, data quality objectives, and data validation levels as presented in Appendix B of the RI/FS Work Plan.

The pre-construction performance monitoring will involve the installation of soil borings by drill rig for samples to be collected deeper than approximately 4 feet bgs, and either hand auger or test pit excavation for locations where sample collection is limited to 0 to 4-feet bgs.

All borings will be monitored by a field technician as described in the SAP/QAPP. Geologic logging will be conducted throughout the boring installation, including intervals that may not be targeted for sample collection. Soil descriptions will be recorded on a soil boring log form (Appendix A).

The sample-naming format includes the "performance monitoring sample (PM) location number-depth of sample interval (in feet)." For example, a sample collected from PM-001 from the 1- to 2-foot depth interval, will be labeled PM001-01.0-02.0.

5.2 SELECTION OF SAMPLING LOCATIONS

Samples will be collected at locations representing the anticipated base and sidewalls of future excavation, based on existing data. These base and sidewall samples will be analyzed immediately following collection, and are designated as "Tier 1" or "first tier" samples. Samples will also be collected from "stepped-out" locations, anticipating the potential that Tier 1 sample data either do not define excavation limits that achieve the remediation level or require unnecessary over-excavation. These "Tier 2" or "second tier" samples will be archived by the laboratory for future analysis as needed based on the results of Tier 1 sample analyses. This tiered analysis approach is consistent with previous RI sampling events.

Figure 3.2 shows Cleanup Areas A, B, and C. Sampling and analysis schemes are presented in Sections 5.2.1 and 5.2.2 for Cleanup Areas A and B. Cleanup Area C encompasses all shallow dioxins/furans-contaminated areas with dioxins/furans TEQ concentrations between 13 and 100 pg/g. A sampling and analysis scheme is not included for Cleanup Area C, as soil dioxins/furans TEQ concentrations in this area are less than the remediation level and may be left in place or consolidated at the DMCA.

5.2.1 Cleanup Area A: Sampling and Analysis Scheme

Cleanup Area A includes the Central and Eastern Source Areas (Areas A1, A2, and A3) where deep contamination (i.e., 10–20 feet bgs or deeper) of dioxins/furans, cPAHs, PCP, and TPH and shallow contamination (i.e., less than 4 feet bgs) of lead are present. To confirm the horizontal and vertical extents of the contaminants within Cleanup Area A, the performance monitoring sampling includes the installation of 42 soil borings by direct-push methods to a maximum depth of 25 feet bgs, depending on known contamination extent. Soil boring locations are shown on Figure 5.1, with sample depth intervals and analytical requirements for each boring location provided in Table 5.1. A total of 119 samples (including first and second tier) is to be collected in Cleanup Area A.

5.2.1.1 Sample Location Spacing

Generally, borings will be spaced on a 45-foot grid for the remedy sampling scheme to provide adequate site coverage to fully delineate contamination extent. However, because Cleanup Area A is the primary source area and excavations will occur at depths potentially greater than 20 feet bgs, borings will be spaced more densely—particularly in Area A1, which contains the

greatest dioxins/furans TEQ concentrations. Denser spacing will better define the large volume of soil with the greatest concentrations that requires excavation and will reduce the potential for over-excavation of cleaner material.

5.2.1.2 Sample Intervals

All samples will be collected from 1-foot intervals. Table 5.1 outlines the analytes to be targeted at each sample location and the specific sampling intervals to be analyzed (and archived). Sample intervals at each location depend upon the sampling objective and known approximate contamination extent based on existing data. To illustrate the proposed sample interval depths compared to the known extent of contamination based on existing data, a cross section of the LL Apartments Parcel is presented in Figure 5.2. Samples will be collected to meet the objectives described in the following sections.

5.2.1.2.1 Delineation of Vertical Contamination Extent

Base First Tier Performance Monitoring Samples. Base first tier samples consist of those samples collected for the purpose of delineating the vertical extent of contamination and providing performance monitoring data in areas with known horizontal contamination extents. Excavation base first tier samples will be collected and analyzed immediately upon collection. Base samples will be collected at a depth interval directly below the known approximate vertical contamination extent based upon existing data. For example, base samples in the 10-foot excavation area (Area A2) within the Central Source Area will be collected at 10 feet bgs. Existing data in this area indicate that the dioxins/furans TEQ concentration at boring location PSB-10 decreases rapidly between 10 feet bgs (108 pg/g) and 14 feet bgs (0.653 pg/g). Therefore, the sample interval below 10 feet bgs (10 to 11 feet bgs), will be sampled to determine if it contains dioxins/furans TEQ concentrations less than 100 pg/g, which will vertically delineate the contamination. A sample from 10 to 11 feet bgs will be analyzed rather than a deeper or shallower sample to attempt to limit the extent of excavation as much as possible.

It is important to note that base first tier, as well as base second tier and sidewall first tier samples discussed later in this section, are not differentiated on Figure 5.1 but are jointly identified as "First Tier Performance Monitoring Samples." This allows flexibility during the field event and subsequent analysis to determine whether certain samples can be used to meet both sampling objectives. The placement of the samples, as shown on Figure 5.1, generally indicates their primary sampling objective.

Base Second Tier Samples. Base second tier samples are those samples collected from above and below the first tier sample depths in the event that the first tier samples do not return dioxins/furans TEQ concentrations less than 100 pg/g, or the first tier sample concentration is substantially less than the 100 pg/g remediation level. Second tier samples will be archived and analyzed only as needed. For example, in Area A3, second tier samples will be collected from 11 to 12 feet bgs, directly below the first tier interval. Samples will also be collected from 9 to 10 feet bgs, as existing base data are limited and contamination may be shallower than

10 feet bgs. Soil will then be excavated during remedial construction to the shallowest depth of the delineating samples. In Area A1, several second tier samples will be collected to depths down to 26 feet bgs because the vertical extent of contamination was not delineated in the RI. The deepest existing sample in Area A1 collected from the 14- to 16-foot bgs interval from boring PSB-11 has an elevated dioxins/furans TEQ concentration (2,050 pg/g). Because the dioxins/furans TEQ concentration is so elevated, samples at several depths in Area A1 will be analyzed as first tier. An estimated excavation depth of 20 feet bgs was conservatively assumed in the RI/FS (Floyd|Snider 2015a), and will be refined by these data. Samples will be collected and archived to a depth of 26 feet bgs as a measure of conservatism. Contamination has not been observed below 25 feet bgs in any boring on-site.

5.2.1.2.2 Delineation of Horizontal Contamination Extent

Sidewall First Tier Samples. Sidewall first tier samples are intended to delineate the horizontal extent of excavation. Excavation sidewall first tier samples will be collected and analyzed immediately upon collection (refer to Figure 5.1 for sample locations). They will be collected around the edge of the approximate extent of dioxins/furans TEQ contamination exceeding the remediation level, based on existing data. For example, in Areas A2 and A3, sidewall samples will be collected from two depths: at the surface and at the anticipated base of excavation. In Area A1, the deepest source area (20 feet bgs), sidewall samples will be collected from three depths: at the surface, at either approximately midway down the excavation sidewall or at the depth where the greatest dioxins/furans TEQ concentration was observed during previous sampling, and at the anticipated base of excavation. Target sampling depths for excavation sidewall samples are presented in Table 5.1.

Sidewall Second Tier Samples. Sidewall second tier samples are intended to provide additional data around the first tier samples. Sidewall second tier samples are those samples collected by stepping out (or in) from the first tier samples in the event that the first tier samples do not return dioxins/furans TEQ concentrations less than the remediation level of 100 pg/g, or the results of first tier samples are substantially less than 100 pg/g. Sample locations have been proposed outside of the current assumed excavation extent (refer to Figure 5.1). Sidewall second tier samples will be collected from the same depths as the first tier sidewall samples.

5.2.1.3 Use of Existing Data

Existing site data have been used to determine the nature and extent of contamination at the Site, as described in detail in the RI/FS (Floyd|Snider 2015a). Select data collected as part of previous site investigations will be used to delineate the extent of excavation at the LL Apartments Parcel, given their location with regard to the planned excavation extent. Data that are expected to assist in delineating the extent of excavation at the LL Apartments Parcel are presented in Figure 5.1.

5.2.2 Cleanup Area B: Sampling and Analysis Scheme

Cleanup Area B encompasses all shallow dioxins/furans-contaminated areas outside of the source areas with dioxins/furans TEQ concentrations greater than 100 pg/g (Areas B1, B2, B3, B4, and B5). In addition to dioxins/furans, there exists limited cPAH contamination in Area B2. The current vertical extent of contamination of dioxins/furans TEQ concentrations greater than 100 pg/g in Cleanup Area B is as deep as 4 feet bgs, but the majority of the contamination is limited to 0.5 feet bgs based on existing data. To delineate the horizontal and vertical extents of the contamination within Cleanup Area B, the performance monitoring sampling includes the installation of 76 soil borings by either hand auger or test pit excavation, depending on the boring depth. Soil boring locations are shown on Figure 5.1, with sample depth intervals and analytical requirements for each boring location described in Table 5.1. A total of 155 samples (including first and second tier) is to be collected within or adjacent to Cleanup Area B.

5.2.2.1 Boring Location Spacing

Borings and test pit locations have been generally spaced on a 45-foot grid in Cleanup Area B. Boring and test pit locations are shown in Figure 5.1.

5.2.2.2 Sample Intervals

Samples will be collected from specific depth intervals at each boring location and will either be immediately analyzed for dioxins/furans (and cPAHs in Area B2) or archived for potential future analysis using the tiered analysis approach described above. All samples will be collected from 1-foot depth intervals. Sample intervals at each location depend upon the sampling objective and known approximate contamination extent based on existing data.

5.2.2.3 Use of Existing Data

As described, data supporting the delineation of the excavation area were previously collected during the RI. For example, the assumed vertical contamination extent of Area B1 was based on two samples (PSB-04 and LL-12) with dioxins/furans TEQ concentrations greater than 100 pg/g present in the 0- to 0.5-foot bgs depth interval (194 and 234 pg/g, respectively). Samples collected at the 1.5- to 2-foot bgs depth interval at these locations have dioxins/furans TEQ concentrations substantially less than 100 pg/g (1.74 and 5.3 pg/g, respectively). This rapid decrease in dioxins/furans TEQ concentration relative to depth is consistent with the known site history, in which soil from the source area was used to re-grade the LL Apartments Parcel. The existing RI data are incorporated, to the extent possible, to supplement the performance monitoring data collected during this event. Existing data used to inform additional sample locations are presented in Figure 5.1.

5.2.2.4 Additional Data Collection during Construction

Following excavation of Cleanup Area B, soil samples will be collected from the excavation eastern sidewall abutting the Des Moines Memorial Drive S. to document any dioxins/furans TEQ concentrations remaining in place beneath the right-of-way. Environmental covenants will be placed, if needed, that require any excavation of soil in the right-of-way be properly managed to protect against exposure to excavated soil.

5.3 SOIL SAMPLE ANALYSIS AND DATA QUALITY REVIEW

Consistent with project remedial investigations, soil samples will be transported to Analytical Resources Inc. (ARI) laboratory in Tukwila, Washington, for chemical analysis of dioxins/furans, cPAHs, PCP, lead, and TPH using the following methods:

- Dioxins/furans: U.S. Environmental Protection Agency (USEPA) Method 1613
- cPAH: USEPA Method 8270D
- PCP: USEPA Method 8041
- Lead: USEPA Method 6010
- TPH: NWTPH-G, NWTPH-Dx

The analyses will be conducted to achieve a reporting limit that is less than the applicable soil cleanup levels identified in Table 2.1. Floyd|Snider will review the laboratory reports for internal consistency, transmittal errors, consistency with laboratory protocols, and adherence to the USEPA analytical methods and data validation guidance. As described in the SAP/QAPP, Level III Data Quality Review (Summary Validation) will be performed on all the analytical data, except dioxins, which will have a Level IV, Tier III Data Quality Review (Full Validation).

5.4 SURVEY DATA

All soil boring locations will be surveyed to document the horizontal location and vertical elevation of ground surface at all soil sampling locations. This is necessary for accurate delineation of the excavation extent during remedial design, and provides the basis for excavation control points that will be verified by survey during construction. Soil borings will be surveyed to a horizontal and vertical accuracy of within 0.1 foot.

Site mapping will be conducted using the Washington State Plane North Coordinate System. The vertical datum used will be the North American Vertical Datum of 1988 (NAVD 88). Survey data will be included in the Soil Performance Monitoring Data Report, which will be issued as an appendix to the LL Apartments Parcel EDR.

6.0 Lora Lake Apartments Parcel Confirmation Monitoring and Contingency Actions

This section details the approach for ensuring the long-term effectiveness of remedial actions implemented at the LL Apartments Parcel including institutional control maintenance and contingency actions. This confirmation monitoring meets the intent of WAC 173-340-410(1)(c).

6.1 INSTITUTIONAL CONTROLS

Environmental covenants to implement institutional controls will be placed on the LL Apartments Parcel. The covenants will require institutional controls to maintain the barrier to wildlife to prevent exposure to soil contamination greater than cleanup levels, to prevent groundwater withdrawal while contamination remains on-site at concentrations greater than cleanup levels (groundwater is anticipated to exceed cleanup levels for less than 5 years), and to require that the property remains in commercial use and is, therefore, not subject to terrestrial cleanup standards.

The environmental covenants will describe the nature and extent of contamination remaining on-site after completion of cleanup construction, and detail the restrictions applicable to the Site to prevent human and wildlife exposure to contaminants remaining on-site.

Two draft environmental covenants will be submitted to WSDOE: one covenant will be for maintenance of long-term institutional controls for the barrier to wildlife and to keep the area in commercial use. The other will prevent groundwater withdrawal. It is anticipated that this covenant will be removed once confirmation monitoring indicates groundwater is in compliance with cleanup standards.

Separate environmental covenants may be needed for the former Seattle City Light Sunnydale Substation (now owned by the Port) and a small area east of the LL Apartments Parcel property boundary within the City of Burien right-of-way. The need for environmental covenants for these areas will be determined after compliance monitoring data have been collected and the COC concentrations remaining in these areas are known.

6.2 WILDLIFE BARRIER PHYSICAL INSPECTIONS

Performance monitoring will be performed to verify wildlife barrier integrity and performance (through effective isolation of the underlying soils). Wildlife barrier inspections will be performed to verify the physical integrity of the LL Apartments Parcel barrier. Monitoring activities and objectives will include visual inspection of barrier conditions to ensure that the barrier is intact and coverage has been maintained (i.e., underlying existing soil is not exposed).

The LL Apartments Parcel extent of the wildlife barrier that will be monitored during physical inspections is shown on Figure 6.1, and includes the entire LL Apartments Parcel property.

Observations of the barrier will be documented using an approximate 150-foot monitoring grid along the boundary and throughout the LL Apartments Parcel. The inspections will document the following observations:

- Barrier surface characteristics (i.e., gravel, engineered surface, equipment placement, etc.)
- Any areas of exposed underlying soil due to physical disturbance of barrier
- Any apparent loss of barrier material
- Any apparent downslope movement of barrier materials
- Presence of debris on the barrier surface
- Any substantial plant growth, indicating ineffective barrier function

Barrier observations will be documented on the wildlife barrier physical integrity inspection form (Appendix B).

6.3 MONITORING SCHEDULE

LL Apartments Parcel wildlife barrier physical integrity inspections will be conducted annually according to the monitoring schedule presented in Section 12.0. Additional barrier physical integrity inspections may also be completed after one of the following occurrences is thought to have potentially adversely impacted the integrity of the barrier: a storm event that has led to a barrier failure, such as erosion or a landslide; a site use accident, such as a substantial barrier penetration or spill; or a seismic event where structural damages have been realized on Port property. Determination of the need for these additional monitoring events will be made in consultation with WSDOE.

The first 5-year periodic review will assess the appropriate monitoring frequency for the next 5 years, and subsequent 5-year periodic reviews will set the frequency for the following 5-year period.

6.4 CONTINGENCY ACTIONS

If the results of the wildlife barrier physical integrity inspections and observation comparisons to previous monitoring events indicate that significant areas of the wildlife barrier are not intact, determination of appropriate contingency actions will be coordinated with WSDOE. Potential contingency actions may include, but are not limited to, the following:

- Conducting supplemental field inspections to delineate areas of wildlife barrier disturbance and to collect additional information to determine potential causes of the wildlife barrier disturbance.
- Performing repairs and/or modifications to failed areas of the wildlife barrier to prevent wildlife exposures and limit future disturbance of the barrier.

- Implementing administrative controls to limit further wildlife barrier disturbance, such as potentially modifying site use or traffic in areas that are subject to substantial erosion or disturbance.

Implementation of potential contingency actions will be based on the evaluation of existing data/monitoring results as whether contingency actions are needed. The LL Apartments Site Operations and Maintenance Plan will provide additional details regarding wildlife barrier repair, acceptable durations to conduct repairs, and protocols for communication to WSDOE regarding wildlife barrier disturbance.

7.0 Groundwater Performance and Confirmation Monitoring and Contingency Actions

This section details the approach for demonstrating that the groundwater at the Site is in compliance with cleanup standards following remedy construction, in accordance with WAC 173-340-720(9). This includes a description of the monitoring well network, and the data analysis and evaluation procedures that will be used to demonstrate groundwater cleanup standard compliance. Groundwater contamination is limited to the LL Apartments Parcel in one well, located in the Central Source Area. Groundwater downgradient of the LL Apartments Parcel, beneath the LL Parcel, and beneath and downgradient of the DMCA has not been impacted by contamination. Contingency actions if groundwater compliance is not achieved or maintained are also described.

Field activities and sample collection will be conducted in general accordance with procedures described in SAP/QAPP (Floyd|Snider 2010) and the Health and Safety Plan (Floyd|Snider 2010), including the same analytical methods, reporting limits, data quality objectives, and data validation levels.

7.1 CONFIRMATION MONITORING WELL NETWORK

Prior to remedy construction, all wells within the excavation area will be decommissioned. The groundwater performance monitoring at the LL Apartments Parcel following remedy construction includes replacement well installation, well development, and groundwater data collection activities. The proposed confirmation monitoring well network consists of the following wells and is presented in Figure 7.1:

- One upgradient monitoring well located within the northwest corner of the property, replacing existing well MW-2 following soil excavation.
- One centrally located monitoring well within the Central Source Area, replacing existing well MW-1 following soil excavation.
- Two downgradient monitoring wells located at the southeastern property boundary, directly downgradient of existing wells MW-4 and MW-5.

7.1.1 Well Decommissioning

Because both excavation and re-grading activities will disturb the entire LL Apartments Parcel, all existing monitoring wells located on the LL Apartments Parcel will be decommissioned, and new wells will be installed where required for groundwater performance monitoring. Existing monitoring wells located outside the LL Apartments Parcel that are not selected for use during groundwater performance monitoring will also be decommissioned. Monitoring wells will be decommissioned by a driller licensed in the state of Washington in accordance with state well construction standards provided in WAC 173-160-460, and will be decommissioned by filling with

bentonite and then sealing the surface with concrete if located outside of an excavation area. Well decommissioning will be conducted prior to start of excavation activities.

7.1.2 Well Installation

Following completion of remedy construction and re-grading at the LL Apartments Parcel, four new monitoring wells (MW-C1 through MW-C4) will be installed (refer to Figure 7.1). Groundwater monitoring wells will be installed to approximate depths of 20 feet, and will be screened in the same shallow aquifer and fill unit as the RI site monitoring well network.

The replacement monitoring wells will be installed following the "Minimum Standards for Construction and Maintenance of Wells" from WAC 173-160. The wells will be installed using hollow-stem auger technologies. During well installation, soil samples will be collected for visual classification, using a split-spoon sampler. Each split-spoon sample is 1.5 feet in length, and will be geologically logged and recorded by a field technician. The monitoring well soil borings will be classified according to the United Soil Classification System.

Consistent with the existing RI monitoring well network, the confirmation monitoring wells will be constructed of a 2-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) well casing and screen. Well screen assemblies will consist of a 10-foot to 15-foot length of 0.020-inch (20-slot) machine-slotted PVC with a 0.5-foot-long sump and threaded end cap. The screened interval will span across the water table, and the screen will be set in a 10/20 (or equivalent) silica sand filter pack. The sand filter pack will be installed by pouring sand into the space between the well casing and auger as the auger is withdrawn. A weighted tape will be used to monitor filter pack placement and depth during installation. The sand filter pack will extend a minimum of 1 foot and up to 2 feet above the top of the screened interval. A minimum 2-foot-thick seal of hydrated bentonite chips will be installed in the annular space immediately above the sand filter pack and hydrated with potable water if installed above the water table.

The confirmation monitoring wells will be secured with a flush-to-ground locking steel protective monument with an expansion seal on the well casing to minimize the potential of rain/surface water entering the monument. The installed wells will be labeled with a permanent marker on the well casing and on the well cover of flush mounts. During installation, well construction details, the WSDOE well ID number, and well location coordinates collected with a Global Positioning System (GPS) unit will be recorded on a groundwater monitoring well installation log form (Appendix C).

Well development will be performed on the confirmation monitoring wells to remove water and fines from the well casing, filter pack, and surrounding formation disrupted by well installation. Well development will establish a hydraulic connection between the well and the surrounding water table and will be completed by alternating cycles of surging the well with a surge block or submersible pump to draw fine-grained material into the well casing and pumping at a steady rate to remove the fine-grained material. Well development equipment will be decontaminated

prior to use by pumping a soap solution followed by clean water through the pump and washing to the satisfaction of the field staff.

Low turbidity conditions are desirable during well development and groundwater sampling activities minimize the risk of false positives associated with COCs sorbed to soil particles. Well development will be completed with the goal of achieving the least possible turbidity levels that site conditions will allow, and will be considered complete when the variation in turbidity (measured in Nephelometric Turbidity Units) readings is less than 10 percent and a minimum of 10 well volumes have been removed. The final turbidity reading and duration of stability will be recorded in the field logbook.

All purge water and decontamination water generated during well development activities will be collected in 55-gallon drums that will be labeled to indicate date of generation, monitoring well source, and volume of contents, and properly disposed of according to state and federal regulations.

7.2 GROUNDWATER MONITORING METHODOLOGY

Confirmation monitoring wells will be sampled using low-flow procedures to achieve the least turbidity possible with a peristaltic pump (or equivalent) and disposable polyethylene tubing lowered to the middle of the well screen. Prior to sampling, depth to water will be measured to the nearest 0.01 foot using a water level indicator, and the condition of the monument and well will be recorded on the field form. The monitoring wells will be purged prior to sampling using the low-flow peristaltic pump (or equivalent) at a maximum rate of 0.5 liters per minute, or a sufficiently slow rate to prevent drawdown of the groundwater level in the well (maximum allowable water level drawdown is 0.33 feet). During purging, field parameters (temperature, pH, conductivity, oxidation reduction potential, dissolved oxygen, and turbidity) will be recorded at 3- to 5-minute intervals using a multi-parameter water quality meter equipped with a flow-through cell. Once the field measurements for turbidity, pH, and conductivity are approximately stable (within 10 percent) for three consecutive readings, the groundwater sample will be collected. Because these field parameters may not reach stabilization criteria, collection of the groundwater sample will be based on the field personnel's professional judgment at the time of sampling. The last set of field parameters measured during purging will represent field parameters in the groundwater sample. All field measurements will be recorded on a groundwater sample collection form (Appendix C).

7.3 GROUNDWATER SAMPLE ANALYSIS AND DATA QUALITY REVIEW

All groundwater samples will be transported to the same laboratory used for RI sample analyses, ARI laboratory in Tukwila, Washington, for analysis of those chemicals that exceeded their respective cleanup levels during RI groundwater monitoring: dioxins/furans, arsenic, and PCP.

Groundwater samples will be analyzed using the following methods:

- Dioxins/furans: USEPA Method 1613
- Arsenic: USEPA Method 200.8
- PCP: USEPA Method 8041

The analyses will be conducted to achieve a reporting limit that is less than the applicable groundwater cleanup levels identified in Section 2.1. During each monitoring event, all groundwater samples will be analyzed for all analytes as identified above, and a field duplicate quality control sample will be collected.

Floyd|Snider will review the laboratory reports for internal consistency, transmittal errors, consistency with laboratory protocols, and adherence to the USEPA analytical methods and data validation guidance. Data validation of all analytical data will be performed. As described in the SAP/QAPP, Level III Data Quality Review (Summary Validation) will be performed on all the analytical data, except dioxins/furans, which will have a Level IV, Tier III Data Quality Review (Full Validation).

7.4 DATA ANALYSIS AND EVALUATION PROCEDURES TO ASSESS COMPLIANCE

Compliance with the MTCA cleanup levels for dioxins/furans TEQ, arsenic, and PCP during quarterly monitoring events is proposed to be determined by direct comparison of detected concentrations to cleanup levels. The direct comparison is proposed to avoid artificial determinations of probable exceedances using confidence limits or similar statistical approaches that are largely dependent on the size of the data set.

7.5 MONITORING SCHEDULE AND DURATION

Groundwater confirmation monitoring will include the collection of groundwater samples from all wells in the confirmation monitoring network (a total of four wells) for four quarterly events per year, consisting of two wet season monitoring events and two dry season monitoring events (refer to Section 12.0 for a monitoring schedule). It is anticipated that the first confirmation monitoring event, following remedy construction completion, will occur in the winter of 2017/2018 as a wet season event. Once groundwater cleanup levels have been met for an individual analyte (dioxins/furans TEQ, arsenic, or PCP) in four consecutive monitoring events, confirmation monitoring for that analyte will be considered complete, and will no longer be required. Groundwater monitoring will continue until four consecutive monitoring events have documented that chemical concentrations in groundwater are less than the site cleanup levels for all groundwater COCs.

7.6 CONTINGENCY ACTIONS

If COC concentrations are greater than the applicable cleanup levels for more than 5 years after site remedy implementation, then contingency actions will be evaluated by the Port in

coordination with WSDOE. Contingency actions considered will use the collected data to determine an appropriate and protective contingency action. Contingency actions could include statistical evaluation of data to identify trends, collection of additional groundwater data from the existing monitoring network, modifying the frequency or analytes of the monitoring program, installing additional groundwater monitoring wells, and/or extending the duration of institutional controls (groundwater use restrictions) of site groundwater. Determination of appropriate contingency actions will be coordinated with WSDOE.

8.0 Lora Lake Parcel Sediment Cap Performance and Confirmation Monitoring and Contingency Actions

This section details the approach for demonstrating that contamination from the isolated and immobilized Lora Lake sediment is not migrating through the sediment cap. This includes a description of the method for monitoring, the proposed sediment cap performance monitoring well network, and the data analyses and evaluation procedures that will be used to demonstrate cap performance and compliance with sediment cap design criteria.

Performance monitoring during cap placement and wetland filling will be conducted to document that the required fill extent and thickness have been achieved. Sampling of the fill material as placed will also be required to document that the organic carbon content of the sand cap is in compliance with the remedial design.

8.1 INSTITUTIONAL CONTROLS

An environmental covenant will be placed on the LL Parcel Sediment Cleanup Area. It will require the rehabilitated wetland to continue to be managed in accordance with recorded restrictive covenants already in place as part of the NRMP. This will ensure that WSDOE is consulted and agrees to removal or modification of the restrictive covenants for this area. The environmental covenant will describe the nature and extent of contamination remaining on-site after completion of cleanup construction.

8.2 SEDIMENT REMEDY PERFORMANCE MONITORING

Performance monitoring during remedy construction will be conducted by survey, to confirm the extent and thickness of sediment cap placement, and through analytical sampling of imported material. Cap design will be finalized during the design process; however, as determined in the RI/FS via numerical sediment cap modeling and described in the CAP, the constructed sediment cap must have the isolation capacity of an 18-inch sand cap with a minimum 0.06 percent organic carbon content.

8.2.1 Cap Extent and Thickness Monitoring

The surface of the sediment cap will be surveyed to document horizontal extent and vertical elevation. The sediment cap surface will be surveyed on 1-foot contours, to a horizontal and vertical accuracy of within 0.1 feet. Site mapping will be conducted using the Washington State Plane North Coordinate System. The vertical datum used will be the NAVD 88. Survey data will be included in the Construction Completion Report, which will be issued following construction.

8.2.2 Cap Carbon Content Monitoring

To ensure that the sand cap material has sufficient carbon content, the cap material will be tested at the quarry supplier. If the cap material is found to contain less than the necessary 0.06 percent

carbon, a carbon amendment, such as granular activated carbon, will be blended with the sand. Prior to cap material delivery and placement, up to eight cap material samples (approximately one sample per 1,000 cubic yards) will be collected and tested for organic carbon to confirm that a sufficient amount is present. Samples will be analyzed for fraction of organic carbon by USEPA Method 9060. Samples will be transported to the analytical laboratory under chain of custody procedures consistent with the methods discussed in Section 5.3 for soil samples.

8.3 SEDIMENT REMEDY CONFIRMATION MONITORING

Following remedy implementation, confirmation monitoring of the sediment remedy will be performed to assess whether contamination from the isolated and immobilized Lora Lake sediment is migrating through the sediment cap. Groundwater samples will be collected just above the sediment cap and between the former lake footprint and Miller Creek to assess whether contaminants are moving from the isolated Lora Lake sediment. Confirmation monitoring data for dioxins/furans and arsenic will be evaluated for statistical difference from a set of site vicinity background samples collected from within Port-owned property, or the public right-of-way (described further in Section 8.4.2).

The sediment cap is designed to achieve compliance with surface water quality criteria at the cap surface. The surface water quality criterion of 0.005 pg/L dioxins/furans TEQ is significantly less than current laboratory practical quantitation limits of approximately 3.5 pg/L dioxins/furans TEQ. Data from upgradient and cross-gradient groundwater wells indicate that the background groundwater concentrations of dioxins/furans in the vicinity of the Site currently exceed the practical quantitation limit. Similarly, arsenic is a known regional background contaminant and has been detected in upgradient and cross-gradient groundwater wells. This statistical comparison method for confirmation monitoring samples provides a measurable method to determine if samples collected immediately above the sediment cap are different than samples collected from site vicinity background locations.

Sediment cap confirmation monitoring at the Lora Lake Parcel Sediment Cleanup Area following remedy construction includes well installation, well development, and groundwater data collection activities. Detailed procedures for these activities will follow procedures for groundwater well installation development and sampling as described in Section 7.1. The proposed sediment remedy confirmation monitoring network consists of the following wells:

- Four site vicinity background wells (MW-VB1, MW-13, HC00-B312, and HC00-B311)
- Four monitoring wells across the footprint of the sediment cap (formerly Lora Lake) (MW-CP1, MW-CP2, MW-CP3, and MW-CP4)
- Three additional monitoring well locations between the former lake footprint and Miller Creek (MW-CP5, MW-CP6, and MW-CP7)

The exact locations of monitoring locations across the footprint of the sediment cap and between the former lake and Miller Creek will be determined after the wetland has been designed, and

will be influenced by modeled groundwater hydrology and the final sediment cap extent. Approximate monitoring locations are shown on Figure 7.1, and if actual locations vary more than 20 feet from the approximate proposed locations, WSDOE approval will be obtained before monitoring well installation.

8.4 DATA ANALYSIS AND EVALUATION PROCEDURES TO ASSESS COMPLIANCE

8.4.1 Analytical Methods

Groundwater samples collected for sediment cap confirmation monitoring will be analyzed using the following methods:

- Dioxins/furans: USEPA Method 1613
- Arsenic: USEPA Method 200.8

8.4.2 Statistical Comparison to Site Vicinity Background

Confirmation monitoring of the sediment remedy will be conducted by evaluating statistical difference between groundwater monitoring data collected from wells immediately above and downgradient of the sediment cap and a set of site vicinity background samples collected from wells within Port-owned property, or the public right-of-way.

As described in Section 8.3, the sediment cap design criteria of surface water quality protection include surface water quality criteria less than the current laboratory practical quantitation limits, and concentrations observed in groundwater upgradient and cross-gradient of the Site at concentrations greater than the practical quantitation limit. Because a direct comparison of water exiting the cap to the cap design criteria (surface water quality criteria) as a method of cap performance is not possible (due to the laboratory detection limits), and samples are likely to contain detectable COC concentrations (due not to breakthrough from the sediment cap but rather to urban background contamination), a statistical comparison method will be conducted to evaluate cap remedy performance. This statistical comparison method for confirmation monitoring samples provides a measurable method to determine if concentrations from samples collected immediately above the sediment cap are different from samples collected from upgradient and cross-gradient (site vicinity) locations. This would be a direct indication of cap performance. The site vicinity background data set will contain a minimum of 20 samples, collected from four site vicinity wells, annually, through the first 5-year period review, as well as at all future 5-year period reviews, sampled concurrently with the confirmation monitoring wells discussed below. Confirmation monitoring data will be statistically compared to this site vicinity background data set.

The site vicinity background concentration will be calculated using the statistical software ProUCL (USEPA 2015) according to Section 4.3.3.2 and Figure 12 of the *Statistical Guidance for Ecology Site Managers* (WSDOE 1992). A goodness-of-fit test will be conducted in ProUCL to determine the statistical distribution of dioxins/furans or arsenic using a significance level of 5 percent

($p<0.05$). Lognormal distribution is assumed for environmental data. Based on the data distribution, the 90th percentile values and medians will be calculated. The site vicinity background concentration will be set to either the 90th percentile value or 4 times the median, whichever is lesser.

To compare the compliance monitoring data to the site vicinity background concentration, the distribution of the compliance monitoring data will be determined as described above. Per the Ecology Statistical Guidance (WSDOE 1992), the 95 percent upper confidence limit (UCL) of the true mean of the data will then be calculated based on the distribution of the data. For datasets with less than 30 samples ($n \leq 30$), not more than 20 percent of the sample results can exceed the background concentration and no sample result can exceed 2 times the background concentration. If more than 20 percent of the sample results exceed background, or a detected result exceeds 2 times the background concentration, the sediment cap confirmation monitoring data will be considered to exceed the site vicinity background.

8.5 MONITORING SCHEDULE

Confirmation monitoring will include the collection of groundwater samples for sediment cap confirmation monitoring from all wells in the confirmation monitoring network (Figure 7.1) for five annual events after wetland construction, and concurrent with quarterly groundwater monitoring events at the LL Apartments Parcel if possible. It is anticipated that the first confirmation monitoring event, following remedy construction completion, will occur in the spring of 2018 as a wet season event. The first 5-year periodic review will assess the appropriate monitoring frequency for the next 5 years, and subsequent 5-year periodic reviews will set the frequency for the following 5-year period.

8.6 CONTINGENCY ACTIONS

If the sediment cap confirmation monitoring data exceeds the site vicinity background, the Port, in coordination with and at the direction of WSDOE, will determine what contingency actions may be necessary and appropriate. Although not used for evaluation of sediment cap performance, the site groundwater dioxins/furans cleanup level of 6.7 pg/L TEQ is applicable throughout the Site, including at the LL Parcel. Detections of dioxins/furans TEQs in confirmation monitoring groundwater samples that exceed the site groundwater cleanup level would require contingency actions, as described in Section 7.6, regardless of the results of the statistical comparison to the site vicinity background data set.

WSDOE will consider the net environmental benefit of any proposed response action that involves significant disturbance of the wetland mitigation area. Implementation of any proposed response actions that involve significant disturbance of the mitigation area must be authorized by the U.S. Army Corps of Engineers and WSDOE as required by the Restrictive Covenant that applies to the Miller Creek/Lora Lake/Vacca Farm Wetland and Floodplain Mitigation Area (Port of Seattle 2003).

Contingency actions that will be considered in coordination with WSDOE may include the following:

- Resampling of the site vicinity background and confirmation monitoring locations to increase the size of the data set and, therefore, the power of the statistical comparison.
- Conducting a trend analysis of the existing data set to determine if exceedances are due to site vicinity-wide increases, or individual sampling location increases.
- More frequent monitoring to assess whether potential impacts rise to a level that requires a further contingency response.
- Adding sample locations to better assess the occurrence of cap breakthrough.
- Adding more organic carbon to the subsurface through appropriate means such as injection through borings or other methods identified when the nature of the breakthrough is known.
- Identifying contingency actions at the time cap breakthrough is observed, as approved by WSDOE.

9.0 Lora Lake Parcel Shallow Soil Cleanup Area Performance Monitoring

This section details the approach for ensuring that the site is in compliance with cleanup standards following remedy construction. Because contaminants will not remain on-site at concentrations greater than the cleanup level, confirmation monitoring is not required. Samples will be collected from the excavation sidewall to document concentrations that may remain in the right-of-way beneath the roadway infrastructure. If these concentrations exceed cleanup levels, an institutional control will be placed.

9.1 REMEDY CONSTRUCTION SOIL PERFORMANCE MONITORING

For performance monitoring of the LL Parcel Shallow Soil Cleanup Area, existing data are sufficient to document compliance with cleanup levels, and excavation extents will be verified by survey to document that excavation has occurred at the locations of existing data. The 95 percent UCL of the true mean remaining dioxins/furans TEQ soil concentration will be calculated and compared to the natural background-based dioxins/furans cleanup level of 5.2 pg/g TEQ per WAC 173-340-740(7)(d)and(e) and the *Statistical Guidance for Ecology Site Managers* (WSDOE 1992). The Statistical Guidance provides that for relatively small compliance monitoring sample sizes (number of samples less than 30), not more than 20 percent of the samples should exceed a background-based cleanup level and no sample result can exceed 2 times the cleanup level. The current available dioxins/furans data are considered adequate to identify the areas that are required to be excavated to bring the true mean soil dioxins/furans TEQ concentration in this area to less than 5.2 pg/g TEQ. The areas will be excavated to the extent shown in Figure 3.3, and verified by survey.

Following excavation, soil samples will be collected from the excavation base at 6 feet bgs, the conditional POC, and at the western sidewall abutting the Des Moines Memorial Drive S. paved sidewalk to document any dioxins/furans TEQ concentrations remaining in place at the conditional POC, or beneath the right-of-way. The conditional POC is established as 6 feet bgs in accordance with WAC 173-340-7490(4)(a) because this is the assumed depth of the biologically active zone and is, therefore, protective of ecological receptors. Environmental covenants will be necessary if the soil samples collected at 6 feet bgs contain dioxins/furans in excess of cleanup levels. Environmental covenants will be placed, if needed, that require any excavation of soil in the right-of-way or deeper than 6 feet be properly managed to protect ecological receptors against exposure to excavated soil.

9.2 INSTITUTIONAL CONTROLS

An environmental covenant will be placed on the public right-of-way if samples collected from the excavation sidewall adjacent to the road indicate COCs are present greater than cleanup levels beneath the right-of-way. The covenant will ensure that WSDOE is consulted if earth-disturbing activities are conducted in the area, and must agree to removal or modification of the

restrictive covenants for this area. The environmental covenant will describe the nature and extent of contamination remaining on-site after completion of cleanup construction.

9.3 CONTINGENCY ACTIONS

For soil at the LL Parcel in exceedance of site cleanup levels, the selected remedy provides for excavation of contaminated soil, backfilling with clean soil, and restoration and replanting of the excavated area in accordance with the NRMP. After remedy construction, the Port will continue to monitor the cleanup area to confirm compliance with the requirements of the NRMP. Because all contaminated soils will be excavated, there is no additional monitoring required to ensure remedy performance.

10.0 DMCA Wildlife Barrier Confirmation Monitoring and Contingency Actions

This section describes performance monitoring to be conducted at the DMCA to ensure that the wildlife barrier is maintained, and contingency actions to be evaluated should issues with wildlife barrier construction or performance be identified during performance monitoring.

10.1 INSTITUTIONAL CONTROLS

A draft environmental covenant will be submitted to WSDOE for consideration with the As-Built Reports for the work. At the DMCA, concentrations of site COCs are less than the applicable MTCA Method C industrial cleanup levels. Port future land use plans consist of surface improvements (e.g., placement of a compacted gravel or engineered surface), which will eliminate potential wildlife exposure pathways and allow for an exclusion from the TEE and application of cleanup standards for terrestrial and ecological protection. An environmental covenant will be placed on the DMCA to implement institutional controls. The institutional controls will require that the property use is maintained as industrial and that the wildlife barrier is maintained in the future.

10.2 WILDLIFE BARRIER PHYSICAL INSPECTIONS

Performance monitoring will be conducted to verify wildlife barrier integrity and performance (through effective isolation of the underlying soils). Wildlife barrier inspections will be performed to verify the physical integrity of the DMCA wildlife barrier. Monitoring activities and objectives will include visual inspection of wildlife barrier conditions to ensure that the wildlife barrier is intact and coverage has been maintained (i.e., underlying existing soil is not exposed).

The DMCA boundary and planned extent of the wildlife barrier that will be monitored during physical inspections are shown on Figure 6.1. Observations of the wildlife barrier will be documented using approximate 150-foot monitoring intervals along the boundary and throughout the central area of the DMCA. The exact interior monitoring intervals may be adjusted based on the final material consolidation configuration, to be determined during remedial design.

The inspections will document the following observations:

- Wildlife barrier surface characteristics (i.e., gravel, engineered surface, equipment placement, etc.) and general condition of barrier
- Condition of barrier where armored for slope protection adjacent to the 100-year floodplain
- Any areas of exposed underlying soil due to physical disturbance of wildlife barrier
- Any apparent loss of wildlife barrier material
- Any substantial plant growth, indicating ineffective wildlife barrier function

Wildlife barrier observations will be documented on the wildlife barrier physical integrity inspection form (Appendix B).

10.3 MONITORING SCHEDULE

DMCA wildlife barrier physical integrity inspections will be conducted annually according to the monitoring schedule presented in Section 12.0. Additional wildlife barrier physical integrity inspections may also be completed after one of the following occurrences is thought to have potentially adversely impacted the integrity of the barrier: a storm event that has led to a wildlife barrier failure, such as erosion or a landslide; a construction staging accident, such as a substantial wildlife barrier penetration or spill; or a seismic event where structural damages have been realized within the Port. Determination of the need for these additional monitoring events will be made in consultation with WSDOE.

The first 5-year periodic review will assess the appropriate monitoring frequency for the next 5 years, and subsequent 5-year periodic reviews will set the frequency for the following 5-year period.

10.4 CONTINGENCY ACTIONS

If the results of the wildlife barrier physical integrity inspections and observation comparisons to previous monitoring events indicate that significant areas of the wildlife barrier are not intact, or insufficiently functioning, determination of appropriate contingency actions will be coordinated with WSDOE. Potential contingency actions may include, but are not limited to, the following:

- Conducting supplemental field inspections to delineate areas of wildlife barrier disturbance and to collect additional information to determine potential causes of the wildlife barrier disturbance, if needed.
- Performing repairs and/or modifications to failed areas of the wildlife barrier to prevent wildlife exposures and limit future disturbance of the barrier.
- Implementing administrative controls to limit further wildlife barrier disturbance, such as potentially modifying construction staging or Port traffic in areas that are subject to substantial erosion or disturbance.

Implementation of potential contingency actions will be based on the evaluation of existing data/monitoring results as well as evaluating if contingency actions are needed. The LL Apartments Site Operations and Maintenance Plan will provide additional details regarding wildlife barrier repair, durations of repair, and protocols for communication to WSDOE regarding wildlife barrier disturbance.

11.0 Protection Monitoring During Remedy Implementation

The purpose of protection monitoring is to ensure that human health and the environment are adequately protected during construction and the operations and maintenance period of the cleanup action. In accordance with WAC 173-340-410(1)(a), protection monitoring will be described in the project health and safety plan developed for remedial construction and long-term monitoring. This section provides a summary of the stormwater and erosion control measures that will be implemented during remedy construction and details the fugitive dust monitoring to be performed to verify that human health and the environment are protected during construction. Other types of protection monitoring to occur during remedy implementation and information on worker personal protection equipment and worker safety will be addressed in the site-specific Health and Safety Plan prepared as an appendix of the EDR.

11.1 STORMWATER AND EROSION CONTROL MEASURES

In accordance with the National Pollutant Discharge Elimination System Construction Stormwater General Permit (CSWGP) for project construction, discharges must not cause or contribute to a violation of surface water, groundwater, and sediment quality standards. Prior to the discharge, "all known, available, and reasonable methods of prevention, control and treatment (AKART) must be applied" (WSDOE 2015b). This includes preparation of a Stormwater Pollution Prevention Plan (SWPPP), with all appropriate erosion and sediment control and storm water management best management practices (BMPs) to be implemented. The SWPPP and BMPs will be developed in accordance with WSDOE's *2012 Stormwater Management Manual for Western Washington* (WSDOE 2012, amended 2014). The contractor will place BMPs to control stormwater sediment and erosion to the maximum extent practicable and in accordance with the SWPPP and project plans and specifications. The plan will be maintained on-site until completion of construction and will be updated to reflect changes in the field as appropriate, in coordination with WSDOE. Specific actions and erosion controls will be determined during the design phase of the project, and will be described in the EDR. BMPs are expected to include, but are not limited to, collection and treatment of stormwater for compliance with project permits and discharge authorizations, erosion control measures around excavations to control stormwater run-on/run-off from contaminated areas, stockpile management controls, and truck cleaning requirements to control transport of soil off-site.

A 14.25-acre area will be disturbed for the project; therefore, a CSWGP will be obtained. A Notice of Intent application will be completed online prior to the first public notice period and at least 60 days prior to discharging stormwater. The public notice will be published one time each week, for 2 weeks in a row, with 7 days in between publishing dates. A 30-day public comment period will begin after the second notice is published. Unless notified by WSDOE, permit coverage will begin 31 days after the second notice is published. The permit coverage application may be submitted prior to completing the SWPPP, but it must be available upon request to WSDOE before the construction commences.

In accordance with the CSWGP, site inspections must be conducted by a Certified Erosion and Sediment Control Lead (CESCL) at least weekly and within 24 hours of any discharge from the Site throughout the duration of the remedial action construction. The CESCL must be on-site at all times, and will examine stormwater visually for discoloration and oil sheen, and adjust the BMPs accordingly if any issues are observed. The CESCL will also monitor for turbidity in the stormwater using a turbidity meter.

11.2 FUGITIVE DUST MONITORING

During and following completion of remedial construction, BMPs will be implemented to control dust generation and contaminant migration, and to reduce short-term construction impacts to air quality. Fugitive dust may be emitted from the roadway, soil excavation and backfill stockpiles, and other construction activities, including mobilization and demobilization activities. The minimum dust control measures are presented in the following sections.

11.2.1 Site Inspections and Documentation

During construction, project personnel will continuously monitor for the presence of fugitive dust during any earth-disturbing activities along the downwind site boundary, and within the work zone. Any observation of substantial fugitive dust will be noted and recorded on the fugitive dust control monitoring log (Appendix D) and addressed. Any observation of visible dust will require the construction contractor to control dust generation with application of water.

11.2.2 Dust Control Measures

The Port will provide dust control measures for all areas disturbed by construction. The measures listed in this section will be implemented as necessary to control fugitive dust. Fugitive dust located outside of the project limits but identified as originating from the project will be handled similarly.

Dust control will be implemented as appropriate by the Port throughout the construction phase, regardless of whether soil excavation is occurring. Dust control is required any time dust is substantially visible in the air, or measured by dust monitors at the downwind property boundaries. Dust control will be achieved primarily through application of water, and by covering exposed soil stockpiles during windy conditions.

11.2.2.1 On-Site Dust Control

During mobilization, construction, and demobilization of the project, the Port will suppress any observed fugitive dust by applying water. The Port will apply water to the active construction work area, without creating muddy areas and resulting in tracking of mud and soil onto paved roads (track-out). The Port and contractor will also construct stabilized construction entrances for ingress and egress points to prevent track-out of soil from the Site onto paved roadways. Any

transport of soil onto public roads will be cleanup up immediately by sweeping and daily vacuum cleaning.

Stabilization BMPs to be used for disturbed areas not supporting construction traffic or active work may also include vegetation, plastic covering, erosion control fabrics, and matting. During grading, excavation, and other construction activities, water sprays will be used to keep the soil damp to minimize generation of dust. Additionally, stockpiles that are not actively being worked, or that are exposed to windy conditions, may be covered or wetted to control dust.

Any trucks leaving the Site with soils or waste material that could result in fugitive dust will be required to cover their loads to control release of dust during transit.

12.0 Compliance Monitoring Schedule and Reporting

12.1 COMPLIANCE MONITORING SCHEDULE AND REPORTING

As described in the previous chapters, compliance monitoring at the Site will be conducted in multiple stages due to the complexities associated with conditions and COCs at the Site. Table 12.1 details the project schedule for tasks coordinated with the compliance monitoring work.

Table 12.1
Compliance Monitoring Schedule and Reporting

Task	Date	Notes
Draft CMP submitted for WSDOE Review	August 5, 2015	WSDOE comments within 21 days of receipt of Draft CMP
Final CMP submitted for WSDOE approval	September 4, 2015	10 days following receipt of WSDOE comments
Field Sampling Event for LL Apartments Parcel Soil Performance Monitoring	September 8, 2015	20-day field event
LL Apartments Parcel Tiered Analysis Determination in Consultation with WSDOE	October–December 2015	Two rounds of tiered sample analyses assumed
Draft LL Apartments Soil Performance Monitoring Data Report submitted for WSDOE Review	January 2016	Includes data submittal to WSDOE's Environmental Information Management (EIM) site. WSDOE comments 30 days following receipt of Draft Data Report
Final LL Apartments Parcel Soil Performance Monitoring Data Report submitted	March 2016	Final Data Report to be included as an appendix to the LL Apartments Parcel EDR
LL Parcel Shallow Soil Remedy Construction Performance Monitoring	During construction	
LL Apartments Parcel and DMCA Wildlife Barrier Physical Inspections	Within 1 year of construction completion	Annually through the first 5-year period review, with appropriate frequency to be assessed with WSDOE for the following 5-year period

Task	Date	Notes
Groundwater Confirmation Monitoring	Quarterly, following construction completion	When cleanup levels are met in four consecutive events, monitoring is completed
LL Sediment Cap Performance Monitoring	Annually, following construction completion	Annually through the first 5-year period review, with appropriate frequency to be assessed with WSDOE for the following 5-year period

Results of the LL Apartments Parcel soil performance monitoring will be documented and provided to WSDOE in a standard data report format for review and comment. Following receipt of WSDOE's comments, the document will be revised to incorporate comments and submitted again to WSDOE as an appendix to the Draft EDR for the LL Apartments Parcel.

Chemical data collected during soil performance monitoring activities will be submitted to WSDOE in the Environmental Information Management System format in accordance with current WSDOE requirements and stipulations written in the AO.

ArcGIS files will be submitted with the WSDOE Review Draft LL Apartments Parcel Soil Performance Monitoring Data Report. The files will include the locations of all samples used to evaluate compliance (including RI samples collected prior to the soil performance monitoring field event) in Washington State Plane North Coordinates, their depths, and their elevations in the NAVD 88. The ArcGIS files will be designed so that the samples that demonstrate compliance with a particular excavation depth can be selected and evaluated against the planned excavation extent for that depth. Samples will be coded as to whether they are bottom samples or sidewall samples for the particular excavation area. The sample table will include the sample results.

12.2 LORA LAKE APARTMENTS SITE POST-REMEDY CONSTRUCTION COMPLIANCE MONITORING SCHEDULE AND REPORTING

Performance and protection monitoring data generated during implementation of this plan will be reported to WSDOE. Soil data collected at the LL Apartments Parcel will be documented in a Soil Performance Monitoring Data Report, and submitted to WSDOE for review, prior to finalization of the report as an appendix to the EDR.

Documentation for the erosion control and fugitive dust monitoring (copies of the fugitive dust control monitoring log) will be submitted to WSDOE weekly during remedy construction.

Results of any soil performance monitoring conducted during soil excavation will be discussed with WSDOE immediately following receipt of analytical data. All final validated data will be reported to WSDOE as part of the Construction Completion Report submitted following completion of the LL Apartments Parcel and DMCA remedy construction.

Data collected during groundwater confirmation monitoring and LL Parcel sediment cap performance monitoring will be reported in annual compliance monitoring reports. Project reporting will be discussed in greater detail in the EDR, and is expected to include results of quarterly groundwater monitoring, sediment cap performance monitoring, and wildlife barrier inspections at the LL Apartments Parcel and DMCA.

Documentation of wildlife barrier physical integrity inspections at both the LL Apartments Parcel and the DMCA will be submitted to WSDOE on an annual basis or as inspections may be required to occur due to additional events or activities such as those described in Sections 6.3 and 10.3.

The contact information for the WSDOE Project Manager is as follows:

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13.0 References

Federal Aviation Administration (FAA). 2008. *Advisory Circular 150/5300-13, Airport Design.* 19 June.

Floyd|Snider. 2010. *Lora Lake Apartments Final Remedial Investigation/Feasibility Study Work Plan*. Prepared for Port of Seattle. 30 July.

_____. 2015a. *Final Lora Lake Apartments Site Remedial Investigation/Feasibility Study*. Prepared for Port of Seattle. 16 January.

_____. 2015b. *Demonstration of Groundwater Protection of Surface Water Beneficial Uses.* Prepared for Port of Seattle. 11 March.

Port of Seattle. 2003. Declaration of Restrictive Covenants (Miller Creek/Lora Lake/Vacca Farm Wetland and Floodplain Mitigation Area). #20030312001777.

United States Environmental Protection Agency (USEPA) 2015. "ProUCL Software." http://www2.epa.gov/land-research/proucl-software. Last accessed 8/18/2015. 3 April.

Washington State Department of Ecology (WSDOE). 1992. *Statistical Guidance for Ecology Site Managers*. Publication No. 92-54. 1 August.

_____. 2007. *Model Toxics Control Act Cleanup Regulation, Chapter 173-340 WAC.* Publication No. 94-06. Revised November 2007.

_____. 2009. Agreed Order No. DE-6703 issued to the Port of Seattle.

_____. 2012. *Stormwater Management Manual for Western Washington*. Publication No. 12-10-030. August. Amended 2014.

_____. 2015a. *Cleanup Action Plan*.

_____. 2015b. Construction Stormwater General Permit. 2 December.

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Lora Lake Apartments Site

Compliance Monitoring Plan

Tables

Table 5.1
Lora Lake Apartments Parcel
Proposed Soil Performance Monitoring Locations and Analytes

Location Name	Sample Analysis	Sample Interval 1 (feet bgs)	Sample Interval 2 (feet bgs)	Sample Interval 3 (feet bgs)	Sample Interval 4 (feet bgs)
Area A1: First Tier Locations					
PM-071	Dioxins/Furans, cPAHs, TPH	19–20	21–22	23–24 A	25–26 A
PM-072	Dioxins/Furans, cPAHs, PCP, TPH	19–20	21–22	23–24 A	25–26 A
PM-073	Dioxins/Furans, cPAHs, PCP, TPH	19–20	21–22	23–24 A	25–26 A
PM-074	Dioxins/Furans, cPAHs, PCP, TPH	1–2	10–11	19–20	--
PM-084	Dioxins/Furans, cPAHs, PCP, TPH	19–20	21–22	23–24 A	25–26 A
PM-085	Dioxins/Furans, cPAHs, PCP, TPH	1–2	10–11	19–20	--
PM-086	Dioxins/Furans, cPAHs, PCP, TPH	19–20	21–22	23–24 A	25–26 A
PM-087	Dioxins/Furans, cPAHs, TPH	1–2	10–11	19–20	--
PM-094	Dioxins/Furans, cPAHs, TPH	19–20	21–22	23–24 A	25–26 A
PM-095	Dioxins/Furans, cPAHs, PCP, TPH	1–2	10–11	19–20	--
Area A1: Second Tier Locations					
PM-083	Dioxins/Furans, cPAHs, TPH	1–2 A	10–11 A	19–20 A	--
PM-092	Dioxins/Furans, cPAHs, TPH	1–2 A	10–11 A	19–20 A	--
PM-093	Dioxins/Furans, cPAHs, TPH	1–2 A	10–11 A	19–20 A	--
PM-098	Dioxins/Furans, cPAHs, TPH	1–2 A	10–11 A	19–20 A	--
Area A2: First Tier Locations					
PM-051	Dioxins/Furans	1–2	7–8	--	--
PM-057	Dioxins/Furans	9–10 A	10–11	11–12 A	--
PM-060	Dioxins/Furans	1–2 A	7–8 A	--	--
PM-061	Dioxins/Furans, PCP	1–2	7–8	--	--
PM-062	Dioxins/Furans	9–10 A	10–11	11–12 A	--
PM-063	Dioxins/Furans	9–10 A	10–11	11–12 A	--
PM-064	Dioxins/Furans	9–10 A	10–11	11–12 A	--
PM-065	Dioxins/Furans	1–2	7–8	--	--
PM-070	Dioxins/Furans, PCP	9–10 A	10–11	11–12 A	--
PM-082	Dioxins/Furans	9–10 A	10–11	11–12 A	--
Area A2: Second Tier Locations					
PM-056	Dioxins/Furans	1–2 A	7–8 A	--	--
PM-058	Dioxins/Furans	1–2 A	7–8 A	--	--
PM-068	Dioxins/Furans	1–2 A	7–8 A	--	--
PM-069	Dioxins/Furans	1–2 A	7–8 A	--	--
PM-075	Dioxins/Furans	1–2 A	7–8 A	--	--
PM-081	Dioxins/Furans	1–2 A	7–8 A	--	--
Area A3: First Tier Locations					
PM-091	Dioxins/Furans, cPAHs, Lead, PCP	1–2	9–10	11–12 A	--
PM-097	Dioxins/Furans, cPAHs	1–2	9–10	11–12 A	--
PM-101	Dioxins/Furans, cPAHs, Lead, PCP	1–2	9–10	11–12 A	--
PM-103	Dioxins/Furans, cPAHs, PCP	1–2	9–10	11–12 A	--
PM-111	Dioxins/Furans, cPAHs, Lead, PCP	1–2	9–10	11–12 A	--
Area A3: Second Tier Locations					
PM-066	Dioxins/Furans, cPAHs	1–2 A	9–10 A	--	--
PM-076	Dioxins/Furans, cPAHs, Lead, PCP	1–2 A	9–10 A	--	--
PM-080	Dioxins/Furans, cPAHs, Lead, PCP	1–2 A	9–10 A	--	--
PM-088	Dioxins/Furans, cPAHs, Lead, PCP	1–2 A	9–10 A	11–12 A	--
PM-096	Dioxins/Furans, cPAHs, Lead, PCP	1–2 A	9–10 A	11–12 A	--
PM-099	Dioxins/Furans, cPAHs, Lead, PCP	1–2 A	9–10 A	11–12 A	--
PM-107	Dioxins/Furans, cPAHs, Lead, PCP	1–2 A	9–10 A	11–12 A	--
Area B1: First Tier Locations					
PM-013	Dioxins/Furans	0–1	1–2 A	2–3 A	--
PM-014	Dioxins/Furans	0–1	1–2 A	2–3 A	--
PM-015	Dioxins/Furans	0–1	1–2 A	2–3 A	--
PM-019	Dioxins/Furans	0–1	1–2 A	2–3 A	--
PM-020	Dioxins/Furans	1–2	2–3 A	--	--
PM-021	Dioxins/Furans	0–1	1–2 A	2–3 A	--
PM-026	Dioxins/Furans	0–1	1–2 A	2–3 A	--
PM-027	Dioxins/Furans	0–1	1–2 A	2–3 A	--
PM-028	Dioxins/Furans	0–1	1–2 A	2–3 A	--
PM-029	Dioxins/Furans	0–1	1–2 A	--	--
PM-035	Dioxins/Furans	0–1	1–2 A	2–3 A	--
PM-041	Dioxins/Furans	0–1	1–2 A	2–3 A	--
Area B1: Second Tier Locations					
PM-001	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-002	Dioxins/Furans	0–1 A	1–2 A	2–3 A	--
PM-003	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-004	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-005	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-006	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-007	Dioxins/Furans	0–1 A	1–2 A	2–3 A	--
PM-008	Dioxins/Furans	1–2 A	2–3 A	--	--
PM-009	Dioxins/Furans	0–1 A	1–2 A	2–3 A	--
PM-010	Dioxins/Furans	0–1 A	1–2 A	--	--

Table 5.1
Lora Lake Apartments Parcel
Proposed Soil Performance Monitoring Locations and Analytes

Location Name	Sample Analysis	Sample Interval 1 (feet bgs)	Sample Interval 2 (feet bgs)	Sample Interval 3 (feet bgs)	Sample Interval 4 (feet bgs)
Area B1: Second Tier Locations (Continued)					
PM-011	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-012	Dioxins/Furans	0–1 A	1–2 A	2–3 A	--
PM-016	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-017	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-018	Dioxins/Furans	0–1 A	1–2 A	2–3 A	--
PM-022	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-024	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-025	Dioxins/Furans	0–1 A	1–2 A	2–3 A	--
PM-032	Dioxins/Furans	0–1 A	1–2 A	2–3 A	--
PM-033	Dioxins/Furans	1–2 A	2–3 A	--	--
PM-034	Dioxins/Furans	1–2 A	2–3 A	--	--
PM-038	Dioxins/Furans	0–1 A	1–2 A	2–3 A	--
PM-039	Dioxins/Furans	1–2 A	2–3 A	--	--
PM-040	Dioxins/Furans	1–2 A	2–3 A	--	--
PM-044	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-045	Dioxins/Furans	0–1 A	1–2 A	2–3 A	--
PM-046	Dioxins/Furans	1–2 A	2–3 A	7–8 A	--
PM-047	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-052	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-053	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-054	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-055	Dioxins/Furans	0–1 A	1–2 A	--	--
PM-059	Dioxins/Furans	0–1 A	1–2 A	--	--
Area B2: First Tier Locations					
PM-030	Dioxins/Furans, cPAHs	4–5	5–6 A	--	--
PM-036	Dioxins/Furans, cPAHs	2–3	--	--	--
PM-037	Dioxins/Furans, cPAHs	4–5	5–6 A	--	--
PM-042	Dioxins/Furans, cPAHs	2–3	--	--	--
Area B2: Second Tier Locations					
PM-023	Dioxins/Furans, cPAHs	2–3 A	--	--	--
PM-031	Dioxins/Furans, cPAHs	2–3 A	--	--	--
PM-048	Dioxins/Furans, cPAHs	2–3 A	--	--	--
PM-049	Dioxins/Furans, cPAHs	2–3 A	--	--	--
PM-050	Dioxins/Furans, cPAHs	2–3 A	--	--	--
PM-043	Dioxins/Furans, cPAHs	2–3 A	--	--	--
Area B3: First Tier Locations					
PM-100	Dioxins/Furans	1–2	2–3 A	--	--
Area B3: Second Tier Locations					
PM-078	Dioxins/Furans	1–2 A	2–3 A	--	--
PM-090	Dioxins/Furans	1–2 A	--	--	--
Area B4: First Tier Locations					
PM-104	Dioxins/Furans	2–3	--	--	--
PM-108	Dioxins/Furans	2–3	4–5 A	--	--
PM-109	Dioxins/Furans	2–3	4–5 A	--	--
PM-112	Dioxins/Furans	2–3	4–5 A	--	--
PM-113	Dioxins/Furans	2–3	4–5 A	--	--
PM-116	Dioxins/Furans	2–3	4–5 A	--	--
Area B4: Second Tier Locations					
PM-102	Dioxins/Furans	2–3 A	--	--	--
PM-105	Dioxins/Furans	2–3 A	--	--	--
PM-106	Dioxins/Furans	2–3 A	--	--	--
PM-110	Dioxins/Furans	2–3 A			
PM-114	Dioxins/Furans	2–3 A	--	--	--
PM-115	Dioxins/Furans	2–3 A	--	--	--
PM-117	Dioxins/Furans	2–3 A	4–5 A	--	--
PM-118	Dioxins/Furans	2–3 A	--	--	--
Area B5: First Tier Locations					
PM-067	Dioxins/Furans	1–2	2–3 A	--	--
PM-077	Dioxins/Furans	1–2	2–3 A	--	--
PM-079	Dioxins/Furans	1–2	2–3 A	--	--
PM-089	Dioxins/Furans	1–2	2–3 A		

Note:

-- No sample will be collected from this interval.

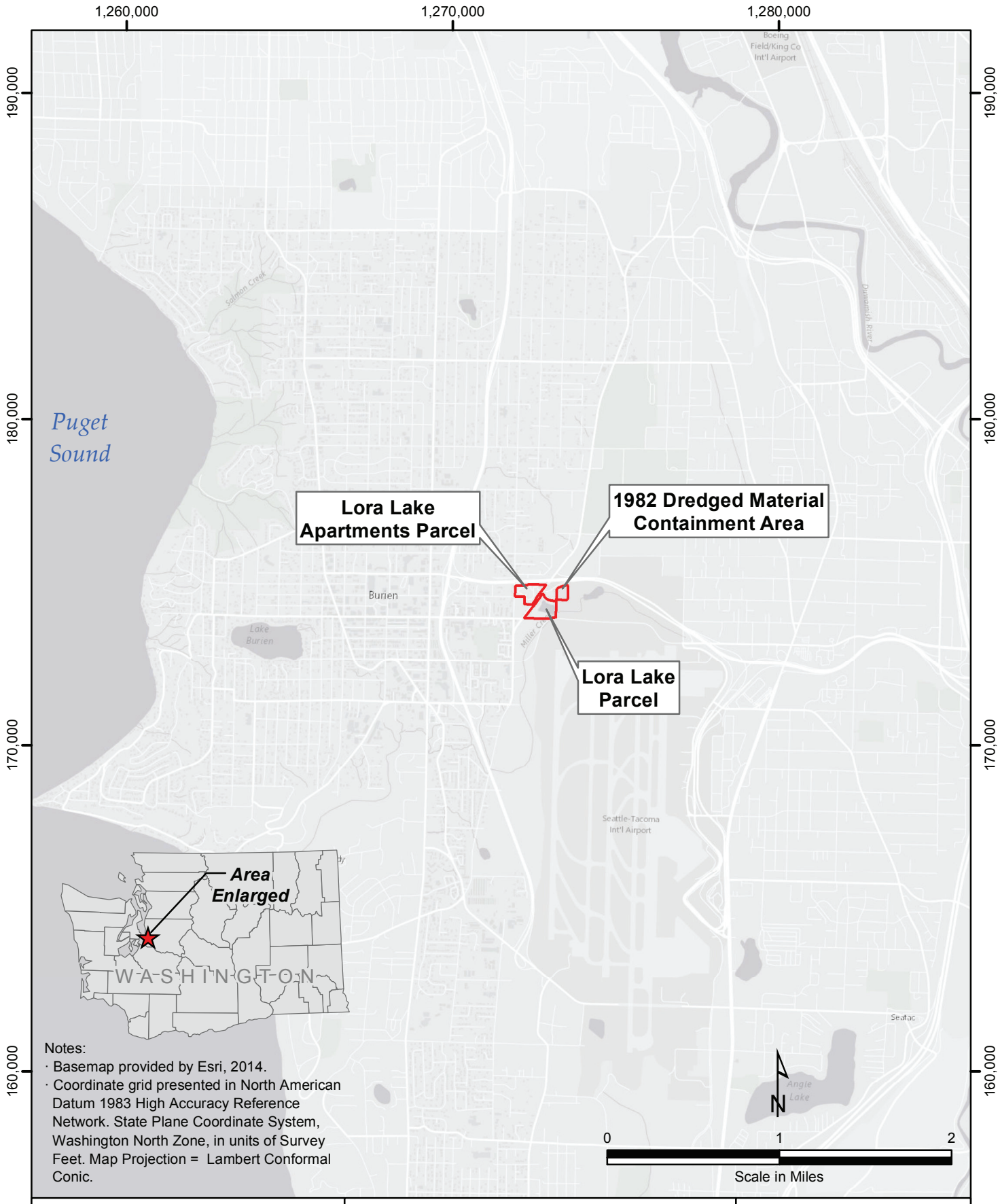
Abbreviations:

A Indicates second tier sample
bgs Below ground surface
cPAH Carcinogenic polycyclic aromatic hydrocarbon
PCP Pentachlorophenol
TPH Total petroleum hydrocarbons

Port of Seattle
Lora Lake Apartments Site

Compliance Monitoring Plan

Figures



Notes:
· Basemap provided by Esri, 2014.
· Coordinate grid presented in North American Datum 1983 High Accuracy Reference Network. State Plane Coordinate System, Washington North Zone, in units of Survey Feet. Map Projection = Lambert Conformal Conic.

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Compliance Monitoring Plan
Port of Seattle
Lora Lake Apartments Site
Burien, Washington

Figure 1.1
Site Vicinity Map

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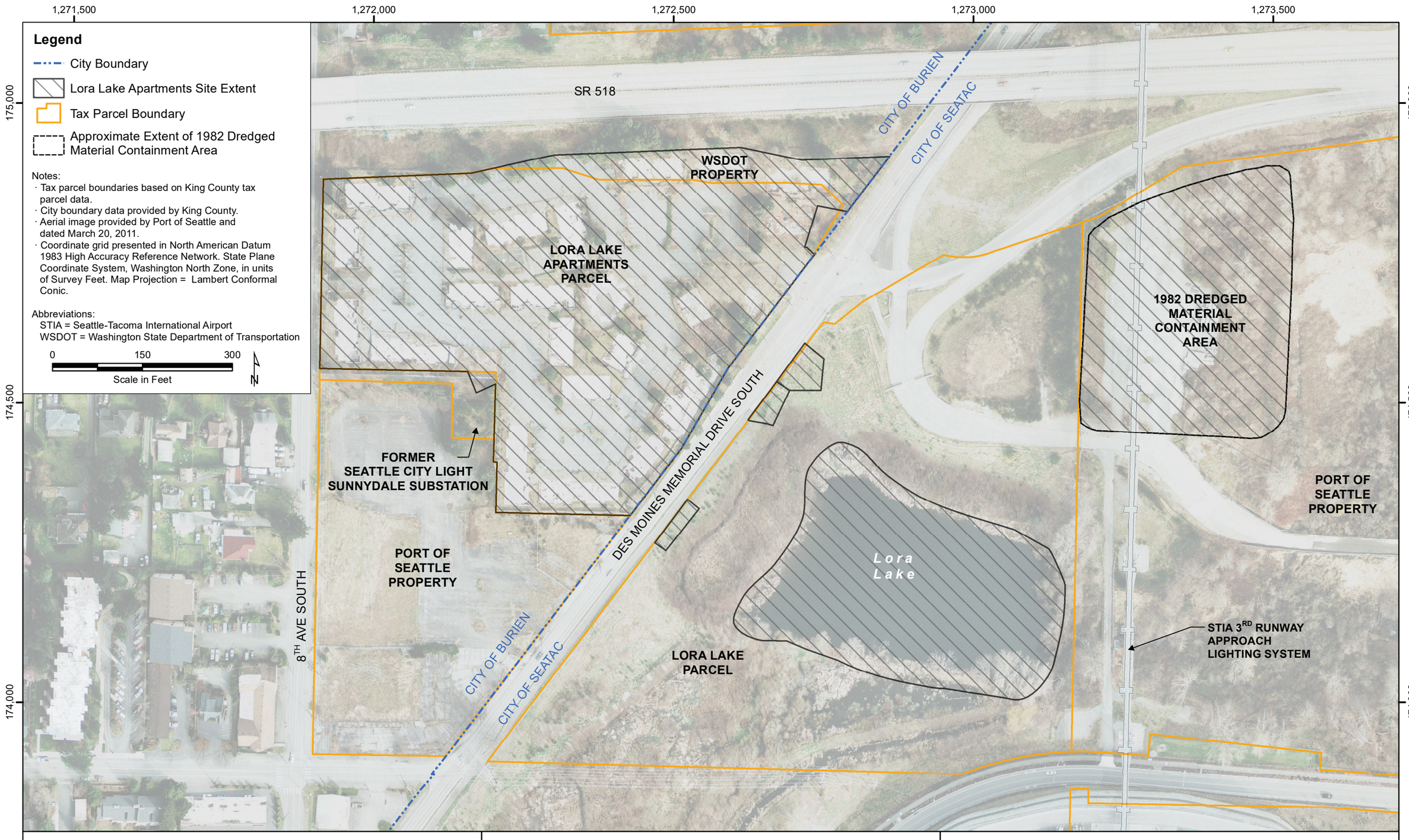
8/14/2015



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Compliance Monitoring Plan
Port of Seattle
Lora Lake Apartments Site
Burien, Washington

Figure 1.2
Site Map

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2/2/2022

Revised – January 2022

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Port of Seattle
Lora Lake Apartments Site
Burien, Washington

Figure 2.1
Points of Compliance

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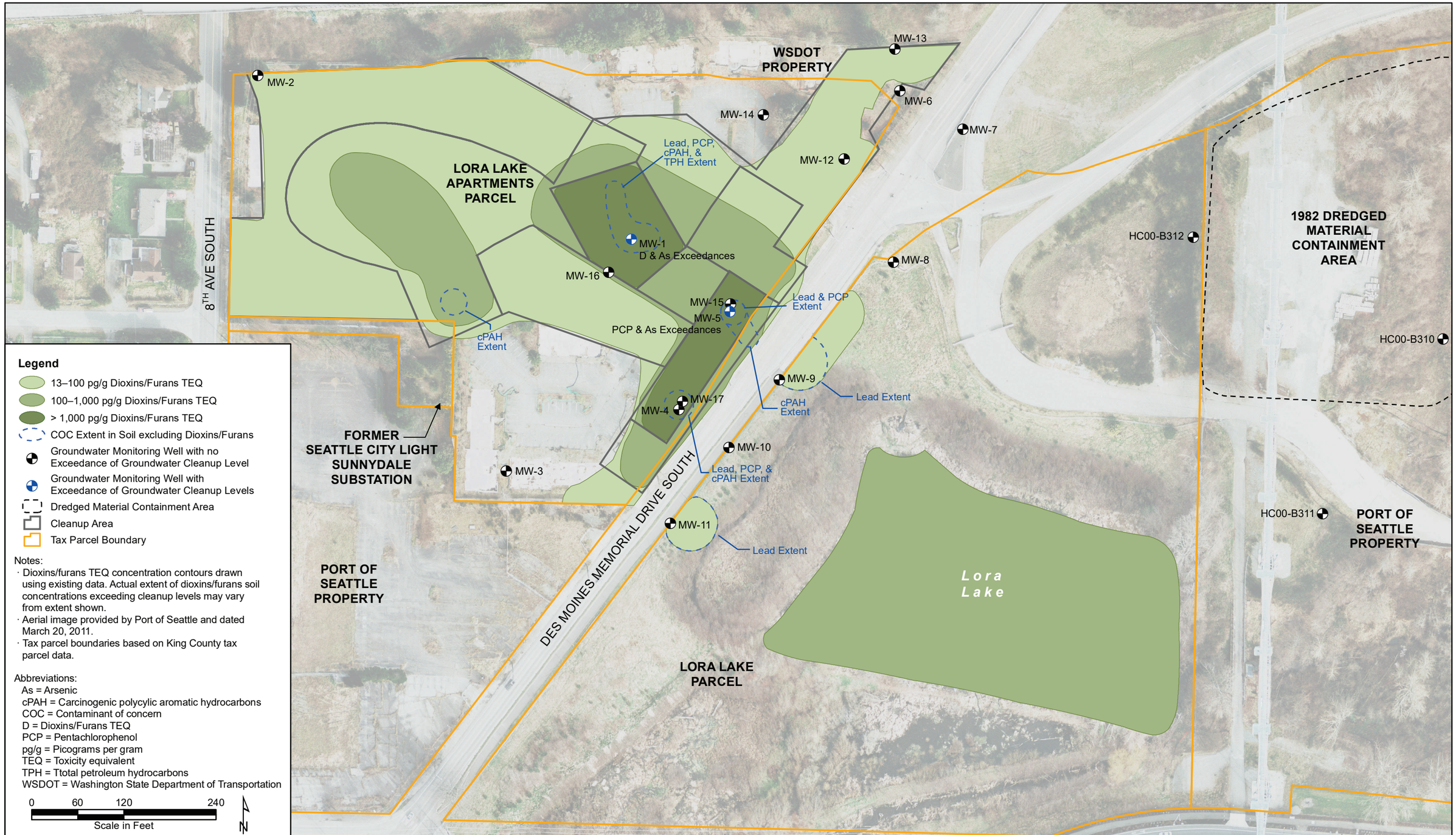
2/2/2022

Revised – January 2022



Legend

- 13–100 pg/g Dioxins/Furans TEQ
- 100–1,000 pg/g Dioxins/Furans TEQ
- > 1,000 pg/g Dioxins/Furans TEQ
- COC Extent in Soil excluding Dioxins/Furans
- Groundwater Monitoring Well with no Exceedance of Groundwater Cleanup Level
- Groundwater Monitoring Well with Exceedance of Groundwater Cleanup Levels
- Dredged Material Containment Area
- Cleanup Area
- Tax Parcel Boundary

Notes:

- Dioxins/furans TEQ concentration contours drawn using existing data. Actual extent of dioxins/furans soil concentrations exceeding cleanup levels may vary from extent shown.
- Aerial image provided by Port of Seattle and dated March 20, 2011.
- Tax parcel boundaries based on King County tax parcel data.

Abbreviations:

As = Arsenic
cPAH = Carcinogenic polycylic aromatic hydrocarbons
COC = Contaminant of concern
D = Dioxins/Furans TEQ
PCP = Pentachlorophenol
pg/g = Picograms per gram
TEQ = Toxicity equivalent
TPH = Ttotal petroleum hydrocarbons
WSDOT = Washington State Department of Transportation

0 60 120 240
Scale in Feet
N

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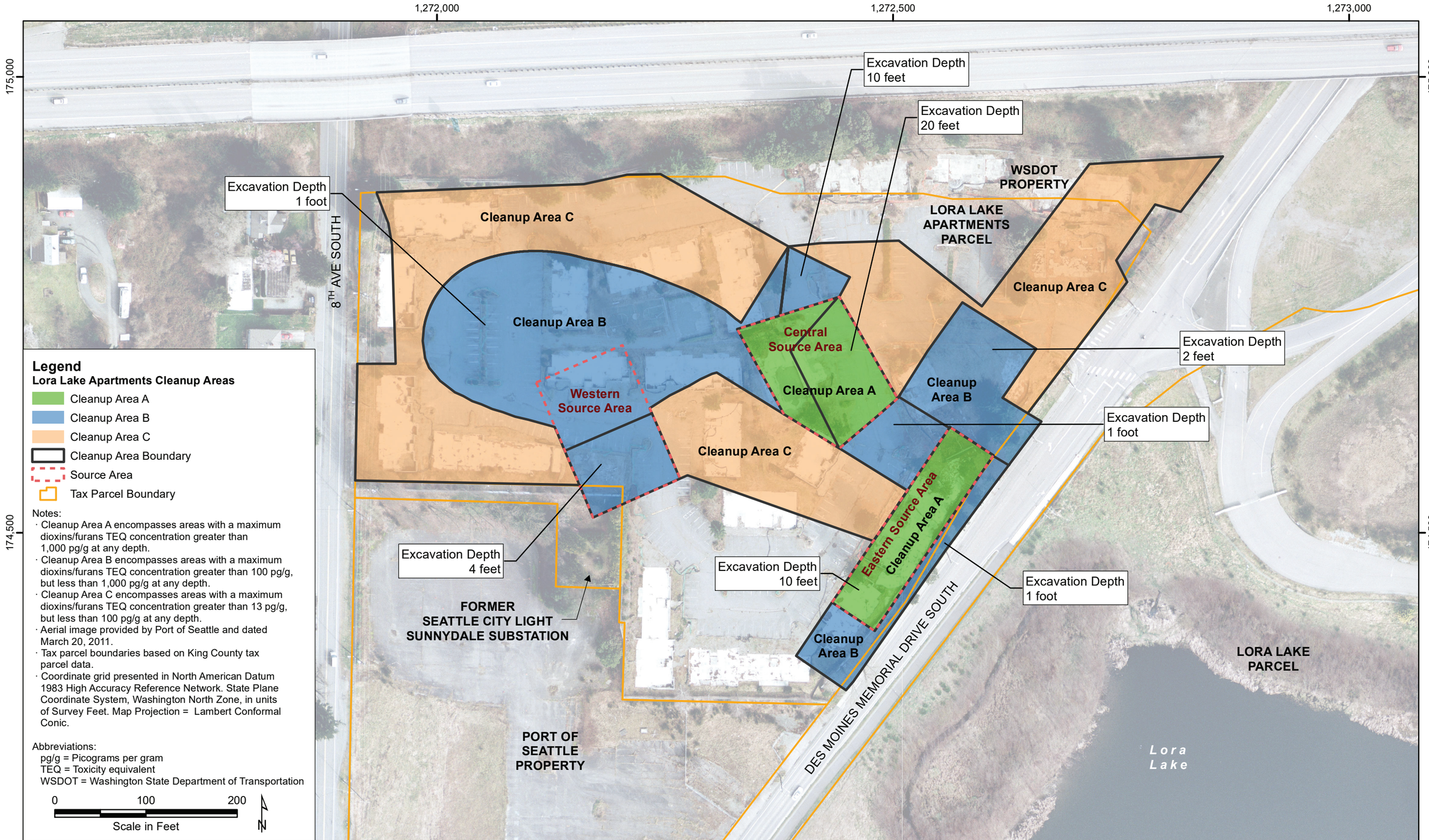
Port of Seattle
Lora Lake Apartments Site
Burien, Washington

Figure 3.1
Summary of Contaminant Distribution

I:\GIS\Projects\POS_LLA\MXD\Task8140\CMP - Revised January 2022\Figure 3.1 Summary of Contaminant Distribution.mxd
2/2/2022

Revised – January 2022



Legend

Lora Lake Apartments Cleanup Areas

- Cleanup Area A
- Cleanup Area B
- Cleanup Area C
- Cleanup Area Boundary
- Source Area
- Tax Parcel Boundary

Notes:

- Cleanup Area A encompasses areas with a maximum dioxins/furans TEQ concentration greater than 1,000 pg/g at any depth.
- Cleanup Area B encompasses areas with a maximum dioxins/furans TEQ concentration greater than 100 pg/g, but less than 1,000 pg/g at any depth.
- Cleanup Area C encompasses areas with a maximum dioxins/furans TEQ concentration greater than 13 pg/g, but less than 100 pg/g at any depth.
- Aerial image provided by Port of Seattle and dated March 20, 2011.
- Tax parcel boundaries based on King County tax parcel data.
- Coordinate grid presented in North American Datum 1983 High Accuracy Reference Network. State Plane Coordinate System, Washington North Zone, in units of Survey Feet. Map Projection = Lambert Conformal Conic.

Abbreviations:

pg/g = Picograms per gram
TEQ = Toxicity equivalent
WSDOT = Washington State Department of Transportation

0 100 200
Scale in Feet

N

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Lora Lake Apartments Site
Burien, Washington

Figure 3.2
Lora Lake Apartments Parcel
Cleanup Areas

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2/2/2022

Revised – January 2022

1,272,500 1,273,000 1,273,500

174,500 174,500

LORA LAKE APARTMENTS PARCEL

FORMER SEATTLE CITY LIGHT SUNNYDALE SUBSTATION

PORT OF SEATTLE PROPERTY

DES MOINES MEMORIAL DRIVE SOUTH

LL Parcel Shallow Soil Cleanup Area

LL Parcel Shallow Soil Cleanup Area

LL Parcel Sediment Cleanup Area

Lora Lake

LORA LAKE PARCEL

PORT OF SEATTLE PROPERTY

Legend

- LL Parcel Sediment Cleanup Area
- LL Parcel Shallow Soil Cleanup Area
- Tax Parcel Boundary

Notes:

- Contamination has been fully remediated in the LL Parcel Shallow Soil Cleanup Areas and no ongoing monitoring is required.
- Tax parcel boundaries based on King County tax parcel data.
- Aerial image provided by Port of Seattle and dated March 20, 2011.
- Coordinate grid presented in North American Datum of 1983 High Accuracy Reference Network. State Plane Coordinate System, Washington North Zone, in units of Survey Feet. Map Projection = Lambert Conformal Conic.

Abbreviation:
LL = Lora Lake

0 100 200
Scale in Feet

N

174,000 174,000

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Burien, Washington

Figure 3.3
Lora Lake Parcel Cleanup Areas

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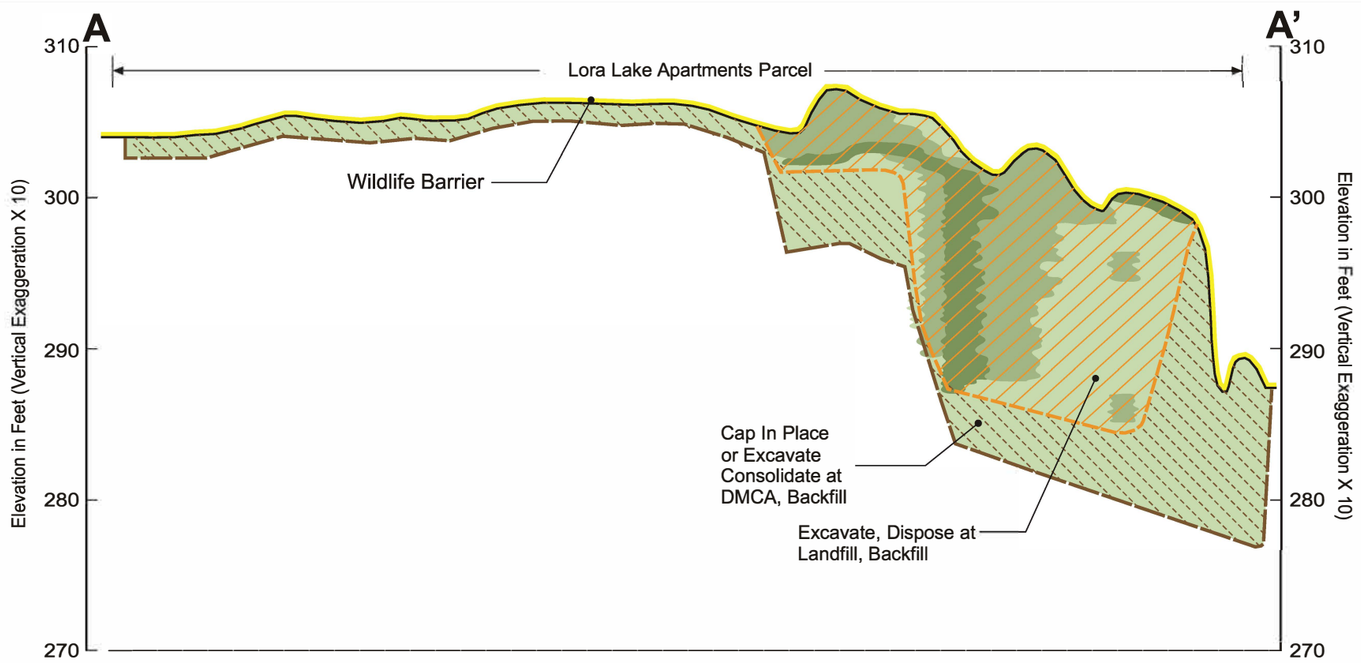
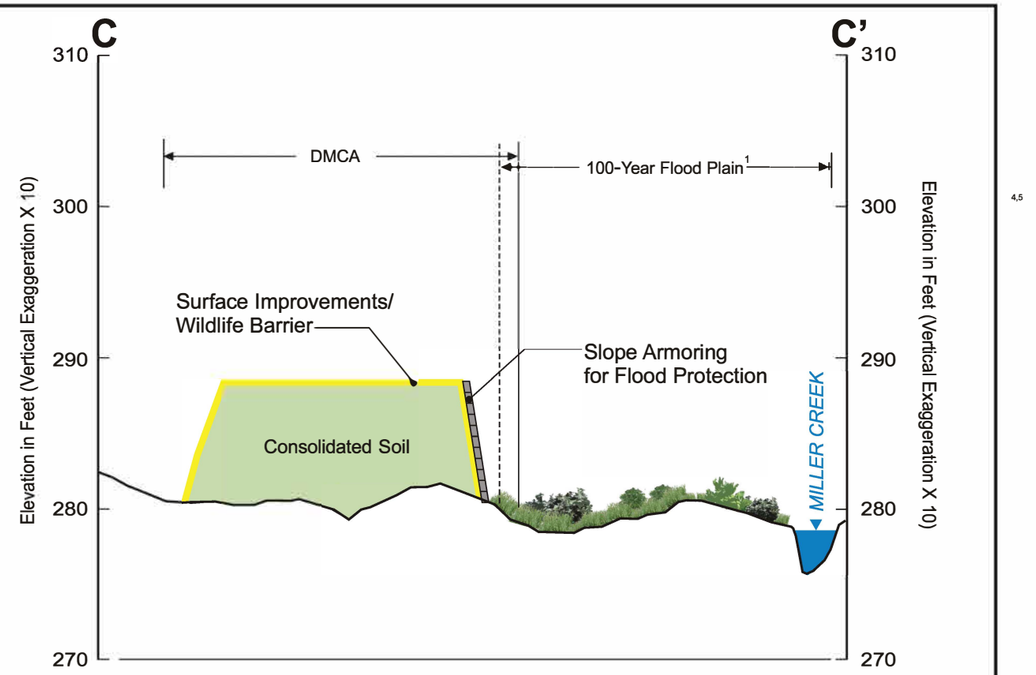
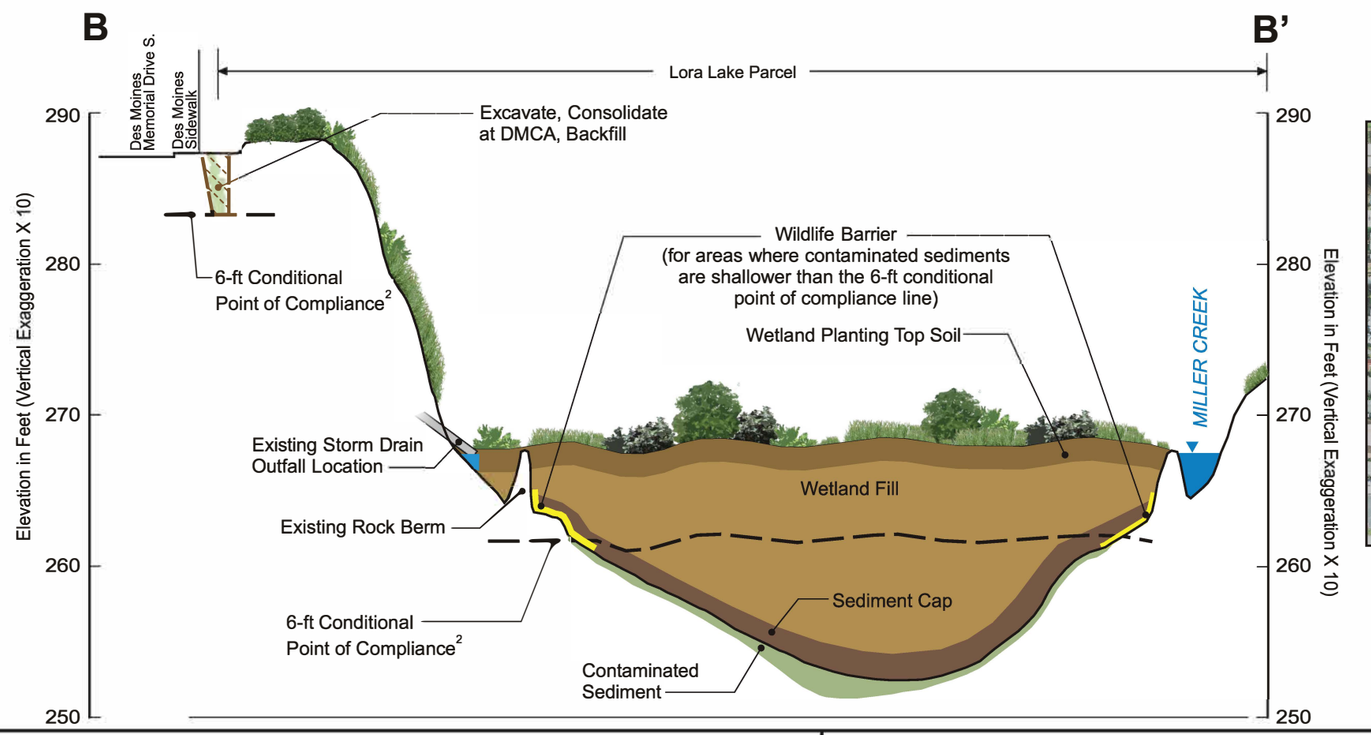
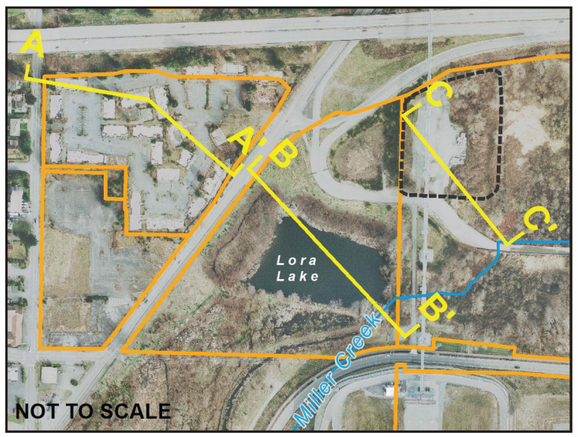
2/2/2022

Revised – January 2022









Cross Section Locations

Abbreviations:

DMCA =	Dredged Material Containment Area
ft =	Feet
RI/FS =	Remedial Investigation/Feasibility Study
sq. =	square
WAC =	Washington Administrative Code

Notes:

1. Approximately 1,000 sq. ft (0.7%) of the DMCA along its southern boundary lies within the 100-year flood plain. Prior to consolidation, the boundary of the 100-year flood plain will be surveyed, and no material will be consolidated in this area.
2. The depth of the biologically active zone (6 ft below ground surface) is established as the conditional point of compliance protective of ecological receptors. This is consistent with WAC 173-340-7490(4)(a) and with the existence of institutional controls to prevent excavation of deeper soil in the areas per the RI/FS.

- Green shading of soils and sediment indicates material contaminated with dioxins/furans. Darker green shading indicates greater concentrations of dioxins/furans.

0 100 200

Cross Sections Scale in Feet

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Burien, Washington

Figure 4.1
Conceptual Remedy Cross Section

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1,272,000

1,272,500

174,500

174,500

Legend

Excavation Depth

- 1 ft
- 2 ft
- 4 ft
- 10 ft
- 20 ft

- First Tier Performance Monitoring Sample
- Second Tier Archive Sample
- Existing Sample Location
- Extent of Contamination
- Source Area
- Tax Parcel Boundary

Notes:

- Specific sample information for each location can be found in Table 5.1.
- For all existing locations, the shallowest clean sample (for dioxins/furans TEQ) is shown. All concentrations in pg/g. Red values indicate an exceedance of 100 pg/kg.
- Aerial image provided by Port of Seattle and dated March 20, 2011.
- Tax parcel boundaries based on King County tax parcel data.
- Coordinate grid presented in North American Datum of 1983 High Accuracy Reference Network. State Plane Coordinate System, Washington North Zone, in units of Survey Feet. Map Projection = Lambert Conformal Conic.

Abbreviations:

ft = Foot
pg/g = Picograms per gram
pg/kg = Picograms per kilogram
TEQ = Toxicity equivalent
WSDOT = Washington State Department of Transportation

0 80 160

Scale in Feet

N

SSB-04 2.81 at 0.5'
MW-02 2.08 at 15.5'
PSB-03 2.26 at 2'
SSB-01 6.94 at 2'
PSB-05 0.555 at 5'
PSB-01 3.87 at 4'
PSB-04 1.74 at 1.5'
SSB-02 15.2 at 2'
PSB-02 0.299 at 6'
LL-07 33.8 at 2'
DP-1 0.29 at 2'
SSB-03 0.239 at 2'
DP-2 0.13 at 2.5'
SSB-05 0.529 at 2'
DP-3 56 at 1.5'
DP-9 4.29 at 1'
LL-12 5.28 at 1.5'
LL-08 0.778 at 13'
PSB-06 0.716 at 4'
PSB-07 0.666 at 2'
LL-09 0.034 at 15'
PSB-22 1.17 at 2'
MW-13 1.02 at 4'
PSB-24 1.14 at 2'
MW-14 1.03 at 2'
PSB-23 5.01 at 2'
MW-06 0.0729 at 21.5'
SSB-10 3.19 at 2'
MW-12 0.893 at 5.5'
PSB-10 0.653 at 14'
LL-10 2600 at 2'
PSB-12 74.1 at 17'
PSB-13 50.5 at 4'
PSB-27 1810 at 2'
LL-01 1550 at 2'
MW-01 2050 at 16'
PSB-11 302 at 15'
PSB-21 2.81 at 6'
PSB-09A 0.754 at 4'
LL-11 3.15 at 2'
PSB-14 38.4 at 1.5'
PSB-15 1.49 at 17'
MW-05 59.7 at 11.5'
PSB-20 31 at 0.5'
PSB-08 0.602 at 2'
PSB-17 0.732 at 13'
PSB-16 13.2 at 1'
MW-04 6.43 at 14'
PSB-19 2.19 at 2'
PSB-18 0.589 at 1.5'
MW-03 0.0617 at 15.5'
LLA-HA1 3.15 at 2'
LLA-HA2 2.37 at 1.5'
LLA-HA3 0.655 at 2'

PM-001 PM-002 PM-003 PM-004 PM-005 PM-006 PM-007 PM-008 PM-009 PM-010 PM-011 PM-012 PM-013 PM-014 PM-015 PM-016 PM-017 PM-018 PM-019 PM-020 PM-021 PM-022 PM-023 PM-024 PM-025 PM-026 PM-027 PM-028 PM-029 PM-030 PM-031 PM-032 PM-033 PM-034 PM-035 PM-036 PM-037 PM-038 PM-039 PM-040 PM-041 PM-042 PM-043 PM-044 PM-045 PM-046 PM-047 PM-048 PM-049 PM-050 PM-051 PM-052 PM-053 PM-054 PM-055 PM-056 PM-057 PM-058 PM-059 PM-060 PM-061 PM-062 PM-063 PM-064 PM-065 PM-066 PM-067 PM-068 PM-069 PM-070 PM-071 PM-072 PM-073 PM-074 PM-075 PM-076 PM-077 PM-078 PM-079 PM-080 PM-081 PM-082 PM-083 PM-084 PM-085 PM-086 PM-087 PM-088 PM-089 PM-090 PM-091 PM-092 PM-093 PM-094 PM-095 PM-096 PM-097 PM-098 PM-099 PM-100 PM-101 PM-102 PM-103 PM-104 PM-105 PM-106 PM-107 PM-108 PM-109 PM-110 PM-111 PM-112 PM-113 PM-114 PM-115 PM-116 PM-117 PM-118

B1 B2 A1 A2 A3 B3 B4 B5

Western Source Area

Eastern Source Area

WSDOT PROPERTY

LORA LAKE APARTMENTS PARCEL

FORMER SEATTLE CITY LIGHT SUNNYDALE SUBSTATION

PORT OF SEATTLE PROPERTY

LORA LAKE PARCEL

DES MOINES MEMORIAL DRIVE SOUTH

8TH AVE SOUTH

Total Proposed Locations: 118
Proposed First Tier Samples: 73
Proposed Second Tier Samples: 201
Total Proposed Samples: 274

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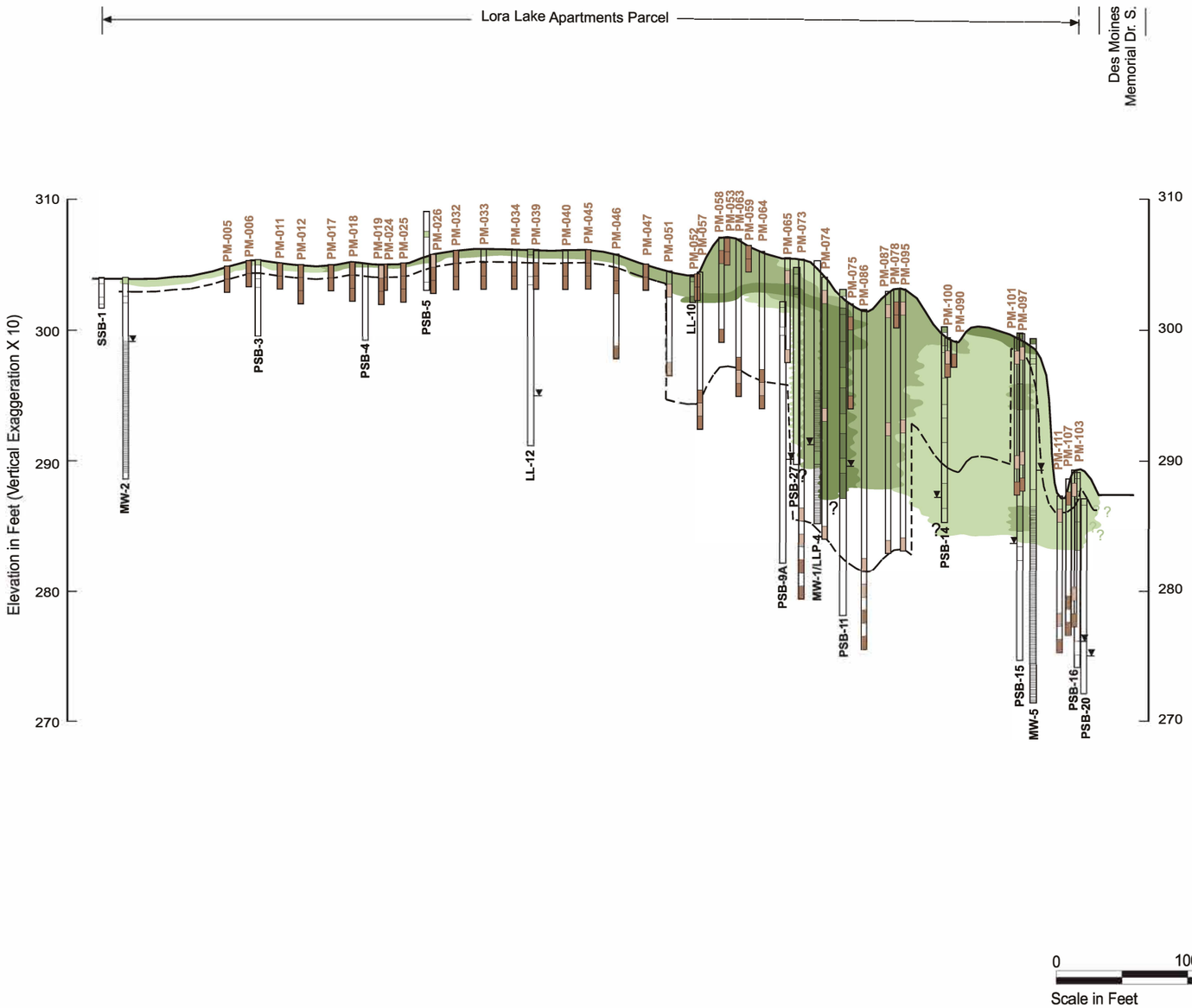
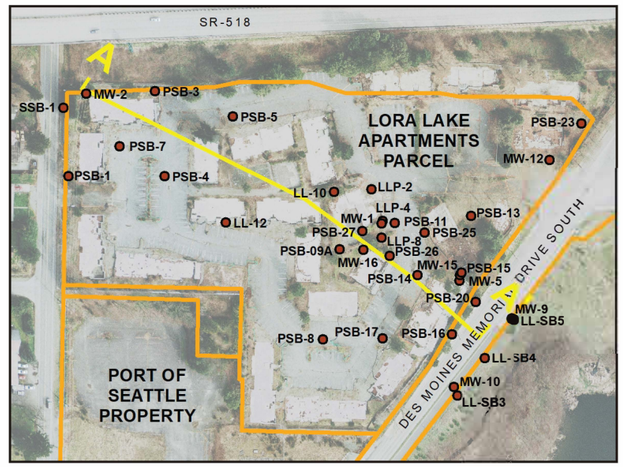
Figure 5.1
Proposed Performance Monitoring Sample Locations

I:\GIS\Projects\POS_LLA\MXD\Task8140\CMP - Revised January 2022\Figure 5.1 Proposed Performance Monitoring Sample Locations.mxd
2/2/2022

Revised – January 2022





Legend

- First Tier Performance Monitoring Sample
- Second Tier Performance Monitoring Sample
- > 1,000 pg/g
- 100–1,000 pg/g
- 13–100 pg/g
- < 13 pg/g

Exploration Location

- Analytical Sample Interval
- Dioxins/Furans TEQ[1,2] > 1,000 pg/g
- Dioxins/Furans TEQ[1,2] 100–1,000 pg/g
- Dioxins/Furans TEQ[1,2] 13–100 pg/g
- Dioxins/Furans TEQ[1,2] <13 pg/g
- Groundwater Level
- Screen Interval
- Approximate Excavation Extent

Abbreviations:

pg/g = Picograms per gram
TEQ = Toxicity Equivalent Quotient

Notes:

1. World Health Organization 2005 Toxic Equivalency Factors used for calculation of dioxins/furans TEQ (Van den Berg et al. 2006).
2. Calculated using detected dioxins/furans concentrations plus one-half the detection limit for dioxins/furans that were not detected.

- Topographic profile derived from Bare-Earth Return LiDAR provided by the Puget Sound LiDAR consortium and presented in units of feet relative to North American Vertical Datum of 1988.
- Soil boring and monitoring well locations based on Port of Seattle survey data and projected to cross section profile. Projected ground surface based on survey elevations at these locations and ground truthing.

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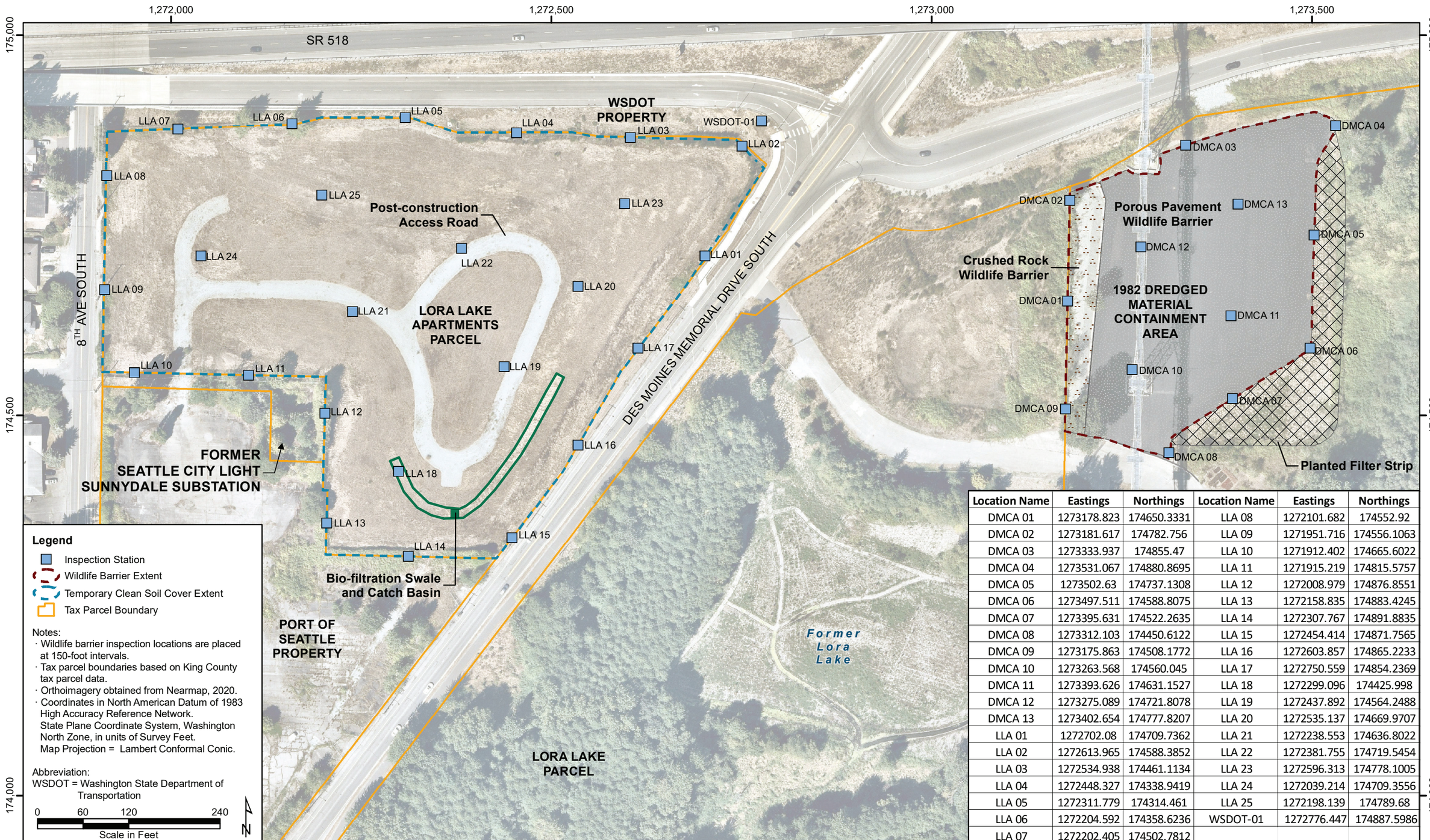
Figure 5.2
Proposed Performance Monitoring Sample Locations and Depths

G:Project\Clients\Floyd Snider\Lora Lake\Figure 7.2

Revised – January 2022



Legend

- Inspection Station
- Wildlife Barrier Extent
- Temporary Clean Soil Cover Extent
- Tax Parcel Boundary

Notes:

- Wildlife barrier inspection locations are placed at 150-foot intervals.
- Tax parcel boundaries based on King County tax parcel data.
- Orthoimagery obtained from Nearmap, 2020.
- Coordinates in North American Datum of 1983 High Accuracy Reference Network. State Plane Coordinate System, Washington North Zone, in units of Survey Feet. Map Projection = Lambert Conformal Conic.

Abbreviation:
WSDOT = Washington State Department of Transportation

0 60 120 240
Scale in Feet

N

Location Name	Eastings	Northings	Location Name	Eastings	Northings
DMCA 01	1273178.823	174650.3331	LLA 08	1272101.682	174552.92
DMCA 02	1273181.617	174782.756	LLA 09	1271951.716	174556.1063
DMCA 03	1273333.937	174855.47	LLA 10	1271912.402	174665.6022
DMCA 04	1273531.067	174880.8695	LLA 11	1271915.219	174815.5757
DMCA 05	1273502.63	174737.1308	LLA 12	1272008.979	174876.8551
DMCA 06	1273497.511	174588.8075	LLA 13	1272158.835	174883.4245
DMCA 07	1273395.631	174522.2635	LLA 14	1272307.767	174891.8835
DMCA 08	1273312.103	174450.6122	LLA 15	1272454.414	174871.7565
DMCA 09	1273175.863	174508.1772	LLA 16	1272603.857	174865.2233
DMCA 10	1273263.568	174560.045	LLA 17	1272750.559	174854.2369
DMCA 11	1273393.626	174631.1527	LLA 18	1272299.096	174425.998
DMCA 12	1273275.089	174721.8078	LLA 19	1272437.892	174564.2488
DMCA 13	1273402.654	174777.8207	LLA 20	1272535.137	174669.9707
LLA 01	1272702.08	174709.7362	LLA 21	1272238.553	174636.8022
LLA 02	1272613.965	174588.3852	LLA 22	1272381.755	174719.5454
LLA 03	1272534.938	174461.1134	LLA 23	1272596.313	174778.1005
LLA 04	1272448.327	174338.9419	LLA 24	1272039.214	174709.3556
LLA 05	1272311.779	174314.461	LLA 25	1272198.139	174789.68
LLA 06	1272204.592	174358.6236	WSDOT-01	1272776.447	174887.5986
LLA 07	1272202.405	174502.7812			

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Figure 6.1
Wildlife Barrier Inspection Locations

I:\GIS\Projects\POS_LLA\MXD\Task8140\CMP - Revised January 2022\Figure 6.1 Wildlife Barrier Inspection Locations.mxd
2/3/2022

Revised – January 2022

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Figure 7.1
Groundwater Compliance and Sediment Cap Performance Monitoring Locations

I:\GIS\Projects\POS_LLA\MXD\Task8140\CMP - Revised January 2022\Figure 7.1 Groundwater Compliance and Sediment Cap Performance Monitoring Locations.mxd
2/3/2022

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Compliance Monitoring Plan

Appendix A
Soil Boring Log

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	PROJECT:	LOCATION:	BORING ID:
	LOGGED BY:	COORDINATE SYSTEM:	
DRILLED BY:		NORTHING:	EASTING:
DRILLING EQUIPMENT:		GROUND SURFACE ELEVATION:	
DRILLING METHOD:		TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):
SAMPLING METHOD:		BORING DIAMETER:	DRILL DATE:

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID
0							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

ABBREVIATIONS:
ft bgs = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

NOTES:

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	PROJECT:	LOCATION:	BORING ID:
	LOGGED BY:	COORDINATE SYSTEM:	
DRILLED BY:		NORTHING:	EASTING:
DRILLING EQUIPMENT:		GROUND SURFACE ELEVATION:	
DRILLING METHOD:		TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):
SAMPLING METHOD:		BORING DIAMETER:	DRILL DATE:

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

ABBREVIATIONS:
ft bgs = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

NOTES:

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	PROJECT:	LOCATION:	BORING ID:
	LOGGED BY:	COORDINATE SYSTEM:	
DRILLED BY:		NORTHING:	EASTING:
DRILLING EQUIPMENT:		GROUND SURFACE ELEVATION:	
DRILLING METHOD:		TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):
SAMPLING METHOD:		BORING DIAMETER:	DRILL DATE:

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

ABBREVIATIONS:
ft bgs = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

NOTES:

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Lora Lake Apartments Site

Compliance Monitoring Plan

Appendix B
Wildlife Barrier Physical Integrity Inspection Forms

Project:	***Definitions:**
Field Personnel:	**Good - No repair is needed, barrier integrity remains within established performance criteria.**
Date Monitoring Year:	**Fair - Some issues noted such as plant growth, but no significant barrier failure or lack of performance.**
Weather:	**Poor - Repair is needed, observations and/or indications of barrier failure and performance concerns visible such as overgrown vegetation, cracking, and loss of material.**

Monitoring Station	**CHECK ALL THAT APPLY**						**Overall Condition of Barrier* (check one)**			**Repair Needed (check one)**		**Comments/Observations**
	Engineered surface characteristics condition compromised	**Exposed underlying soil**	**Loss of barrier material**	**Down-slope movement of barrier material**	**Presence of debris on barrier surface**	**Substantial plant growth**	**Good**	**Fair**	**Poor**	**Yes**	**No**	
LLA 01	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 02	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 03	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 04	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 05	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 06	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 07	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 08	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 09	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 10	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 12	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 13	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 14	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

Monitoring Station	CHECK ALL THAT APPLY						Overall Condition of Barrier* (check one)			Repair Needed (check one)		Comments/Observations
	Engineered surface characteristics condition compromised	Exposed underlying soil	Loss of barrier material	Down-slope movement of barrier material	Presence of debris on barrier surface	Substantial plant growth	Good	Fair	Poor	Yes	No	
LLA 15	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 16	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 17	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 18	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 19	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 20	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 21	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 22	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 23	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 24	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 25	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 26	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LLA 27	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

PHOTOGRAPH DOCUMENTATION	
Project:	
Field Personnel:	
Date and Monitoring Year:	
Weather:	

Monitoring Station	Photograph Number	Direction	Latitude/Longitude	Time	Notes
LLA 01					
LLA 02					
LLA 03					
LLA 04					
LLA 05					
LLA 06					
LLA 07					
LLA 08					
LLA 09					
LLA 10					
LLA 11					
LLA 12					
LLA 13					
LLA 14					
LLA 15					
LLA 16					
LLA 17					
LLA 18					
LLA 19					
LLA 20					
LLA 21					
LLA 22					

Monitoring Station	Photograph Number	Direction	Latitude/Longitude	Time	Notes
LLA 23					
LLA 24					
LLA 25					
LLA 26					
LLA 27					

Additional Notes: (For additional photo points, identify reason for taking additional photograph)

Project:.2	***Definitions:**
Field Personnel:	**Good - No repair is needed, barrier integrity remains within established performance criteria.**
Date Monitoring Year:	**Fair - Some issues noted such as plant growth, but no significant barrier failure or lack of performance.**
Weather:	**Poor - Repair is needed, observations and/or indications of barrier failure and performance concerns visible such as overgrown vegetation, cracking, and loss of material.**

Monitoring Station	**CHECK ALL THAT APPLY**						**Overall Condition of Barrier* (check one)**			**Repair Needed (check one)**		**Comments/Observations**
	Engineered surface characteristics condition compromised	**Exposed underlying soil**	**Loss of barrier material**	**Down-slope movement of barrier material**	**Presence of debris on barrier surface**	**Substantial plant growth**	**Good**	**Fair**	**Poor**	**Yes**	**No**	
DMCA 01	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 02	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 03	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 04	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 05	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 06	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 07	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 08	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 09	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 10	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 12	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
DMCA 13	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

PHOTOGRAPH DOCUMENTATION	
Project:	
Field Personnel:	
Date and Monitoring Year:	
Weather:	

Monitoring Station	Photograph Number	Direction	Latitude/Longitude	Time	Notes
DMCA 01					
DMCA 02					
DMCA 03					
DMCA 04					
DMCA 05					
DMCA 06					
DMCA 07					
DMCA 08					
DMCA 09					
DMCA 10					
DMCA 11					
DMCA 12					
DMCA 13					

Additional Notes: (For additional photo points, identify reason for taking additional photograph)

Port of Seattle
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Compliance Monitoring Plan

Appendix C
Groundwater Well Installation Log and Groundwater Sample Collection Form

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	PROJECT:	LOCATION:	WELL ID:
	LOGGED BY:	DRILL DATE:	ECOLOGY WELL ID:
DRILLED BY:	BORING DIAMETER:	COORDINATE SYSTEM:	
DRILLING EQUIPMENT:	SCREENED INTERVAL:	NORTHING:	EASTING:
DRILLING METHOD:		GROUND SURFACE ELEV.:	TOC ELEVATION:
SAMPLING METHOD:		TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID	Well Construction
0								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

ABBREVIATIONS:
ft bgs = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

NOTES:

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	PROJECT:	LOCATION:	WELL ID:
	LOGGED BY:	DRILL DATE:	ECOLOGY WELL ID:
DRILLED BY:	BORING DIAMETER:	COORDINATE SYSTEM:	
DRILLING EQUIPMENT:	SCREENED INTERVAL:	NORTHING:	EASTING:
DRILLING METHOD:		GROUND SURFACE ELEV.:	TOC ELEVATION:
SAMPLING METHOD:		TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID	Well Construction
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

ABBREVIATIONS:
ft bgs = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

NOTES:

GROUNDWATER OR SURFACE WATER SAMPLE COLLECTION FORM

Project Name:_____ Date of Collection: _____

Project Number:_____ Field Personnel: _____

Purge Data

Well ID: _____ Secure: ☐ Yes ☐ No Well Condition/Damage Description: _____

_____

Depth Sounder decontaminated Prior to Placement in Well: ☐ Yes ☐ No One Casing Volume (gal): _____

Depth of water (from top of well casing): _____ Well Casing Type/Diameter/Screened Interval: _____

After 5 minutes of purging (from top of casing): _____

Begin purge (time):_____

End purge (time): _____

Gallons purged: _____

Purge water disposal method: _____

Volume of Schedule 40 PVC Pipe

Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Lineal Ft.)
1 ¼"	1.660"	1.380"	0.08	0.64
2"	2.375"	2.067"	0.17	1.45
3"	3.500"	3.068"	0.38	3.2
4"	4.500"	4.026"	0.66	5.51
6"	6.625"	6.065"	1.5	12.5

Time	Depth to Water	Vol. Purged	pH	DO	Conductivity	Turbidity	Temp	ORP	Comments

Sampling Data

Sample No:_____ Location and Depth: _____

Date Collected (mo/dy/yr): _____ Time Collected: _____ ☐ AM ☐ PM Weather: _____

Type: ☐ Ground Water ☐ Surface Water Other: _____ Sample: ☐ Filtered ☐ Unfiltered Other:_____

Sample Collected with: ☐ Bailer ☐ Pump Other: _____ Type: _____

Water Quality Instrument Data Collected with: Type: ☐ Horiba U-22 ☐ Horiba U-50 Other:_____

Sample Decon Procedure: Sample collected with (circle one): decontaminated all tubing; disposable and/or dedicated silicon and poly tubing Other: _____

Sample Description (Color, Turbidity, Odor, Other): _____

Sample Analyses

TPH-D	(HCl) ☐	Chlor / Fluor	(unpres) ☐	COD / TOC	(H2SO4) ☐	Orthophos	(FILTER)☐	Diss. Metals	(HNO3) ☐
TPH-G	(HCl) ☐	BTEX	(HCl) ☐	Total Metals	(HNO3) ☐	TKN/Phos	(N2SO4) ☐	VOCs	(HCl) ☐

Additional Information

Types of Sample Containers: Quantity:	Duplicate Sample Numbers:	Comments:

Signature: _____ **Date:** _____

Port of Seattle
Lora Lake Apartments Site

Compliance Monitoring Plan

Appendix D
Fugitive Dust Control Monitoring Log

Appendix D
Self-Inspection Checklist: Fugitive Dust Control Monitoring Log

Date/Time	Location	Fugitive Dust Source	Control Method	Comments