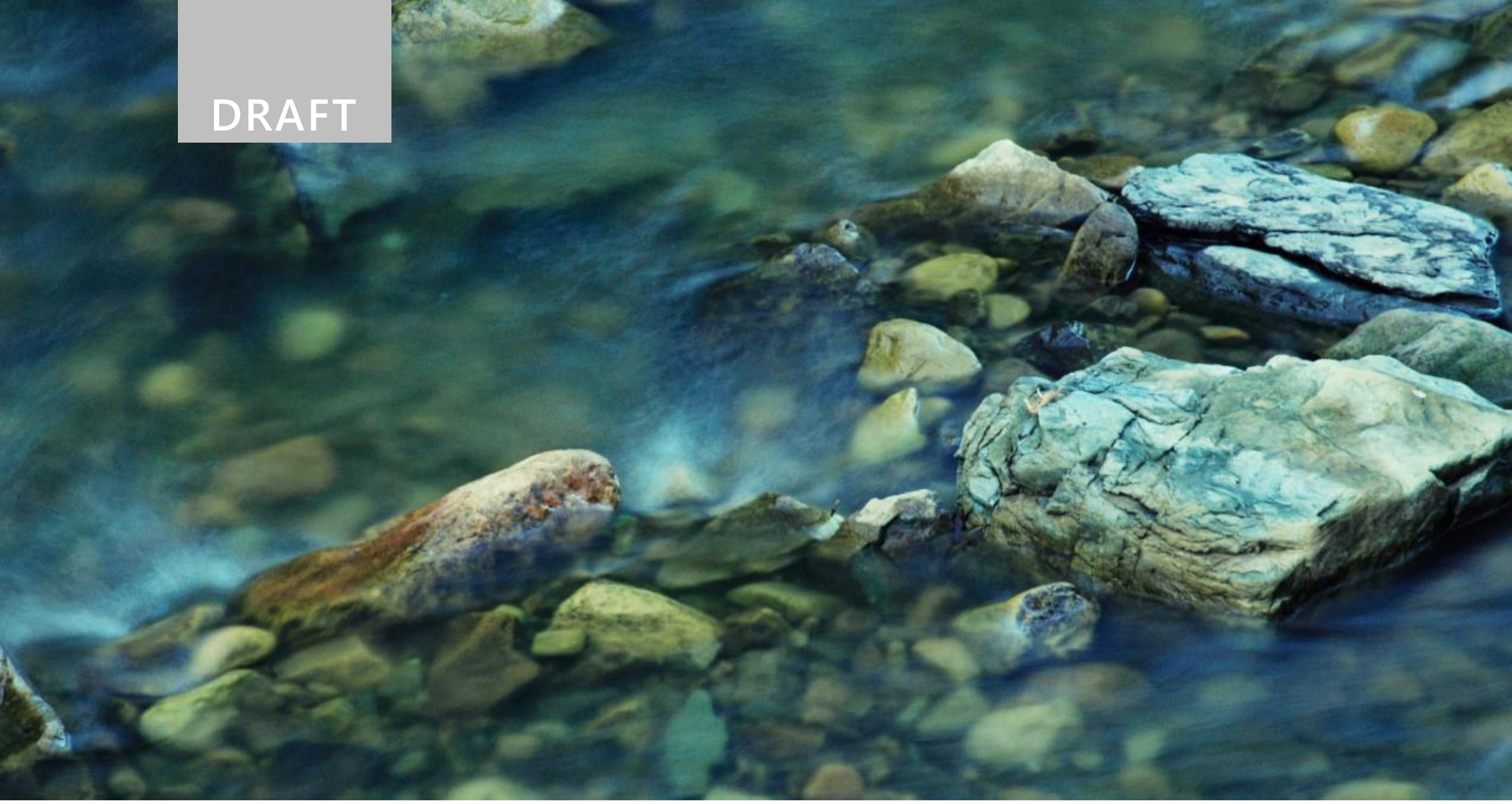

December 2025
Terminal 25 South Site

Engineering Evaluation and Cost Analysis

Prepared for the Port of Seattle

DRAFT

December 2025
Terminal 25 South Site

Engineering Evaluation and Cost Analysis

Prepared for

Port of Seattle

Prepared by
Anchor QEA, Inc.
1201 3rd Avenue, Suite 2600
Seattle, Washington 98101

Project Number: 210003-03.01 Task 3.2

EXECUTIVE SUMMARY

This Draft Final Engineering Evaluation and Cost Analysis (Draft Final EE/CA) has been prepared by Anchor QEA on behalf of the Port of Seattle (Port) for the Terminal 25 South Site (T-25S Site; Figure ES-1), under the Administrative Settlement Agreement and Order on Consent (ASAOC; Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [CERCLA] Docket No. 10-2022-0159) executed between the Port and the U.S. Environmental Protection Agency (EPA; EPA 2022).

Figure ES-1
Terminal 25 South Site Map

The T-25S Site is located partially within the East Waterway (EW) Operable Unit (OU) of the Harbor Island Superfund Site. EPA issued an Interim Record of Decision (IROD; EPA 2024) that selected the interim remedial action for the EW OU, including the overlapping sediment portion of the T-25S Site within EW. The Remedial Action Levels (RALs; referred herein as EW RALs) were also identified in the IROD.

The Port plans to construct a habitat restoration project at the T-25S Site (Figure ES-2) that will restore intertidal and shallow subtidal habitat by removing contaminated sediments from the EW and contaminated soils from the adjacent upland to create off-channel emergent marsh and riparian habitat. Currently, the T-25S Site includes existing EW sediments (referred to as the in-water portion) and upland area that will become marsh habitat (below the future relocated mean higher high water elevation) as part of the habitat restoration work (referred to as the upland portion). The cleanup of the T-25S Site will address the in-water areas of the T-25S Site in a manner that is consistent with applicable components of the EW IROD. Cleanup will occur ahead of habitat restoration construction activities as part of the same construction mobilization.

The primary objectives of this Draft Final EE/CA are to characterize the T-25S Site conditions based on available data, develop a range of alternatives using appropriate technologies to address contaminants in T-25S Site sediments and soils, and select a preferred removal action. This Draft Final EE/CA has been conducted in accordance with the EE/CA Work Plan (Anchor QEA 2023a), the ASAOC, the EW IROD (EPA 2024), and removal action requirements under 40 *Code of Federal Regulations* 300.415, EPA's Guidance on Conducting Non-Time Critical Removal Actions (NTCRAs) Under CERCLA (EPA 1993), and other published EPA policy and guidance for conducting removal actions. This EE/CA has also been developed in a manner that is consistent with applicable components of the EW IROD.

Figure ES-2
Conceptual Restoration Site Plan

Site Characterization

The T-25S Site includes approximately 5 acres of upland area, and 5 acres of submerged and intertidal areas within the footprint of the EW OU. The T-25S Site shoreline is an armored, riprap slope, with a treated-wood piling field from the historical Pier 24, which remains in the subtidal area on the northern half of the Site (Figure ES-1). The upland topography at the T-25S Site is relatively flat, with tidally influenced groundwater flowing northwest toward the EW OU (Anchor QEA and Aspect 2012). The in-water portion of the T-25S Site is predominantly deep in the channel, with relatively shallow subtidal and intertidal habitat on the shoreline. The T-25S Site upland footprint is currently paved or covered with compacted gravel and it is graded to drain stormwater to a collection system consisting of catch basins, which discharge to the EW. The Port currently leases the upland portions of the T-25S Site to various tenants who use the area for equipment and material laydown, light industrial activity, and truck parking. A piling field in most of the western and all of the northern shoreline areas is currently not in use.

Nature and Extent of Contamination

T-25S Site soil and sediment data were evaluated against EW RALs from the IROD to determine the nature and extent of contamination. The 11 contaminants of concern (COCs) that have EW RALs include total polychlorinated biphenyls (PCBs), total dioxin/furan toxic equivalency (relative to 2,3,7,8-TCDD), arsenic, tributyltin (TBT), 1,4-dichlorobenzene, butylbenzyl phthalate, acenaphthene, fluoranthene, fluorene, mercury, and phenanthrene.

In the upland portion of the T-25S Site, a total of 60 soil borings were collected from various depths down to 20 feet below ground surface (bgs) to characterize the extent of contamination in the planned habitat subgrade.[1] Slightly over half of the soil borings had concentrations greater than the EW RALs below the habitat subgrade for at least one sample and one chemical. Figure ES-3 (left panel) shows no soil concentrations greater than the EW RAL below habitat subgrade in any locations within the northern portion of the T-25S Site or along the eastern T-25S Site boundary. Elevated PCB concentrations have been identified within a “Focused Investigation Area” (Figure ES-3 right panel). Within this area, between 6 and 11 feet bgs, the average PCB concentration is 140,000 micrograms per kilogram (μg/kg). Samples deeper than 11 feet bgs have significantly lower PCB concentrations, averaging 11,800 μg/kg, but are greater than the PCB EW RAL. Most samples deeper than 14 feet bgs have concentrations less than the PCB EW RAL. Non-aqueous phase liquid (NAPL) and sheen were observed at some boring locations in the Focused Investigation Area.

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[1] Defined as 2 feet below the planned final habitat restoration design surface, which allows for placement of a minimum of 2 feet of clean backfill for habitat substrate.

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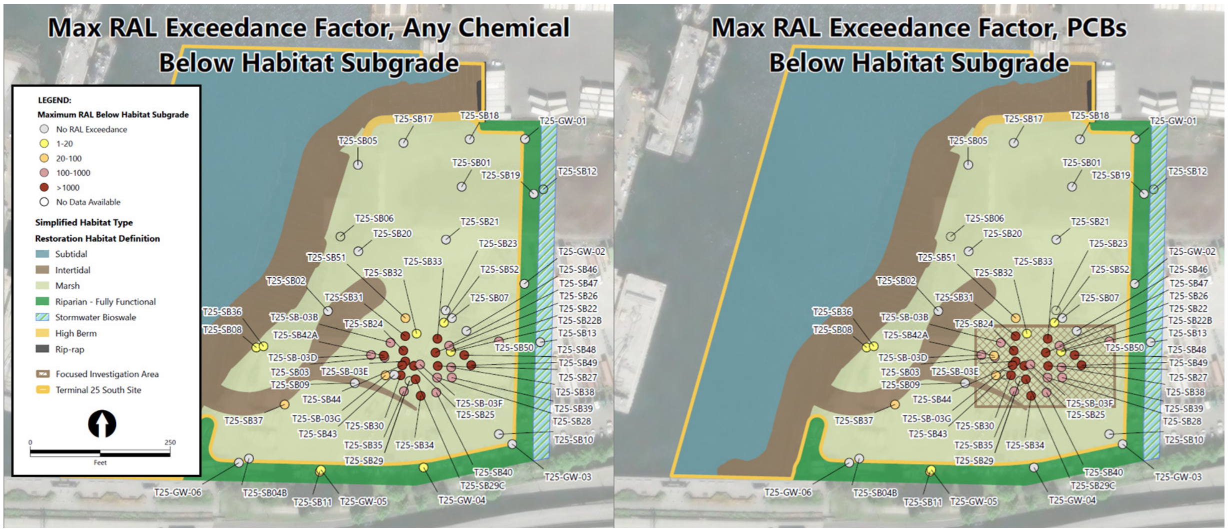
Figure ES-3
Maximum RAL Screening for the Upland Portion of the T-25S Site



In the in-water portion of the T-25S Site, 32 of the 36 core locations had concentrations greater than the EW RAL in one or more sample intervals, while six of the 11 surface grab locations had concentrations greater than the EW RAL. Most contaminant concentrations in sediment decrease with depth; the maximum depth of contamination in T-25S Site sediments ranges from approximately 5 to 11.3 feet below mudline.

Conceptual Site Model

Contamination at the T-25S Site is likely a result of both on-property and off-property sources. Potential on-property sources include historic cold storage, food and fish processing and packing facilities, a sawmill, electric equipment warehouse and manufacturing, and an automobile preparation facility (Pinnacle Geosciences 2003). Operations may have released contaminants such as PCBs, metals, and petroleum hydrocarbons to soil. Floor drains in the former compressor building and maintenance shop area may have drained spills directly into a void space beneath the building floors, which were pile-supported. PCBs and NAPL were identified in subsurface soils within the Focused Investigation Area, which is located within the footprint of a former compressor building and maintenance shop.

Off-property sources include sources within the EW that could migrate to sediment areas within the T-25S Site from river and tidal currents and from vessel propwash that could resuspend and spread sediment from off-site areas. Additional off-property sources include discharges from outfalls and combined sewer overflows adjacent to the T-25S Site such as the City of Seattle Hinds Outfall.

Recontamination Evaluation

The potential for groundwater to re-contaminate future restored marsh sediments at the T-25S Site is unlikely. This potential was evaluated using a one-dimensional fate and transport model. The results of the evaluation indicated that recontamination from groundwater is unlikely due to modeled concentrations predicted to be less than the EW RALs. The analysis is conservative because the model uses the maximum detected concentration (rather than the average detected concentration) and does not consider lateral nor vertical attenuation during groundwater transport. Other potential sources of recontamination include sediments transported from sources within the EW (via the Duwamish River, vessel propwash, or tidal fluctuations), CSO discharges, direct atmospheric deposition, and/or spills. The conceptual habitat restoration design has incorporated several features, including berms to the north and west and green stormwater infrastructure, as measures to reduce the potential for recontamination. The EW OU in-water cleanup and related source control efforts will further reduce the potential for recontamination.

Removal Action Objective

The removal action objective (RAO) to be achieved by the T-25S Site removal action is the RAO to be achieved by the Interim Action described in the IROD for the EW OU:

- **RAO to be achieved by this removal action:** *"Reduce through active remediation concentrations of COCs in sediment greater than remedial action levels"* (EPA 2024).

This RAO and the removal action are intended to support the final cleanup action and long-term objectives of the EW OU cleanup, which are described in the EW IROD. The removal action for the T 25S Site will comply with (or formally waive) all Applicable or Relevant and Appropriate Requirements (ARARs) consistent with the ARARs identified for the EW OU cleanup.

Identification of Technologies

This Draft Final EE/CA identifies technologies that are most applicable at the T-25S Site to address sediment and soil contamination, that are readily available, and can be implemented within the anticipated NTCRA timeframe. The in-water technologies that are applicable to the in-water portion of the T-25S Site are mechanical dredging, residual management cover (RMC), backfill, disposal, and institutional controls; these technologies were selected for the EW OU (encompassing the T-25S Site) as part of the EW IROD.[2] The upland technologies that have been retained in this Draft Final EE/CA are excavation, engineered capping with amendments, backfill, containment barrier, ex situ

[2] Several other in-water technologies (hydraulic dredging, engineered capping, in situ treatment technologies, monitored natural recovery, and enhanced natural recovery) were selected in the EW IROD for the EW OU but are not applicable to the T-25S Site portion of the EW.

treatment, disposal, and institutional controls. All the upland technologies are viable, well-established, and have been successfully implemented for other upland areas.

Removal Action Alternatives

Three alternatives were developed for the T-25S Site to address sediment and soil contamination and achieve the RAO. The removal action areas were delineated using Thiessen data interpolation to identify the lateral and vertical extents of areas greater than the EW RALs. The Thiessen polygons were further grouped into dredge units (DUs) or excavation units (EUs) based on similar removal depths and/or similar type of contamination. For the in-water portion of the T-25S Site, only one in-water alternative is considered in order to be consistent with the EW IROD. Three alternatives for the upland portion of the T-25S Site consider a range of lateral and vertical extents of contaminated soil removal, backfill, and capping. Though not required by EPA as part of the NTCRA, all alternatives include some excavation of soils without EW RAL exceedances down to required habitat subgrade elevations, followed by placement of clean 2-foot backfill that will occur in certain areas.

Alternative 1

Alternative 1 includes partial excavation of 11.5 feet of upland contaminated soil in the area with the highest EW RAL exceedances (primarily the highest PCB RAL exceedances) and NAPL presence, followed by placement of an amended cap (composed of a 0.5-foot-thick organoclay-amended sand for NAPL sorption and a 1-foot-thick granular activated carbon [GAC]-amended sand for chemical isolation), and an average of 5.2 feet of clean backfill (atop the cap) to reach final habitat design elevations. Alternative 1 also includes partial excavation of contaminated soils in other focused upland areas to address EW RAL exceedances, followed by 2 feet of clean backfill placement to achieve final habitat design elevations. Consistent with the EW IROD, the in-water portion includes removal of debris and pilings to the maximum extent practicable, dredging of contaminated sediments, followed by RMC and placement of sloped backfill and armor.

Alternative 1 is considered effective in the long- and short-term, and is easily implementable, with an anticipated construction timeframe of 14 working months.[3] The total estimated cost for this alternative is approximately $88.5 million, approximately $46.1 million to address the in-water sediments, and approximately $42.4 million to implement the removal action in the upland portion of the T-25S Site.

[3] The in-water work will be subject to the in-water construction window (October 1 to February 15 and in coordination with the Tribes), while the upland work could be conducted year-round.

Alternative 2

Alternative 2 includes partial excavation of 13.5 feet of upland contaminated soil in the area with the highest EW RAL exceedances (primarily the highest PCB RAL exceedances) and presence of NAPL, followed by placement of an amended cap (composed of a 0.5-foot-thick organoclay-amended sand for NAPL sorption, and a 1-foot-thick GAC-amended sand for chemical isolation), and an average of 7.2 feet of clean backfill (atop the cap) to reach final habitat design elevations. Partial excavation of contaminated soils in other focused upland areas will address EW RAL exceedances down to required habitat subgrade elevations, followed by placement of a 1-foot-thick GAC-amended cap and 2 feet of clean backfill. The in-water action for this alternative is the same as Alternative 1.

Alternative 2 is considered effective in the long- and short-term, and is easily implementable, with an anticipated construction timeframe of 14.6 working months. The total estimated cost for this alternative is approximately $91.9 million, approximately $46.1 million for the in-water portion and approximately $45.8 million to implement the removal action in the upland portion of the T-25S Site.

Alternative 3

Alternative 3 includes full excavation of upland contaminated soils in the area with the highest EW RAL exceedances and presence of NAPL (down to 16 feet bgs) and in other upland areas to address soil contamination with concentrations greater than the EW RALs, followed by clean backfill placement to achieve final habitat design elevations. The in-water action for this alternative is the same as Alternative 1.

Alternative 3 is considered effective in the long- and short-term, and is easily implementable, with an anticipated construction timeframe of 16.1 working months. The total estimated cost for this alternative is approximately $99.0 million, approximately $46.1 million for the in-water portion, and approximately $52.9 million to implement the removal action in the upland portion of the T-25S Site.

Alternatives 1 through 3 are shown on Figures ES-4 through ES-6, respectively.

Figure ES-4
Alternative 1 Removal and Placement

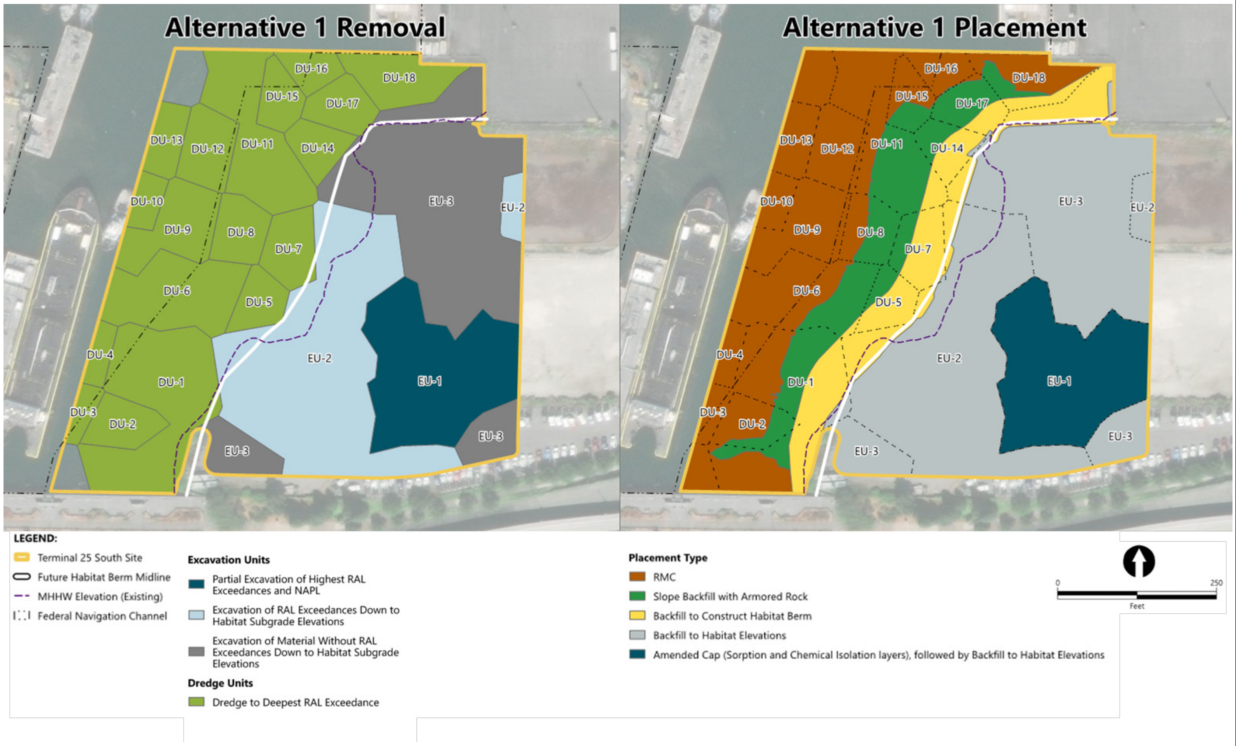


Figure ES-5
Alternative 2 Removal and Placement

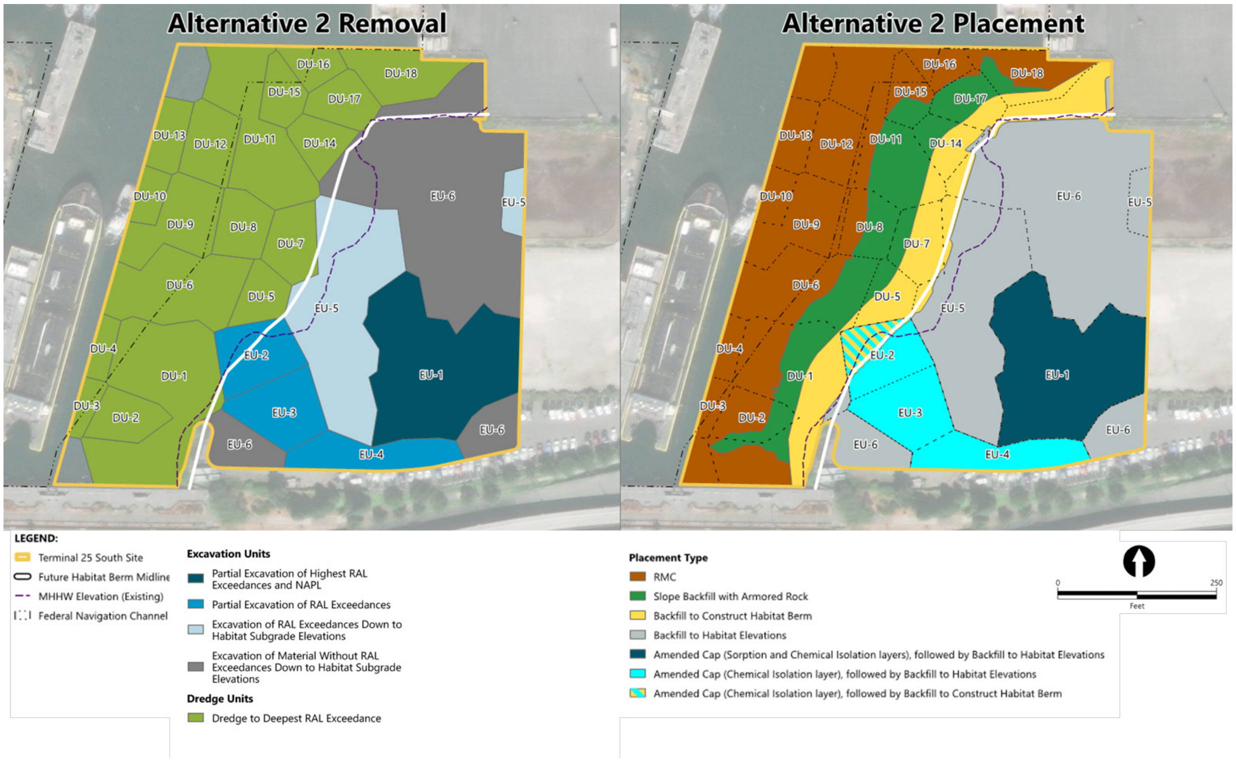
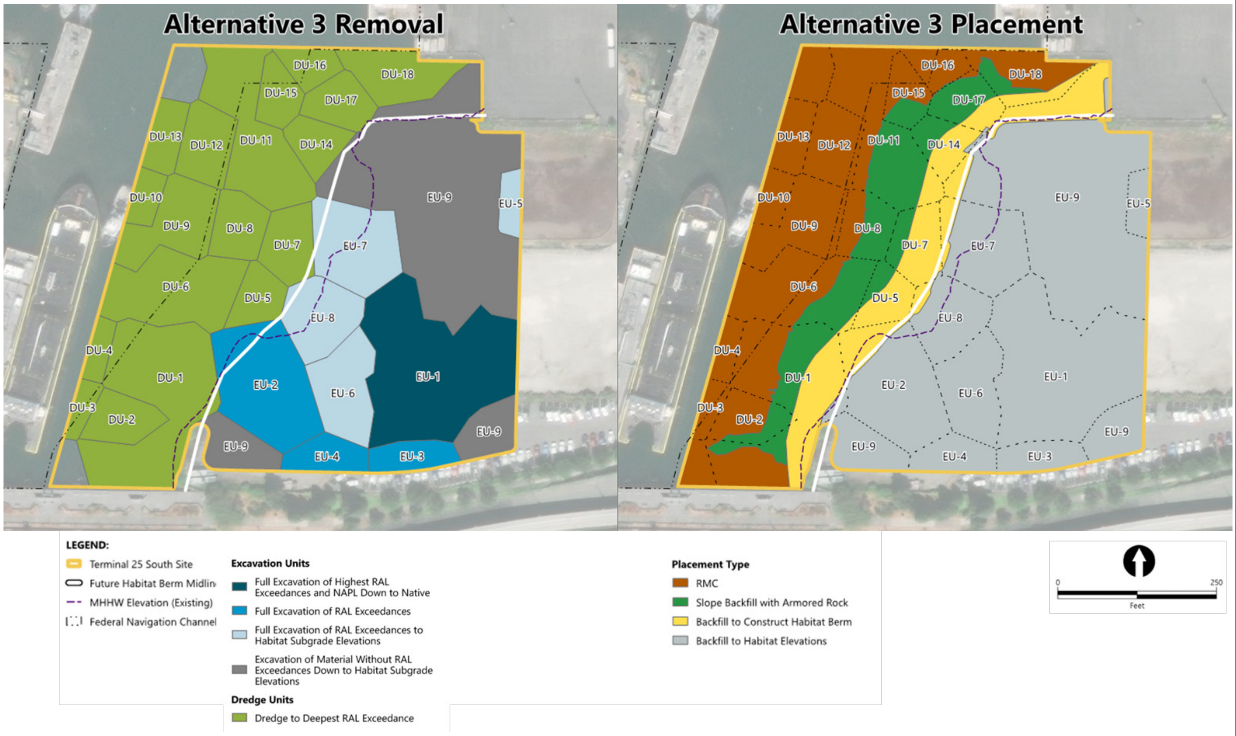


Figure ES-6
Alternative 3 Removal and Placement



Summary of Comparative Analysis

A comparative analysis for the three alternatives was conducted based on their effectiveness, implementability, and cost, consistent with evaluation criteria described in the EPA NTCRA guidance (EPA 1993). Alternative 1 is more implementable than Alternatives 2 and 3 because it requires less construction. Alternative 1 is less effective than Alternatives 2 and 3 because it removes less contamination and relies more on capping than permanent removal. Alternative 3 offers the advantage of complete removal of COCs from the T-25S Site without the reliance of capping to provide long-term protection, but has more significant short-term impacts due to the largest removal and backfill volumes and longest construction duration than Alternatives 1 and 2. Alternative 2 proposes a lower volume of contaminated soil removal when compared to Alternative 3. Costs for Alternatives 1 and 2 are lower than Alternative 3, even though Alternatives 1 and 2 have higher long-term costs associated with cap monitoring, inspection, and maintenance.

Preferred Removal Action

EPA has recommended Alternative 3 as the preferred removal action for the T-25S Site NTCRA. This alternative provides a high level of certainty of long-term effectiveness and permanence because it will meet the EW RALs and achieve the RAO throughout the T-25S Site immediately after construction. The construction for Alternative 3 will be accomplished in approximately 16.1 working months, which is a slightly longer timeframe than for Alternatives 1 and 2. The cost for implementing Alternative 3 is approximately $10.5 million and $7.1 million more than the cost for Alternatives 1 and 2, respectively, but the higher cost is offset by the added environmental benefits associated with Alternative 3, which will readily achieve the greatest effectiveness (immediately eliminating any potential residual risks from the future intertidal aquatic environment) and permanence right after construction is complete and in the long term (due to the excavation to native soil and the largest mass removal of contaminated soils, particularly the highest EW RAL exceedance area, from the T-25S Site). The additional costs incurred by Alternative 3 (when compared to the other two alternatives) are therefore justified as this alternative offers the advantage of complete removal of COCs from the T-25S Site without the reliance of capping to provide long-term protection and eliminates the need for any cap monitoring, inspection, and maintenance.

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ABBREVIATIONS

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
ARAR	Applicable or Relevant and Appropriate Requirements
ASAOC	Administrative Settlement Agreement and Order on Consent
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
BMP	best management practice
BTEX	benzene, toluene, ethylbenzene, and xylenes
CDF	confined disposal facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
City	City of Seattle
COC	contaminant of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbons
CSM	conceptual site model
CSO	combined sewer overflow
CWA AWQC	National Human Health AWQC for the consumption of marine organisms
cy	cubic yard
D/F	dioxin/furan
DMMP	Dredged Material Management Program
DQ	data quality
DRO	diesel-range organics
DU	dredge unit
Ecology	Washington State Department of Ecology
EE/CA	Engineering Evaluation and Cost Analysis
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
EU	excavation units
EW	East Waterway
FS	Feasibility Study
GAC	granular activated carbon
GRO	gasoline-range organics
HHRA	Human Health Risk Assessment
IROD	Interim Record of Decision
LDW	Lower Duwamish Waterway
LUST	leaking underground storage tank

MHHW	mean higher high water
MLLW	mean lower low water
NAPL	non-aqueous phase liquid
NAVD88	North American Vertical Datum of 1988
ng/kg	nanograms per kilogram
NOAA	National Oceanic and Atmospheric Administration
NPV	net present value
NTCRA	Non-Time Critical Removal Action
OC	organic carbon
OMB	Office of Management and Budget
ORO	oil-range organics
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
Port	Port of Seattle
ppm	parts per million
RAL	Remedial Action Levels
RAO	removal action objective
RCRA	United States Resource Conservation and Recovery Act
RMC	residuals management cover
RNA	Restricted Navigation Area
RSL	regional screening levels
SMS	Sediment Management Standards
SOW	Statement of Work
SQAPP	Sampling and Quality Assurance Project Plan
SRI	Supplemental Remedial Investigation
SVOC	semivolatile organic compound
T-117 EAA	Terminal 117 Early Action Area
T-25S Site	Terminal 25 South Site
TBT	tributyltin
TEQ	toxic equivalency
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
UECA	Uniform Environmental Covenants Act
USCG	U.S. Coast Guard
VOC	volatile organic compound

WDOH	Washington State Department of Health

1 Introduction

This Draft Final Engineering Evaluation and Cost Analysis (Draft Final EE/CA) has been prepared by Anchor QEA on behalf of the Port of Seattle (Port) for the Terminal 25 South Site (T-25S Site) located at 2917 East Marginal Way South, Seattle, Washington (Figures 1-1 and 1-2). This Draft Final EE/CA has been prepared under the Administrative Settlement Agreement and Order on Consent (ASAOC; Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [CERCLA] Docket No. 10-2022-0159) executed between the Port and the U.S. Environmental Protection Agency (EPA; EPA 2022). The Statement of Work (SOW) for the T-25S Site is Appendix B to the ASAOC and sets forth the requirements for the EE/CA.

The T-25S Site is located along the southeast portion of the East Waterway (EW) Operable Unit (OU) of the Harbor Island Superfund Site. EPA is overseeing cleanup studies in the EW under an existing ASAOC with the Port (EPA Docket No. CERCLA-10-2007-0030). The EW, located south of downtown Seattle, stretches 1 mile along Harbor Island between the end of the Lower Duwamish Waterway (LDW) and Elliott Bay (Figures 1-1 and 1-2). The EW has been part of Seattle's main industrial corridor with Elliott Bay and Puget Sound since it was formed in the early 1900s and is hydraulically connected to the LDW. The EW is tidally influenced.

The EW OU is one of seven OUs of the Harbor Island Superfund Site that was added to the EPA National Priorities List in 1983. A Final Supplemental Remedial Investigation Report (Windward and Anchor QEA 2014) was approved by EPA in 2014 and includes the *Baseline Human Health Risk Assessment* (HHRA; Windward 2012a), *Baseline Ecological Risk Assessment* (ERA; Windward 2012b), and assembled data to identify the nature and extent of sediment contamination in the EW, evaluate sediment transport processes, and identify potential sources and pathways of contamination to the EW. The basis for action for sediments within the T-25S Site is established through the HHRA and ERA. The *Final Feasibility Study* (FS; Anchor QEA and Windward 2019), approved by EPA in 2019, developed and evaluated EW-wide remedial alternatives to address potential risk posed by contaminants of concern (COCs) within the EW. EPA issued a Proposed Plan (EPA 2023a) that recommended a preferred sediment remedy and cleanup plan for the EW OU, including within the overlapping sediment portion of the T-25S Site. After the public comment period, EPA issued an Interim Record of Decision (IROD; EPA 2024) that selected the interim remedial action for the EW OU. The IROD identifies Remedial Action Levels (RALs; referred herein as EW RALs) but does not select cleanup levels for the EW OU. EPA anticipates developing and selecting cleanup levels in a future decision document based on data collected during and after construction of the Interim Action (EPA 2024).

The Port anticipates constructing a habitat restoration project at the T-25S Site (Figure 1-3), which will restore intertidal and shallow subtidal habitat by removing contaminated sediments from the EW and contaminated soils from the adjacent upland to create off-channel emergent marsh and riparian habitat. The T-25S Site is in a critical estuarine and marine transition area that is important to juvenile salmon. The removal action will occur ahead of habitat restoration construction activities, likely as part of the same construction mobilization. The T-25S Site includes existing EW sediments and the portion of the upland that will become marsh habitat (below the future planned mean higher high water [MHHW] elevation), as part of the habitat restoration work. The habitat restoration also includes a riparian buffer along the new south, east, and northeast shorelines and an area for future green stormwater infrastructure to the east (Figure 1-3). The future riparian buffer and green stormwater infrastructure areas are not part of the T-25S Site.

1.1 Objectives of the Engineering Evaluation and Cost Analysis

The primary objectives of this Draft Final EE/CA,[4] as described in the EE/CA Work Plan (Anchor QEA 2023a), are as follows:

- Evaluate the adequacy of previously screened data, identify data gaps, and develop a sampling plan for necessary media and a groundwater monitoring plan for any data gaps that need to be filled to characterize the T-25S Site.
- Evaluate the potential human health and ecological risks posed by T-25S Site COCs (i.e., EW RALs established in the EW FS and IROD).
- Present a conceptual site model (CSM) that determines complete and incomplete contamination migration pathways and exposure pathways and evaluates receptors and exposure scenarios.
- Evaluate potential recontamination of the EW RALs to the T-25S Site from adjacent upland areas and the EW; adjacent upland areas include the remainder of the terminal and adjacent rights-of-way.
- Evaluate the appropriate technologies that address soil or sediment concentrations greater than the EW RALs.

In addition to the primary objectives from the EE/CA Work Plan (Anchor QEA 2023a), EPA's "*Guidance on Conducting Non-Time Critical Removal Actions (NTCRAs) Under CERCLA*" (EPA 1993) includes the following objectives that also apply to this Draft Final EE/CA:

- Develop a range of removal alternatives that are protective of human health and the environment, achieve the removal action goal and objectives, and are compatible with the anticipated habitat restoration for the T-25S Site. Soil contamination in the current upland portion of the T-25S Site would pose unacceptable risk to aquatic receptors following the planned inundation of that area following excavation for the removal action.

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[4] The EE/CA objectives from the ASAOC SOW have been revised, based on EPA direction, to objectives that EPA has authority to enforce under CERCLA.

- Compare alternatives based on NTCRA guidance criteria.
- Select a preferred removal action based on the comparative alternatives analysis.

This Draft Final EE/CA has been conducted in accordance with the EE/CA Work Plan (Anchor QEA 2023a), the ASAOC, the EW IROD (EPA 2024), and removal action requirements under 40 *Code of Federal Regulations* (CFR) 300.415, EPA's *Guidance on Conducting Non-Time Critical Removal Actions (NTCRAs) Under CERCLA* (EPA 1993), and other published EPA policy and guidance for conducting removal actions. Attachment 1 of the SOW includes a deliverables schedule. Deliverables required by the ASAOC are subject to EPA review and approval. The removal action will be selected by EPA in a future Action Memorandum.

1.2 Engineering Evaluation and Cost Analysis Organization

This Draft Final EE/CA is organized as follows:

- Section 2, Site Characterization, describes the T-25S Site location and summarizes the environmental setting; geology and hydrogeology; natural and cultural resources; current and historical uses and operations and environmental investigations of the T-25S Site and adjacent properties; prior remedial actions at the T-25S Site; EW baseline risk assessments; database development; nature and extent of contamination at the T-25S Site; a CSM; and recontamination evaluation.
- Section 3, Removal Action Goal and Objectives and Regulatory Requirements, describes the removal action goal, removal action objectives (RAOs), and future T-25S Site use considerations. It also summarizes the applicable regulatory requirements.
- Section 4, Identification of Technologies, describes the institutional controls required for the cleanup work and the basis for the technologies that can be implemented for the removal action at the T-25S Site.
- Section 5, Development of Alternatives, describes the process for the delineation of the removal action areas in the in-water and upland portions of the T-25S Site and describes the alternatives under consideration for the removal action.
- Section 6, Comparative Analysis of Alternatives, presents the comparison of the alternatives based on NTCRA criteria (effectiveness, implementability, and costs) and provides the basis for selecting the preferred removal action.
- Section 7, Preferred Removal Action, describes the elements of the preferred removal action based on the comparative analysis of alternatives conducted in Section 6, the anticipated removal action design[5], and implementation schedule.
- Section 8, References, presents a list of the references cited within this Draft Final EE/CA.

[5] The removal action design includes the in-water dredging, the upland excavation, and the habitat restoration designs.

- Appendices:
  - Appendix A, Supplemental Data
    - A-1 (EE/CA Sampling Soil Boring Logs and Photographs)
    - A-2 (Well Construction Details)
    - A-3 (EE/CA Data Package)
    - A-4 (Previous Data Quality-1 Data)
    - A-5 (Compiled Soil Data Flatfile)
    - A-6 (Compiled Sediment Data Flatfile)
    - A-7 (Compiled Groundwater Data Flatfile)
  - Appendix B, Fate and Transport Model Analyses to Evaluate Feasibility of Chemical Isolation Caps in Proposed Capping Areas and Recontamination Potential of Backfill Material from Groundwater
  - Appendix C, Port of Seattle Terminal 25 South Bench-Scale Treatability Study Report
  - Appendix D, Alternative Detailed Cost Summary

2 Site Characterization

This section describes the operational and regulatory history of the T-25S Site and the surrounding properties. It describes the T-25S Site location and summarizes the environmental setting; geology and hydrogeology; natural and cultural resources; current and historical uses and operations and future T-25S Site use; environmental investigations of the T-25S Site and adjacent properties; prior remedial actions at the T-25S Site; EW baseline risk assessments; database development; the nature and extent of contamination; the CSM; and results of the recontamination evaluation.

2.1 Site Description

Terminal 25 is located at 2917 East Marginal Way South, Seattle, Washington, and consists of a single parcel that is owned and managed by the Port. The parcel (Assessor's Parcel Number 7666207905) is approximately 37 acres in size. The T-25S Site includes approximately 5 acres of upland area generally located at the southwestern portion of the parcel and 5 acres of submerged and intertidal areas within the footprint of the EW OU. The upland portion of the T-25S Site includes the area that will likely be restored to become marsh habitat, which is below the future planned MHHW elevation (approximately +12 feet mean lower low water [MLLW]; Figure 1-3).

The T-25S Site is bounded to the east by the NW Seaport Alliance Lease Area, to the south by Spokane Street, to the west by the remaining EW OU, and to the north by a currently vacant terminal facility (Figure 2-1). The upland portion of the T-25S Site parcel and surrounding properties are zoned Industrial General 1.

The T-25S Site is located within the EW OU and within the source control area of the EW OU of the Harbor Island Superfund Site. The eastern and western boundaries of the EW OU are delineated by the existing MHHW elevation (Anchor QEA and Windward Environmental LLC 2019). The overall strategy for addressing contamination in the EW OU includes removal of contaminated sediment and controlling sources of contamination to the EW from upland areas. In accordance with EPA guidance and prudent practice, remedial actions should occur following source control implementation and verification.

The Port is the Respondent for the EW OU cleanup studies (ASAOC EPA Docket No. CERCLA-10-2007-0030) and for the EE/CA (ASAOC Docket No. 10-2022-0159) but will coordinate with other parties regarding any source control activities needed to support the removal action and subsequent habitat restoration. This includes the East Waterway Group parties (King County and City of Seattle), who entered into a Memorandum of Agreement with the Port to jointly conduct the EW OU cleanup studies but not the EE/CA or subsequent removal action or restoration activities. The East Waterway Group currently coordinates and implements source control efforts in the EW and works in cooperation with local jurisdictions, the Washington State Department of Ecology (Ecology), and EPA to implement source control actions. The ongoing source control efforts in the EW are not anticipated to delay planned remediation in the EW OU (Anchor QEA and Windward 2019).

The risks from human consumption of seafood and sediment direct contact in EW were assessed in the Baseline HHRA and Baseline ERA, conducted as part of the EW OU Supplemental Remedial Investigation/Feasibility Study (Windward and Anchor QEA 2014). Actions needed to address these risks were addressed in the EW FS (Anchor QEA and Windward 2019). A summary of the EW baseline risk assessments, including exposure pathways, receptors, and COCs, is provided in Section 2.7.

EPA will lead the sediment cleanup performed by the East Waterway Group and has issued an IROD (EPA 2024), which sets forth the preferred remedial action for the cleanup of sediments in the EW OU. Implementation of the EW OU cleanup is expected to begin in 2028 or later after completion of design and permitting under EPA oversight.

2.2 Environmental Setting

2.2.1 Bathymetry and Topography

The T-25S Site shoreline is an armored, riprap slope. A treated-wood piling field from the historical Pier 24 remains in the subtidal area on the northern half of the T-25S Site. Bathymetry of -15 to -20 feet MLLW leads into the channel from the piling field (Figure 2-2). Towards the southern edge of the shoreline, the bathymetry is shallower, and depths are between 0 and -5 feet MLLW. T-25S Site bathymetric and topographic contour elevations are depicted in Figure 2-2.

The upland topography at the T-25S Site is relatively flat with a ground surface elevation in the upland area ranging from +10 to +16 feet MLLW. MLLW is an area-specific vertical datum based on observed tidal fluctuation that can be converted to other datums such as North American Vertical Datum of 1988 (NAVD88). For the purpose of this Draft Final EE/CA, the vertical datum conversion based on National Oceanic and Atmospheric Administration (NOAA) Tidal Station 9447130 (at Colman Dock) is as follows:

Tidal Datums at Seattle, Washington (NOAA Tidal Station 9447130)

Tidal Datum	Elevation (feet relative to MLLW)	Elevation (feet relative to NAVD88)
Highest Observed Tide	14.5	12.2
Highest Astronomical Tide	13.3	11.0
Mean Higher High Water	11.3	9.1
Mean High Water	10.5	8.2
Mean Sea Level	6.6	4.3
Mean Low Water	2.8	0.5
North American Vertical Datum	2.3	0
Mean Lower Low Water	0	-2.3

A portion of the existing in-water area of the T-25S Site is located within the federal navigation channel in the EW. To accommodate the placement of in-water backfill and armoring that will support future habitat restoration at the T-25S Site, the Port formally requested deauthorization of a portion of the federal navigation channel in February 2024. The deauthorization was approved by Congress in 2025 in Bill H.R. 8812 - Water Resources Development Act of 2024. The updated federal navigation channel boundary is shown on Figure 1-3.

2.2.2 Geology and Hydrogeology

This section provides an overview of the T-25S Site geologic and hydrogeologic conditions. Soil boring and sediment core logs providing subsurface geologic information for the T-25S Site and adjacent properties have a typical depth of 10 to 20 feet below ground surface (bgs) and a maximum depth of 81.5 feet bgs. Appendix A-1 provides available boring and sediment core logs from investigations conducted on the T-25S Site or adjacent EW. Appendix A-2 also includes a tabulation of available well construction information (e.g., screen depths and elevations) for monitoring wells at the T-25S Site. Further details are available in Section 2.3 of the EE/CA Work Plan (Anchor QEA 2023a).

2.2.2.1 T-25S Site Geology

During the late 1800s, the T-25S Site was located at the northern tip of a small island at the eastern side of the mouth of the Duwamish River. The remainder of the T-25S Site was within the river channel or adjacent estuarine mudflats of the Duwamish River delta.

The T-25S Site was initially constructed by dredging and filling activities in the early 1900s, when the Duwamish River was reconfigured to the current channel location. In addition to sediment fill placement at the T-25S Site, other upland fill materials (associated with the regrading of Beacon Hill and Denny Hill) were placed in this area to create upland areas. A former turning basin directly north of the T-25S Site (in the EW) was filled in 1972 to create the existing container terminal area.

The T-25S Site is relatively flat. The fill over much of the T-25S Site is composed of silty and sandy soils from the upland regrading sources and silty and sandy sediments from the dredging of the Duwamish channel. On-site fill also includes wood debris (sawdust and fragments) in some areas further detailed in Section 2.2.2.3.

The geological units at the T-25S Site are as follows, from shallowest to deepest:

- Upland area:
  - Upland fill unit (dredge and fill materials, including some wood debris)
  - Upland area lower alluvium
- EW sediments:
  - Recent sediments
  - Upper alluvium/transition
  - Lower alluvium

2.2.2.2 Upland Area Hydrogeology

Hydrogeology for the upland fill unit is described in this section. Based on T-25S Site groundwater measurements and previous studies, groundwater is inferred to flow northwest, towards the EW. Although there are no site-specific hydrogeologic data for the upland area lower alluvium unit at the T-25S Site, hydrogeology of this unit in comparable Puget Sound shorelines is discussed in greater detail in Section 2.3.3.1.2 of the EE/CA Work Plan.

All existing T-25S Site monitoring wells were installed within the unconfined upland fill unit. Based on a groundwater investigation that included three wells in 1990, groundwater was encountered in the upland fill unit above and below wood debris. In 2011, groundwater wells were installed to characterize nearshore groundwater conditions at the T-25S Site. The wells were screened in the upland fill unit to approximately 13 to 14.5 feet bgs (Anchor QEA and Aspect 2012). Results from the nearshore well network indicate groundwater elevations of approximately 2.9 feet MLLW at low tide and up to 10.4 feet MLLW at high tide near the T-25S Site shoreline. The analysis of the water level measurements with respect to tide stage and cycle suggests that T-25S Site groundwater is tidally influenced and flows northwest toward the EW OU (Anchor QEA and Aspect 2012).

The presence of upland utility and stormwater corridors may affect current groundwater flow; however, all existing subsurface utilities and stormwater infrastructure will be removed from the upland area during T-25S Site habitat construction.

2.2.2.3 Wood Debris

Wood debris has been encountered during soil boring collection at the T-25S Site (Anchor QEA 2021a; Appendix A-1). Wood debris observations range from abundant wood within silty intervals and finer mulch-like wood intervals with trace soil, to larger wood chunks consistent with drilling through buried pilings. The depth of wood debris, deposit thickness, and type of wood vary throughout the T-25S Site. Wood debris was encountered more frequently in the southern portion of the T-25S Site. Deposits in this area tend to be thicker, typically around 4 to 11 feet thick, beginning around 7 feet bgs and occasionally extend to the top of the native unit (roughly 16 feet bgs). The upper contact of wood debris in the southern portion of the T-25S Site is on average at least 3 feet below the planned habitat subgrade following habitat restoration construction. In a few locations (e.g., SB32, SB37, and SB47) wood debris are present at the same elevation as the planned habitat subgrade, and the wood debris ranges from the planned habitat subgrade to 11 feet below the planned habitat subgrade. Substantial wood debris (up to 100%) was observed in borings from this area. Only one boring in the northern portion of the T-25S Site (SB17) had intervals with substantial wood and included pieces of wood and wood pulp observed between approximately 5.5 to 8 feet bgs. Other observations of wood debris in the northern portion were more sporadic and predominantly consisted of wood fibers and chunks of wood. The upper contact of wood debris in the northern portion of the T-25S Site is at least 2 feet below the planned habitat subgrade following habitat restoration construction, but ranged widely from 2 feet to 13 feet below the planned habitat subgrade.

2.3 Natural Resources

This section summarizes habitat availability at the T-25S Site along with discussion of sensitive species observed in the EW. Further description of the biological communities is discussed in Section 2.4.3 of the EE/CA Work Plan. In addition to the existing habitats described below, the goal of the habitat restoration project is to restore estuarine wetland functions across the T-25S Site, as well as to restore and create riparian habitat and off-channel rearing and refuge habitat for salmonids and other migratory and resident fish and wildlife in the EW.

2.3.1 Upland Areas

The upland areas of the T-25S Site and surrounding properties have been developed for industrial uses consistent with the City of Seattle's (City's) industrial land use zoning. No terrestrial and riparian habitat is currently present along the T-25S Site bank. The Washington Department of Fish and Wildlife manages the Priority Habitats and Species Program, which provides fish, wildlife, and habitat information. The Washington Department of Fish and Wildlife Priority Habitats and Species Program does not identify any priority species or habitats that may occur on the T-25S Site or nearby areas.

2.3.2 Aquatic Habitats

Aquatic habitats include those in the intertidal and subtidal areas of the EW within and near the T-25S Site. No tidal marsh or mudflat areas are present within the EW. Aquatic habitat at the T-25S Site includes the water column and intertidal and subtidal substrates (typically mud, sand, gravel, cobble, or riprap). Habitat at the T-25S Site is predominantly deep water with relatively little shallow subtidal and intertidal habitat. A few isolated areas of sloping mud and sand flats and gravel/cobble in the lower intertidal zone are present. Just north of the Spokane Street Bridge, a mound of fill stabilized by rock was placed specifically for habitat restoration purposes to provide shallow water and intertidal habitat.

Sixteen aquatic and aquatic-dependent species reported in the vicinity of Elliott Bay area are listed under either the Endangered Species Act or by the Washington Department of Fish and Wildlife as candidate species, threatened species, endangered species, or species of concern. Of these species, Chinook salmon, coho salmon, steelhead salmon, brown rockfish (*Sebastes auriculatus*), bald eagle, western grebe (*Aechmophorus occidentalis*), and Pacific herring (*Clupea pallasii*) are commonly observed in the EW.

2.4 Cultural Resources

The area that is now the T-25S Site was deeply subtidal—part of an embayment that extended south as far as present-day Auburn—until the Duwamish River delta began to aggrade about 5,700 years ago after a large eruption of Mount Rainier. The eruption created the Osceola Mudflow, which introduced massive amounts of sediment into the Duwamish drainage and caused the river mouth to move northward as the river valley filled with sediment. The Duwamish River delta was near its historical location by 1,500 to 2,200 years ago, at which time it would have been available for use by Native American communities. An earthquake around 1,050 years ago further uplifted the Lower Duwamish River area, raising the terraces adjacent to the river mouth. The Duwamish River mouth at historic contact was situated in an extensive tide flat area surrounded by higher terraces (Dragovich et al. 1994; Updegrave 2007; Miss et al. 2008).

The T-25S Site is located in an area mapped as intertidal in early maps, prior to historical and modern filling. This area would have been submerged daily at high tides. Between 1900 and 1920, dredging projects straightened the course of the Duwamish River, creating the Duwamish Waterway. The waterway extends about 4.5 miles upstream from the southern extent of Harbor Island, where it meets the Duwamish River. Waterway sediment and upland regrade material was used to build Harbor Island and placed on adjacent properties to either side of the island (Wilma 2001a, 2001b).

After filling created uplands in the T-25S Site vicinity, the T-25S Site was used for industrial purposes (see Section 2.6.2 of the EE/CA Work Plan). There are no standing structures on the parcel. No cultural resources surveys have been conducted at the T-25S Site area, and no archaeological sites or historic structures are recorded on the parcel. Based on the landform history, the potential for cultural resources at the T-25S Site is low. Sampling activities for this Draft Final EE/CA development included an inadvertent discovery plan (IDP) and no cultural resources were encountered. An updated IDP will be developed during design to provide direction and guidance for the proper procedures to follow if unanticipated cultural resources are discovered during removal activities.

2.5 T-25S Site Development and Operations

This section provides an overview of the T-25S Site historical and current uses and operations and a discussion of the planned future use. Further details on the T-25S Site development and operations are included in Section 2.6 of the EE/CA Work Plan (Anchor QEA 2023a).

2.5.1 Historical Site Use and Operations

The T-25S Site is one of the Port's earliest operating commercial terminals (Pinnacle Geosciences 2003). Its origins and commercial use date back to the original filling of the intertidal lands. The T-25S Site was initially constructed by dredging and filling activities in the early 1900s, when the Duwamish River was reconfigured to the current channel location. In addition to sediment fill placement at the T-25S Site, other upland fill materials (associated with the regrading of Beacon Hill and Denny Hill) were placed. From 1915 to approximately 1930, the T-25S Site was used for cold storage, logging facilities, and as a sawmill. By 1930, the mill operations were expanded. The mill site was removed to allow for lumber storage and automobile staging in the early 1960s. Additional automobile undercoating facilities were constructed in the 1970s. The current terminal area north of the T-25S Site was a turning basin until 1972, when it was filled in. During the 1980s, the T-25S Site was used for cold storage, seafood processing, and shipping operations. Most structures and buildings were demolished at the T-25S Site in the 1990s, with the cold storage building demolished in the early 2000s. Historical operations are depicted in Figure 2-3.

2.5.2 Current Site Use and Operations

The T-25S Site is paved or covered with compacted gravel. It is graded to drain stormwater to a collection system consisting of catch basins. Collected stormwater is discharged to the EW through outfall locations on the west end of the T-25S Site. The current stormwater drainage network for the T-25S Site is further detailed in Section 2.9.4.

The T-25S Site is bounded to the east by Northwest Seaport Alliance property adjacent to East Marginal Way, to the south by Spokane Street, to the west by the EW, and to the north by a currently vacant terminal facility (Figure 2-1). A piling field (former Pier 24) is present within the sediment area adjacent to most of the western and all of the north shoreline areas. The deck was removed from this structure in 2006 by the Port, and the area is currently not in use. No vessel moorage activities occur within the T-25S Site.

The Port currently leases the upland portions of the T-25S Site to various tenants who use the area for equipment and material laydown, light industrial activity, and truck parking. The southeastern portion of the T-25S Site includes the City's right of way and is paved with asphalt and used as an active construction laydown area and parking area for trucks. The western portion of the T-25S Site contains paved and unpaved portions and abuts the eastern shoreline of the EW. The southwestern portion of the T-25S Site is used as a log and woody debris storage area. The northern portions of the T-25S Site upland area are currently unused. Current T-25S Site use areas and features are depicted in Figure 2-1.

Fish are known to be present and support commercial, recreational, and tribal fisheries. The EW is within the usual and accustomed fishing area for the Yakama Nation, the Muckleshoot Indian Tribe, and the Suquamish Tribe (W.D. Wash., 1974; Muckleshoot Indian Tribe and Port of Seattle 2006).

Use and operations on adjacent properties outside of the T-25S Site boundary are summarized in Table 2-1 and depicted in Figure 2-4.

2.5.3 Future T-25S Site Use

The T-25S Site is intended to be the location of a habitat restoration project constructed by the Port, which will restore intertidal and shallow subtidal habitat by removing contaminated sediments from the EW OU and contaminated soil from the adjacent upland prior to creating off-channel emergent marsh and riparian habitat. The habitat restoration project includes excavation of more than 5 acres of upland area, dredging 5 acres of contaminated sediments, and removal of creosote piling along with restoration of marsh, intertidal, and subtidal habitat within and around the footprint of a former dock structure with creosote-piling, to create off-channel emergent mudflat, marsh, and riparian habitat. Armor rock will be placed below 0 feet MLLW down to the EW channel to provide geotechnically stable substrate at a 2H:1V slope that supports the habitat restoration area. The habitat restoration project also includes the addition of a high berm on the northern end of the marsh, a lower berm on the western end of the marsh, and a riparian buffer along the new southern and eastern shorelines. The Port is also planning for future green stormwater infrastructure to the east of the riparian buffer (Figure 1-3). Following construction of the removal action and habitat area, future use of the T-25S Site will include routine monitoring and maintenance of intertidal marsh and adjacent riparian areas. No public access will be provided to or within the future T-25S Site, and the upland area surrounding the future marsh and riparian buffer will be fenced to restrict access.

2.6 Terminal 25 Site Investigations, Previous Remedial Actions, and Investigations on Adjacent Properties

Environmental investigations of soil, sediment, groundwater and storm drain solids have been conducted at the T-25S Site for various purposes beginning in the late 1960s, as detailed in

Section 2.7 of the EE/CA Work Plan (Anchor QEA 2023a). These investigations are summarized in Table 2-2. Data from these investigations were used to inform the CSM and assessed for usability in this Draft Final EE/CA as referenced in Section 2.8.

In 1989, a remedial action was conducted at the T-25S Site. Sweet-Edwards/EMCON, Inc. removed a leaking underground storage tank (LUST) (Figure 2-3; Sweet-Edwards/EMCON, Inc. 1990). Post-excavation and tank removal soil and groundwater samples indicated no concentrations greater than the Model Toxics Control Act soil or groundwater cleanup levels. As discussed in Section 2.7 of the EE/CA Work Plan (Anchor QEA 2023a), Ecology issued a No Further Action following the LUST removal and confirmatory sampling (Ecology 2012).

A summary of previous remedial actions and investigations on adjacent properties is included in Table 2-3.

2.7 East Waterway Baseline Risk Assessments

As part of any EE/CA, a streamline risk evaluation is conducted to identify unacceptable risks that warrant taking a removal action under CERCLA. For the T-25S Site, the basis for the removal action is already established based on the EW HHRA and ERA. The objective of the removal action is to address unacceptable risks in EW sediments and upland soils that will become EW sediments within the T-25S Site, as established in the EW baseline risk assessments by removing, treating, and/or capping soil or sediment with concentrations greater than the EW RALs established in the EW IROD (EPA 2024). This section summarizes the exposure pathways and receptors identified in the EW baseline risk assessments and describes the COCs for which EW RALs were developed.

2.7.1 East Waterway Baseline Risk Assessment Exposure Pathways and Receptors

This section summarizes the receptors and complete exposure pathways evaluated in the EW human health (Windward 2012a) and ecological (Windward 2012b) baseline risk assessments. These receptors and exposure pathways are applicable for the T-25S Site.

Exposure pathways are the routes through which people or ecological organisms are exposed to contaminants in media (e.g., soils, sediments, and groundwater) at a site. Complete exposure pathways indicate that there is a contaminant source, a release and transport mechanism from a source, an exposure point where contact can occur, and an exposure route through which contact can occur to a receptor population. The exposure pathways and receptors are summarized from the EW HHRA (Windward 2012a) and ERA (Windward 2012b; Appendices B and A of the Supplemental Remedial Investigation (SRI), respectively; Windward and Anchor QEA 2014).

2.7.1.1 Aquatic Human Health

The EW HHRA identified five complete and significant exposure scenarios where humans may be exposed to contamination, either directly or indirectly via ingestion of seafood. The receptors and complete pathways evaluated quantitatively in the EW HHRA included the following:

- Water recreation (e.g., swimming) including child and adult dermal contact and incidental ingestion of surface water
- Occupational exposure (habitat restoration) adult dermal contact and incidental ingestion of sediment
- Fish and crab collection (netfishing) including adult dermal contact and incidental ingestion of sediment
- Shellfish collection in intertidal areas adult dermal contact and incidental ingestion of sediment
- Consumption of resident seafood including Tribal and Asian Pacific Islander child and adult seafood consumption

2.7.1.2 Aquatic Ecological

The EW ERA identified five types of ecological receptors of concern to represent receptors that may be exposed to contamination in the EW, either directly or indirectly via ingestion of prey. These receptors of concern and the complete and significant exposure pathways identified and evaluated quantitatively in the EW ERA include the following:

- Fish (juvenile Chinook salmon, English sole, Brown rockfish) exposure through direct water contact and benthic organism ingestion and Brown rockfish ingestion of fish
- Benthic community exposure through ingestion and direct contact with sediment; direct water contact, ingestion of benthos and other aquatic organisms (e.g., zooplankton, algae, terrestrial insects)
- Crab exposure through benthic organism ingestion; fish ingestion and direct water contact
- Piscivorous birds (osprey) and marine mammals (harbor seal) exposure through sediment ingestion, water ingestion, consumption of fish
- Piscivorous and benthivorous wildlife (river otter, pigeon guillemot) exposure through sediment ingestion, water ingestion, and consumption of fish, benthos and other aquatic organisms

Other complete exposure pathways of unknown significance and receptors considered less exposed due to foraging or diet were qualitatively discussed but were not further evaluated in the ERA (Windward 2012b).

2.7.2 East Waterway Baseline Risk Assessment COCs and COCs with RALs in the East Waterway Interim Record of Decision

The EW HHRA and ERA performed a risk-based screening to identify contaminants of potential concern, followed by risk characterization to identify COCs to support the EW FS (Anchor QEA and Windward 2019). The following COCs and associated pathways were identified in the EW HHRA and ERA following assessment of complete exposure pathways:

- Human health COCs: carcinogenic polycyclic aromatic hydrocarbons (cPAHs) (as benzo(a)pyrene equivalent concentration[6]; B(a)P-EQ), total polychlorinated biphenyls (PCBs) and dioxin/furan (D/F) toxic equivalency (TEQ) (seafood consumption) and B(a)P-EQ and arsenic (sediment direct contact).
- Ecological COCs: 28 COCs including metals, PAHs, phthalates, and other semivolatile organic compounds (SVOCs) (benthic macroinvertebrates); tributyltin (TBT) (benthic macroinvertebrates); and total PCBs (benthic invertebrates; English sole, Brown rockfish).

Of these COCs, EW RALs were developed for three of four human health COCs (total PCBs, arsenic, and D/Fs). As described in Section 3.3.4 of the EW FS (Anchor QEA and Windward 2019), B(a)P-EQ was excluded from RAL development because the risk is attributed to the consumption of clams, but the relationship between clam tissue and sediment concentrations is too uncertain to develop a risk-based sediment concentration. EW RALs were also developed for a subset of the ecological COCs including TBT and a set of indicator Washington State Sediment Management Standards (SMS) chemicals that represent the extent of concentrations greater than SMS in the EW (i.e., other contaminants with concentrations greater than the EW RAL are collocated with these indicator chemicals). EW RAL development is described in Section 6 of the EW FS (Anchor QEA and Windward 2019).

2.8 Database Development

A data quality assessment was performed as part of the EE/CA Work Plan (Anchor QEA 2023a) and data assigned a data quality (DQ) classification of DQ-1 were deemed acceptable for use in this Draft Final EE/CA report. Much of the data from historical investigations was classified as DQ-2 and was replaced by data collected as part of the EE/CA Work Plan. The DQ assessment is further detailed in Section 2.10.2 of the EE/CA Work Plan (Anchor QEA 2023a). Table 2-4 summarizes the DQ-1 data used in the EE/CA and sample locations are presented in Figure 2-5a and Figure 2-5b. The available data and data treatment for this Draft Final EE/CA is further described in the following subsections.

[6] The EW HHRA, EW SRI, and EW FS use the term carcinogenic polycyclic aromatic hydrocarbon toxic equivalents quotient (cPAH TEQ), however, B(a)P-EQ is the term used in this document to reflect that the calculation evaluates cancer potency, but does not address all potential toxic effects of cPAHs.

2.8.1 T-25S Site Data

This section provides an overview of the available T-25S Site soil and groundwater data.

2.8.1.1 Soil

Soil sample data from soil borings collected as part of the 2019 and 2020 T-25S Site investigation and the 2023 and 2024 T-25S EE/CA Data Gaps Investigation are included in this Draft Final EE/CA. In total, data from 60 soil borings were evaluated, including 18 soil borings from 2019 and 2020 investigations and 42 soil borings from 2023 and 2024 investigations (Table 2-4). Samples were collected from various depths to characterize the nature and extent of contamination and to characterize the planned subgrade following habitat restoration construction.

The T-25S EE/CA Data Gaps Investigation data is included in the validated EE/CA data package in Appendix A-3. This includes initial chemistry analyses for the 2023 and 2024 T-25S EE/CA Data Gaps investigation (EE/CA data) and additional analyses that were triggered at the laboratory based on the initial results to delineate concentrations greater than the EW RAL. DQ-1 soil data from the 2019 and 2020 investigations are provided in Appendix A-4. All validated soil data used in the EE/CA are provided in Appendix A-5.

2.8.1.2 Groundwater

Groundwater sample data includes samples collected during wet- and dry-weather events as part of the 2023 and 2024 T-25S EE/CA Data Gaps Investigation. During each event, six wells near the upland perimeter of the site were sampled to characterize the quality of groundwater discharging to the T-25S Site. In total, data from 14 samples (including a field duplicate for each event) were evaluated. All validated groundwater data collected during this EE/CA investigation are compiled and presented in the EE/CA data package in Appendix A-3 and Appendix A-7.

2.8.1.3 Sediment

Sediment sample data includes surface sediment grabs and sediment cores collected as part of the EW Supplemental Remedial Investigation and sediment cores collected as part of 2019-2021 T-25S Site investigations. In total, data from 34 subsurface sediment cores, 11 surface sediment grabs, and two surface sediment composites were evaluated (Table 2-4). Data for a 2011 surface sediment composite sample collected on the shoreline of the T-25S Site (Figure 2-5a) was included in the summary statistics presented in Section 2.9; however, this sample was not included for mapping purposes given the large area represented by the composite. The sediment data are compiled and presented in Appendix A-4 and Appendix A-6.

As discussed in Section 2.1, sediment remediation in the EW will be addressed under the EW IROD. For the purposes of this Draft Final EE/CA, sediment data from the EW OU within the T-25S Site are evaluated with recent sediment and soil data collected as part of T-25S Site investigations to inform the CSM and assess human health and ecological risks. Ultimately, the EW RALs that were developed in the Final EW FS (Anchor QEA and Windward 2019) and presented in the IROD (EPA 2024) form the basis for establishing sediment concentrations at the T-25S Site protective of human health and the environment.

2.9 Nature and Extent of Contamination

This section summarizes T-25S soil and sediment data, which were screened using the EW RALs from the IROD (EPA 2024). This section also summarizes groundwater data collected near the upland perimeter of the T-25S Site. Groundwater data for chemicals with EW RALs are compared to Ambient Water Quality Criteria (AWQC; EPA 2019, 2023b, 2023c) to characterize the quality of groundwater discharging to the T-25S Site. A qualitative discussion of available storm drain solids data is also provided.

Screening of soil and sediment to EW RALs is presented in Sections 2.9.1.1 and 2.9.2, respectively. The CSM is described in Section 2.10.

The EW RALs, presented in Table 2-5, are numerical concentrations in sediment that were developed to achieve the interim RAO described in the EW IROD for the EW OU (see Section 3.2). The 11 chemicals and chemical totals with EW RALs include total PCBs, total D/F TEQ (relative to 2,3,7,8-TCDD), arsenic, TBT, 1,4-dichlorobenzene, butylbenzyl phthalate, acenaphthene, fluoranthene, fluorene, mercury, and phenanthrene.

2.9.1 Soil

The available soil data for the upland portion of the T-25S Site are summarized in Table 2-4 and sample locations are shown in Figures 2-5a and 2-5b. T-25S soil investigations include data from 0 to 20 feet bgs. In addition to discussing the nature and extent of contamination encountered at any depth interval, contamination at or below the anticipated future habitat post-excavation surface depth (i.e., habitat subgrade) is also discussed. The habitat subgrade is defined as 2 feet below the planned final habitat restoration design surface, which allows for placement of a minimum of 2 feet of clean backfill for habitat substrate. Section 2.9.1.1 provides a summary of the soil data screened against the EW RALs at all depth intervals and for intervals at or below the habitat subgrade. The EW RALs are presented in Table 2-5 and are applicable to soil because of the planned future use of this area for marsh habitat (Figure 1-3). Section 2.9.1.2 discusses the Focused Investigation Area including soil with the highest PCB concentrations at the T-25S Site and the intermittent presence of non-aqueous phase liquid (NAPL) and volatile organic compounds (VOCs) identified during the EE/CA investigation. Finally, Section 2.9.1.3 summarizes the nature and extent of soil contamination identified across the T-25S Site.

2.9.1.1 EW RAL Screening

A summary of the soil data and comparison to EW RALs is provided in Table 2-6, and locations with concentrations greater than EW RAL(s) are shown in Figure 2-6a. A vertical profile of soil data at each location is provided in Tables 2-7a through 2-7g with indications of where concentrations greater than EW RAL(s) were identified. In total, 60 soil borings were evaluated, including data from 18 soil borings from previous investigations and 42 soil borings from the EE/CA investigation. Samples were collected from various depths to characterize the nature and extent of contamination and to characterize the planned habitat subgrade.

Sample concentrations were compared to the EW RALs to determine the number of samples that were greater than the EW RAL and, if a contaminant was greater than its respective EW RAL, the maximum exceedance factor was calculated (Table 2-6). For chemicals that were not detected, the reporting limit, or method detection limit for high resolution methods, was compared to the EW RALs. For samples with field duplicates, the maximum concentration between the normal and field duplicate sample was used for data screening. Contaminant concentrations that were greater than an EW RAL within the upland portion of the T-25S Site include the following (Table 2-6):

- Total PCBs
- Total D/F TEQ (relative to 2,3,7,8-TCDD)
- Acenaphthene
- Fluoranthene
- Fluorene
- Phenanthrene
- 1,4-dichlorobenzene

Locations with contaminant concentrations greater than the EW RAL are presented in Figure 2-6a, with the left panel identifying concentrations greater than the EW RAL at any depth and the right panel identifying concentrations greater than the EW RAL at or below the habitat subgrade. Though some locations reside just outside of the T-25S Site boundary, data for these locations (which were sampled as part of the EE/CA investigation) are used for interpolating the nature and extent of contamination at the T-25S Site and are discussed in this section. Contaminant concentrations greater than the EW RAL are generally limited to the southern portion of the T-25S Site and were identified between the surface and 17 feet bgs (Table 2-7a). In the northern portion of the T-25S Site, three locations (SB06, SB12, and SB20) have contaminant concentrations greater than the EW RAL, each of which are within the upper 2-foot removal prism required to excavate to the habitat subgrade (Table 2-7a). SB06 was collected as a soil boring but is located below MHHW, so data from this location are more relevant to the sediment evaluation. SB20 was collected landward of SB06, and sample intervals tested down to 16 feet bgs indicate the deepest concentration greater than the EW RAL is 4 feet bgs (Table 2-7a). SB19 was collocated with SB12, and no contaminant concentrations greater than the EW RAL were identified in any interval tested (2 to 6 feet bgs; Table 2-7a). Along the central portion of the west side of the T-25S Site, four locations (SB02, SB08, SB36, and SB37) have contaminant concentrations greater than the EW RAL. Contaminant concentrations greater than the EW RAL at these locations range from 3 feet to 14 feet bgs (Table 2-7a). Immediately adjacent to the southern T-25S Site boundary, three locations (SB11, GW-04, and GW-05) have contaminant concentrations greater than the EW RAL that range from 4 to 11 feet bgs (Table 2-7a). The central portion of the T-25S Site has a higher sample density and was part of a focused investigation specifically evaluating PCBs; however, various RAL chemicals were also analyzed. Contaminant concentrations greater than the EW RAL for each chemical group are further discussed in the following subsections.

2.9.1.1.1 PCBs

PCB Aroclors were analyzed in 181 samples from 56 locations across the T-25S Site (Table 2-6). In a localized area, also known as the Focused Investigation Area (Figure 2-5b), dense sampling was conducted to characterize the lateral and vertical extent of elevated PCB concentrations encountered at SB03 during the 2019 investigation (PCB concentrations up to 62,300 micrograms per kilogram [µg/kg]). Step-out sampling to further characterize the area was conducted in 2020, 2023, and 2024. PCB concentrations in the Focused Investigation Area are discussed in Section 2.9.1.2.

This section focuses on PCB concentrations greater than the EW RAL throughout the remainder of the T-25S upland area (i.e., outside of the Focused Investigation Area). Locations with concentrations greater than the EW RAL at any depth are presented in Figure 2-6b (left panel). PCB concentrations greater than the EW RAL are limited to the southern half of the T-25S Site. PCB concentrations in 10 samples were greater than the EW RAL (total of results screened on a dry-weight or organic carbon [OC]-normalized basis) with a maximum concentration of 110 times the EW RAL (Table 2-6). PCB concentrations greater than the EW RAL were identified at nine locations at depths between 3 to 14 feet bgs (Figure 2-6b and Table 2-7b). PCB concentrations greater than the EW RAL have been bounded vertically for all borings outside of the Focused Investigation Area, except SB08, SB11, SB51, and SB52. For SB08 and SB11, these locations were reoccupied in 2023 by locations SB36 and GW-05, respectively, to bound PCB concentrations greater than the EW RAL. For SB36, reoccupying SB08 (with a PCB concentration greater than the EW RAL at 12 to 14 feet), no PCB concentrations greater than the EW RAL were identified between 14 and 20 feet bgs. For GW-05, reoccupying SB11 (with a PCB concentration greater than the EW RAL at 9 to 11 feet), no PCB concentrations greater than the EW RAL were identified between 11 and 17 feet bgs. Therefore, collocated borings bounded PCB concentrations greater than the EW RAL at both SB08 and SB11. SB51 and SB52 are near the northern edge of the Focused Investigation Area. The unbounded depths of PCB contamination at SB51 and SB52 are 12 and 11 feet, respectively.

PCB concentrations greater than the EW RAL are present below the habitat subgrade at seven of the nine locations outside the Focused Investigation Area, where PCB concentrations greater than the EW RAL were identified (Figure 2-6b right panel). The maximum concentration present below the habitat subgrade is the same as the maximum concentration across all depths (110 times the EW RAL).

2.9.1.1.2 Dioxin/Furans

D/Fs were analyzed in 40 samples from 25 locations across the T-25S Site (Table 2-6; Figure 2-6c left panel). D/F TEQ concentrations in six samples were greater than the EW RAL with a maximum concentration of 40 times the EW RAL (Table 2-6). D/F concentrations greater than the EW RAL were identified at five locations at depths between 6 to 12 feet bgs and concentrations are bounded at all locations, except SB03, SB09, and SB11 (Table 2-7c). Location SB03 (with a D/F concentration greater than the EW RALat 7 to 10 feet) was reoccupied by boring SB42A and no D/F concentrations greater than the EW RAL were identified between 18 and 20 feet bgs. Contamination at SB09 is unbounded at 10 feet bgs. Location SB11 (with a D/F concentration greater than the EW RAL at 9 to 11 feet) was reoccupied by boring GW-05 and no D/F concentrations greater than the EW RAL were identified between 6 to 8 feet and 11 to 17 feet bgs. All locations with D/F concentrations greater than the EW RAL are located in the southern portion of the site (Figure 2-6c). D/F concentrations greater than the EW RAL were identified below the habitat subgrade at four of the five locations, with a maximum D/F concentration of 40 times the RAL (Figure 2-c right panel; Table 2-7c).

2.9.1.1.3 Metals

Metals were analyzed in 49 samples from 32 locations across the T-25S Site (Table 2-6; Figure 2-6d left panel). RALs have been established for arsenic and mercury. Arsenic concentrations were all less than the EW RAL (Table 2-6). The mercury concentration in one sample, GW-04, was greater than the EW RAL with a concentration of 6 times the RAL between 6 to 8 feet bgs (Figure 2-6d left panel; Table 2-6). This single mercury concentration greater than the EW RAL is present within the riparian buffer (it is a planned upland area following habitat restoration) and below the habitat subgrade outside the southern boundary of the site (Figure 2-6d right panel; Table 2-7d).

2.9.1.1.4 PAHs

Polycyclic aromatic hydrocarbons (PAHs) were analyzed in 80 samples from 40 locations across the T-25S Site (Table 2-6; Figure 2-6e left panel). PAH concentrations greater than the EW RAL were identified for each of the four PAHs with EW RAL criteria at locations spread across the T-25S Site and are bounded at all locations (Figure 2-6e, Table 2-7e). The acenaphthene concentration in one sample was greater than the EW RAL with a concentration of 2 times the EW RAL (Table 2-6). Fluoranthene concentrations in four samples were greater than the EW RAL with a maximum concentration of 2 times the EW RAL (Table 2-6). The fluorene concentration in one sample was greater than the EW RAL with a concentration of 1 times the EW RAL (Table 2-6). Phenanthrene concentrations in eight samples were greater than the EW RAL with a maximum concentration of 3 times the RAL (Table 2-6). PAH concentrations greater than the EW RAL are primarily located in the western portion of the T-25S Site, with four of the nine locations with PAH concentrations greater than the EW RAL located in this area (Figure 2-6e left panel). Three PAH concentrations greater than the EW RAL are located along the southern boundary of the T-25S Site, with two of these locations being collocated (SB11 and GW-05). One location in the northeast portion of the T-25S Site, SB12, has a shallow PAH concentration greater than the EW RAL at 0 to 2 feet bgs. The remaining PAH concentration greater than the EW RAL is at SB03 in the central portion of the T-25S Site (Figure 2-6e). PAH concentrations greater than the EW RAL range from the ground surface to 10 feet bgs and were identified below the habitat subgrade at four locations: GW-04, GW-05, SB03, and SB49 (Table 2-7e, Figure 2-6e right panel). The maximum PAH concentration present below the habitat subgrade is 2 times the EW RAL.

2.9.1.1.5 Semivolatile Organic Compounds

SVOCs[7] were analyzed in 75 samples from 40 locations across the T-25S Site (Table 2-6; Figure 2-6f). SVOCs with EW RALs include 1,4-dichlorobenzene and butylbenzyl phthalate. Butylbenzyl phthalate concentrations were all less than the EW RAL, except for one non-detect concentration further described below (Table 2-6). A detected 1,4-dichlorobenzene concentration in one sample, SB38, was greater than the EW RAL with a concentration of 2 times the EW RAL (Table 2-6) between 5 to 6 feet bgs (Figure 2-6f left panel; Table 2-7f). 1,4-dichlorobenzene was not detected at 13 to 14 feet bgs at this location. Reporting limits for 1,4-dichlorobenzene for two non-detect samples were greater than the EW RAL as described below. No detected concentrations are greater than the EW RAL below the habitat subgrade for SVOCs.

Three locations had non-detect concentrations for SVOCs based on reporting limits greater than the EW RALs:

- SB29 had a non-detect concentration greater than the EW RAL for 1,4-dichlorobenzene for a sample aliquot that was collected at 6.5 feet bgs. The reporting limit was 5 times the EW RAL. The reporting limit is elevated for this sample due to sample dilution. SB29 was reoccupied by SB29C and there were no detections of 1,4-dichlorobenzene in the tested intervals, which include shallow intervals and an interval at 8 to 9 feet bgs. Reporting limits for the SB29C results were less than the EW RAL.
- SB39 had a non-detect concentration greater than the RAL for 1,4-dichlorobenzene at 13 to 14 feet bgs with a concentration of 2 times the RAL. 1,4-dichlorobenzene was not detected in

[7] 1,4-dichlorobenzene was also analyzed via the VOC method for 27 samples and those additional results are included in the screening for a total of 101 samples.

deeper intervals at SB39 between 15 to 17 feet bgs and the reporting limits for these results are less than the EW RAL.

- SB50 had a non-detect concentration greater than the EW RAL for butylbenzyl phthalate at 7 to 8 feet bgs. The reporting limit was 2 times the EW RAL. The reporting limit is elevated due to sample dilution, so it is undetermined if butylbenzyl phthalate is present at a concentration greater than the EW RAL in this sample. No other soil samples had butylbenzyl phthalate concentrations greater than the EW RAL.

2.9.1.1.6 Tributyltin

TBT was analyzed in 10 samples from eight locations across the T-25S Site (Table 2-6; Figure 2-6g). TBT was analyzed between 2 to 12 feet bgs (Table 2-7g). TBT was not detected in any sample, and reporting limits for non-detect samples were less than the EW RAL with the exception of one location, GW-05 at 6 to 8 feet bgs, where a non-detect concentration greater than the EW RAL was identified at 2 times the RAL. The TBT EW RAL is based on an OC-normalized concentration and there is no dry-weight RAL available. The TOC concentration for T25-GW05-SB-6-8 is very low (0.03%), resulting in a higher OC-normalized concentration for the non-detect result. On a dry-weight basis, the non-detect result is 3.86 µg/kg. Using the average TOC concentration in EW sediments, 1.6% (Windward and Anchor QEA 2014), a dry-weight equivalent to the EW RAL was calculated as 120 µg/kg. On a dry-weight basis, this non-detect result is well below the calculated EW RAL equivalent. Additionally, based on the lack of TBT detections in soil at the T-25S Site, it is unlikely that TBT is present in this sample.

2.9.1.2 Focused Investigation Area

The Focused Investigation Area was initially identified after PCB concentrations up to 62,300 µg/kg were detected at boring SB03 in 2019, and step-out borings sampled in 2020 confirmed the presence of elevated PCB concentrations within a localized area of the T-25S Site. Soil boring locations were proposed within the Focused Investigation Area to further delineate the extent of elevated PCB concentrations as part of the 2023 Sampling and Quality Assurance Project Plan (SQAPP; Anchor QEA 2023b). During implementation of the EE/CA Work Plan in October 2023, high photoionization detector (PID) readings and observations of strong odor were encountered in three soil borings within the Focused Investigation Area. NAPL was additionally encountered within one of the three borings. Additional sampling locations were proposed as part of a SQAPP Addendum to delineate the extent of VOCs and suspected total petroleum hydrocarbons (TPH) based on field observations (Anchor QEA 2024a). The spatial extent of the Focused Investigation Area was expanded following the collection of these additional samples that identified high PCB concentrations east of the previously estimated extent. The Focused Investigation Area presented on figures in this Draft Final EE/CA is representative of the expanded Focused Investigation Area. Results of the focused PCB, NAPL, and VOC sampling are discussed in Sections 2.9.1.2.1 through 2.9.1.2.3.

2.9.1.2.1 PCBs

Based on PCB concentrations encountered at SB03 during 2019 sampling and 2020 step-out sampling, additional sampling was conducted in 2023 and 2024 within the Focused Investigation Area (Figure 2-6h) to delineate the nature and extent of elevated PCB concentrations. Within the Focused Investigation Area, sample locations were analyzed for PCBs between 4 and 18 feet bgs, and a high frequency of RAL exceedances were encountered between 6 and 11 feet bgs (Table 2-7b). PCB concentrations within the Focused Investigation Area between 6 and 11 feet bgs range from 3.5 to 2,500,000 µg/kg, with an average of 140,000 µg/kg. The maximum PCB concentration identified was at SB31, between 9 and 10 feet bgs. PCB concentrations decrease significantly at 11 feet bgs. Among borings within the Focused Investigation Area, PCB concentrations below 11 feet range from 4 to 179,000 µg/kg, with an average of 11,800 µg/kg. The maximum PCB concentration below 11 feet was at 12 feet bgs at SB30.

Within the Focused Investigation Area, the vertical extent of EW RAL exceedances has been vertically delineated at 8 locations (i.e., SB22B, SB30, SB31, SB32, SB34, SB38, SB42A, and SB44; Table 2-7b and Figure 2-6h). All PCB concentrations greater than the EW RAL were identified within fill material. No PCB concentrations greater than the EW RAL have been identified within native sample intervals. The average depth to native in this area is approximately 16 feet. The deepest PCB concentration greater than the EW RAL (3 times the EW RAL) is at 17 feet bgs in SB03, located above the native contact. SB03 was reoccupied in 2023 with boring SB42A. No PCB concentrations greater than the EW RAL were identified in SB42A samples between 16 to 18 feet bgs and the lithology indicates the samples were collected in the native unit (i.e., poorly graded grey sand). Additional native material in the Focused Investigation Area was analyzed for PCBs at T25-SB31 (18 to 19 feet bgs), and T25-SB34 (15 to 16 feet bgs) and PCB concentrations in these intervals were less than the EW RAL.

2.9.1.2.2 NAPL

NAPL, sheen, or evidence of NAPL was observed at 10 boring locations within the Focused Investigation Area during the EE/CA investigation (Figure 2-7). NAPL and sheen observations were constrained to a relatively limited area of the Site, approximately 180 feet (east-west) by 100 feet (north-south), within the Focused Investigation Area. NAPL and sheen observations overlap with borings with PCB concentrations greater than the EW RAL and are delineated laterally by adjacent soil borings with no observations of NAPL or sheen during sampling.

Visual observations of NAPL in soil borings ranged from sheen to NAPL blebs in soil samples and notes from each location with NAPL observations are summarized in Table 2-8. Soil-water shake tests were used to confirm the presence of NAPL when visual observations were uncertain or when NAPL was not visible, but PID readings for borings were greater than 50 parts per million (ppm). At several locations, NAPL was not observed in the soil samples but sheen and/or NAPL blebs were observed in the drill cuttings. NAPL-coated or saturated conditions were not observed, though NAPL coating was visible within the SB22 sample liners from approximately 14 to 16 feet bgs (Table 2-9). These SB22 sample intervals were not processed due to the lack of appropriate personal protective equipment and safety precautions (NAPL was not identified as a potential Site COC at the time that SB22 was collected). The SB22 location was reoccupied during a subsequent remobilization and collocated boring SB22B was collected. At SB22B, sheen and NAPL were not visually observed in the soil samples, but sheen and NAPL blebs were observed in the rinse water during decontamination of sampling tools from the approximately 14 to 16-foot interval; the same depth interval where NAPL-coated sample liners were observed at SB22. The variation in NAPL observations at SB22 and SB22B suggest that it is possible that NAPL-coated or saturated conditions may exist in the subsurface at SB22, but given the absence of similar conditions in the collocated core, NAPL-coated or saturated conditions, if present, are localized and discrete.

NAPL and sheen, where observed, are generally limited to the fill unit, though depths vary considerably within the fill unit (Table 2-9). NAPL was observed as shallow as 2 to 5 feet bgs at one location (SB49). At most locations where sheen and NAPL were observed, it was present at varying depths between approximately 6 feet bgs and the bottom of the fill unit. NAPL was observed in the native unit at one location, SB47 and was vertically delineated within this boring (Table 2-9). NAPL was not observed in the native unit at any other soil boring locations.

Laboratory test results suggest that the analyte(s) most relevant to sheen and NAPL observations is TPH (gasoline- [GRO], diesel- [DRO] and oil-range [ORO] organics). TPH is consistently detected in elevated concentrations where sheen and NAPL are observed. TPH concentrations are consistent with field descriptions of NAPL as an amber liquid that produces rainbow sheen with creosote and hydrocarbon odors. The dominant TPH fraction varies considerably between sampling locations, with NAPL at some locations being dominated by the lighter TPH fraction (GRO), and other locations dominated by the heavier TPH fractions (DRO, ORO, or a combination of DRO/ORO).

Of the 10 boring locations where NAPL or sheen was observed, there were only three borings where observations co-occurred with a concentration greater than an EW RAL in the same interval:

- At SB51, black staining was observed from 7.4 to 10 feet bgs and silvery sheen was observed from 10 to 14 feet bgs (positive shake test at 10 to 11 feet bgs). Samples collected from these intervals had PCB concentrations greater than the EW RAL (up to 22 times the RAL at 8 to 9 feet bgs).
- At SB52, silvery sheen was observed from 6 to 7 feet bgs and 10 to 12 feet bgs. One sample collected from the 10 to 11 feet bgs interval had a PCB concentration greater than the EW RAL (9 times the EW RAL). Samples from 7 to 10 feet bgs intervals also had PCB concentrations greater than the EW RAL, but sheen was not observed at these intervals.
- At SB38, silvery sheen was observed at 5 to 6.6 feet bgs (positive shake test at 5 to 6 feet bgs) and 13 to 15 feet bgs (positive shake test at 13 to 14 feet bgs). The sample from 5 to

6 feet bgs had a 1,4-dichlorobenzene concentration greater than the EW RAL (2 times the RAL). Samples were not tested for PCBs in the intervals where sheen was observed. However, samples from 8 to 11 feet bgs intervals had PCB concentrations greater than the EW RAL.

2.9.1.2.3 VOC Characterization

VOCs, though not RAL chemicals, were collected as part of 2024 EE/CA sampling to serve two purposes:

1. VOCs (specifically 4-isopropyltoluene) were analyzed to delineate elevated 4-isopropyltoluene concentrations identified in previous (i.e., 2019) borings.
2. VOCs (full suite) were analyzed during 2024 EE/CA sampling in response to elevated PID readings during the 2023 EE/CA sampling event. In accordance with the SQAPP Addendum (Anchor QEA 2024a), borings with a PID reading greater than 50 ppm, the sample interval with the highest PID reading, were analyzed for VOCs. Additionally, the deepest sample with visible NAPL or a positive NAPL shake test was analyzed for VOCs.

VOC results of interest are summarized in Tables 2-10 and 2-11 and are described below. Full VOC results are included in Appendices A-3, A-4, and A-5.

- **4-Isopropyltoluene:** 4-isopropyltoluene was detected in samples from nine soil boring locations (SB23, SB37, SB22, SB22B, SB29, SB35, SB49, SB50, and SB51) during the EE/CA investigation. The maximum detected concentration is 110,000 µg/kg (SB51, 10-11 feet bgs).
  - SB23 was collocated with 2019 boring location SB07 to further investigate 4-isopropyltoluene above and below 13.4 feet bgs where elevated concentrations were previously identified (15,700 µg/kg). At SB23, samples from 10 to 16 feet bgs were analyzed for 4-isopropyltoluene. This VOC was only detected in the field duplicate for the interval at 14 to 16 feet bgs (120 µg/kg). Therefore, the elevated 4-isopropyltoluene concentrations appear to be localized near SB07 and limited to depths around 13.5 feet bgs. A deeper sample at SB07 (16 to 16.1 feet bgs) confirms the concentrations decrease significantly with depth (2.78 µg/kg).
  - SB37 was collocated with 2019 boring location SB09 to analyze concentrations of 4-isopropyltoluene above and below 10 feet bgs where elevated concentrations were previously identified (72,900 µg/kg). At SB37, samples from 6 to 12 feet bgs were analyzed for 4-isopropyltoluene. This VOC was only detected in the sample for the interval 10 to 12 feet bgs (140 µg/kg). Similar to SB07, the elevated 4-isopropyltoluene concentrations at SB09 appear to be localized and limited to depths around 10 feet bgs. A deeper sample at SB09 (15.5 to 15.6 feet bgs) confirms the concentrations decrease significantly with depth (1.22 µg/kg).
  - SB51 was collected as an additional boring for PCB delineation in the field and triggered for VOC analysis in response to elevated PID readings observed during sample

processing. Samples from 10 to 13 feet bgs were analyzed, and the 4-isopropyltoluene concentrations at 10 to 11 feet bgs were 110,000 µg/kg. 4-isopropyltoluene concentrations decreased with depth to 1,500 µg/kg at 12 to 13 feet bgs.

- **BTEX:** Benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds were also evaluated for samples analyzed for VOCs. The maximum total BTEX concentration was identified at SB29 at a depth of 6.5 feet bgs (15,400 µg/kg). The highest PID reading (>15,000 ppm) was also observed at this sample location and depth (Table 2-10). However, when this station was reoccupied during the January 2024 event, the PID readings in the collocated boring, SB29, were significantly lower.
- **Naphthalene:** Naphthalene concentrations were elevated in a single sample, SB29 at 6.5 feet bgs (43,000 µg/kg). As discussed above, this sample had the highest PID reading and the highest BTEX concentrations.

Field PID measurements indicate elevated VOC concentrations are limited to the portion of the T-25S Site with elevated PCBs. Table 2-11 provides a summary of total VOC concentrations for samples that were triggered based on field observations. Most samples had low-level VOC detections. Samples with the highest VOC concentrations were collected from borings with PCB concentrations greater than the EW RAL. 4-isopropyltoluene is the most common VOC detected. Of the 11 locations where 4-isopropyltoluene was detected, seven had PCB concentrations greater than the EW RAL (Table 2-11). BTEX and naphthalene concentrations were generally low, and the only elevated concentrations occurred at SB29 and SB29c, which are centrally located within the area of borings that have the highest PCB concentrations.

2.9.1.3 Summary of Nature and Extent of Soil Contamination

At least one sample collected from 41 of the 60 soil borings had concentrations greater than the EW RAL for PAHs, PCB Aroclors, SVOCs, or D/F (Figure 2-6a, left panel). Figure 2-6a (right panel) depicts locations where soil concentrations were greater than an EW RAL for any analyte in the habitat subgrade; at least one sample collected from 34 of the 60 soil borings had concentrations greater than an EW RAL below the habitat subgrade. A summary of the contaminant concentrations that were greater than their respective EW RALs is provided in Table 2-12. All locations within the northern portion of the T-25S Site and most locations in the southern portion of the site outside of the Focused Investigation Area do not contain concentrations greater than the EW RAL below the habitat subgrade. The Focused Investigation Area encompasses the majority of the locations that have contaminant concentrations greater than the EW RAL below the habitat subgrade, mainly due to PCBs. Some locations within this area have visual observations of NAPL. As such, the EW RAL exceedances and NAPL within Focused Investigation Area will be addressed as part of any alternative.

2.9.2 Sediment

The EW sediment data collected within and near the T-25S Site boundary are summarized in Table 2-4 and sample locations are shown in Figure 2-5a. This section provides a summary of the sediment data screened against EW RALs. The EW RALs are presented in Table 2-5.

A summary of the sediment data and comparison to EW RALs is provided in Table 2-13 and locations with concentrations greater than the EW RALs are shown in Figure 2-8a. Contaminant concentrations in all samples were compared to the EW RALs to determine the number of samples with concentrations greater than the EW RALs. For contaminants that were not detected, the reporting limit, or detection limit for high resolution methods, was compared to the EW RALs. For samples with field duplicates, the maximum concentration between the normal and field duplicate sample was used for data screening.

Contaminants that had concentrations greater than an EW RAL in EW sediments include the following (Tables 2-12 and 2-13):

- Mercury
- TBT
- 1,4-Dichlorobenzene
- Butylbenzyl phthalate
- Acenaphthene
- Fluoranthene
- Fluorene
- Phenanthrene
- Total D/F TEQ (relative to 2,3,7,8-TCDD)
- Total PCBs

Figure 2-8b depicts all locations and core depth intervals where detected sediment concentrations were greater than an EW RAL. Six of the 11 surface grab locations that were tested for RAL chemicals had concentrations greater than the EW RAL. For sediment cores, including SB05 and SB06 (which were collected as upland borings below MHHW), 32 of the 36 locations had concentrations greater than an EW RAL in at least one sample interval. In most cores, contaminant concentrations in sediment decrease in deeper intervals, with the maximum depth of contamination ranging from approximately 5 to 11.3 feet below mudline.

In the EW sediments and along the north and west T-25S Site boundaries, the vertical extent of contamination was fully delineated at 22 out of 25 sediment core locations outside of the piling field (Figure 2-8b). At each of these locations, the deepest available sediment core interval did not have concentrations greater than an EW RAL. In total, the vertical extent of contamination was fully delineated in 24 of the 36 sediment cores shown in Figure 2-8b. Most of the locations where the vertical extent of contamination is bounded by clean sediment were collected in 2021 (under EPA oversight) to support habitat restoration design.

Several cores encountered refusal along the piling field area, including T25-SC02, T25-SC03, T25-SC04, T25-SC05, T25-SC06, T25-SC07, T25-SC08, T25-SC09B, T25-SC20, and T25-SC22. At each of these locations, the deepest available sediment core interval had concentrations greater than an EW RAL for at least one contaminant, with the exception of T25-SC03. The contaminant concentrations in the deepest interval at T25-SC03 (5.7 to 6.2 feet) were less than all EW RALs. Although obstructions limited core depth in the piling field, adjacent cores in the in-water area (EW10-SC08, T25-SC14, T25-SC17, and T25-SC24) and in the upland area (SB02 and SB05) fully delineated the vertical extent of contamination (Section 2.9.1.1). Although the vertical extent of sediment contamination in some areas of the T-25S Site piling field has not been determined, additional sediment sampling is not planned due to previous refusal and access limitations associated with the piling field in this area. Pilings will be removed to the maximum extent practicable, as part of the removal action. For this Draft Final EE/CA, existing data from surrounding sediment cores and shoreline borings are used to extrapolate the depth of contamination in this area. Post-dredge confirmatory sampling will be performed in the piling field area during construction to assess the post-dredge surface prior to any clean material placement and to assess whether additional contingency re-dredging will be required in these areas. This post-dredge confirmatory sampling will occur during the removal action and ensure this area will not present unacceptable risk to ecological receptors.

2.9.3 Groundwater

To assess the quality of groundwater discharging to the T-25S and support recontamination evaluations, six shallow groundwater monitoring wells were installed along the upland boundaries of the T-25S Site in September 2023.

Groundwater sample locations are shown in Figure 2-9. Groundwater samples were collected from each well during two monitoring events in September 2023 (dry-weather event) and January 2024 (wet-weather event) in accordance with the SQAPP. Final well screen depths are provided in Table A-2. In total, data from 12 samples, and two field duplicates, were evaluated. Samples were analyzed for total and dissolved metals, SVOCs, PAHs, PCB Aroclors, and D/F to support the recontamination evaluation in accordance with the SQAPP. In addition, due to elevated PID readings observed in some soil borings in the focused investigation area during the September 2023 investigation, groundwater samples during the January 2024 event were also analyzed for VOCs in accordance with the SQAPP Addendum (Anchor QEA 2024a).

In accordance with the SQAPP, chemicals with EW RALs (i.e., arsenic, mercury, 1,4-dichlorobenzene, butylbenzyl phthalate, acenaphthene, fluorene, fluoranthene, phenanthrene, total D/F, and total

PCBs) were screened to AWQC, which included the National Aquatic Life AWQC (aquatic life AWQC [for chronic and acute exposures]; EPA 2023b), the National Human Health AWQC for the consumption of marine organisms (CWA AWQC; EPA 2019), as well as the EPA Human Health AWQC for the consumption of marine organisms (EPA 2023c). Screened groundwater data are presented in Table 2-14. All other groundwater data collected during the EE/CA investigation are provided in Appendix A-7.

Mercury was not detected at any well during either sampling event. SVOCs 1,4-dichlorobenzene and butylbenzyl phthalate were not detected at any well during either sampling event. PAHs were either not detected or detected at low concentrations in all monitoring wells during both sampling events. All detected PAH concentrations were less than all applicable AWQC. VOCs were either non-detect or detected at low concentrations during both sampling events.

EW RAL chemical concentrations that were greater than at least one screening criteria include the following:

- Arsenic (total and dissolved)
- Total D/F TEQ 2005 (mammal) (U = 1/2)
- Total PCB Aroclors (U = 0)

Arsenic was detected at all locations for each sampling event, with the exception of GW-03 (no detections for either event) and GW-05 for the September 2023 event. The maximum arsenic concentration was measured at GW-01 during the September sampling event (52.4 micrograms per liter (µg/L) on a dissolved basis); both the normal and field duplicate sample concentrations were greater than the chronic aquatic life AWQC by up to 1.5 times. Arsenic concentrations were not greater than the chronic aquatic life AWQC during the January 2024 event at GW-01, but were greater than both AWQC for human health. Arsenic concentrations in the remaining wells were lower than at GW-01, but concentrations were greater than the human health AWQC during both events at each of the remaining wells (except for GW-03 and the September 2023 result for GW-05). In some instances, the dissolved arsenic concentration was greater than the total arsenic concentration, indicating that arsenic is predominantly in the dissolved state. Although arsenic concentrations in groundwater are greater than the AWQC, arsenic concentrations in soil were less than the EW RAL, as discussed in Section 2.9.1.1.3. D/Fs were detected at wells GW-04 during the September 2023 sampling event and at GW-01 and GW-05 during the January 2024 sampling event. The maximum detected D/F concentration was measured at GW-05 during the January 2024 sampling event (0.00344 µg/L). D/F concentrations were greater than the CWA AWQC (human health for the consumption of organisms). No aquatic life AWQC are available for D/F.

PCB Aroclors were detected at GW-05 during the September 2023 sampling event. The PCB concentration (0.096 μg/L) was greater than both the aquatic life and human health AWQC. PCB Aroclors were not detected at any other well.

The arsenic, PCBs, and D/F concentrations in groundwater are further evaluated as part of the recontamination evaluation in Appendix B and summarized in Section 2.11.

2.9.4 Storm Drain Solids

One near-end-of-pipe storm drain solids sample was collected from the T-25S Site in 2020 to assess the current quality of accumulated in-line storm drain solids. The storm drain solid sample location as well as current utilities and stormwater infrastructure are depicted in Figure 2-10. The sample was collected from drainage basin T25-7 at catch basin 10067, which is located near the shoreline in the southwestern portion of the T-25S Site. The sample was analyzed for PCB Aroclors, D/F, mercury, TOC, total solids, and grain size. PCB Aroclors, D/F, and mercury were detected in the sample. All stormwater lines and infrastructure will be removed from the T-25S Site during habitat restoration construction. The catch basin sample is not considered representative of conditions following habitat restoration construction, as this stormwater infrastructure will be removed during construction, with stormwater from off-site areas managed in a new stormwater feature.

2.10 Conceptual Site Model

This section presents the CSM, which was developed in the EE/CA Work Plan based on available historical information, the environmental setting, and the findings of previous investigations, and has been updated in this Draft Final EE/CA based on the results of the EE/CA investigation. The CSM is a description of environmental conditions that includes sources of contamination, contaminant fate and transport in T-25S Site media, and potential routes of contaminant exposure for human and ecological receptors. A three-dimensional graphical CSM illustrating representative potential sources and migration of contaminants at the T-25S Site following the planned removal action and habitat restoration is provided in Figure 2-11.

2.10.1 On-Property Contaminant Sources

This section presents a summary of the on-property source areas and materials based on T-25S Site operational history presented in Section 2.5 and the results of the EE/CA investigation. Over time, the T-25S Site has been used for primarily cold storage and freezing for fruit and fish, fish processing, sawmill operations, and as an automobile preparation facility.

As part of the original development of the upland site in the early 1900s, fill material was placed from unknown sources over the historical nearshore land and tidelands next to the existing Spokane Street trestle. During this time, extensive dredging and filling activity occurred, which reshaped the entire area. In addition to sediment fill placement at the T-25S Site, other upland fill materials (associated with the regrading of Beacon Hill and Denny Hill) were placed.

The southern portion of the T-25S Site was first developed as a sawmill in 1915 and had evolved into a plywood and veneer plant by the time of its closing in the 1960s (Figure 2-3). The northern portion of the T-25S Site included cold storage and food processing warehouses.

Between 1916 and 1965, contamination may have resulted from petroleum hydrocarbons related to machinery and vehicles, PCBs related to transformers, capacitors, or other equipment, and/or paint solvents, as well as practices in the compressor building and surrounding areas, such as maintenance activities related to the compressor facility and forklift facility, and possible agricultural fumigation (Figure 2-3). Additional features of the warehouse building and surrounding area included a boiler, used oil storage, and substation. Possible contaminants included petroleum hydrocarbons associated with the boiler room and any tank that fueled it, petroleum hydrocarbons associated with compressor equipment and forklift maintenance activities, solvents (petroleum-based or chlorinated) associated with compressor and forklift maintenance activities, PCBs associated with electrical equipment, residual fumigants associated with the possible fumigation facility, and metals (lead and cadmium) associated with the maintenance of forklift batteries.

During the mid-1960s to early 1970s, and after the sawmill operations were removed from the T-25S Site, an automobile preparation facility was developed to replace the sawmill operations (Figure 2-3). Possible contaminants associated with the automobile preparation facility included petroleum hydrocarbons (predominantly kerosene), solvents (petroleum-based or chlorinated), and paints and paint thinners (Pinnacle Geosciences 2003).

Based on the findings of the Phase I ESA Report (Pinnacle Geosciences 2003), floor drains in the former compressor building and maintenance shop area may have drained spills (e.g., of hydraulic oil or transformer oil) directly into a void space beneath the building floors, which were pile-supported. It is unknown whether the former void space communicated directly with the river; however, the buildings would flood during high tide. This historical T-25S Site condition may explain the source of PCBs and NAPL identified in subsurface soils within the Focused Investigation Area, which is located within the footprint of the former compressor building and maintenance shop.

In the 1960s, the transformer pad located on the east side of the former compressor building was remodeled, and three 5,400-pound transformers were added to this area (Pinnacle Geosciences 2003). Transformer spills in this area (which are located within the Focused Investigation Area) may have been a historical source of PCB contamination.

The alignment of historical site operations with NAPL observations and varying TPH (GRO/DRO/ORO) soil concentrations suggests that NAPL impacts observed in the Focused

Investigation Area may have been related to multiple historical site operations, as opposed to a single source. The TPH fraction that dominates in soil varies significantly from GRO to ORO depending on the location (see Section 2.9.1.2.2). In some cases, elevated GRO was detected, while DRO and ORO were non-detect, and vice versa. This suggests different types of NAPLs may have been historically released to the subsurface or placed as contaminated backfill, and further indicates that these NAPL impacts are discrete and not related to a larger/more significant area of NAPL impacts. NAPL was not observed in any T-25S Site groundwater wells.

Based on the EE/CA sampling results and observations, vehicle operations at the T-25S Site may have resulted in localized TPH spills to shallow subsurface soil.

2.10.2 Off-Property Contaminant Sources

This section presents a summary of the potential off-property sources based on the adjacent property operational history presented Table 2-1 and shown on Figure 2-4. As discussed in Section 2.1, the EW sediments portion of the T-25S Site is located within the larger EW OU of the Harbor Island Superfund Site. Off-property sources of contamination to sediment include sources within the EW that could potentially migrate to existing and new sediment areas within the T-25S Site from river and tidal currents and from vessel propwash that could resuspend and spread sediment from off-site areas (Figure 2-11).

Off-property discharges from outfalls and combined sewer overflows (CSOs) within the EW and LDW, such as the City of Seattle Hinds Outfall (Figure 2-10), are potential off-property contaminant sources.

As presented in Table 2-3, investigations of properties in the vicinity to the T-25S Site have identified soil contamination. Contaminated soils could be a potential source through leaching to groundwater, which could discharge into the planned habitat restoration area. Potential for recontamination of the T-25S Site is further discussed in Section 2.11.

2.11 Recontamination Evaluation

This section evaluates the potential recontamination of future marsh sediment. Potential sources of contamination include groundwater, sediment transport, outfalls/CSOs, and atmospheric deposition, and spills. Each of these potential sources are further discussed below.

2.11.1 Groundwater

The potential for groundwater to re-contaminate future marsh sediments at the T-25S Site was evaluated using the one-dimensional fate and transport model, CapSim. The evaluation used detected COC concentrations from groundwater samples collected along the south and east perimeter of the T-25S Site upgradient of the direction of groundwater flow. The evaluation conservatively assumed that detected groundwater concentrations were present as an infinite source immediately below the future marsh sediment surface (i.e., imported backfill) for the duration of the model simulation of 100 years. The maximum detected concentration was used to model all RAL chemicals. This analysis is conservative because the model uses the maximum detected concentration rather than an average detected concentration. Other conservative assumptions include the lack of attenuation in the lateral or vertical direction from the groundwater sampling locations along the perimeter of the T-25S Site (i.e., as stated above, the concentration is assumed to be present immediately beneath the future marsh sediment as an infinite source). In addition, the groundwater sample used for modeling was turbid, indicating it was influenced by solids, which overpredicts the dissolved-phase concentration. The recontamination evaluation is detailed in Appendix B to this Draft Final EE/CA and the results of the evaluation suggest that recontamination from groundwater is not of concern due to modeled concentrations predicted to be less than the EW RALs. Within T-25S Site areas that require capping (see Sections 5.2 and 5.3), the chemical isolation layer designed to address concentrations greater than the EW RAL in soils was sufficient to also prevent recontamination of the future marsh sediments at concentrations greater than the EW RALs. Within the remaining uncapped areas, recontamination from groundwater is not of concern due to modeled concentrations predicted to be less than the EW RALs.

2.11.2 Sediment Transport

Another potential source of recontamination includes sediments transported into the T-25S Site from sources within the EW. These sediments could migrate to existing and new sediment areas within the T-25S Site from river and tidal currents and from vessel propwash that could resuspend and spread sediment from off-site areas. The conceptual habitat restoration design has incorporated berms to the north and west as a measure to reduce the potential for recontamination from sediment transport.

2.11.3 Outfalls and Combined Sewer Overflows

Additional potential sources of recontamination include off-property sources that discharge through outfalls and CSOs within the EW and LDW. An updated recontamination evaluation is currently being conducted for the entire EW for these outfalls and CSOs under oversight by EPA, which will be considered as part of future removal action and habitat restoration design development. The conceptual habitat restoration design has incorporated berms to the north and west as a measure to reduce the potential for recontamination from outfalls and CSOs. Potential recontamination from stormwater runoff (i.e., from adjacent upland areas) will be addressed by the green stormwater infrastructure that will be constructed adjacent to the riparian area along the eastern T-25S Site boundary.

2.11.4 Atmospheric Deposition

Direct atmospheric deposition is a pathway for chemicals to deposit directly on the water surface of the EW. The T-25S Site is near several major roadways (e.g., the West Seattle Bridge, Spokane Street Corridor, and State Route 99) that are potential sources of direct atmospheric deposition. The EW FS (Anchor QEA and Windward 2019) concluded that direct atmospheric deposition to the EW surface does not appear to be a significant pathway for most contaminants to the EW. If recontamination of future marsh sediment occurs, this pathway could be further evaluated.

2.11.5 Spills

Spills can occur accidentally or purposefully in the case of illegal dumping. Spills can be a complete pathway when they discharge directly to the EW via nearshore or overwater operations, or a source when indirectly discharged into storm drains or CSOs to the EW or by movement through soil to groundwater or erosion of impacted soil. The EW FS (Anchor QEA 2019) concluded that spills directly to the EW are considered potential recontamination sources inherent in any commercial/industrial waterway. Any future spills in the EW will be managed under existing spill prevention and response programs and evaluated for sediment recontamination potential on a case-by-case basis.

3 Removal Action Goal and Objectives and Regulatory Requirements

This section describes the removal action goal and objectives in consideration of the future T-25S Site use, along with the regulatory requirements, which form the framework used to develop the alternatives in this Draft Final EE/CA.

3.1 Removal Action Scope

This Draft Final EE/CA has been prepared to define the scope and approach for the NTCRA that is protective of human health and the environment within the T-25S Site. The nature and extent of contamination discussed in Section 2.9 was used to support the understanding of the sources of contamination, contaminant fate and transport in various media, and potential routes of contaminant exposure for human and ecological receptors for the T-25S Site. With this CSM framework, this Draft Final EE/CA demonstrates that the proposed removal action is designed to sufficiently meet NTCRA requirements, significantly reducing the exposure for ecological and human receptors to T-25S Site COCs, and thereby, reducing current and future risks. In addition, the future T-25S Site use was considered in the design and selection of the preferred removal action. The anticipated removal action will address contamination only within the limits of the T-25S Site; cleanup for the remainder of the EW OU sediments will occur through the selection of the remaining remedial actions established by EPA in the EW IROD.

The scope of this Draft Final EE/CA also includes an assessment of recontamination potential from and to adjacent properties, as described in Section 2.11. The long-term success of the NTCRA relies on the identification, characterization, and control of potential recontamination, as it may exist after completion of the removal action.

3.2 Removal Action Goal and Objectives and Future T-25S Site Use Considerations

Per EPA NTCRA guidance (EPA 1993), a removal action goal specifies what is to be achieved by the removal action through controlling or eliminating specific exposure pathways and, therefore, addressing risks. The RAOs are specific measures that aid in meeting the removal action goal and future site-specific cleanup levels, while meeting the statutory limits and Applicable or Relevant and Appropriate Requirements (ARARs) to the extent practicable (EPA 1993).

The removal action goal, objectives, and cleanup criteria are determined by the future land use at the T-25S Site (which is anticipated to become a restored habitat with no recreational use) and by the contamination present in each portion of the in-water sediment and upland soil areas. The goal of the removal action for the T-25S Site is to address contamination and associated potential exposure risks in a manner that is protective of human health and the environment and compatible with the habitat restoration project. As described in Section 2.5.3, future land use on the T-25S Site will include an aquatic habitat with a berm separating the marsh from the EW channel and an upland riparian buffer along the new southern and eastern shorelines; the Port is also planning for future green stormwater infrastructure to the east of the riparian buffer. No public access will be provided to or within the future T-25S Site, and the upland area surrounding the future marsh and riparian buffer will be fenced to restrict access.

The ASAOC (CERCLA Docket No. 10-2022-0159) describes that RAOs as follows:

- "*Direct contact exposure and protection of benthic invertebrates, juvenile salmon, flatfish, and specific bird assemblages following habitat restoration*."
- "*Evaluation of potential recontamination of the T-25S Site from adjacent upland areas and the EW; adjacent upland areas include the remainder of the T-25S Site, terminal and adjacent rights-of-way*."

The RAO to be achieved by the T-25S Site removal action is the same as the RAO to be achieved by the Interim Action described in the IROD for the entire EW OU:

- **RAO to be achieved by this Removal Action:** *"Reduce through active remediation concentrations of COCs in sediment greater than remedial action levels."* (EPA 2024).

This RAO and the removal action is intended to support the final cleanup action and long-term objectives of the EW OU cleanup, which are described in the IROD and are listed below:

- **Anticipated Final RAO 1:** Reduce to protective levels risks associated with the consumption of contaminated resident EW OU fish and shellfish by adults and children with the highest potential exposure. PCBs, arsenic, carcinogenic PAHs, and D/F are the primary COCs that contribute to the estimated unacceptable cancer risk and non-cancer hazard from the consumption of resident contaminated fish and shellfish.
- **Anticipated Final RAO 2:** Reduce to protective levels risks from direct contact (skin contact and incidental ingestion) by adults and children to contaminated sediments during netfishing and clamming. Arsenic is the primary COC that contributes to estimated unacceptable cancer risks from netfishing and clamming.
- **Anticipated Final RAO 3:** Reduce to protective levels risks to benthic invertebrates from exposure to contaminated sediments.
- **Anticipated Final RAO 4:** Reduce to protective levels risks to crabs and fish from exposure to contaminated sediment, surface water, and prey.

Therefore, the removal action for the T-25S Site will use active measures to address sediment concentrations greater than EW RALs. The existing sediment areas of the EW OU will be addressed using the cleanup technologies identified in the EW IROD. For the existing upland area, soil will be removed to support the future restored habitat area, and additional active measures will be employed to ensure that the final sediment condition will address exceedances of EW RALs. The removal action will also minimize the likelihood of recontamination in the future restored habitat area from controllable sources in adjacent upland areas. Each of the alternatives presented in Section 5 were designed to achieve the removal action goal and RAOs.

3.3 Applicable or Relevant and Appropriate Requirements

The NCP at 40 C.F.R. § 300.415 requires removal actions to comply with (or formally waive) ARARs to the extent practicable considering the exigencies of the situation, which are defined as any legally applicable or relevant and appropriate standards, requirement, criterion, or limitation under federal environmental law, or promulgated under any state environmental or facility siting law that is more stringent than the federal requirements. Table 3-1 lists and summarizes ARARs for the T-25S Site NTCRA, which are consistent with the ARARs identified for the EW OU cleanup and include standards, requirements, criteria, or limitations promulgated by both the federal government and the State of Washington. Some ARARs prescribe minimum numerical requirements or standards for specific media, such as sediment, surface water, and groundwater. Other ARARs place requirements or limitations on actions that may be undertaken as part of a remedy.

Some ARARs contain either numerical values or methods for developing such values. These ARARs establish minimally acceptable amounts or concentrations of hazardous substances that may remain in or be released to the environment, or minimum standards of effectiveness and performance expectations for the alternatives. Risk-based target concentrations based on risks to human health or the environment may dictate setting more stringent standards for remedial action performance, but they cannot be used to relax the minimum legally prescribed standards in ARARs (EPA 1991).

The evaluation of whether the proposed alternatives comply with these ARARs is presented in Section 6.

4 Identification of Technologies

This section identifies the technologies that are most applicable for implementation of the removal action at the T-25S Site: in-water technologies (applicable to existing sediments) and upland technologies (applicable to existing upland areas that will become sediment areas as a result of the removal action). The cleanup activities described in this Draft Final EE/CA focus on addressing sediment and soil contamination; therefore, emphasis is placed upon those technologies that are suited to those media, are readily available, and can be implemented within the anticipated NTCRA timeframe. Rather than following the conventional process of fully identifying and screening technologies, this Draft Final EE/CA focused on the technologies demonstrated to be proven and readily implementable at full scale, and includes consideration of the appropriateness of the technology for the size and site-specific conditions of the T-25S Site. In-water technologies that have been selected for the EW OU (encompassing the T-25S Site) as part of the EW IROD (EPA 2024) are described in this section, including institutional controls, mechanical dredging, and ancillary technologies; several other in-water technologies selected in the EW IROD are not applicable to the T-25S Site portion of the EW OU[8] and therefore, not listed here. For the upland portion of the T-25S Site, this Draft Final EE/CA considers traditional active upland technologies that have been successfully implemented for upland areas that are creating new aquatic and sediment footprints with similar environmental considerations and geographical location, such as the Terminal 117 Early Action Area (T-117 EAA), located on the west side of the LDW approximately 4 miles upstream of the T-25S Site.

General response actions such as institutional controls, removal, containment, treatment, and disposal can be applied to the in-water and upland portions of the T-25S Site and are described in detail in this section.

A summary of identified technologies applicable to the T-25S Site is presented in Table 4-1. These technologies were used to develop the alternatives presented in Section 5. A summary of identified technologies considered but not retained for the upland portion of the T-25S Site is presented in Table 4-2.

4.1 Institutional Controls

Institutional controls are non-engineered measures that may be selected as part of response actions in combination with engineered remedies, such as administrative and legal controls, that minimize the potential for human exposure to contamination by limiting land or resource use (EPA 2000). The

[8] Hydraulic dredging, engineered capping, in situ treatment, monitored natural recovery, and enhanced natural recovery are not technologies applicable to the T-25S Site in the EW IROD (EPA 2024).

National Contingency Plan[9] sets forth environmentally beneficial preferences for permanent solutions, complete elimination rather than controls of risks, and treatment of principal threats to the extent practicable. Where permanent and/or complete elimination are not practicable, the National Contingency Plan creates the expectation that EPA will use institutional controls to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants. It states that institutional controls may not be used as a sole remedy unless other measures are determined not to be practicable, based on balancing trade-offs among alternatives (40 CFR 300.430 [a][1][iii]).

EPA recommends that where they may provide greater protection, multiple institutional controls should be used in combination, referred to as "layering." Institutional controls may be an important part of the overall cleanup at a site, whenever contamination is anticipated to remain following remediation at concentrations that exceed cleanup levels. Institutional controls may be applied during remedy implementation to minimize the potential for human exposure (as temporary land use or exposure limitations). These controls may also extend beyond the end of construction (or be created at that time) or even after RAOs are achieved to ensure the long-term protectiveness of the remedy that leave contaminants on site above cleanup levels as long-term or permanent limitations (e.g., protecting a contaminant barrier like a sediment cap from being accidentally breached).

Institutional controls retained for cleanup of the T-25S Site are listed below. An integrated Institutional Controls Implementation Plan for the EW OU that meets specific location, tribal, and community needs will be developed as part of the larger EW OU cleanup. A similar plan may be developed for the T-25S Site, depending on the removal action selected and the timing in relation to the larger EW OU cleanup. Note the first two institutional control mechanisms listed below under informational devices are also included in the EW IROD as potential mechanisms for the EW OU. This Draft Final EE/CA does not describe institutional controls that will be implemented by others, such as the Elliott Bay Trustee Council, who are expected to require protection of the T-25S Site habitat areas (e.g., conservation easement). Any other institutional controls that may be required beyond what is required by EPA are not anticipated to be in conflict, but are expected to be developed in coordination with all parties involved.

- **Informational Devices:**
  - **Seafood consumption advisories and educational outreach**: Advisories and education outreach programs are informational devices to inform the public of the risks associated with the consumption of contaminated fish and shellfish. Currently, Washington State Department of Health (WDOH) has issued seafood consumption advisories for the EW OU, which encompasses the in-water portion of the T-25S Site. WDOH maintains a

[9] Short for National Oil and Hazardous Substances Pollution Contingency Plan.

website that includes its advisories, provides publications and other educational forums (informational meetings) that cover healthy eating and seafood consumption, and has installed advisory signs at public/fishing access locations in the EW OU. Following these advisories is wholly voluntary, which limits the effectiveness of advisories. Any program for the EW OU, including specific to the T-25S Site, is expected to be implemented in coordination/consultation with other agencies, health-based initiatives (such as the LDW fishers outreach program), and affected tribes (which have tribal fishing rights in the EW OU).

- **Monitoring and notification of waterway users**: Monitoring, notification, and reporting programs are another informational device that can be used to enhance the protection of areas where contamination remains above specified levels, including areas where capping has been utilized. Notification to waterway users of activity or use restrictions could be provided through enhanced signage and other forms of public notice, education, and outreach. Such areas could be periodically monitored (by vessels and/or surveillance technology) to evaluate compliance with activity or use restrictions, with vessels performing the dual role of educating potential violators of the existence of activity restrictions and promptly reporting violations of use restrictions to EPA or the U.S. Coast Guard (USCG). If an area within the T-25S Site were formally designated as a Restricted Navigation Area (RNA) by formal USCG rulemaking, enforcement tools could be employed, which are further discussed in the next bullet.
- **Enforcement tools**: RNAs are a form of notification program that are created by the promulgation of formal rules by the USCG. RNAs represent an enforceable means of protecting containment remedies and other areas where contamination remains from anchoring and other physical interference, particularly where Uniform Environmental Covenants Act (UECA) covenants or other proprietary controls may not be achievable. To the extent that RNAs may potentially interfere with seafood harvest activities, particularly tribal harvests, engineered or alternate means of accommodating fish harvest should be devised (e.g., alternative means of allowing anchoring or tying off a net within an RNA-created no-anchor zone). Although this option has the significant potential to regulate potential impacts associated with anchorage, barge spudding, and tugboat propeller wash, it could restrict maritime commerce or preclude commercial activities generally necessary for construction, maintenance, and operation of commercial piers, depending on where the RNA was located. RNAs require a careful and often highly complex balancing of competing interests and may only be useful in certain locations or circumstances.
- **Environmental covenants registry**: Placement and maintenance of containment remedies, or anywhere where contamination remains above specified levels, on Ecology's Environmental Covenants Registry in its Integrated Site Information System would

provide information regarding applicable restrictions (RNAs or proprietary controls, discussed in the next bullet) to anyone who uses or consults the state registry.

- **Proprietary controls:**
  - **Environmental covenants**: The State of Washington passed its UECA, which allows EPA, as well as the state (in addition to the parties to an UECA covenant), to enforce environmental covenants. Therefore, UECA covenants are anticipated to be the primary proprietary control that can be used for any areas where contamination remains above specified levels at the T-25S Site. Covenants could control or prevent current and future owners from conducting or allowing activity that could result in the release or exposure of buried contamination for as long as necessary. Potential activities controlled or prohibited may include in-water activities (e.g., anchoring, spudding, or vessel or tug maneuvering) and construction activities (e.g., pile driving and pulling, dredging, or filling) where buried contamination may become exposed as a result of the activity, as long as it is an activity that the owner may legally control. Selecting a less expensive response action in the form of a proprietary control that limits future property uses in ways that a more expensive action would not involves a complex balancing of interests by EPA.

4.2 In-Water Technologies for Existing Sediments

The technologies presented in the EW IROD apply only to the existing sediments in the in-water portion of the T-25S Site and are described in this Draft Final EE/CA to ensure that work in this portion of the T-25S Site is consistent with the EW OU IROD. These in-water technologies include the removal of contaminated sediments and the associated off-site disposal, and other ancillary technologies (residuals management cover [RMC] and backfill) and were selected for the EW OU (encompassing the T-25S Site) as part of the EW IROD.

The technologies retained for the in-water portion of the T-25S Site are discussed in Sections 4.2.1 and 4.2.2.

Technologies that are common to both in-water and upland portions of the T-25S Site, such as ex situ treatment and disposal, are discussed in Section 4.5.

4.2.1 Mechanical Dredging

Mechanical dredging has been used extensively in the Puget Sound for sediment remediation projects, is widely available, and is designed to remove sediment at or near in situ density (EPA 2005). Mechanical dredging is considered feasible for open-water and nearshore areas (using either articulate fixed-arm or cable-operated dredges situated on a barge or from the shore) because of its effective removal of consolidated sediment, debris, and other materials (such as piling and riprap) and its ability to relocate, thus reducing the potential impact to existing site operations. Some amount of excess water is typically entrained in the dredge bucket as it closes and is lifted up through the water column, although the quantity of water generated using mechanical dredging is orders of magnitude less than that generated by other sediment removal technologies, such as hydraulic dredging. The barge-mounted or land-based crane can use different types of buckets or attachments to dredge or assist with demolition activities. Mechanical dredging is capable of working in difficult-to-access areas and is relatively easy to relocate, thus reducing the potential impact to existing site operations. Environmental buckets offer the advantages of a large footprint, a level cut, and the capability to remove even layers of sediment can be used in the appropriate sediment conditions (unconsolidated sediments) to help limit sediment resuspension during bucket retrieval.

Some applications of mechanical dredging in shallow water environments have been performed with increased positional control over the dredge bucket when using a fixed arm (as opposed to a cable arm). This method has been employed at the Plant 2 Early Action Area in the LDW. This method would be applicable for nearshore areas within the T-25S Site.

Mechanical dredging removes contaminated sediments and, therefore, may result in the least uncertainty regarding future environmental exposure to contaminants (EPA 2005). A couple of drawbacks need to be considered when conducting mechanical dredging: 1) the release of contaminants associated with the removal action (i.e., dissolved or sorbed to suspended sediment particles), which in turn results in short-term water quality impacts from removal that can increase fish and shellfish tissue concentrations both locally and down current (tidal direction) (Bridges et al. 2010); and 2) the disturbance of the benthic community that must recolonize the biologically active zone and regain ecological functions following remediation. Removal has been proven to be an effective in-water technology for achieving cleanup goals when used in combination with residuals management (see Section 4.2.2.1) and other best management practices (BMPs).

A typical "treatment or process train" for mechanical dredging (assuming landfill disposal) assumed for this Draft Final EE/CA is listed below:

- Dredge contaminated sediment.
- Place contaminated sediment in a haul barge or upland stockpile area.
- Dewater on the barge (treatment by filtering or any active measures to meet water quality criteria at the point of compliance) or in stockpiles on site.
- Transport contaminated sediment to either an on-site or off-site offloading/staging area (if needed).
- Offload sediment to a stockpile area (if needed).
- Treat effluent from the stockpile and discharge to receiving waters or approved publicly owned treatment works.
- Transport contaminated sediment over land by truck or rail.

- Dispose contaminated sediment at a landfill facility.

Mechanical dredging was selected in the EW IROD as a viable in-water technology, given it is a well-established technology and the requirement of maintaining navigation depths for the EW OU. Therefore, it is included in the in-water areas of the alternatives (Section 5).

4.2.2 Ancillary In-Water Technologies

RMC and backfill are ancillary in-water technologies selected in the EW IROD for the cleanup of the T-25S Site existing sediment areas. These technologies are not designed to be implemented as standalone technologies, but rather implemented following dredging to further ensure the achievement of cleanup goals.

4.2.2.1 Residuals Management Cover

All dredging projects result in some degree of resuspension, release, and residuals (NRC 2007). Dredge residuals include undisturbed residuals (or missed inventory) and generated residuals.

- **Missed inventory** denotes the contaminated sediment that remains un-dredged due to the inability to be 100% accurate in delineating all of the contaminated sediment. The quantity of missed inventory can be minimized through pre-design investigation sampling conducted as part of the removal design phase.
- **Generated residuals** are contaminated sediment resuspended during dredging, due to removal equipment limitations in preventing loss of particulate material, which settles back on the dredged surface. The need to address dredging residual contamination depends upon the concentrations and thicknesses of residuals remaining. However, empirical data from numerous sediment remediation projects indicate that residual contamination is a common occurrence and that sites are unlikely to achieve their RAOs with dredge technology alone (Patmont and Palermo 2007; NRC 2007).

Placement of RMC is considered a cost-effective method for mitigating dredge residuals and achieving post-dredging performance goals. RMC refers to the placement of approximately 4 to 12 inches[10] of clean sand following dredging to reduce the impact of dredging residuals on surface sediment concentrations, as needed, in open-water dredging areas. RMC is generally assumed to mix with shallow subsurface sediment and incoming sediment as a result of bioturbation and vessel propwash in scour areas. Recent sediment remediation project designs in the Puget Sound area included placing an RMC layer as either the primary or secondary residuals management technology (e.g., LDW Slip 4 Early Action Area, East Waterway Phase 1 Removal Action, Port of Olympia Berths 2

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[10] In the EW IROD for the EW OU (EPA 2024), approximately 9 inches of RMC is assumed to be implemented, following the completion of dredging.

and 3 Interim Action, Port Gamble Wood Waste Removal, and Denny Way Interim Action). Placement of RMC may be limited by site conditions, such as inability to remain in place on steep slopes because of the sandy nature of the RMC material.

RMC was selected in the EW IROD as a viable ancillary in-water technology following dredging, given that the relatively deep water depths in the navigational portion of the T-25S Site increase the likelihood of generating dredge residuals, which could spread to adjacent un-remediated areas as a result of vessel propwash (because the removal action would be conducted in an active waterway). Therefore, it is included in the in-water portion of the alternatives (Section 5).

For this Draft Final EE/CA, it has been conservatively assumed for costing purposes that RMC will be placed in all open-water dredged areas.

4.2.2.2 Backfill

Backfill refers to the placement of clean materials following sediment removal to return grade to final habitat design elevations. The EW IROD describes use of this in-water technology to return elevations to existing contours; however, the planned use of the T-25S Site as a restoration area necessitates placement of sloped backfill in nearshore areas to support the habitat bench and habitat berm along the edge of the planned marsh area (Section 2.5.3 and Figure 1-3). The backfill material will consist of suitable habitat substrate, which will be determined during removal action design. Placement of backfill following dredging near the current shoreline area of the T-25S Site was selected as a viable ancillary in-water technology and therefore, it is included in the in-water portion of the alternatives (Section 5).

4.3 Upland Technologies for Areas that Will Become Sediments within the EW OU

Several upland technologies were considered for implementation of the removal action in the upland portion of the T-25S Site, including excavation and containment. While excavation removes contaminants from a site, containment and in situ treatment reduce the exposure and mobility of the contaminants in place. The upland technologies retained in this Draft Final EE/CA for the upland portion of the T-25S Site include excavation, engineered capping (with amendments), and several ancillary technologies that are discussed in Section 4.3.1 through 4.3.3. The upland technologies considered but not retained are provided in Section 4.3.4.

Technologies that are common to both the in-water and upland portions of the T-25S Site, such as ex situ treatment and disposal, are discussed in Section 4.5.

4.3.1 Excavation

Excavation of contaminated media is a common cleanup approach for source removal and is usually coupled with various off-site treatment or disposal options. Excavation is typically conducted using backhoes, front-end loaders, and dump trucks. Supporting methods include shoring (for excavations that are deep or close to structures), soil stockpiling and containment, dust control, groundwater extraction (for dewatering deeper excavations), and storing and treating extracted groundwater. Contaminated soil or sediment can be excavated, placed in lined trucks, and transported to appropriate treatment or disposal facilities. Truck wheel washing and inspection are necessary to control soil track-out during excavation work. Excavation of subsurface contaminated soils at the T-25S Site would require a planned sequence and engineering controls for control of surface and groundwater, temporary shoring of slopes, segregation of materials, potential stockpiling for treatment, and/or direct loading into trucks for disposal. Dust control of stockpiling areas is required where PCBs in soils are present at concentrations greater than the Toxic Substances Control Act (TSCA) remediation waste threshold.

Excavation has been successfully implemented during previous removal actions in the uplands adjacent to the LDW (T-117 EAA) and is a proven removal method for the T-25S Site; therefore, it has been retained in this Draft Final EE/CA as a viable technology in the upland portion of the T-25S Site and used as a technology in the development of the alternatives (Section 5).

Due to the proximity of the EW and the need to excavate within transition zones between upland and in-water areas, excavation may also be conducted by diverting or draining water. Diversion of water from the excavation area can be facilitated through the installation of temporary cofferdams, sheetpiling, or other water management structures and the subsequent lowering of the surface water elevation within the excavation area. Additional information on containment barrier applications as an ancillary technology to support excavation is included in Section 4.3.3.2. Dewatering the excavation area may involve water management and treatment prior to discharge. Following dewatering of the area, equipment can be positioned on the surface within the excavation area or immediately adjacent to the dewatered excavation area.

During removal action design, engineering evaluations would be conducted to determine appropriate methods for reducing spread of contamination resulting from use of temporary structures, diverting water, dewatering excavation areas, or other activities that have the potential to spread contamination.

4.3.2 Engineered Capping

Capping refers to the placement of an engineered cover or cap of clean material on top of contaminated soil or sediment that will remain in place, preventing or reducing the exposure and mobility of those contaminants through groundwater or porewater transport. When properly designed for site-specific conditions, capping can be an effective and reliable method to prevent direct contact and migration of contamination. Amendments can be added to caps to target specific COCs that may require further protection, which can be designed such that contaminants sorb (via adsorption or absorption) to cap amendments and sequester contaminants, resulting in a more effective barrier to contaminant mobility. As described in EPA (2005), caps can quickly reduce exposure to contaminants and typically require less infrastructure than ex situ technologies (e.g., dewatering, treatment, and disposal). Long-term cap integrity can be ensured through implementation of appropriate institutional controls and routine inspection and maintenance.

Capping has been retained as a technology for the upland portion of the T-25S Site because it is a cost-effective method to reduce the potential for exposure of contamination and its efficacy has been demonstrated by numerous successful projects, such as the T-117 EAA, Puget Sound Resources Superfund Site (Seattle, Washington), the former Gasco Manufactured Gas Plant Operable Unit (Portland, Oregon), the Central Waterfront Site (Bellingham, Washington), and Pasco Sanitary Landfill National Priorities List Site (Pasco, Washington).

For the T-25S Site, the incorporation of sequestering agents as part of capping (as amendment) has been evaluated to reduce the mobility of soil contaminants. The amendments in consideration are listed below:

- **Activated Carbon**: Carbonaceous amendment such as activated carbon is typically selected as part of the remediation of contaminated soil and sediment. Given its strong sorbent properties, PCBs, PAHs, and dioxins/furans are strongly adsorbed by activated carbon, making these contaminants less mobile. As contaminated groundwater flow through a layer of activated carbon (mixed with sand), the contaminant concentration in groundwater or porewater is reduced due to adsorption on to activated carbon, which prevents further migration.
- **Organoclay**: Organoclay is an amendment that is commonly used in soil and sediment cleanups. Although it is less sorptive than activated carbon, organoclay can reduce the bioavailability of non-soluble organics and other contaminants (Sarkar et al. 2000). Organoclay is recognized for its effectiveness in immobilization of NAPL (Integral et al. 2021).

Numerical modeling has been conducted in this Draft Final EE/CA to evaluate the feasibility of a chemical isolation layer of an engineered cap to address flux of the dissolved-phase COCs that exceed the EW RALs in the soils beneath the post-excavation elevation and to address the flux of contaminants associated with NAPL that is present in some soils beneath the post-excavation elevation. The cap modeling analyses described in Appendix B were performed in accordance with guidance on cap design set forth by EPA and the U.S. Army Corps of Engineers (Palermo et al. 1998) and the Interstate Technology and Regulatory Council (ITRC 2014, 2023). The cap modeling assumes that soils remaining after excavation would become sediments following the cleanup and restoration, in either subtidal or intertidal areas.

The cap modeling evaluations indicate that a cap with a 1-foot chemical isolation layer with activated carbon is needed to meet the EW RALs in the areas of the Site where COC concentrations exceed the EW RAL in soils remaining after removal. Where NAPL was observed (i.e., in a portion of the Focused Investigation Area), evaluations suggest that NAPL could potentially migrate into the cap via advection or gas ebullition (but not consolidation[11]). Based on a conservative estimate of the amount of NAPL present in soils beneath the post-removal elevation, it is possible that NAPL could migrate from the soils into the overlying area via advection (i.e., the NAPL may flow). The presence of wood waste in some areas at and below the post-excavation surface could create conditions conducive of gas generation as a result of microbial decomposition of organic matter. Microbial decomposition of organic matter can lead to gas bubble formation and migration from sediment to surface water (i.e., gas ebullition). NAPL migration can occur via gas ebullition, where NAPL/contaminants that are present attach to the gas bubbles as they migrate upward. NAPL migration could potentially occur after the removal action as a result of wood waste degradation, but is not expected to be a significant post-remediation pathway.[12] Based on the NAPL evaluation, placement of a 0.5-foot thick NAPL sorption layer consisting of sand and organoclay below the chemical isolation area is recommended in the Focused Investigation Area. This conservatively designed NAPL sorption layer would have sufficient capacity to manage NAPL that might migrate via advection and/or gas ebullition. Details of these evaluations are documented in Appendix B of this Draft Final EE/CA.

For the T-25S Site upland area that will be converted to a sediment area following habitat restoration, capping with amendments has been retained in this Draft Final EE/CA for the T-25S Site as viable, given it is a well-established upland technology.

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[11] Any soils remaining post-cleanup are already well consolidated due to compression by the weight of feet overlying soils; therefore, post-construction consolidation (and subsequent expression of NAPL from soils/sediments) is not expected to occur.

[12] The wood waste is not expected to be a significant source of gas ebullition for two reasons. First, research indicates that gas production decreases with depth in sediment and is likely significant only in shallow sediment (i.e., within the upper 30 cm (12 inches; Joyce and Jewell 2003; SERDP 2009). Capping done for removal action purposes, coupled with the construction of a habitat restoration layer, involves placement of 2 to 3 feet of material over the post-excavation surface. As a result, the wood waste will be buried at depths below which significant gas ebullition typically occurs. Second, gas generation and eventual ebullition is typically observed in soft, low-strength unconsolidated sediments that are often characteristic of the surface of a sediment bed. The presence of fine-grained sediment (silt and clay) encourages gas buildup because the low permeability of the sediment relative to fluid flow prevents gas bubbles from gradually dissipating as they would in more permeable sediment. Due the low strength of such sediments, the gas bubbles can fracture the sediment and create pathways to move upward through the sediment to the water column. In contrast, the wood waste is relatively well consolidated and expected to have higher strength compared to typical soft, unconsolidated fine-grained (silt and clay) organic-rich sediments deposited in water bodies that are typically associated with gas ebullition.

4.3.3 Ancillary Upland Technologies

Backfill and containment barriers are ancillary upland technologies retained in this Draft Final EE/CA for the upland portion of the T-25S Site. These technologies are not designed to be implemented as standalone technologies, but rather implemented following excavation to further ensure the achievement of the cleanup goals.

4.3.3.1 Backfill

For the upland construction, backfill refers to the placement of clean materials following soil excavation to return the grade to required design elevations. Backfill could further reduce the potential exposure of contaminants remaining below the backfill; although it is not designed to function as an engineered cap that can reliably limit the migration of contaminants (e.g., through the upwelling of groundwater), it can provide further physical separation between the top of an engineered cap and the final required grade.

Backfill has been retained as an ancillary upland technology in the Draft Final EE/CA for the T-25S Site upland area to be converted to sediment. It would be implemented following soil excavation in the upland area to achieve the final habitat design elevations. The backfill material will consist of suitable habitat substrate, which is expected to be comprised primarily of sand but will be determined during removal action design.

4.3.3.2 Containment Barrier

A containment barrier may be employed to separate upland cleanup activities from aquatic areas. While upland cleanup may be conducted outside of the in-water construction window, a containment barrier may be needed for separation and to control suspended sediments and contaminant exposure during upland cleanup. Options for a containment barrier include use of a soil berm (to physically separate upland cleanup work from in-water cleanup work), a silt curtain, or rigid containment (refers to the placement of a physical rigid barrier such as a sheetpile wall typically for water containment purposes). A soil berm and rigid containment were employed as part of the T-117 EAA construction.

Further descriptions of the potential containment barrier technologies are provided below:

- **Soil berms** refer to compacted structures designed to slow, pond, filter, and/or divert runoff. Soil berms can be constructed using various materials, including soil, sand, rock wood chips, and compost. Soil berms are engineering controls to isolate the work area in the upland from the river to limit the potential for release from the upland area. The completion of the upland/bank excavation from the top of the shoreline berm to the intertidal area will ensure that any material released from the upper reaches of the cut during excavation will be captured as part of the other removal work in the lower portion of the bank (i.e., down to the intertidal mudflat elevation). Soil berms can also limit tidal influence of groundwater and prevent tidal inundation of upland soil removal areas.

- **Sheetpile walls** are retaining walls constructed to retain earth, water, or any other filling materials. Sheetpile walls are made of individual steel sheets that are connected by interlocks and driven into the soil. Sheetpile walls are a common technology as a temporary measure to isolate the work area in the upland from the river, similar to the soil berms. Sheetpile walls can also be constructed to support excavation below grade to stabilize the side slope (vertically) and allow for dewatering.
- **Silt fences** are a temporary sediment barrier made of porous fabric and held up by wooden or metal posts driven into the ground. Silt fences are designed to retain soils on a disturbed land (such as a construction site) and minimize soils to be washed off into nearby waterbodies or onto other sites. Although silt fences are an inexpensive technology and relatively easy to install, they require routine inspection.

Containment barriers have been retained in the Draft Final EE/CA for the T-25S Site as an ancillary upland technology to soil excavation. Feasibility and implementability as well as a planned construction sequencing approach for a containment barrier in the upland portion of the T-25S Site, if needed, will be determined during removal action design.

4.3.4 Upland Technologies Considered But Not Retained for Areas that Will Become Sediments within the EW OU

Table 4-2 includes a summary of a variety of upland technologies that were considered but not retained for the upland portion of the T-25S Site due to being not viable for one or more considerations regarding effectiveness and technical implementability.

4.4 Common Technologies

4.4.1 Ex Situ Treatment

Ex situ treatment refers to technologies that include the addition of ex situ reagents to immobilize, transform, or destroy COCs, after physically removing contaminated soils from the site, but prior to off-site disposal. For the T-25S Site, a preliminary laboratory bench-scale study was performed to assess the treatability and effectiveness of ecoSPEARS' green technology, ecoAINA, to remove (through a soil washing/extraction process) PCB and D/F mass from excavated contaminated soils. Appendix C includes the *Terminal 25 South – Laboratory Bench-Scale Treatability Study Work Plan Memorandum* (Anchor QEA 2024b), the *Terminal 25 South – Bench-Scale Treatability Study Report* (ecoSPEARS 2024), and the associated third-party laboratory and validation reports.

The primary objectives of the treatability study are as follows (Anchor QEA 2024b):

- Evaluate the capability of the ecoAINA technology to reduce the highest soil PCB concentrations to below the TSCA remediation waste threshold (50,000 µg/kg) to allow for soil disposal in a non-hazardous waste landfill.
- Evaluate the capability of the ecoAINA technology to reduce soil PCB and D/F concentrations for soil in areas of the site that have moderate PCB concentrations (less than the TSCA threshold) and elevated D/F concentrations to below EPA regional screening levels (RSLs) for industrial land use. The EPA industrial land use RSLs for PCBs and D/Fs are 940 µg/kg and 22 nanograms per kilogram (ng/kg), respectively. Soil with contaminant concentrations below industrial cleanup levels may be suitable for beneficial use elsewhere on industrial Port property.

Preliminary results for the laboratory bench-scale studies indicate that the ecoAINA technology is an effective treatment for reducing PCB concentrations in soil. Using representative soil samples collected from the T-25S Site, three soil replicates with PCB concentrations exceeding the TSCA threshold (50,000 µg/kg), and ranging from 204,000 to 216,000 µg/kg, were treated with ecoAINA. Post-treatment, PCB concentrations in the three replicates were reduced by 79% on average, to concentrations ranging between 41,000 and 49,000 µg/kg. In another experiment, three soil replicates with PCB and D/F concentrations exceeding the EW RALs (130 µg/kg[13] and 25 ng/kg, respectively) were treated with ecoAINA. The initial concentrations ranged from 1,300 to 1,600 µg/kg PCBs and 160 to 220 ng/kg D/F. Post-treatment, PCB concentrations in the three replicates were reduced by 88% on average, to concentrations ranging between 99.6 to 190 µg/kg. D/F concentrations in the three replicates post-treatment were reduced by 50% on average, to concentrations ranging from 89 to 101 ng/kg D/F. Post-treatment D/F concentrations were above the EPA industrial land use RSL.

The ex situ treatment technology has been retained for the T-25S Site, although it has not been integrated into the development of the alternatives in Section 5. Further understanding of the effectiveness of ecoAINA in removing PCBs and D/F mass and potential applicable dosages for ex situ soil treatment is needed to confirm its viability for full implementation at the T-25S Site during removal action design.

4.4.2 Disposal

4.4.2.1 Off-Site Disposal (Subtitle D and C Landfills)

Dredged sediment and excavated soil from a CERCLA site, if untreated, must be disposed of off-site at an upland disposal facility, consistent with the Off-Site Rule (40 CFR 200.440). Dredged and

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[13] The lowest apparent effects threshold for PCBs, 130 µg/kg, was used as the dry-weight equivalent of the EW RAL.

excavated materials that satisfy the solid waste regulations will be disposed of in Subtitle D Resource Conservation and Recovery Act (RCRA) commercial landfills or equivalent. Dredged and excavated materials that classify as a hazardous waste under RCRA or PCB Remediation Waste under the TSCA[14] will be disposed of in a RCRA-authorized hazardous waste landfill or TSCA-authorized disposal facility (i.e., Subtitle C landfill).

The Roosevelt Regional Landfill operated by Republic Services in Roosevelt, Washington; the Columbia Ridge Landfill operated by Waste Management near Arlington, Oregon; and the Headquarters Landfill operated by Cowlitz County at Castle Rock, Washington, are three upland regional landfills that have established services to receive sediments/soils. One additional landfill, the Greater Wenatchee Regional Landfill in Wenatchee, Washington, requires that the sediment portion of the waste be dewatered so that it will pass the paint filter test for free water prior to accepting the sediment.[15]

Subtitle C landfills accept waste designated as hazardous waste and dangerous waste and have special controls (i.e., double liners, leak detection, double leachate collection systems) to prevent release of contaminants to the environment. The Chemical Waste Management Landfill operated by Waste Management in Arlington, Oregon, is the only Subtitle C landfill in the northwest region. This facility is approved by EPA for disposal of PCB remediation waste.

Subtitle D (or equivalent) and C landfill disposal are retained as representative disposal technologies for the alternatives that call for sediment and soil removal with disposal at an off-site, upland landfill. Facility capacity and accessibility evaluations will be required during design to identify which locations are available and accessible.

4.4.2.2 Beneficial Use

Beneficial use includes in-water and upland placement of dredged/excavated material to support other intended uses. Aquatic placement can include use of the sediment/soil as capping material, residual management, or habitat creation. Upland beneficial use can include using the untreated or treated sediments/soils as fill, as part of compost, or as a commercial soil mixture when blended with other humic materials. The physical properties of the treated material may limit its applicability to some of these potential use options.

[14] The TSCA regulations define "PCB Remediation Waste" as waste containing concentrations greater than or equal to 50,000 µg/kg.

[15] Disposal at this landfill requires dewatering of sediments for both transport and disposal of the dredged material, which would entail a dewatering facility at the point where wet sediments are offloaded from the haul barge to shore.

Although sediments/soils removed from within a CERCLA site are generally not suitable for direct beneficial use applications because of the liability associated with using contaminated material, beneficial use has been successfully implemented in several sediment/soil sites:

- Lower Fox River, WI: Sand separated from dredged contaminated sediment was used for public roadway-base construction.
- Sitcum Waterway, Commencement Bay, WA: Dredged contaminated sediment was used in the Milwaukee Waterway upland confined disposal facility (CDF)/port container terminal redevelopment.
- Thea Foss Waterway, Commencement Bay, WA: Dredged contaminated sediment was used in the St. Paul Waterway upland CDF/industrial pulp mill redevelopment.
- Hylebos and Middle Waterways, Commencement Bay, WA: Dredged contaminated sediment was used in the Blair Waterway upland CDF/port container terminal redevelopment.
- Port of Port Angeles Terminal 3, WA: Dredged sediment unsuitable for in-water disposal was used as subgrade fill to support future development.
- Port of Tacoma Parcel 14, WA: Contaminated dredged sediment and excavated soil was placed on Parcel 14 to support multi-purpose redevelopment.

T-25S sediments and much of the T-25S soils removed during the removal action contain contamination above levels that would allow beneficial use as fill material unless treated prior to reuse, such as ex situ treatment through soil washing with reagents (Section 4.4.1). However, a portion of the excavated soil, approximately 13,000 cubic yards (cy), from T-25S for the habitat restoration project is anticipated to be cleaner material that may be feasible for beneficial use without treatment either on nearby Port property or within the T-25S Site as part of backfill used to raise grades following excavation to support final habitat design elevation requirements. Therefore, beneficial use has been retained for this Draft Final EE/CA for further evaluation during design.

4.4.2.3 Open-Water Disposal

Open-water disposal consists of disposal of sediments or shoreline soils at the Dredged Material Management Program (DMMP) unconfined, open-water disposal site in Elliott Bay. This disposal technology would require approval from the DMMP agencies, which include EPA. To be suitable for open-water disposal, sediment must meet screening criteria that is based on chemistry testing, and if needed bioassay and/or bioaccumulation testing. Sediments required to be removed from the EW contain contamination that will not be suitable for open-water disposal. Similarly, soils excavated with concentrations above EW RALs are not expected to qualify for open-water disposal. However, some soils will be removed that are below EW RALs (approximately 13,000 cy) that may contain concentrations below open-water disposal screening criteria. Under DMMP guidance, soils removed to support waterway expansion may qualify for open-water disposal. Therefore, this technology is not retained for sediments at the T-25S Site, but has been retained for excavated soils with lower concentrations.

4.4.3 Common Technologies Considered But Not Retained

The two disposal technologies that were considered but not retained in this Draft Final EE/CA are confined aquatic disposal and nearshore CDF. These technologies are presented in Table 4-2.

4.5 Summary of Applicable Technologies

Table 4-1 presents a summary of technologies applicable to one or more of the alternatives discussed in Section 5.

5 Development of Alternatives

This section describes a range of alternatives aimed at achieving the RAOs (established in Section 3.2) based on combinations of technologies for the in-water and upland portions of the T-25S Site to address sediment and soil contamination. This section also discusses the anticipated effectiveness, implementability, and estimated cost for each alternative.

Three alternatives are presented in this Draft Final EE/CA. They incorporate one or more of the upland technologies evaluated and retained in Section 4.3 for the upland portion of the T-25S Site. The three alternatives also incorporate the in-water technologies selected in the EW IROD for the T-25S Site in-water portion of the EW OU. Specific technology considerations for the in-water and upland portions of the T-25S Site are described under each alternative.

The process for the delineation of the removal action areas for the three alternatives is described in this section, which was based on EW RAL exceedances for the RAL chemicals identified in Section 2.9. For the in-water portion of the T-25S Site, all three alternatives have the same lateral and vertical extent of the contaminated sediments and account for full removal to the maximum extent practicable of the existing debris and pilings, consistent with the EW IROD. For the upland portion of the T-25S Site, the removal action areas consider a range of lateral and vertical extents of soil removal, with a common soil removal of the highest EW RAL exceedances (primarily the highest PCB RAL exceedances). Finally, all alternatives are designed to have an NTCRA cleanup that supports and is compatible with backfilling with clean materials to the required final habitat design elevations.

The alternatives presented in this section are consistent with the NTCRA and EW IROD requirements (for in-water areas) and are expected to be compatible with the remainder of the EW remedy described in the IROD. In addition, for areas with the highest PCB EW RAL exceedances, each alternative in this Draft Final EE/CA meets the substantive requirements under TSCA (40 CFR 761.61(c)), because the NTCRA for the T-25S Site is established as a risk-based cleanup, using the EW PCB RAL from the EW IROD (EPA 2024) to determine the areas requiring PCB cleanup. As described in Section 2.5.3, the T-25S Site will become a restored habitat in the future with new creation of marsh, intertidal/subtidal habitat zones, and adjacent riparian areas. The future riparian areas are located outside of the T-25S Site boundary. All areas within the T-25S Site will be transformed into aquatic areas.

5.1 Process for Delineation of Removal Action Areas

This section describes the process and rationale for delineation of the removal action areas at the T-25S Site as the established active cleanup footprint and the subsequent development of the dredge units (DUs; for the in-water portion) and the excavation units (EUs; for the upland portion), defined as subunits for removal action within the T-25S Site.

The delineation of the removal action areas was an iterative process, and a stepwise methodology was implemented in this Draft Final EE/CA to evaluate all available sediment and soil data,[16] as follows:

- First, for each alternative, the T-25S Site boundary was selected as the baseline for the maximum horizontal extent used for data interpolation[17] to generate the spatial distribution of contamination throughout the in-water and upland areas of the T-25S Site.
- Second, all soil and sediment core samples within the T-25S Site were evaluated to determine the appropriate data treatment methodology.[18] Figures 2-6a through 2-6h and 2-7, respectively, provide a summary of the sediment and soil subsurface data used for data interpolation, and as stated in Section 2.9, these data were screened using EW RALs developed in the EW IROD for all EW RAL chemicals.
- Third, Thiessen data interpolations were conducted for two scenarios to process laterally the sediment and soil subsurface data for the T-25S Site.
- Fourth, sediment and soil subsurface EW RAL exceedance data and Thiessen data interpolations were evaluated in conjunction to determine areas needing removal based on their depth to contamination and the depth to reach the required habitat subgrade elevations.[19] This allows for assignment of depths required for removal (dredging or excavation) and delineation of associated units with similar removal action conditions.

In using a Thiessen interpolation, each sample point concentration is assumed to contribute to the area-wide mean concentration according to the relative size of the polygon area it represents. Interpolation using Thiessen polygons is a reasonably unbiased method when the distance between sample points is relatively small, because accuracy depends largely on sampling density. However, when sampling locations are spaced several hundred feet apart, the uncertainty in this assumption increases (as with any interpolation method). Areas of dense sampling are characterized by relatively small polygons, whereas areas of sparse sampling are characterized by relatively large polygons. The Thiessen interpolation approach was determined during the EW FS (Windward and Anchor QEA

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[16] Surface sediment and soil data (0 to 10 cm for surface grabs and 0 to 15 cm for composite grabs) was not included in the delineation of the removal action areas because by definition, the habitat restoration design established a minimum dredging depth and excavation depth (an average of 6.5 feet bgs) in the upland portion of the T-25S Site to accommodate the clean habitat backfill and achieve the final habitat design elevations.

[17] For any sample locations outside the T-25S Site boundary, the data were included for data interpolation purposes, but the resulting interpolated areas were cut off at the T-25S Site boundary.

[18] For interpolation purposes: 1) for field duplicate samples, the maximum concentration between the normal and field duplicate samples was used; 2) for any colocated cores, the data was compiled to reflect one location within the interpolated Thiessen polygon; and 3) for chemicals that were not detected, the reporting limit, or method detection limit for high resolution methods, was used for comparison to the EW RALs.

[19] If no EW RAL exceedances were present above the habitat subgrade elevations, the depth to habitat subgrade was used to assign the excavation depth for the interpolated Thiessen polygon. If the depth of EW RAL exceedances (depth to contamination) was determined to be below the required habitat subgrade elevations, the depth to contamination was used to inform the excavation depth for the interpolated Thiessen polygon.

2019) to be an appropriate interpolation method to evaluate the extent of EW RAL chemical concentrations throughout the entire EW OU due to the high density of data points with good spatial distribution; therefore, Thiessen data interpolation was applied to the T-25S Site.

Two Thiessen data interpolations were developed in this Draft Final EE/CA. The first one was based on the deepest EW RAL exceedance factor (to understand the lateral extent of the deepest contamination; Figure 5-1), in which the deepest maximum exceedance factor from all of the EW RAL chemicals at each sample location was used to assign a status to a Thiessen polygon. The second one was based on the maximum EW RAL exceedance factor (to understand the lateral extent of the driver chemicals with highest EW RAL exceedance factors; Figure 5-2), in which the maximum exceedance factor from all EW RAL chemicals at each sample location was used to assign a status to a Thiessen polygon.

Figure 5-1, the interpolation for the deepest EW RAL exceedance factors, shows the majority of the EW RAL exceedances in soil in the upland are within the southern portion of the T-25S Site. Roughly 46% of the upland area has no EW RAL exceedances at any depth. The deepest exceedances can be found in the southeastern portion of the T-25S Site, which is 14 to 16.2 feet bgs. Where EW RAL exceedances are present in the upland area, the average depth to contamination is 10.1 feet bgs. For the in-water portion, the EW RAL exceedances in sediment are evenly distributed; only 9% of the in-water area has sediments with no EW RAL exceedances at any depth, which corresponds to three sediment cores, surrounded by EW RAL exceedances (Figure 5-1). The average depth of sediment EW RAL exceedances (i.e., depth to contamination) for the remaining in-water area is 6.3 feet below mudline.

Figure 5-2, the interpolation for the maximum EW RAL exceedance factors, confirms that for the upland portion of the T-25S Site, the majority of the EW RAL exceedances are concentrated in the southern portion of the Site. As expected, the greatest EW RAL exceedance factors are in the area where the highest PCB concentrations in soil are present, ranging between 3.5 to 2,500,00 µg/kg (see Section 2.9.1.2.1). Notably, 65% of the footprint contains soils with concentrations less than the EW RALs. Using the information shown in Figures 5-1 and 5-2, removal action areas for the T-25S Site were assigned to any Thiessen polygons with at least one EW RAL exceedance at depth. Subsequently, for each Thiessen polygon, a depth to contamination was identified as the deepest thickness where soil concentrations were greater than any EW RALs (i.e., a known clean sample interval was below) and the equivalent depth was assigned as required depth for removal. If the vertical extent of an EW RAL exceedance at a polygon was not reached,[20] the required removal depth

[20] It is important to note that vertical extent of an EW RAL exceedance may not have been achieved due to substantial debris encountered, due to core penetration limited by its location (particularly within the piling field), or due to refusal after recovery of 2 feet of material (e.g. SC-02); further details can be found in the EE/CA Work Plan (Anchor QEA 2023a).

was increased by an additional 1.0 foot below the bottom of the deepest sampled extent of contamination to address the uncertainty. A summary of the depth to contamination and required depth of removal for all in-water and upland areas of the T-25S Site is presented in Tables 5-1 and 5-2, and 5-3a through 5-3c, respectively.

An additional step of laterally delineating DUs and EUs was conducted, as described below (and as shown in Figures 5-3 through 5-5 series for each alternative):

- **DU delineation:** Based on the Thiessen polygons in the in-water portion of the T-25S Site, the polygons were grouped into constructable DUs (footprints that have similar dredge depths).
- **EU delineation:** Based on the Thiessen polygons in the upland portion of the T-25S Site, the polygons were grouped into constructable EUs (footprints that have similar excavation thickness and/or similar type of contamination or EW RAL chemicals; all polygons with the highest EW RAL exceedances and NAPL presence were grouped within the same EU-1).

Though removal of soils with concentrations below the EW RALs in the upland portion of the T-25S Site is not required by EPA under the NTCRA, the Port's future land use for the T-25S Site is to construct a habitat restoration project, which requires excavation of soils without EW RAL exceedances in some T-25S Site areas to accommodate construction of the new off-channel emergent marsh and riparian habitat, and this is included in all three alternatives.

5.2 Alternative 1

This alternative involves the partial excavation of upland soils with EW RAL exceedances in the area with the highest EW RAL exceedances (primarily the highest PCB RAL exceedances) and NAPL presence(EU-1), followed by placement of an amended cap and an average of 5.2 feet of clean backfill material (atop the cap) to reach final habitat design elevations; partial excavation of soils with EW RAL exceedances in other focused upland areas of the T-25S Site to address EW RAL exceedances (EU-2), followed by 2 feet of clean backfill placement; and excavation of soils without RAL exceedances down to habitat restoration subgrade elevations (EU-3), followed by clean backfill placement (2 feet) to achieve final habitat design elevations. In-water actions include removal of debris and pilings and dredging of contaminated sediments (18 DUs), followed by RMC and placement of sloped backfill and armor (Figures 5-3a and 5-3b). Table 5-4 presents the removal action areas, excavation/dredging volumes, cap/backfill placement volumes, estimated construction duration, and total cost of Alternative 1. Appendix D presents the detailed cost estimate for this alternative.

5.2.1 Upland Removal Action

For Alternative 1, upland removal is composed of three EUs with excavation depths ranging from 2 to 11.5 feet bgs. The assumptions for each EU are described below (also see Tables 5-2 and Table 5-3a):

- **EU-1:** Soils exceeding EW RALs within EU-1 will be removed to 11.5 feet bgs. As stated in Section 2.9.1.2.1, high PCB concentrations decrease significantly in EU-1 at 11 feet bgs. In addition, at this depth (and below), the average PCB concentration is 11,800 µg/kg, including all cores within EU-1 with PCB results at or below 11 feet bgs.[21] Removal will be followed by placement of an amended cap, composed of a 0.5-foot-thick organoclay-amended sand cap (NAPL sorption layer; see Appendix B) and a 1.0-foot-thick granular activated carbon (GAC)-amended sand cap (chemical isolation layer; see Appendix B). An average of 5.2 feet of clean backfill will be placed above the cap within EU-1 to required final design habitat elevations.
- **EU-2:** Soils exceeding EW RALs within EU-2 will be excavated for EW RAL exceedances down to required habitat subgrade elevations. Removal is followed by placement of clean backfill to required final design habitat elevations. The minimal removal in this EU will be conducted to accommodate 2 feet of clean backfill needed for the marsh construction throughout the T-25S Site upland area.
- **EU-3:** EU-3 includes excavation of soils without EW RAL exceedances down to habitat subgrade elevations. Removal is followed by placement of 2 feet of clean backfill to required final design habitat elevations. The minimal removal in this EU will be conducted to accommodate 2 feet of backfill needed for the marsh construction throughout the T-25S Site upland area.

5.2.2 In-Water Removal Action

The in-water action for Alternative 1 is composed of 18 DUs with dredging depths ranging from 3 to 11 feet (below mudline) to address the full extent of sediment contamination (see Table 5-1). Additional actions for the in-water portion of this alternative are described below:

- **Piling field removal:** A treated-wood piling field from the former Pier 24 remains in the subtidal area on the northern half of the in-water portion of the T-25S Site. Bathymetric contours within the piling field are above -20 feet MLLW. All pilings and other debris will be

[21] Only one core (SB30) with elevated PCB results will remain below the required excavation depth of 11.5 feet bgs (see Section 2.9.2.2.1); the sample interval runs from 11 to 12 feet bgs; therefore, the contamination associated with this core will be partially removed.

removed to the maximum extent practicable, followed by sediment dredging to dredge depths established for each DU to remove EW RAL exceedances[22].

- **Placement:** Removal will be followed by placement of a sloped backfill (at a 3H:1V slope), with an armor rock layer placed above at a 2H:1V slope (assumed thickness of 3 feet) from the post-dredge surface (ranging from approximately -48 to -5 feet MLLW) up to 0 feet MLLW. Clean backfill will be placed above 0 feet MLLW to required final design habitat elevations (berm backfill). Areas lower than -40 feet MLLW are assumed to be covered with a 1.5-foot-thick RMC layer[23].

5.2.3 Considerations for Alternative 1

Additional specific considerations in terms of effectiveness, implementability, and costs for Alternative 1 are provided below.

5.2.3.1 Effectiveness

Alternative 1 is considered effective in the short-term[24] because soil excavation in the upland portion of the T-25S Site will immediately eliminate risks from the future intertidal aquatic environment because a substantial quantity of the contaminated soils will be removed, segregated as needed (soils with high PCB concentrations), and sent for off-site disposal at Subtitle D (approximately 49,050 cy of soils) and Subtitle C (approximately 15,810 cy of soils) commercial landfill facilities; however, this alternative has the potential for inclusion of ex situ treatment as a technology for upland contaminated soils as a means to reduce waste classification and allow lower levels for off-site disposal (i.e., ex situ treatment of soil material with the highest EW PCB RAL exceedances [located in EU-1]) to achieve Subtitle D levels, or ex situ treatment of Subtitle D-level soil material to achieve industrial land use level), and thus, reducing overall project costs.

In addition, capping within EU-1 is expected to be protective in the long- and short-term, as the chemical isolation and NAPL sorption layers will successfully isolate remaining residual, deeper PCB-contaminated soils beneath the future marsh. The cap will require operation, inspection, and maintenance over the long term to ensure proper function and continuous performance. In addition, institutional controls (administrative and legal) will be required to minimize the potential for

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[22] If the vertical extent of an EW RAL exceedance was not reached within a specific DU, the required dredging depth was increased by an additional 1.0 foot below the bottom of the deepest sampled extent of contamination to address the vertical bounding uncertainty. Decisions regarding additional contingency re-dredging of sediment beyond the required dredge depth (prior to any in-water placement) may be required during construction based on the results of confirmational sediment sampling; potential contingency re-dredging is included in this Draft Final EE/CA for cost estimating purposes.

[23] This RMC thickness is inclusive of an assumed 0.5-foot placement allowance.

[24] Appendix B model results in EUs-2, -3, and -4 (designated as backfill areas in Removal Alternative 1) indicate that sand only (i.e., equivalent to placement of backfill only) is not sufficient to meet the EW RAL in the long-term; therefore, it is acknowledged that potential recontamination of the backfill could occur in EU-2 of Removal Alternative 1 within 100 years.

ecological and human exposure to residual contamination that will remain below the cap installed within EU-1.

Piling removal to the maximum extent practicable and dredging in the in-water portion of the T-25S Site will contribute to long- and short-term effectiveness of this alternative, because these actions will significantly eliminate the sediment contamination (approximately 64,400 cy of sediments and 1,718 piles) and therefore reduce surface sediment concentrations from existing conditions in the long term. Also, RMC placement will considerably reduce the concentrations of generated dredge residuals from dredging in the navigational portion of the T-25S Site (which will provide a clean surface after dredging) and minimize the risk of dredge residuals spreading to other areas of the EW OU due to vessel propwash (since the removal action would be conducted in an active waterway).

5.2.3.2 Implementability

The anticipated construction timeframe for Alternative 1 is approximately 14.0 working months[25] (herein referred to as months) as a total duration encompassing in-water and upland construction activities.[26] Implementation of the in-water portion of Alternative 1 will be subject to the in-water construction window (October 1 to February 15) for any in-water work[27]; whereas upland work could be conducted year-round.

This alternative is easily implementable for the existing in-water and upland portions of the T-25S Site, as conventional land-based earth-moving equipment and overwater mechanical dredge equipment, standard construction techniques, equipment, and materials that are available in the local area would be used to accomplish the work. Excavation in the upland portion of the T-25S Site area may require either side-sloping or temporary shoring, due to the proposed depths of excavation in the various EUs for Alternative 1. Excavation of the area with the highest EW RAL exceedances (EU-1) will require segregation of the overburden soil layers located above and below the highest PCB-contaminated soils, for applicable off-site disposal waste stream classification. It is anticipated that the contaminated soils with the highest EW PCB RAL exceedances from EU-1 will also be directly loaded into trucks (lined and sealed) for off-site transportation and Subtitle C disposal to avoid material re-handling within the T-25S Site. An upland staging/stockpile area may be required to temporarily stage/stockpile clean materials brought on site and potentially Subtitle D contaminated materials being loaded for off-site disposal.

Sediment dredged for this alternative is anticipated to be directly transloaded from the barge into trucks or railcars at an existing transload facility located in the LDW for upland transportation and

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[25] Months required to complete the construction (i.e., not including weekends, holidays, or any other non-working periods).
[26] The total duration presented in the Draft Final EE/CA does not account for any implementability efficiencies that could result from a sequencing evaluation.
[27] In-water construction activities will be coordinated with the Tribes to reduce impacts on tribal fishers within the EW.

off-site disposal; alternatively, dredged sediment could be offloaded via a land-based crane into a designated stockpile area in the upland for truck or rail transport to the disposal landfill.

Implementation of capping for Alternative 1 will require more specialized construction techniques to ensure the minimum required thicknesses of the chemical isolation and NAPL sorption layers are achieved uniformly throughout the required capped areas. Amendments used for the caps will require established protocols for blending materials to the desired dosage requirements.

Shallow groundwater and proximity to the EW can present additional challenges for upland excavation, but excavation is expected to be similar to the cleanup and habitat restoration conducted as part of the T-117 EAA. Dewatering of soils and sediments will be required prior to upland transportation and off-site disposal.

5.2.3.3 Costs

The total estimated cost for Alternative 1 is approximately $88.5 million (Table 5-4), representing approximately $46.1 million to implement the in-water portion of the removal action and approximately $42.4 million to implement the removal action in the upland portion of the T-25S Site. See Section 6.3 and Appendix D for further cost information.

5.3 Alternative 2

This alternative involves the partial excavation of upland soils with EW RAL exceedances in the area with the highest EW RAL exceedances and NAPL presence (EU-1), followed by placement of an amended cap and an average of 7.2 feet of clean backfill material (atop the cap) to reach final habitat design elevations; partial excavation of soils with EW RAL exceedances in other focused upland areas of the T-25S Site to address EW RAL exceedances (EU-2 through EU-5), followed by placement of an amended cap and 2 feet of clean backfill material (atop the cap) to reach final habitat design elevations; and excavation of soils without EW RAL exceedances down to habitat restoration subgrade elevations (EU-6), followed by clean backfill placement (2 feet) to achieve final habitat design elevations. The in-water actions are the same as Alternative 1, which include removal of debris and pilings and dredging of contaminated sediments, followed by RMC and placement of slope backfill and armor (Figures 5-4a and 5-4b). Table 5-4 presents the removal action areas, excavation/dredging volumes, cap/backfill placement volumes, estimated construction duration, and total cost of Alternative 2. Appendix D presents the detailed cost estimate for this alternative.

5.3.1 Upland Removal Action

For Alternative 2, upland removal is composed of six EUs with excavation depths ranging from 2 to 13.5 feet bgs. The assumptions for each EU are described below (also see Tables 5-2 and Table 5-3b):

- **EU-1:** Soils with EW RAL exceedances within EU-1 will be removed to 13.5 feet bgs. As stated in Section 2.9.1.2.1, high PCB concentrations decrease significantly in EU-1 at 11 feet bgs, and for this alternative, all locations with high PCB RAL exceedances will be removed to 13.5 feet bgs. In addition, at this depth (and below), the average PCB concentration is 70 µg/kg.[28] Removal will be followed by placement of an amended cap, composed of a 0.5-foot-thick organoclay-amended cap layer (NAPL sorption layer; see Appendix B) and a 1.0-foot-thick GAC-amended sand cap layer (chemical isolation layer; see Appendix B). An average of 7.2 feet of clean backfill will be placed above the cap within EU-1 to required final design habitat elevations.

- **EU-2 through EU-4:** Soils with EW RAL exceedances within EU-2, EU-3, and EU-4 will be partially excavated for EW RAL exceedances down to habitat subgrade elevations, plus an additional 1 foot. The additional 1 foot of soil removal will allow placement of an amended cap, composed of a 1-foot-thick GAC-amended sand layer (chemical isolation layer; see Appendix B). Two feet of clean backfill will be placed atop the cap to required final design habitat elevations.
- **EU-5:** EU-5 includes excavation of soils exceeding EW RALs down to habitat subgrade elevations. Removal will be followed by placement of 2 feet of clean backfill to required final design habitat elevations. The minimal removal in this EU will accommodate the placement of 2 feet of clean backfill needed for the future marsh construction in this area.
- **EU-6:** EU-6 includes excavation of soil without EW RAL exceedances down to habitat subgrade elevations. Removal will be followed by placement of 2 feet of clean backfill to required final design habitat elevations.

5.3.2 In-Water Removal Action

In-water actions for this alternative remain the same as for Alternative 1, and assumptions for these actions are described in Section 5.2.2.

5.3.3 Considerations for Alternative 2

Additional specific considerations in terms of effectiveness, implementability, and costs for Alternative 2 are provided below.

5.3.3.1 Effectiveness

Alternative 2 is considered effective in the long- and short-term because soil excavation in the upland portion of the T-25S Site (almost all high PCB concentrations [and EW RAL exceedances] in EU-1 and all EW RAL exceedances in EU-2 through EU-5) will immediately eliminate risks from the future intertidal aquatic environment, as a substantial quantity of the contaminated soils will be removed, segregated as needed (soils with high PCB concentrations), and sent for off-site disposal at Subtitle D (approximately 50,250 cy of soils) and Subtitle C (approximately 17,660 cy of soils)

[28] No cores with high PCB RAL exceedances will remain below the required excavation depth of 13.5 feet bgs.

commercial landfill facilities; however, this alternative has the potential for inclusion of ex situ treatment as a technology for upland contaminated soils as a means to reduce the waste classification and allow lower levels for off-site disposal (i.e., ex situ treatment of soil with the highest EW PCB RAL exceedances [located in EU-1]) to achieve Subtitle D levels, or ex situ treatment of Subtitle D-level soil to achieve industrial land use levels), and thus, reducing overall project costs.

In addition, capping within EU-1 through EU-4 is expected to be effective and protective in the long- and short-term, as the chemical isolation and NAPL sorption cap layers will successfully isolate remaining residual, deeper PCB-contaminated soils in the future marsh. However, the caps will require operation, inspection, and maintenance over the long term to ensure proper function and continuous performance. In addition, institutional controls (administrative and legal) will be required to minimize the potential for ecological and human exposure to residual contamination that will remain below the caps installed within EU-1 through EU-4.

Effectiveness considerations for Alternative 2 within the in-water portion of the T-25S Site are the same as for Alternative 1 (see Section 5.2.3.1).

5.3.3.2 Implementability

The anticipated construction timeframe for Alternative 2 is approximately 14.6 months. Implementation of the in-water portion of Alternative 2 will be subject to the in-water construction window (October 1 to February 15) for any in-water work[29]; however, any upland work could be conducted year-round.

This alternative is easily implementable for the in-water and upland portions of the T-25S Site, as conventional land-based earth-moving equipment and overwater mechanical dredge equipment, standard construction techniques, equipment, and materials that are available in the local area would be used to accomplish the work. Additional implementability considerations for Alternative 2 are the same as for Alternative 1 (see Section 5.2.3.2).

5.3.3.3 Costs

The total estimated cost for Alternative 2 is approximately $91.9 million (Table 5-4), representing approximately $46.1 million to implement the in-water portion of the removal action and approximately $45.8 million to implement the removal action in the upland portion of the T-25S Site. See Section 6.3 and Appendix D for further cost information.

[29] In-water construction activities will be coordinated with the Tribes to reduce impacts on tribal fishers within the EW.

5.4 Alternative 3

This alternative involves the full excavation of upland soils exceeding EW RALs in the area with the highest EW RAL exceedances and NAPL presence (EU-1) and full excavation of soils exceeding EW RALs in other focused upland areas of the T-25 Site to address EW RAL exceedances (EU-2 through EU-8) and excavation of soils without EW RAL exceedances down to habitat restoration subgrade elevations (EU-9), followed by clean backfill placement to achieve final habitat design elevations. In-water actions are the same as Alternative 1, which include removal of debris and pilings and dredging of contaminated sediments, followed by RMC and placement of sloped backfill and armor (Figures 5-5a and 5-5b). Table 5-4 presents the removal action areas, excavation/dredging volumes, cap/backfill placement volumes, estimated construction duration, and total cost of Alternative 3. Appendix D presents the detailed cost estimate for this alternative.

5.4.1 Upland Removal Action

For Alternative 3, upland removal is composed of 9 EUs with excavation depths ranging from 2 to 16 feet bgs. The assumptions for each EU are described below (also see Tables 5-2 and 5-3c):

- **EU-1:** Soils exceeding EW RALs within EU-1 will be removed down to 16 feet bgs. As stated in Section 2.9.1.2.1, high PCB concentrations of samples below 11 decrease significantly, and no PCB RAL exceedances were identified within native sample intervals. Based on field observations, the average depth to native soil was encountered at 16 feet bgs. Soil removal will be followed by placement of clean backfill to required final design habitat elevations.
- **EU-2 through EU-4:** EU-2 through EU-4 include full excavation of soil with concentrations exceeding EW RALs. Removal thickness assigned to each EU was defined as the deepest interval that exceeded EW RALs. As described in Section 5.1, if the vertical extent of an EW RAL exceedance was not reached, the required excavation depth was increased by an additional 1.0 foot below the bottom of the deepest sampled extent of contamination to address the vertical bounding uncertainty[30] (Table 5-2). Soil removal will be followed by placement of clean backfill to required final design habitat elevations in these EUs.
- **EU-5 through EU-8:** EU-5 through EU-8 include full excavation of soils exceeding RALs down to habitat subgrade elevations. All soils with EW RAL exceedances within these EUs are within the removed depths needed to reach habitat subgrade elevations and to accommodate for 2 feet of clean backfill needed for the future marsh construction throughout the upland T-25S Site. Soil removal is followed by placement of clean backfill to required final design habitat elevations.

[30] Decisions regarding additional potential contingency re-excavation of soil beyond the required excavation depth may be required during construction for EU-2 through EU-4 based on the results of confirmational soil sampling; potential contingency re-excavation is included in this Draft Final EE/CA for cost estimating purposes.

- **EU-9:** EU-9 includes excavation of soil without EW RAL exceedances down to habitat subgrade elevations. Removal is followed by placement of clean backfill to required final design habitat elevations. The minimal soil removal in this EU will accommodate the placement of 2 feet of clean backfill to required final design habitat elevations.

5.4.2 In-Water Removal Action

In-water actions for this alternative remain the same as for Alternatives 1 and 2, and the assumptions for these actions are described in Section 5.2.2.

5.4.3 Considerations for Alternative 3

Additional specific considerations in terms of effectiveness, implementability, and costs for Alternative 3 are provided below.

5.4.3.1 Effectiveness

Alternative 3 is considered effective in the long- and short-term because full soil excavation in the upland portion of the T-25S Site will immediately eliminate risks from the future intertidal aquatic environment, as a substantial quantity of the contaminated soils will be removed, segregated as needed (soils with high PCB concentrations), and sent for off-site disposal at Subtitle D (approximately 61,670 cy of soils) and Subtitle C (approximately 20,060 cy of soils) commercial landfill facilities. However, this alternative has the potential for inclusion of ex situ treatment as a technology for upland contaminated soils as a means to reduce the waste classification and allow lower levels for off-site disposal (i.e., ex situ treatment of soil with the highest EW PCB RAL exceedances [located in EU-1]) to achieve Subtitle D levels, or ex situ treatment of Subtitle D-level soil material to achieve industrial land use levels), and thus, reducing overall project costs.

Effectiveness considerations for Alternative 3 within the existing in-water portion of the T-25S Site are the same as for Alternatives 1 and 2 (see Section 5.2.3.1).

5.4.3.2 Implementability

The anticipated construction timeframe for Alternative 3 is approximately 16.1 months. Implementation of the in-water portion of Alternative 3 will be subject to the in-water construction window (October 1 to February 15) for any in-water work[31]; however, any upland work could be conducted year-round.

This alternative is easily implementable for the existing in-water and upland portions of the T-25S Site, as conventional land-based earth-moving equipment and overwater mechanical dredge equipment, standard construction techniques, equipment, and materials that are available in the

[31] In-water construction activities will be coordinated with the Tribes to reduce impacts on tribal fishers within the EW.

local area would be used to accomplish the work. Additional implementability considerations for Alternative 3 are the same as for Alternative 1 (see Section 5.2.3).

5.4.3.3 Costs

The total estimated cost for Alternative 3 is approximately $99.0 million (Table 5-4), representing approximately $46.1 million to implement the in-water portion of the removal action approximately $52.9 million to implement the removal action in the upland portion of the T-25S Site. See Section 6.3 and Appendix D for further cost information.

6 Comparative Analysis of Alternatives

The evaluation criteria described in the EPA NTCRA guidance (EPA 1993) has been applied in this section as a means for the comparative analysis of the three alternatives described in Section 5 of this Draft Final EE/CA. Three criteria, which include effectiveness, implementability, and cost, are used for the alternatives comparative analysis. These criteria are defined below and include additional considerations (sub-criteria), which support establishment of the relative ranking of the alternatives and identification of a preferred removal action for the T-25S Site.

6.1 Effectiveness

The criterion of effectiveness relates to the overall protectiveness of an alternative to human health and the environment, both in the short and long term, by determining the ability to meet and maintain the RAOs following implementation. For the purposes of this evaluation, the in-water portion of the alternatives will be evaluated for the RAO to be achieved by the Interim Action described in the IROD for the entire EW OU: "*Reduce through active remediation concentrations of COCs in sediment greater than remedial action levels*…" (EPA 2024). While sediments are not present within the upland portion of the T-25S Site, the upland area will be evaluated for this RAO as the area will be creating new sediment area within the EW OU, as part of the habitat restoration project. All alternatives will be evaluated against whether they meet or not the long-term objectives of the EW OU cleanup.

The evaluation of effectiveness for each alternative considers permanence, which entails the certainty and degree to which the magnitude of contaminants are reduced, the extent of reduction of toxicity, mobility, and potential re-exposure, each of which reduces residual risks after implementation. Alternatives with high effectiveness have a high probability of success to minimize both short-term impacts[32] and any residual risks, afford long-term protection, and comply with cleanup objectives and ARARs. The comparative analysis of the alternatives based on the effectiveness criterion is presented in this section and in Table 6-1, which summarizes the resulting relative ranking.

6.1.1 Protectiveness

All alternatives are protective of human health and the environment and improve the overall environmental quality by reducing the long-term risks to varying degrees, based on the technologies used to achieve that protectiveness. Alternatives 2 and 3 are considered more protective than Alternative 1 because the greatest mass of contamination will be removed as part these two alternatives. Within EU-1 (the highest EW RAL exceedances and NAPL presence), Alternative 1 leaves

[32] Short-term impacts may occur as a result of implementation of the removal alternative and may affect the environment, the community, and workers.

an average total PCB concentration of 11,800 µg/kg, whereas Alternative 2 leaves an average total PCB concentration of 70 µg/kg, and Alternative 3 removes all soils with PCB concentrations above the EW RAL. Although COC concentrations for all alternatives would meet the EW RALs through a range of soil removal throughout the T-25S Site immediately after construction (through site-wide removal and either backfill or capping and off-site disposal of all contaminated sediments and soils), Alternative 1 has a lower degree of protectiveness in the long term, because modeling predicts soil concentrations may become greater than the EW RALs within 100 years in the southeast portion of the T-25S Site (EU-2; areas with EW RAL exceedances excavated down to habitat subgrade elevation), as no engineered cap is provided in this area. Protectiveness is higher in Alternatives 2 and 3, as cap modeling for Alternative 2 within these EUs predicts concentrations in the post-construction marsh surface will remain below EW RALs in the long term (i.e., 100 years), and in Alternative 3, all soils with EW RAL exceedances throughout the upland areas are removed. All alternatives achieve equal protectiveness in the existing in-water area, as sediments with concentrations greater than the EW RALs will be removed.

6.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

All alternatives are expected to comply with the ARARs established in Section 3 (Table 3-1). All alternatives include sediment removal (to the full extent of contamination) and a range of soil removal to achieve the EW RALs at the completion of construction, which is compatible with the future T-25S Site use in both in-water areas (navigation channel and future habitat restoration area) and upland areas (future habitat restoration area). All alternatives will achieve ARARs through full removal (Alternative 3) or removal with a combination of an amended cap and/or clean backfill (Alternatives 1 and 2), which will result in COC concentrations that will be below the EW RALs in the excavated surface. All alternatives comply with TSCA (40 CFR 761.61(c)) because all PCB-contaminated soils with high EW RAL exceedances that are removed from the existing upland portion of the T-25S Site will be designated for off-site disposal at a Subtitle C landfill facility, unless ex situ treatment reduces PCB soil concentrations to Subtitle D levels.

6.1.3 Permanence

The long-term success of a alternative can be measured by the degree to which an alternative permanently reduces the toxicity, mobility, and volume of hazardous substances and the magnitude of contamination left behind. All alternatives fully reduce the mass of contaminants in the in-water portion of the T-25S Site via dredging, yielding the highest permanence in the in-water area. Alternative 3 is considered the most permanent alternative because all the contaminated soils would be permanently removed and disposed of off site in a permitted landfill facility, eliminating any residual risks. In the upland portion of the T-25S Site, the COC mass reduction via partial excavation of contaminated soils is significant for Alternatives 1 and 2, with an average reduction in PCB concentrations particularly within EU-1 (the area with the highest EW RAL exceedances) by 89.7% and 99.9%, respectively. Mobility and toxicity of COCs are also effectively addressed in Alternatives 1 (only within EU-1) and 2 (EU-1, EU-2, EU-3, and EU-4) via capping with amendments. Alternative 2 has lower residual risks than Alternative 1 due to a larger and deeper removal area and more extensive capping area within Alternative 2. Additionally, the cap modeling results (Appendix B) indicate that the amended caps in EU-1, EU-2, EU-3, and EU-4 for Alternative 2 would be sufficient for soil concentrations to meet EW RALs for all COCs, thus providing permanence comparable to the full removal in Alternative 3. Institutional controls would be required to protect the integrity of the caps and provide for periodic monitoring, inspection, maintenance, and repairs (if needed) to ensure permanence for Alternatives 1 and 2.

6.1.4 Long-Term Effectiveness

Long-term effectiveness of a removal alternative is based on the reliability of technologies to meet and maintain removal action goals and objectives and, if using engineering or institutional controls, on their reliability to manage any residual risks. Alternative 3 has the highest certainty for long-term effectiveness because all contaminated sediment and soils would be removed site-wide to the maximum extent, eliminating all sources of contamination and any potential residual risks. Alternatives 1 and 2 will also be effective in the long term but will require cap compliance performance monitoring, cap inspection/maintenance/repairs, and institutional controls to ensure reliability of the removal action in the upland portion of the T-25S Site.

Per Appendix B, COC concentrations in amended caps (with GAC and organoclay) are predicted to meet the EW RALs in future aquatic sediments within EU-1 and EU-2, EU-3, and EU-4, in the long term, and no NAPL migration is predicted to occur, under Alternatives 1 and 2. Therefore, Alternative 2 ranks high for long-term effectiveness of its capped areas as surface sediment concentrations are predicted to be less than the EW RALs in the long term (i.e., 100 years). Alternative 1 does not include engineered capping outside of EU-1 (all other EUs are designated for backfill placement), which reduces its overall long-term effectiveness based on potential recontamination of backfill in EU-2 after 100 years.

In addition, recontamination from groundwater adjacent to the T-25S Site is not anticipated in the long term, as described in Section 2.11.

For the existing in-water portion of the T-25S Site, the actions are the same for each alternative and are consistent with the requirements of the T-25S Site in the EW IROD. These actions will completely eliminate sediment contamination through piling removal and dredging, significantly reducing surface sediment concentrations from existing conditions, therefore providing maximum effectiveness in the long term.

6.1.5 Short-Term Effectiveness

Short-term effectiveness includes an assessment of risks associated with the implementation of the removal action (in contrast to long-term effectiveness, which considers the effectiveness of the action after completion). Short-term risks are present in each alternative, which are associated with excavation/dredging and transport of the soils/sediments resulting from implementing them; short-term risks may be increased by the alternative construction duration and may outweigh the long-term protectiveness, and therefore, overall risk reduction. Alternative 3 has the greatest potential short-term impacts associated with implementation due to the largest removal of soils with concentrations exceeding EW RALs and clean import volumes (16.1 months), compared to Alternatives 1 (14.0 months) and 2 (14.6 months). Short-term effectiveness and control of risks associated with construction for sediment and soil removal is similar across all alternatives and will be managed through the use of operational BMPs and adequate planning. Construction sequencing will be developed during design, and is expected to include prioritization of removal of contaminated soil from the upland EU-1 area first, with adequate segregation of contaminated soils for Subtitle D and Subtitle C off-site disposal. The highest concentrations of PCBs are present in the upland soils of the T-25S Site, and strict oversight and precautions will be taken during the removal action to ensure that the EW OU and the surrounding community will not be exposed to contaminated soils from the removal action areas. Risks to workers from construction activities, as well as exposure-related contaminants, are similar for all alternatives. While construction risk is proportional to the construction duration, they are generally low and can be managed through established health and safety requirements for work at hazardous waste sites and BMPs. The relative transportation impacts of trucks, trains, and barges needed for transportation of contaminated sediments and soils off site and for import of construction materials (sand, armor stone, GAC, and organoclay) to the T-25S Site will be managed by sourcing material locally (to the extent practicable) and through traffic control plans developed during design.

COC concentrations for all alternatives are predicted to achieve the EW RALs immediately after construction. While the anticipated construction timeframes are very similar (varying between 14.0 to 16.1 months; see Section 5), Alternative 1 is predicted to achieve EW RALs slightly faster than other alternatives.

6.2 Implementability

Implementability refers to the ability and feasibility of the alternative to be constructed and its degree of difficulty. It considers technical and administrative implementability as primary factors under this criterion. Technical implementability considers the logistical challenges related to construction; availability of equipment, resources, and expertise needed to perform the work; the overall scope of construction; and site-specific conditions that affect implementation. In addition, it encompasses the complexity and uncertainties associated with implementation of the alternative.

Administrative implementability includes the activities required for coordination with other parties and agencies (e.g., consultation, obtaining permits for any off-site activities, or rights-of-way for construction). Implementability also considers the availability of services, resources, equipment, and labor to conduct the work for the alternatives and the ability to obtain competitive bids for construction. This implementability evaluation primarily focuses on the first two factors because the alternatives use the same types of technologies and, therefore, the same types of equipment and methods, all of which are available and for which expertise exists in the Puget Sound region.

6.2.1 Technical Implementability

The technical implementability is similar for all three alternatives. In-water construction involves moderate technical challenges for all alternatives, including debris and piling removal (to the maximum extent practicable) and off-site disposal, dredging operational controls and BMPs (to comply with water quality criteria), and efficiently dewatering and transloading sediments prior to upland transportation and off-site disposal. Upland soil removal presents similar technical challenges during excavation activities for all alternatives, including adequate segregation of soil types, dewatering, supply of adequate trucks/railcars for upland transportation, and off-site disposal of soils at permitted Subtitle D and Subtitle C off-site disposal facilities. Alternative 3 has some technical challenges associated with the largest excavation soil volume (magnitude and complexity of earthwork requiring more environmental/constructable measures to conduct to the work). Alternatives 1 and 2 have some technical challenges associated with capping, such as blending materials to the dosage requirement, accurate cap layer placement to the required design minimum thicknesses, and long-term monitoring, inspection, and maintenance of the overall upland area. However, each of these technical challenges in cap implementation are manageable.

6.2.2 Administrative Implementability

Administrative implementability for the in-water portion of the T-25S Site is identical for all three alternatives. In-water construction is not allowed year-round in order to protect juvenile salmon and bull trout migrating through the EW; therefore, the in-water work window is estimated to be October 1 to February 15, a period that will be confirmed by EPA in consultation with the National Marine Fisheries Service and U.S. Fish and Wildlife Service before implementation. In addition, coordination is necessary with the tribes, Port tenants, and other waterway users to ensure that impacts to their activities are minimized during cleanup, because the EW is a busy working industrial waterway and used by tribes for a commercial salmon net fishery.

Administrative complexity for all alternatives is associated with deauthorization of a portion of the federal navigation channel to accommodate the placement of the slope backfill and armoring to support habitat restoration at the T-25S Site. The Port formally requested deauthorization of a portion of the federal navigation channel in February of 2024, which was approved by Congress in

2025 in Bill H.R. 8812 - Water Resources Development Act of 2024. Additional administrative factors associated with cap placement include the requirement for institutional control implementation. Alternatives 1 and 2 will require institutional controls in perpetuity to reduce the potential of cap disturbance and to ensure that the cap remains protective and performs as designed over the long term. Each of the alternatives is considered implementable from an administrative perspective.

6.3 Costs

The cost criterion evaluates the total project costs, which are the sum of the in-water and the upland estimated costs. The total project costs include direct construction and indirect construction costs incurred with the implementation of each alternative. Direct construction costs include mobilization/demobilization, pre-construction support activities (such as pre-construction submittal reviews), surveying, structural work (piling removal and off-site disposal), in-water sediment dredging, upland soil excavation, upland transportation and off-site disposal of dredged/excavated soil/sediment, and material placement (RMC in the EW navigation channel, and amended cap and backfill in the upland area, with upland backfill and slope transition backfill into the in-water portion). The indirect construction costs include confirmational sampling and testing during construction, environmental monitoring, long-term performance monitoring, inspection, and maintenance, and closure reporting.

Costs for contingency are included as a percentage of the direct construction costs (30%) and indirect construction costs (30%) to cover for T-25S Site unanticipated conditions and to reduce the overall risk of cost overruns. Contingency is applied based on consideration of potential cost uncertainty associated with the level of information currently available and engineering best professional judgment. Due to the nature of the project (sediment and soil remediation), additional factors that cannot be forecasted at this time—such as scope unknowns (significant changes in site conditions or quantities), price uncertainty (varying market conditions, increasing inflation, fuel and labor changes), or any other unforeseen circumstances (additional design requirements)—may influence contractor bidding prices and impact the final project costs outside, in excess, or below this contingency.

Unit costs are based primarily on contractor and vendor outreach, review of recent total bid costs (contractor market costs for 2024 and 2025) for cleanup projects completed in greater Seattle and Puget Sound region; however, Anchor QEA's best professional judgment and past project pricing experience with cleanup projects of similar scope were also considered. The alternative cost estimates in this Draft Final EE/CA represent the upper end of the costs for planning purposes and are considered accurate to approximately +30% and -30%, consistent with other environmental cleanup projects at the EE/CA phase.

Per EPA NTCRA guidance (EPA 1993), net present value (NPV) was applied to the long-term costs for all the alternatives after construction is completed. Long-term costs were developed for a period of 10 years and account for 1) agency review and oversight and pre-construction baseline monitoring (identified as Year 0); 2) performance monitoring (including surface sediment sampling, bathymetric/topographic surveys) and inspection and maintenance of implemented actions (starting in Year 1 for all alternatives). The NPV calculations used discount rates of 7% for Superfund activities following the Office of Management and Budget (OMB) Circular No. A-94 (OMB 1993) and 1.9% for the 10-year real discount rate following OMB Circular No. A-94 (OMB 2025), consistent with NPV application to the long-term costs in the EW IROD.

The total project costs presented in Table 6-2 include costs for the in-water area and for the current upland and future intertidal areas for the three alternatives. Appendix D presents detailed costs for each of the alternatives. The cost estimates developed in this Draft Final EE/CA are expressed in 2025 dollars.

All three alternatives have similar total project costs, with the costs for the in-water area of all three alternatives at approximately $46.1 million. Costs for the current upland and future intertidal areas for are approximately $42.4 million for Alternative 1, approximately $45.8 million for Alternative 2, and approximately $52.9 million for Alternative 3. While the removal action project costs for Alternatives 1 and 2 are lower than those for Alternative 3, Alternatives 1 and 2 have higher long-term costs associated with cap monitoring, inspection, and maintenance.

6.4 Summary of Alternatives

In summary, Alternatives 2 and 3 are comparable for effectiveness and implementability, while Alternative 1 is less protective in the long term) and high for implementability. Alternative 3 offers the advantage of complete removal of COCs from the T-25S Site without the reliance of capping to provide long-term protection, but has more significant short-term impacts during excavation associated with the largest removal and backfill volumes and longest construction duration. While Alternative 2 involves a lower volume of soil removed when compared to Alternative 3, both alternatives will result in similar effectiveness. While Alternative 2 has a slightly higher potential of residual risks at the T-25S Site from contamination remaining under the capped areas in the upland (average total PCB concentration will be approximately 70 µg/kg), the average PCB concentration is below the EW RAL, the remaining contamination is isolated by an engineered cap predicted to be protective in the long term (100 years), and the remaining contamination is below 7 feet of backfill. Costs for the in-water area are the same for all three alternatives. Costs for Alternatives 1 and 2 are lower than Alternative 3, even though Alternatives 1 and 2 have higher long-term costs associated with cap monitoring, inspection, and maintenance. The comparative analysis is summarized in Table 6-1.

7 Preferred Removal Action

This section presents the conclusions for this Draft Final EE/CA and discusses the preferred removal action alternative (Section 7.1) and design and implementation schedule (Section 7.2).

7.1 Preferred Removal Action

EPA has recommended Alternative 3 as the preferred action for the T-25S Site NTCRA. Among the three alternatives, Alternative 3 is considered the most protective of human health and the environment and will improve the overall environmental quality by reducing the long-term risks. It provides a high level of certainty of long-term effectiveness and permanence because it will meet the EW RALs and achieve the site-specific RAOs throughout the T-25S Site immediately after construction. In addition, Alternative 3 is considered the most permanent alternative because all the contaminated soils would be permanently removed and disposed of off site in permitted landfill facilities.

As stated in Section 5.4.1, the preferred alternative includes deep soil excavation in EU-1 down to the contact with native soils at 16 feet bgs (which accounts for full removal of all the EW RAL exceedances, including the highest PCB RAL exceedances and NAPL presence in EU-1) and full excavation of soils with EW RAL exceedances in EU-2 through EU-4 (to 1 foot below the habitat subgrade elevation). Soils without EW RAL exceedances in other upland areas (i.e., EU-5 through EU-9) will be removed down to the habitat subgrade and 2 feet of backfill will be placed to achieve final habitat design elevations. Excavation of EU-1 will require segregation of the overburden soil layers located above and below the soils with the highest PCB concentrations for applicable off-site disposal waste stream classification at commercial landfill facilities (approximately 61,670 cy of Subtitle D soils and 20,060 cy of Subtitle C soils).

Removal from all T-25S Site areas will be followed by placement of multiple feet of backfill to final habitat design elevations. The protectiveness of the future habitat area will be maintained in the long term by permanently excavating and disposing off site the maximum mass and volume of contaminated materials, substantially removing all sources of contamination and eliminating any potential residual risks throughout the T-25S Site. An Institutional Controls Implementation Plan may be developed for the T-25S Site depending on its timing in relation to the larger EW OU cleanup. All existing upland areas of the T-25S Site will be transformed into aquatic areas during the removal action.

As stated in Section 5.4.2, the in-water action is consistent with the applicable components of the EW IROD. Alternative 3 includes full dredging and off-site disposal of contaminated sediments (approximately 64,600 cy) in the existing in-water portion of the Site, along with debris and piling removal to the maximum extent practicable, which will reduce surface sediment concentrations below the EW RALs, thereby reducing residual risks. Also, RMC placement will considerably reduce the concentrations of generated dredge residuals from dredging in the navigational portion within the T-25S Site. Alternative 3 will cost approximately $99.0 million. Construction will be accomplished in approximately 16.1 working months. The $7.1 million incremental cost between Alternatives 2 and 3 will be significantly offset by the added environmental benefits associated with Alternative 3, which will readily achieve the greatest effectiveness (immediately eliminating any potential residual risks from the future intertidal aquatic environment) and permanence right after construction is complete and in the long term (resulting from the greatest mass removal of contaminated soils, particularly in the highest EW RAL exceedance area). The additional costs incurred by Alternative 3 (when compared to the other two alternatives) are therefore justified as this alternative offers the advantage of complete removal of COCs from the T-25S Site without the reliance of capping to provide long-term protection and eliminates the need for any cap monitoring, inspection, and maintenance.

In summary, Alternative 3:

- Is protective of human health and the environment
- Achieves the site-specific RAOs right after the NTCRA is implemented and in the long term, based on cap and recontamination modeling predictions
- Complies with ARARs
- Provides long-term effectiveness at the T-25S Site through full removal of contaminated sediments and maximum removal of contaminated soils, followed by placement of RMC, sloped backfill, and armor (in the existing in-water portion) and backfill (in the existing upland portion)
- Is technically feasible because it relies on technologies that are proven and readily available
- Is administratively implementable

Long-term performance monitoring, inspection, and maintenance of the T-25S Site will be a part of the post-NTCRA activities.

7.2 Design and Implementation Schedule

The NTCRA design is anticipated to occur between the spring 2026 and early 2028, in conjunction with the habitat restoration design, as follows:

- 30% design: May 2026 to November 2026
- 60% design: January 2027 to May 2027
- 90% design: August 2027 to December 2027
- 100% design: February 2028 to June 2028

Construction of the NTCRA and habitat restoration are anticipated to begin in fall/winter 2028.

8 References

Anchor QEA, 2020. *Terminal 25 Phase 2 Quality Assurance Project Plan Addendum*. Prepared for the Port of Seattle. July 2020.

Anchor QEA, 2021a. *Data Report: Soil and Subsurface Sediment Characterization*. Prepared for U.S. Environmental Protection Agency. Prepared by Anchor QEA on behalf of Port of Seattle. June 2021.

Anchor QEA, 2021b. *Terminal 25 Quality Assurance Project Plan Addendum 2: Subsurface Sediment Characterization*. Prepared for the Port of Seattle. May 2021.

Anchor QEA, 2023a. *Engineering Evaluation and Cost Analysis Work Plan*. Terminal 25 South Site. Prepared for the Port of Seattle. July 2023.

Anchor QEA, 2023b. *Sampling and Quality Assurance Project Plan*. Terminal 25 South Site. Prepared for the Port of Seattle. July 2023.

Anchor QEA, 2024a. *Terminal 25 South Site Draft Final Sampling and Quality Assurance Project Plan Addendum No. 1*. Prepared for the Port of Seattle. January 2024.

Anchor QEA, 2024b. Memorandum to Ravi Sanga (EPA) from Tasha Sorensen, Julia Fitts, and Dan Berlin (Anchor QEA) regarding Terminal 25 South – Laboratory Bench-Scale Treatability Study Work Plan. February 2024.

Anchor QEA and Aspect (Anchor QEA and Aspect Consulting, LLC), 2012. *Field Investigation Report, Terminal 25S Site Investigation*. Prepared for Port of Seattle. December 2012.

Anchor QEA and Windward (Anchor QEA and Windward Environmental LLC), 2019. *Final Feasibility Study. East Waterway Operable Unit Supplemental Remedial Investigation/Feasibility Study*. Prepared for the U.S. Environmental Protection Agency, Region 10, Seattle Washington. June 2019.

BEI (Blymyer Engineers, Inc.), 1989. *Environmental Site Assessment of 3225 East Marginal Way (Terminal 25), Seattle, Washington*. Prepared for Matson Terminals, Inc., San Francisco, California. January 1989.

Bridges, T., K. Gustavson, P. Schroeder, S. Ells, D. Hayes, S. Nadeau, M. Palermo, and C. Patmont, 2010. “Dredging Processes and Remedy Effectiveness: Relationship to the Four Rs of Environmental Dredging.” *Integrated Environmental Assessment and Management*. 2010, 6, 619–630.

Dragovich, J.D., P.T. Pringle, and T.J. Walsh, 1994. "Extent and Geometry of the Mid-Holocene Osceola Mudflow in the Puget Lowland – Implications for Holocene Sedimentation and Paleogeography." *Washington Geology* 22(3):3–26.

Ecology (Washington State Department of Ecology), 2012. Regarding: No Further Action Determination associated with Leaking Underground Storage Take Site: Terminal 25 LUST ID: 1591. February 2012.

Ecology, 2022a. "Cleanup and Tank Search: E Marginal Way S Bridge Rehabilitation." Accessed June 6, 2022. Available at: https://apps.ecology.wa.gov/cleanupsearch/site/12027.

Ecology, 2022b. "Cleanup and Tank Search: BEI Chempro Field Svcs PS." Accessed June 6, 2022. Available at: https://apps.ecology.wa.gov/cleanupsearch/site/84.

ecoSPEARS, 2024. (Pending; to be provided in Appendix C of the Draft Final EE/CA Report.)

EPA (U.S. Environmental Protection Agency), 1991. *Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals)*. Office of Emergency and Remedial Response, Washington, D.C. EPA 540/R-92/003. December 1991.

EPA, 1993. *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA.* OSWER Directive 9360.0-32.

EPA, 2000. Commencement Bay Nearshore/Tideflats Superfund Site – Explanation of Significant Differences. August.

EPA, 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. Office of Solid Waste and Emergency Response. U.S. Environmental Protection Agency, Washington, D.C. EPA-540-R-05-012, OSWER 9355.0-85. December 2005. Available at: http://www.epa.gov/superfund/health/conmedia/sediment/guidance.htm

EPA, 2019. National Recommend Water Quality Criteria for the Protection of Human Health, Updated 2019. Available at: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table. Accessed 3/25/2024.

EPA, 2022. *Administrative Settlement Agreement and Order on Consent for Removal Action Engineering Evaluation and Cost Analysis*. Harbor Island Superfund Site. King County, Washington. April 2023.

EPA, 2023a. *Superfund Proposed Plan*. Harbour Island Superfund Site, East Waterway Operable Unit, Terminal 25 South, Seattle, Washington. February 2022.

EPA, 2023b. National Recommended Water Quality Criteria for the Protection of Aquatic Life. Available at: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table. Accessed March 25, 2024.

EPA, 2023c. Revision of certain Federal water quality criteria applicable to Washington from 40 CFR 131.45. Available at: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-131/subpart-D/section-131.45. Accessed March 25, 2024.

EPA, 2024. Interim Record of Decision. Harbour Island Superfund Site, East Waterway Operable Unit, Seattle, Washington. May 2024.

EPA, 2025. East Waterway Interim Record of Decision correction (Errata #1). p. 103.

Integral Consulting Inc, Anchor QEA, AECOM, de maximis, inc, and Windward Environmental, LLC, 2021. *Upper 9-mile Source Control Interim Remedy Feasibility Study. Lower Passaic River Study Area Remedial Investigation and Feasibility Study*. Prepared for Lower Passaic River Cooperating Parties Group. September 2021.

ITRC (The Interstate Technology and Regulatory Council), 2014. Contaminated Sediments Remediation. Remedy Selection for Contaminated Sediments. August 2014. Available at: https://projects.itrcweb.org/contseds_remedy-selection/Content/Resources/CSRPDF.pdf

ITRC, 2023. Sediment Cap Chemical Isolation Guidance. September 2023. Available at: https://sd-1.itrcweb.org/

Joyce, J. and P.W. Jewell, 2003. Physical controls on methane ebullition from reservoirs and lakes. *Environmental and Engineering Geoscience* IX(2):167-178.

Landau and EcoChem (Landau Associates, Inc., and EcoChem, Inc.), 1990. *Soil and Ground Water Investigation, Maintenance Building – Terminal 25*. Prepared for Port of Seattle, Seattle, Washington. October 1990.

Miss, C.J., A. Valentino, B. Rinck, S.A. Boswell, and C.M. Hodges, 2008. *Archaeological Assessment, S. Holgate Street to S. King Street Viaduct Replacement*. Report on file at the Department of Archaeology and Historic Preservation, Olympia, WA.

Muckleshoot Indian Tribe and Port of Seattle, 2006. Letter of Agreement between Muckleshoot Indian Tribe and Port of Seattle Regarding Slip 27 and Terminal 115. July 13.

NRC (National Research Council), 2007. Sediment Dredging at Superfund Megasites – Assessing the Effectiveness. Committee on Sediment Dredging at Superfund Megasites. Board on Environmental Studies and Toxicology, Division of Life and Earth Studies. National Research

Council of the National Academies. The National Academies Press, 500 5th St, NW Washington D.C., 20001.

OMB, 1993. Memorandum: Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis. Office of Solid Waste and Emergency Response. OSWER Directive No. 9355.3-20. June 25, 1993. Available at: https://semspub.epa.gov/work/11/174414.pdf

OMB, 2025. Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses. OMB Circular No. A-94. Revised November, 2024. Available at: https://bidenwhitehouse.archives.gov/wp-content/uploads/2025/01/M-25-08-2025-Discount-Rates-for-OMB-Circular-No.-A-94.pdf

Palermo, M., S. Maynord, J., Miller, and D. Reible, 1998. Guidance for In-Situ Subaqueous Capping of Contaminated Sediments. Assessment and Remediation of Contaminated Sediments (ARCS) Program. Prepared for U.S. Environmental Protection Agency Great Lakes National Program Office. EPA 905-B96-004. September 1998.

Patmont, C., and M. Palermo, 2007. Case Studies of Environmental Dredging Residuals and Management Implications. Paper D-066, in: Remediation of Contaminated Sediments—2007, Proceedings of the Fourth International Conference on Remediation of Contaminated Sediments. Savannah, Georgia. January.

Pinnacle Geosciences (Pinnacle Geosciences, Inc.), 2003. *Phase I Environmental Site Assessment*. Terminal 25, South Section. Prepared for Port of Seattle. Seattle, Washington. September 2003.

Sarkar, S., N.C. Parker, J. Garson, A. Aggarwal, and S. Haskell. 2000. Place prioritization for Texas using GAP data: the use of biodiversity and environmental surrogates within socioeconomic constraints. Gap Analysis Program Bulletin 9:48–50.

SERDP (Strategic Environmental Research and Development Program), 2009. *Integrating Uncertainty Analysis in the Risk Characterization of In-Place Remedial Strategies for Contaminated Sediments*. Adriaens, P., Wright, S.J., Gruden, C.L., Wolfe, J., Redder, T., Barabas, N., DePinto, J. March 2009.

Shannon and Wilson, 2008. RE: Geotechnical Recommendations for Proposed Light Pole Foundations, Terminal 25 South Yard Expansion, Phase 2, Port of Seattle, Washington. October 2008.

Sweet-Edwards/EMCON, Inc., 1990. *Underground Storage Tank Removal and Subsurface Investigation Report*. Prepared for Port of Seattle, Seattle, Washington. January 1990.

Updegrave, C.A., 2007. *Fourteen Hundred Years of History at the Duwamish River Mouth*. Paper presented at the Geological Society of America, Boulder, CO.

W.D. Wash. 1974. U.S. v. State, 384 F.Supp. 312, 380-81.

Wilma, D., 2001a. "Straightening of Duwamish River Begins on October 14, 1913." HistoryLink.org Essay 2986. Accessed June 2022. Available at: http://www.historylink.org/File/2986.

Wilma, D., 2001b. "Harbor Island, at the Time the World's Largest Artificial Island, Is Completed in 1909." HistoryLink.org Essay 3631. Accessed June 2022. Available at https://www.historylink.org/File/3631.

Windward (Windward Environmental LLC), 2012a. *Baseline Human Health Risk Assessment*. Appendix B, East Waterway Operable Unit Supplemental Remedial Investigation/Feasibility Study. Final. September 2012.

Windward, 2012b. *Baseline Ecological Risk Assessment*. Appendix A, East Waterway Operable Unit Supplemental Remedial Investigation/Feasibility Study. Final. August 2012.

Windward and Anchor QEA, 2014. *East Waterway Operable Unit Supplemental Remedial Investigation and Feasibility Study, Final Supplemental Remedial Investigation Report*. Prepared for U.S. Environmental Protection Agency. January 2014.

Windward and Anchor QEA, 2019. *East Waterway Operable Unit Supplemental Remedial Investigation/Feasibility Study. Final Feasibility Study*. June 2019.

Tables

Table 2-1
Adjacent Property Use and Operations

Adjacent Property Name	Operator	Property Use and Operations
Terminal 25 North	Port (owner); currently vacant	Until the end of 2024, Terminal 25 North was operated by SSA Marine as a container terminal. Terminal 25 North is currently vacant with no active operations.
Hinds Outfall	City of Seattle	The South Hinds Street outfall (outfall number 107) is just north of the northern border of the T-25S Site. It is a separated storm drain and CSO owned and operated by the City of Seattle. It is the smallest CSO basin (56 acres) of the three CSOs located in the EW. Discharge is regulated under a National Pollutant Discharge Elimination System permit with the Washington State Department of Ecology (Permit WA0031682), which requires regular monitoring and reporting.
City of Seattle Right of Way	City of Seattle	The City right of way is along the southeastern boundary of the T-25S Site. This location was the site of the Bent 97 investigation, detailed in Section 2.9.2 of the EE/CA Work Plan. This portion of the T-25S Site is paved and currently used as an active construction laydown area.
EW Operable Unit	Olympic Tug and Barge	Olympic Tug and Barge moors vessels to the west of the T-25S Site within the EW Operable Unit.
Spokane Street Fishing Pier	Public	The fishing pier is open to the public and runs along the south side of the T-25S Site.
Public Bike Path	Public	A public bike path runs along East Marginal Way South and South Spokane Street adjacent to the T-25S Site.

Notes:
CSO: combined sewer overflow
EE/CA: Engineering Evaluation and Cost Analysis
EW: East Waterway
Port: Port of Seattle
SSA: Stevedoring Services of America
T-25S Site: Terminal 25 South Site

Table 2-2
Summary of Terminal 25 Site Investigations

Shannon & Wilson	1968	Upland soil investigation	Fifteen soil borings drilled to depths ranging from 30-60 feet to perform geotechnical evaluations.
Blymyer Engineers, Inc.	1989	Phase 1 ESA	Historical research and completion of a series of soil explorations were conducted. Boring locations were selected based on historical research of past T-25S Site uses. Twelve soil borings were drilled to approximately 10 feet bgs and analyzed for one or more of the following: TPHs, VOCs, SVOCs.
Sweet-Edwards/EMCON, Inc.	1990	Subsurface investigation and UST removal	Investigation documented the excavation and removal of a 3,000-gallon UST from the southwestern portion of the T-25S Site. Soil samples were collected from the excavation area, and four groundwater monitoring wells were installed. Soil and groundwater samples were analyzed for petroleum-related benzene, toluene, ethylbenzene, and xylene and TPH compounds. The wells were decommissioned and are no longer present. In 2012, the T-25S Site received a No Further Action determination by the Washington State Department of Ecology establishing that no further remedial action was necessary to clean up contamination associated with the leaking UST.
Landau Associates, Inc. and EcoChem, Inc.	1990	Upland soil and groundwater investigation	Investigation performed near the location of a former maintenance building in the southwestern portion of the T-25S Site to characterize the contaminant nature of soil and groundwater in the vicinity of a Phase 1 ESA boring from 1989. Three soil borings were drilled, and groundwater monitoring wells were installed to assess potential TPH impacts in nearshore soil and groundwater. The groundwater monitoring wells were decommissioned and are no longer present on the T-25S Site.
Pinnacle Geosciences, Inc.	2003	Phase 1 ESA	The Phase 1 ESA provides an inventory and overview of potential environmental considerations related to soil and groundwater contamination that could affect future redevelopment of the T-25S Site. The document identifies "Recognized Environmental Conditions" based on research and results of investigations completed at the T-25S Site through 2003. Additionally, key historical structures and operations as well as the potential contamination from these operations are summarized.
Shannon & Wilson	2008	Upland soil investigation	One soil boring was drilled to 81.5 feet bgs to perform geotechnical analyses for installation of new light poles at the T-25S Site.
Anchor QEA and Aspect	2012	Upland groundwater and intertidal sediment investigation	Samples of nearshore groundwater and intertidal bank sediments were collected and analyzed for metals, SVOCs, PAHs, and PCBs. Four shallow groundwater wells were installed at approximately 13 to 14.5 feet bgs along the nearshore portion of the T-25S Site to assess the quality of groundwater discharging from the T-25S Site to the EW.
Anchor QEA	2019-2020	2019 Upland soil investigation	Soil borings were collected at 15 locations. Samples were composited from material in the anticipated habitat restoration excavation intervals and tested for waste characterization parameters, including TCLP. Samples were also collected from post-excavation surface material, which represents the expected exposed surface after the proposed restoration project excavation, and analyzed for metals, PAHs, SVOCs, PCBs, and D/F. Samples for geotechnical analyses were also collected to support subsequent phases of design.

Table 2-2
Summary of Terminal 25 Site Investigations

Anchor QEA	2019-2020	2020 Upland soil investigation	Eleven borings were collected in upland locations to characterize the lateral and vertical extent of PCB contamination encountered during the 2019 upland sampling event and for additional waste characterization of the restoration project excavation material.
		In-water sediment investigation	Sediment cores were collected from nine nearshore locations in and around the piling field to support planning for habitat restoration. Cores were collected to characterize the planned dredge prism, the post-dredge (Z-layer) surface, and the nature and extent of contamination using a floating vibracore unit that could access coring locations without significant piling removal activities. Due to substantial debris encountered, several locations were offset from the target locations; two were collected outside of the project area and one had refusal after recovery of 2 feet of material. Because the sediment portion of the T-25S Site is part of the EW OU, it was presumed that the top 4 to 5 feet of the dredge prism was contaminated and would be sent to an upland landfill once removed. Sediment intervals were analyzed based on coordination with EPA to map the vertical extent of contamination.
Anchor QEA, 2020. *Terminal 25 Phase 2 Quality Assurance Project Plan Addendum.* Prepared for the Port of Seattle. July 2020.	2021	In-water sediment investigation	Nineteen subsurface sediment cores were collected throughout the subtidal areas of the planned habitat restoration footprint. Samples were collected to support delineation of the vertical extent of contamination and dredge design evaluations for the future habitat restoration. Twenty locations were planned but one was abandoned due to the presence of shallow rock or other hard material encountered. All samples were analyzed for total solids, total organic carbon, metals, SVOCs, PAHs, total PCB Aroclors and D/F and select samples were analyzed for tributyltin and pesticides.
Anchor QEA	2023-2024	EE/CA Upland soil investigation	Soil borings were collected at 42 locations. Samples were analyzed for a subset of metals, PAHs, SVOCs, PCBs, VOCs, D/F, pesticides, TBT, and TPH.
		EE/CA Groundwater investigation	Six groundwater wells were installed along the perimeter of the T-25S Site to understand groundwater quality entering the project area. Groundwater wells were sampled twice, once during wet conditions and once during dry conditions.

Table 2-2
Summary of Terminal 25 Site Investigations

Notes:

bgs: below ground surface
D/F: dioxin/furan
EE/CA: Engineering Evaluation and Cost Analysis
ESA: Environmental Site Assessment
EW: East Waterway
OU: Operable Unit
PAH: polycyclic aromatic hydrocarbons
PCB: polychlorinated biphenyls
SVOC: semivolatile organic compounds
T-25S Site: Terminal 25 South Site
TCLP: toxicity characteristic leaching procedure
TPH: total petroleum hydrocarbons
UST: underground storage tank
VOC: volatile organic compounds

References:

Anchor QEA, 2020. *Terminal 25 Phase 2 Quality Assurance Project Plan Addendum.* Prepared for the Port of Seattle. July 2020.

Anchor QEA, 2021a. *Data Report: Soil and Subsurface Sediment Characterization*. Prepared for U.S. Environmental Protection Agency. Prepared by Anchor QEA on behalf of Port of Seattle. June 2021.

Anchor QEA, 2021b. *Terminal 25 Quality Assurance Project Plan Addendum 2: Subsurface Sediment Characterization.* Prepared for the Port of Seattle. May 2021.

Anchor QEA and Aspect (Anchor QEA and Aspect Consulting, LLC), 2012. *Field Investigation Report, Terminal 25S Site Investigation*. Prepared for Port of Seattle. December 2012.

BEI (Blymyer Engineers, Inc.), 1989. *Environmental Site Assessment of 3225 East Marginal Way (Terminal 25), Seattle, Washington*. Prepared for Matson Terminals, Inc., San Francisco, California. January 1989.

Landau and EcoChem (Landau Associates, Inc., and EcoChem, Inc.), 1990. *Soil and Ground Water Investigation, Maintenance Building – Terminal 25*. Prepared for Port of Seattle, Seattle, Washington. October 1990.

Pinnacle Geosciences (Pinnacle Geosciences, Inc.), 2003. *Phase I Environmental Site Assessment*. Terminal 25, South Section. Prepared for Port of Seattle. Seattle, Washington. September 2003.

Shannon and Wilson, 2008. RE: Geotechnical Recommendations for Proposed Light Pole Foundations, Terminal 25 South Yard Expansion, Phase 2, Port of Seattle, Washington. October 2008.

Sweet-Edwards/EMCON, Inc., 1990. *Underground Storage Tank Removal and Subsurface Investigation Report*. Prepared for Port of Seattle, Seattle, Washington. January 1990.

Table 2-3
Summary of Investigations on Adjacent Properties

Investigation	Year	Investigation Details
Harbor Island Superfund Site: East Waterway Operable Unit	Ongoing	The Harbor Island, including the EW OU, was added to the National Priorities List in 1983. EPA is overseeing cleanup studies in the EW under an existing Administrative Settlement Agreement and Order on Consent with the Port (EPA Docket No. CERCLA-10-2007-0030), including completion of the SRI/FS. The SRI was approved by EPA in 2014 (Windward and Anchor QEA 2014), which included the Baseline ERA, Baseline HHRA, and assembled data to identify the nature and extent of contamination in the EW, evaluate sediment transport processes, and identify potential sources and pathways of contamination to the EW. The FS was approved by EPA in 2019 and develops and evaluates EW-wide remedial alternatives to address risks posed by COCs within the EW. EPA has issued a Proposed Plan (EPA 2023) that recommends a preferred sediment remedy and cleanup plan. After the public comment period, EPA issued an Interim Record of Decision (IROD; EPA 2024) that selected the interim remedial action. The IROD does not select cleanup levels for the EW OU. EPA anticipates developing and selecting cleanup levels in a future decision document based on data collected during and after construction of the interim action (EPA 2024).
Bent 97 Investigation	2010	Herrera conducted a partial cleanup of localized PCB-contaminated soil at the Bent 97 location in the City's right of way along the southern border of the T-25S Site in 2010. The location was adjacent to the site of the former Westinghouse laboratory building, which was present between the 1940s and 1960s. The City removed contaminated soils from the area, however confirmation testing identified remaining PCB contamination in the soil following removal (Herrera 2010). The Port conducted additional characterization of this PCB area in 2011 and 2012, which was not determined to be a source of upland contamination to EW sediments (Anchor QEA and Aspect 2012).
East Marginal Way South at Horton Street; East Marginal Way South Bridge Rehabilitation	2011	The bridge reconstruction project at East Marginal Way South and South Horton Street identified contaminants in soil exceeding MTCA Method A and B cleanup levels, including arsenic, carcinogenic polycyclic aromatic hydrocarbons, benzene and dioxin/furan toxicity equivalency in 2011 (Ecology 2022a). After contamination was identified, the site was added to Ecology's Confirmed and Suspected Contaminated Sites List. The site is currently awaiting cleanup and is monitored by Ecology as Cleanup Site ID 12027.
3400 East Marginal Way South; BEI Chempro Field Services	1988	BEI Chempro Field Services was listed as a cleanup site by Ecology due to halogenated organics that were suspected in soil. Contamination at the site was officially noted in 1988 and the site was given a No Further Action status in 1995 by Ecology based on the completion of cleanup actions that occurred prior to MTCA becoming law (Ecology 2022b).

Table 2-3
Summary of Investigations on Adjacent Properties

Notes:

COC: contaminant of concern
Ecology: Washington State Department of Ecology
EPA: Environmental Protection Agency
ERA: Ecological Risk Assessment
EW: East Waterway
FS: Feasibility Study
HHRA: Human Health Risk Assessment
MTCA: Model Toxics Control Act
OU: Operable Unit
PCB: polychlorinated biphenyls
SRI: Supplemental Remedial Investigation
T-25S Site: Terminal 25 South Site

References:

Anchor QEA and Aspect (Anchor QEA and Aspect Consulting, LLC), 2012. *Field Investigation Report, Terminal 25S Site Investigation*. Prepared for Port of Seattle. December 2012.

BEI (Blymyer Engineers, Inc.), 1989. *Environmental Site Assessment of 3225 East Marginal Way (Terminal 25), Seattle, Washington*. Prepared for Matson Terminals, Inc., San Francisco, California. January 1989.

Ecology (Washington State Department of Ecology), 2022a. "Cleanup and Tank Search: E Marginal Way S Bridge Rehabilitation." Accessed June 6, 2022. Available at: https://apps.ecology.wa.gov/cleanupsearch/site/12027.

Ecology, 2022b. "Cleanup and Tank Search: BEI Chempro Field Svcs PS." Accessed June 6, 2022. Available at: https://apps.ecology.wa.gov/cleanupsearch/site/84.

EPA (U.S. Environmental Protection Agency), 2023. Superfund Proposed Plan. Harbour Island Superfund Site, East Waterway Operable Unit, Terminal 25 South, Seattle, Washington. February 2022.

EPA, 2024. Interim Record of Decision. Harbour Island Superfund Site, East Waterway Operable Unit, Seattle, Washington. May 2024.

Herrera (Herrera Environmental Consultants, Inc.), 2010. *Bent 97 Excavation of Contaminated Soil, South Spokane Street Viaduct Widening Project.* Prepared for Seattle Department of Transportation. October 2010.

Windward and Anchor QEA, 2014. *East Waterway Operable Unit Supplemental Remedial Investigation and Feasibility Study, Final Supplemental Remedial Investigation Report*. Prepared for U.S. Environmental Protection Agency. January 2014.

Table 2-4
Summary of Terminal 25 South Site EE/CA Data

Study	Purpose of Sample Collection	Reference	Media	Sample Years	Location Count	Sample Count[a]
Soil and Groundwater						
T-25S Site soil and subsurface sediment characterization	Habitat restoration project planning	Anchor QEA (2021a)	Subsurface Soil	2019/2020	18	62 (3 FD)
T-25S EE/CA Data Gaps site soil and groundwater characterization	Nature and extent of contamination for T-25S EE/CA and habitat restoration project planning	Anchor QEA (2023, 2024)	Subsurface Soil	2023/2024	42	171 (7 FD)
			Groundwater	2023 (dry-weather)/ 2024 (wet-weather)	6	15 (2 FD)
Sediment						
EW Nature and Extent of Contamination Surface Sediment Data Report – Phases 1 and 2	Nature and extent of contamination	Windward (2002a)	Surface Sediment	2001	1	2[b]
EW Nature and Extent of Contamination Subsurface Sediment Data Report – Phase 3	Nature and extent of contamination	Windward (2002b)	Subsurface Sediment	2001	1	3
EW OU SRI/FS Surface Sediment Sampling	Nature and extent of contamination	Windward (2010)	Surface Sediment	2009	10	10
EW OU SRI/FS Subsurface Sediment Sampling	Nature and extent of contamination	Windward (2011)	Subsurface Sediment	2010	6	23
T-25S Site investigation	Collection of environmental source control data	Anchor QEA and Aspect (2012)	Surface Sediment	2011	1[c]	1 (1 FD)
T-25S Site soil and subsurface sediment characterization	Habitat restoration project planning	Anchor QEA (2021a)	Subsurface Sediment	2019/2020	8	28 (3 FD)
T-25S Site subsurface sediment characterization	Habitat restoration project planning	Anchor QEA (2021b)	Subsurface Sediment	2021	19	88 (3 FD)

Notes:

a. Sample count is number of normal field samples, with field duplicates provided in parenthesis.

b. Includes a discrete and composite sample collected from approximately the same location.

c. Composite sample

EE/CA: Engineering Evaluation and Cost Analysis

EW: East Waterway

FD: field duplicate

FS: Feasibility Study

SRI: Supplemental Remedial Investigation

References:

Anchor QEA, 2021a. Data Report: Soil and Subsurface Sediment Characterization. Prepared for U.S. Environmental Protection Agency. Prepared by Anchor QEA on behalf of Port of Seattle. June 2021.

Anchor QEA, 2021b. Terminal 25 Quality Assurance Project Plan Addendum 2: Subsurface Sediment Characterization. Prepared for the Port of Seattle. May 2021.

Anchor QEA, 2023. Anchor QEA, 2023. Sampling and Quality Assurance Project Plan. Terminal 25 South Site. Prepared for the Port of Seattle. July 2023.

Anchor QEA, 2024. Terminal 25 South Site Draft Final Sampling and Quality Assurance Project Plan Addendum No. 1. Prepared for the Port of Seattle. January 2024.

Anchor QEA and Aspect (Anchor QEA and Aspect Consulting, LLC), 2012. Field Investigation Report, Terminal 25S Site Investigation. Prepared for Port of Seattle. December 2012.

Windward (Windward Environmental LLC), 2002a. *East Waterway, Harbor Island Superfund Site: Nature and Extent of Contamination Surface Sediment Data Report – Phases 1 and 2.* Prepared for the Port of Seattle.

Windward. 2002b. *East Waterway, Harbor Island Superfund Site: Nature and Extent of Contamination. Subsurface Sediment Data Report – Phase 3*. Prepared for the Port of Seattle.

Windward 2010. *East Waterway Operable Unit Supplemental Remedial Investigation/Feasibility Study Data Report: Surface Sediment Sampling for Chemical Analyses and Toxicity Testing.* Final Report. September 2010.

Windward 2011. *East Waterway Operable Unit Supplemental Remedial Investigation/Feasibility Study Data Report: Subsurface Sediment.* Final Report. April 2011.

Table 2-5
East Waterway Remedial Action Levels

Analyte	Unit	EW RAL[1,2]
Metals (mg/kg)		
Arsenic	mg/kg	57
Mercury	mg/kg	0.41
Organometallic Compounds (mg/kg-OC)		
Tributyltin (ion)	mg/kg-OC	7.5
Polycyclic Aromatic Hydrocarbons (mg/kg-OC)		
Acenaphthene	mg/kg-OC	16
Fluoranthene	mg/kg-OC	160
Fluorene	mg/kg-OC	23
Phenanthrene	mg/kg-OC	100
Polycyclic Aromatic Hydrocarbons (µg/kg)		
Acenaphthene	µg/kg	500
Fluoranthene	µg/kg	1700
Fluorene	µg/kg	540
Phenanthrene	µg/kg	1500
PCB Aroclors (mg/kg-OC)		
Total PCB Aroclors (SMS Marine 2019) (U = 0)	mg/kg-OC	12
PCB Aroclors (µg/kg)		
Total PCB Aroclors (SMS Marine 2019) (U = 0)	µg/kg	130
Semivolatile Organics (mg/kg-OC)		
1,4-dichlorobenzene	mg/kg-OC	3.1
Butylbenzyl phthalate	mg/kg-OC	4.9
Semivolatile Organics (µg/kg)		
1,4-dichlorobenzene	µg/kg	110
Butylbenzyl phthalate	µg/kg	63
Dioxins and Furans (ng/kg)		
Total dioxin/furan TEQ 2005 (mammal) (U = 1/2)	ng/kg	25

Table 2-5
East Waterway Remedial Action Levels

Notes:
1. RALs are from EW OU Final Feasibility Study (Anchor QEA and Windward 2019).
2. Consistent with the EW FS, the LAET is used as the dry weight equivalent to SQS for compounds with OC-normalized criteria for samples outside of the appropriate TOC range. The TOC range for OC-normalization used for the T-25S Site is 0.5 to 3.5%.

--: not applicable
µg/kg: micrograms per kilogram
EW: East Waterway
FS: Feasibility Study
LAET: lowest apparent effects threshold
mg/kg: milligrams per kilogram
mg/kg-OC: milligrams per kilogram-organic carbon
ng/kg: nanograms per kilogram
OC: organic carbon
OU: Operable Unit
PCB: polychlorinated biphenyl
RAL: remedial action level
SMS: sediment management standards
TEQ: toxic equivalents quotient
TOC: total organic carbon
U: compound analyzed, but not detected above detection limit
SQS: Sediment Quality Standard

Reference:
Anchor QEA and Windward (Anchor QEA and Windward Environmental LLC), 2019. Final Feasibility Study. East Waterway Operable Unit Supplemental Remedial Investigation/Feasibility Study. Prepared for the U.S. Environmental Protection Agency, Region 10, Seattle Washington. June 2019.

Table 2-6
Soil Summary Statistics and RAL Exceedances

Analyte	Number of Locations[1]	Number of Samples	Number of Detections	Number of Samples In or Out of TOC Range[2]	Maximum Detected Result	Maximum Exceedance Ratio[3]	Minimum Detected Result	Units	East Waterway RAL	Number of Detections > East Waterway RAL[2]	Number of Non-Detects > East Waterway RAL[2]
Metals											
Arsenic	32	49	49	--	17.7	0.3	1.3	mg/kg	57	0	0
Mercury	29	38	33	--	2.5	6	0.00926	mg/kg	0.41	1	0
Organometals											
Tributyltin (ion)	8	10	0	--	--	--	--	mg/kg-OC	7.5	0	1
Semivolatile Organics											
1,4-Dichlorobenzene[4]	46	101	18	In range: 20	0.647	0.2	0.09	mg/kg-OC	3.1	0	0
				Out of range: 81	240	2	0.7	µg/kg	110	1	2
Butylbenzyl phthalate	40	75	12	In range: 19	4.65	1	0.21	mg/kg-OC	4.9	0	0
				Out of range: 56	58.5	0.9	0.9	µg/kg	63	0	1
Polycyclic Aromatic Hydrocarbons											
Acenaphthene	40	80	49	In range: 21	33	2	0.108	mg/kg-OC	16	1	0
				Out of range: 59	426	0.9	6	µg/kg	500	0	0
Fluoranthene	40	80	58	In range: 21	173	1	0.328	mg/kg-OC	160	1	0
				Out of range: 59	3,280	2	8.6	µg/kg	1,700	4	0
Fluorene	40	80	42	In range: 21	29	1	0.0908	mg/kg-OC	23	1	0
				Out of range: 59	480	0.9	8.7	µg/kg	540	0	0
Phenanthrene	40	80	55	In range: 21	135	1	1.1	mg/kg-OC	100	5	0
				Out of range: 59	3,810	3	11.8	µg/kg	1,500	4	0
Dioxin Furans											
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 max limit)	25	40	35		1,000	40	0.118	ng/kg	25	6	0
PCB Aroclors – All Data											
Total PCB Aroclors (SMS Marine 2019) (U = 0 max limit)	56	181	157	In range: 42	28,600	2000	0.67	mg/kg-OC	12	28	0
				Out of range: 139	2,500,000	20,000	3	µg/kg	130	87	0
PCB Aroclors – Excluding Focused Investigation Area											
Total PCB Aroclors (SMS Marine 2019) (U = 0 max limit)	27	57	34	In range: 20	721	60	0.67	mg/kg-OC	12	7	0
				Out of range: 37	14,100	100	3	µg/kg	130	10	0

Table 2-6
Soil Summary Statistics and RAL Exceedances

Notes:

1. Locations may have multiple sample intervals; therefore, there may be multiple SL exceedances at the same location.
2. For chemicals and chemical totals with a dry-weight and OC-normalized SL, samples with OC between 0.5 to 3.5 percent are screened against the OC-normalized SL, while samples outside this range are screened against the dry-weight SL. Non-detects are also screened against the dry-weight SL. The dry-weight SL for these chemicals is equivalent to the RALs on a dry-weight basis (e.g., 130 µg/kg is equivalent to the 12 mg/kg-OC RAL).
3. Maximum exceedance ratios are rounded to show one significant figure.
4. 1,4-dicholorobenzene is reported under two methods, most frequently under the semivolatile organic method (SW8270). Results from the volatile organic method (SW8260) are also presented in this row.

U = 1/2: totals are calculated as the sum of all detected results and half of the reporting limit of nondetect results. If all results are not detected, the highest limit value is reported as the sum.

U = 0: totals are calculated as the sum of all detected results. If all results are not detected, the highest limit value is reported as the sum.

--: not applicable

µg/kg: micrograms per kilogram

µg/kg: micrograms per kilogram

mg/kg: milligrams per kilogram

mg/kg-OC: milligrams per kilogram-organic carbon

ng/kg: nanograms per kilogram

PCB: polychlorinated biphenyl

RAL: remedial action level

SMS: sediment management standards

TEQ: toxic equivalents quotient

TOC: total organic carbon

Table 2-7a
Vertical Profile of Soil Borings with EW RAL Screening

Location ID	T25-GW-01	T25-GW-02	T25-GW-03	T25-GW-04	T25-GW-05	T25-GW-06	T25-SB-03B	T25-SB-03D	T25-SB-03E	T25-SB-03F	T25-SB-03G	T25-SB01	T25-SB02	T25-SB03
Location within Focused Investigation Area	--	--	--	--	--	--	Yes	Yes	Yes	Yes	Yes	--	--	Yes
Expected Habitat Type	Riparian	Marsh	Riparian	Riparian	Riparian	Riparian	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	12.5	13.6	16.3	16.8	17.1	16.6	15.4	15.5	15.9	15.9	16.0	15.7	12.0	15.6
Habitat Restoration Design Elevation (ft MLLW)	13.5	10.9	12.8	16.2	15.6	12.5	9.7	9.5	9.8	10.0	9.2	10.7	7.5	9.6
Removal Depth Required to Get to Habitat (ft)	N/A	2.6	3.6	0.7	1.5	4.1	5.7	6.0	6.1	5.9	6.8	5.0	4.5	6.0
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	1.0	4.6	5.6	2.7	3.5	6.1	7.7	8.0	8.1	7.9	8.8	7.0	6.5	8.0
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
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16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7a
Vertical Profile of Soil Borings with EW RAL Screening

Location ID	T25-SB04B	T25-SB05	T25-SB06	T25-SB07	T25-SB08	T25-SB09	T25-SB10	T25-SB11	T25-SB12	T25-SB13	T25-SB17	T25-SB18	T25-SB19	T25-SB20
Location within Focused Investigation Area	--	--	--	Yes	--	--	--	--	--	--	--	--	--	--
Expected Habitat Type	Riparian	High Intertidal	High Intertidal	Marsh	Marsh/High Intertidal	Marsh	Marsh	Riparian	Riparian/ Stormwater Bioswale	Riparian/ Stormwater Bioswale	Marsh	Marsh	Stormwater swale	Marsh
Current Elevation (ft MLLW)	16.6	10.6	10.5	14.9	16.3	15.6	16.4	17.0	16.8	13.9	12.0	12.4	17.1	13.0
Habitat Restoration Design Elevation (ft MLLW)	11.0	11.0	10.6	10.2	11.2	6.7	11.6	16.6	16.8	13.9	11.4	11.6	17.0	9.6
Removal Depth Required to Get to Habitat (ft)	5.6	N/A	N/A	4.7	5.1	8.9	4.8	0.4	0.0	0.0	0.7	0.8	0.1	3.4
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	7.6	1.7	2.0	6.7	7.1	10.9	6.8	2.4	2.0	2.0	2.7	2.8	2.1	5.4
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
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11–12 ft														
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13–14 ft														
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16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7a
Vertical Profile of Soil Borings with EW RAL Screening

Location ID	T25-SB21	T25-SB22	T25-SB22B	T25-SB23	T25-SB24	T25-SB25	T25-SB26	T25-SB27	T25-SB28	T25-SB29	T25-SB29C	T25-SB30	T25-SB31	T25-SB32
Location within Focused Investigation Area	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	11.8	15.4	15.4	14.6	15.5	15.9	15.8	16.1	16.3	16.3	16.2	16.2	15.4	15.2
Habitat Restoration Design Elevation (ft MLLW)	9.7	10.4	10.4	10.0	9.9	9.8	10.3	10.1	9.9	9.4	9.6	9.4	9.9	10.1
Removal Depth Required to Get to Habitat (ft)	2.1	5.0	5.0	4.6	5.5	6.1	5.6	6.0	6.4	6.9	6.6	6.8	5.5	5.2
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	4.1	7.0	7.0	6.6	7.5	8.1	7.6	8.0	8.4	8.9	8.6	8.8	7.5	7.2
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
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10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7a
Vertical Profile of Soil Borings with EW RAL Screening

Location ID	T25-SB33	T25-SB34	T25-SB35	T25-SB36	T25-SB37	T25-SB38	T25-SB39	T25-SB40	T25-SB42A	T25-SB43	T25-SB44	T25-SB46	T25-SB47	T25-SB48
Location within Focused Investigation Area	Yes	Yes	Yes	--	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	15.7	16.5	16.5	16.2	16.2	15.8	16.2	16.3	15.6	16.1	16.0	14.6	15.5	15.5
Habitat Restoration Design Elevation (ft MLLW)	10.3	9.3	9.1	10.8	8.6	10.2	10.1	9.6	9.7	9.4	9.7	10.5	10.4	10.5
Removal Depth Required to Get to Habitat (ft)	5.3	7.2	7.4	5.3	7.6	5.6	6.2	6.7	5.9	6.7	6.3	4.1	5.1	5.0
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	7.3	9.2	9.4	7.3	9.6	7.6	8.2	8.7	7.9	8.7	8.3	6.1	7.1	7.0
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
5–6 ft														
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12–13 ft														
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14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7a
Vertical Profile of Soil Borings with EW RAL Screening

Location ID	T25-SB49	T25-SB50	T25-SB51	T25-SB52
Location within Focused Investigation Area	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	15.8	14.5	14.8	15.0
Habitat Restoration Design Elevation (ft MLLW)	10.4	10.9	9.6	10.2
Removal Depth Required to Get to Habitat (ft)	5.4	3.5	5.2	4.8
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	7.4	5.5	7.2	6.8
0–1 ft				
1–2 ft				
2–3 ft				
3–4 ft				
4–5 ft				
5–6 ft				
6–7 ft				
7–8 ft				
8–9 ft				
9–10 ft				
10–11 ft				
11–12 ft				
12–13 ft				
13–14 ft				
14–15 ft				
15–16 ft				
16–17 ft				
17–18 ft				
18–19 ft				
19–20 ft				

Table 2-7a
Vertical Profile of Soil Borings with EW RAL Screening

Notes:

(grey)	No Data Available
(green)	Below RAL
(yellow)	RAL Exceedance

Red line indicates approximate depth of habitat subgrade at each boring location, actual planned habitat subgrade values are provided in the header.
EW: East Waterway
ft: feet
MLLW: mean lower low water
RAL: remedial action level

Table 2-7b
Vertical Profile of Soil Borings with EW RAL Screening – PCBs

Location ID	T25-GW-01	T25-GW-02	T25-GW-03	T25-GW-04	T25-GW-05	T25-GW-06	T25-SB-03B	T25-SB-03D	T25-SB-03E	T25-SB-03F	T25-SB-03G	T25-SB01	T25-SB02	T25-SB03
Location within Focused Investigation Area	--	--	--	--	--	--	Yes	Yes	Yes	Yes	Yes	--	--	Yes
Expected Habitat Type	Riparian	Marsh	Riparian	Riparian	Riparian	Riparian	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	12.5	13.6	16.3	16.8	17.1	16.6	15.4	15.5	15.9	15.9	16.0	15.7	12.0	15.6
Removal Depth Required to Get to Habitat (ft)	N/A	2.6	3.6	0.7	1.5	4.1	5.7	6.0	6.1	5.9	6.8	5.0	4.5	6.0
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	1.0	4.6	5.6	2.7	3.5	6.1	7.7	8.0	8.1	7.9	8.8	7.0	6.5	8.0
0–1 ft														
1–2 ft														
3–4 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
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11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7b
Vertical Profile of Soil Borings with EW RAL Screening – PCBs

Location ID	T25-SB04B	T25-SB05	T25-SB06	T25-SB07	T25-SB08	T25-SB09	T25-SB10	T25-SB11	T25-SB12	T25-SB13	T25-SB17	T25-SB18	T25-SB19	T25-SB20
Location within Focused Investigation Area	--	--	--	Yes	--	--	--	--	--	--	--	--	--	--
Expected Habitat Type	Riparian	High Intertidal	High Intertidal	Marsh	Marsh/High Intertidal	Marsh	Marsh	Riparian	Riparian/ Stormwater Bioswale	Riparian/ Stormwater Bioswale	Marsh	Marsh	Stormwater swale	Marsh
Current Elevation (ft MLLW)	16.6	10.6	10.5	14.9	16.3	15.6	16.4	17.0	16.8	13.9	12.0	12.4	17.1	13.0
Removal Depth Required to Get to Habitat (ft)	5.6	N/A	N/A	4.7	5.1	8.9	4.8	0.4	0.0	0.0	0.7	0.8	0.1	3.4
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	7.6	1.7	2.0	6.7	7.1	10.9	6.8	2.4	2.0	2.0	2.7	2.8	2.1	5.4
0–1 ft														
1–2 ft														
3–4 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
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11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7b
Vertical Profile of Soil Borings with EW RAL Screening – PCBs

Location ID	T25-SB21	T25-SB22B	T25-SB24	T25-SB25	T25-SB26	T25-SB27	T25-SB28	T25-SB29C	T25-SB30	T25-SB31	T25-SB32	T25-SB33	T25-SB34	T25-SB35
Location within Focused Investigation Area	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	11.8	15.4	15.5	15.9	15.8	16.1	16.3	16.2	16.2	15.4	15.2	15.7	16.5	16.5
Removal Depth Required to Get to Habitat (ft)	2.1	5.0	5.5	6.1	5.6	6.0	6.4	6.6	6.8	5.5	5.2	5.3	7.2	7.4
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	4.1	7.0	7.5	8.1	7.6	8.0	8.4	8.6	8.8	7.5	7.2	7.3	9.2	9.4
0–1 ft														
1–2 ft														
3–4 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7b
Vertical Profile of Soil Borings with EW RAL Screening – PCBs

Location ID	T25-SB36	T25-SB37	T25-SB38	T25-SB39	T25-SB40	T25-SB42A	T25-SB44	T25-SB46	T25-SB47	T25-SB48	T25-SB49	T25-SB50	T25-SB51	T25-SB52
Location within Focused Investigation Area	--	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	16.2	16.2	15.8	16.2	16.3	15.6	16.0	14.6	15.5	15.5	15.8	14.5	14.8	15.0
Removal Depth Required to Get to Habitat (ft)	5.3	7.6	5.6	6.2	6.7	5.9	6.3	4.1	5.1	5.0	5.4	3.5	5.2	4.8
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	7.3	9.6	7.6	8.2	8.7	7.9	8.3	6.1	7.1	7.0	7.4	5.5	7.2	6.8
0–1 ft														
1–2 ft														
3–4 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7b
Vertical Profile of Soil Borings with EW RAL Screening – PCBs

Notes:

(gray)	No Data Available
(green)	Below RAL
(yellow)	RAL Exceedance

Red line indicates approximate depth of habitat subgrade at each boring location, actual planned habitat subgrade values are provided in the header.

EW: East Waterway

ft: feet

MLLW: mean lower low water

PCB: polychlorinated biphenyl

RAL: remedial action level

Table 2-7c
Vertical Profile of Soil Borings with EW RAL Screening – D/F

Location ID	T25-GW-01	T25-GW-02	T25-GW-03	T25-GW-04	T25-GW-05	T25-GW-06	T25-SB01	T25-SB02	T25-SB03	T25-SB04B	T25-SB05	T25-SB06	T25-SB07	T25-SB08
Location within Focused Investigation Area	--	--	--	--	--	--	--	--	Yes	--	--	--	Yes	--
Expected Habitat Type	Riparian	Marsh	Riparian	Riparian	Riparian	Riparian	Marsh	Marsh	Marsh	Riparian	High Intertidal	High Intertidal	Marsh	Marsh/ High Intertidal
Current Elevation (ft MLLW)	12.5	13.6	16.3	16.8	17.1	16.6	15.7	12.0	15.6	16.6	10.6	10.5	14.9	16.3
Habitat Restoration Design Elevation (ft MLLW)	13.5	10.9	12.8	16.2	15.6	12.5	10.7	7.5	9.6	11.0	11.0	10.6	10.2	11.2
Removal Depth Required to Get to Habitat (ft)	N/A	2.6	3.6	0.7	1.5	4.1	5.0	4.5	6.0	5.6	N/A	N/A	4.7	5.1
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	1.0	4.6	5.6	2.7	3.5	6.1	7.0	6.5	8.0	7.6	1.7	2.0	6.7	7.1
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														

Table 2-7c
Vertical Profile of Soil Borings with EW RAL Screening – D/F

Location ID	T25-SB09	T25-SB10	T25-SB11	T25-SB12	T25-SB13	T25-SB17	T25-SB18	T25-SB20	T25-SB21	T25-SB37	T25-SB42A
Location within Focused Investigation Area	--	--	--	--	--	--	--	--	--	--	Yes
Expected Habitat Type	Marsh	Marsh	Riparian	Riparian/ Stormwater Bioswale	Riparian/ Stormwater Bioswale	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	15.6	16.4	17.0	16.8	13.9	12.0	12.4	13.0	11.8	16.2	15.6
Habitat Restoration Design Elevation (ft MLLW)	6.7	11.6	16.6	16.8	13.9	11.4	11.6	9.6	9.7	8.6	9.7
Removal Depth Required to Get to Habitat (ft)	8.9	4.8	0.4	0.0	0.0	0.7	0.8	3.4	2.1	7.6	5.9
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	10.9	6.8	2.4	2.0	2.0	2.7	2.8	5.4	4.1	9.6	7.9
0–1 ft											
1–2 ft											
2–3 ft											
3–4 ft											
4–5 ft											
5–6 ft											
6–7 ft											
7–8 ft											
8–9 ft											
9–10 ft											
10–11 ft											
11–12 ft											
12–13 ft											
13–14 ft											
14–15 ft											
15–16 ft											
16–17 ft											
17–18 ft											

Table 2-7c
Vertical Profile of Soil Borings with EW RAL Screening – D/F

Notes:

(grey)	No Data Available
(green)	Below RAL
(yellow)	RAL Exceedance

Red line indicates approximate depth of habitat subgrade at each boring location, actual planned habitat subgrade values are provided in the header.

D/F: dioxin/furan

EW: East Waterway

ft: feet

MLLW: mean lower low water

RAL: remedial action level

Table 2-7d
Vertical Profile of Soil Borings with EW RAL Screening – Metals

Location ID	T25-GW-01	T25-GW-02	T25-GW-03	T25-GW-04[1]	T25-GW-05	T25-GW-06	T25-SB01	T25-SB02	T25-SB03	T25-SB04B	T25-SB05	T25-SB06	T25-SB07	T25-SB08
Location within Focused Investigation Area	--	--	--	--	--	--	--	--	Yes	--	--	--	Yes	--
Expected Habitat Type	Riparian	Marsh	Riparian	Riparian	Riparian	Riparian	Marsh	Marsh	Marsh	Riparian	High Intertidal	High Intertidal	Marsh	Marsh/High Intertidal
Current Elevation (ft MLLW)	12.5	13.6	16.3	16.8	17.1	16.6	15.7	12.0	15.6	16.6	10.6	10.5	14.9	16.3
Habitat Restoration Design Elevation (ft MLLW)	13.5	10.9	12.8	16.2	15.6	12.5	10.7	7.5	9.6	11.0	11.0	10.6	10.2	11.2
Removal Depth Required to Get to Habitat (ft)	N/A	2.6	3.6	0.7	1.5	4.1	5.0	4.5	6.0	5.6	N/A	N/A	4.7	5.1
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	1.0	4.6	5.6	2.7	3.5	6.1	7.0	6.5	8.0	7.6	1.7	2.0	6.7	7.1
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														

Table 2-7d
Vertical Profile of Soil Borings with EW RAL Screening – Metals

Location ID	T25-SB09	T25-SB10	T25-SB11	T25-SB12	T25-SB13	T25-SB17	T25-SB18	T25-SB19	T25-SB20	T25-SB21	T25-SB34	T25-SB36	T25-SB37	T25-SB42A
Location within Focused Investigation Area	--	--	--	--	--	--	--	--	--	--	Yes	--	--	Yes
Expected Habitat Type	Marsh	Marsh	Riparian	Riparian/ Stormwater Bioswale	Riparian/ Stormwater Bioswale	Marsh	Marsh	Stormwater swale	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	15.6	16.4	17.0	16.8	13.9	12.0	12.4	17.1	13.0	11.8	16.5	16.2	16.2	15.6
Habitat Restoration Design Elevation (ft MLLW)	6.7	11.6	16.6	16.8	13.9	11.4	11.6	17.0	9.6	9.7	9.3	10.8	8.6	9.7
Removal Depth Required to Get to Habitat (ft)	8.9	4.8	0.4	0.0	0.0	0.7	0.8	0.1	3.4	2.1	7.2	5.3	7.6	5.9
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	10.9	6.8	2.4	2.0	2.0	2.7	2.8	2.1	5.4	4.1	9.2	7.3	9.6	7.9
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														

Table 2-7d
Vertical Profile of Soil Borings with EW RAL Screening – Metals

Location ID	T25-SB46	T25-SB48	T25-SB49	T25-SB50
Location within Focused Investigation Area	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	14.6	15.5	15.8	14.5
Habitat Restoration Design Elevation (ft MLLW)	10.5	10.5	10.4	10.9
Removal Depth Required to Get to Habitat (ft)	4.1	5.0	5.4	3.5
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	6.1	7.0	7.4	5.5
0–1 ft				
1–2 ft				
2–3 ft				
3–4 ft				
4–5 ft				
5–6 ft				
6–7 ft				
7–8 ft				
8–9 ft				
9–10 ft				
10–11 ft				
11–12 ft				
12–13 ft				
13–14 ft				
14–15 ft				
15–16 ft				
16–17 ft				
17–18 ft				

Table 2-7d
Vertical Profile of Soil Borings with EW RAL Screening – Metals

Notes:
No Data Available
Below RAL
RAL Exceedance
Red line indicates approximate depth of habitat subgrade at each boring location, actual planned habitat subgrade values are provided in the header.
Metals with RALs include arsenic and mercury.
1. The mercury concentrations in GW-04 were greater than the EW RAL for the 6 to 8 ft interval. The 10 to 12 ft interval was also analyzed for mercury, and the results were non-detect. However the mercury testing in the 10 to 12 ft interval was performed outside of the 28 day hold time (testing occurred after two times the hold time had lapsed), and the results were rejected during validation.
EW: East Waterway
ft: feet
MLLW: mean lower low water
RAL: remedial action level

Table 2-7e
Vertical Profile of Soil Borings with EW RAL Screening – PAHs

Location ID	T25-GW-01	T25-GW-02	T25-GW-03	T25-GW-04	T25-GW-05	T25-GW-06	T25-SB01	T25-SB02	T25-SB03	T25-SB04B	T25-SB05	T25-SB06	T25-SB07	T25-SB08
Location within Focused Investigation Area	--	--	--	--	--	--	--	--	Yes	--	--	--	Yes	--
Expected Habitat Type	Riparian	Marsh	Riparian	Riparian	Riparian	Riparian	Marsh	Marsh	Marsh	Riparian	High Intertidal	High Intertidal	Marsh	Marsh/High Intertidal
Current Elevation (ft MLLW)	12.5	13.6	16.3	16.8	17.1	16.6	15.7	12.0	15.6	16.6	10.6	10.5	14.9	16.3
Habitat Restoration Design Elevation (ft MLLW)	13.5	10.9	12.8	16.2	15.6	12.5	10.7	7.5	9.6	11.0	11.0	10.6	10.2	11.2
Removal Depth Required to Get to Habitat (ft)	N/A	2.6	3.6	0.7	1.5	4.1	5.0	4.5	6.0	5.6	N/A	N/A	4.7	5.1
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	1.0	4.6	5.6	2.7	3.5	6.1	7.0	6.5	8.0	7.6	1.7	2.0	6.7	7.1
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7e
Vertical Profile of Soil Borings with EW RAL Screening – PAHs

Location ID	T25-SB09	T25-SB10	T25-SB11	T25-SB12	T25-SB13	T25-SB17	T25-SB18	T25-SB19	T25-SB20	T25-SB21	T25-SB22B	T25-SB23	T25-SB29C	T25-SB34
Location within Focused Investigation Area	--	--	--	--	--	--	--	--	--	--	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Riparian	Riparian/ Stormwater Bioswale	Riparian/ Stormwater Bioswale	Marsh	Marsh	Stormwater swale	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	15.6	16.4	17.0	16.8	13.9	12.0	12.4	17.1	13.0	11.8	15.4	14.6	16.2	16.5
Habitat Restoration Design Elevation (ft MLLW)	6.7	11.6	16.6	16.8	13.9	11.4	11.6	17.0	9.6	9.7	10.4	10.0	9.6	9.3
Removal Depth Required to Get to Habitat (ft)	8.9	4.8	0.4	0.0	0.0	0.7	0.8	0.1	3.4	2.1	5.0	4.6	6.6	7.2
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	10.9	6.8	2.4	2.0	2.0	2.7	2.8	2.1	5.4	4.1	7.0	6.6	8.6	9.2
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7e
Vertical Profile of Soil Borings with EW RAL Screening – PAHs

Location ID	T25-SB35	T25-SB36	T25-SB37	T25-SB38	T25-SB39	T25-SB42A	T25-SB46	T25-SB47	T25-SB48	T25-SB49	T25-SB50	T25-SB51
Location within Focused Investigation Area	Yes	--	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	16.5	16.2	16.2	15.8	16.2	15.6	14.6	15.5	15.5	15.8	14.5	14.8
Habitat Restoration Design Elevation (ft MLLW)	9.1	10.8	8.6	10.2	10.1	9.7	10.5	10.4	10.5	10.4	10.9	9.6
Removal Depth Required to Get to Habitat (ft)	7.4	5.3	7.6	5.6	6.2	5.9	4.1	5.1	5.0	5.4	3.5	5.2
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	9.4	7.3	9.6	7.6	8.2	7.9	6.1	7.1	7.0	7.4	5.5	7.2
0–1 ft												
1–2 ft												
2–3 ft												
3–4 ft												
4–5 ft												
5–6 ft												
6–7 ft												
7–8 ft												
8–9 ft												
9–10 ft												
10–11 ft												
11–12 ft												
12–13 ft												
13–14 ft												
14–15 ft												
15–16 ft												
16–17 ft												
17–18 ft												
18–19 ft												
19–20 ft												

Table 2-7e
Vertical Profile of Soil Borings with EW RAL Screening – PAHs

Notes:

(grey)	No Data Available
(green)	Below RAL
(yellow)	RAL Exceedance

Red line indicates approximate depth of habitat subgrade at each boring location, actual planned habitat subgrade values are provided in the header.
EW: East Waterway
ft: feet
PAH: polycyclic aromatic hydrocarbons
MLLW: mean lower low water
RAL: remedial action level

Table 2-7f
Vertical Profile of Soil Borings with EW RAL Screening – SVOCs

Location ID	T25-GW-01	T25-GW-02	T25-GW-03	T25-GW-04	T25-GW-05	T25-GW-06	T25-SB01	T25-SB02	T25-SB03	T25-SB04B	T25-SB05	T25-SB06	T25-SB07	T25-SB08
Location within Focused Investigation Area	--	--	--	--	--	--	--	--	Yes	--	--	--	Yes	--
Expected Habitat Type	Riparian	Marsh	Riparian	Riparian	Riparian	Riparian	Marsh	Marsh	Marsh	Riparian	High Intertidal	High Intertidal	Marsh	Marsh/High Intertidal
Current Elevation (ft MLLW)	12.5	13.6	16.3	16.8	17.1	16.6	15.7	12.0	15.6	16.6	10.6	10.5	14.9	16.3
Habitat Restoration Design Elevation (ft MLLW)	13.5	10.9	12.8	16.2	15.6	12.5	10.7	7.5	9.6	11.0	11.0	10.6	10.2	11.2
Removal Depth Required to Get to Habitat (ft)	N/A	2.6	3.6	0.7	1.5	4.1	5.0	4.5	6.0	5.6	N/A	N/A	4.7	5.1
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	1.0	4.6	5.6	2.7	3.5	6.1	7.0	6.5	8.0	7.6	1.7	2.0	6.7	7.1
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7f
Vertical Profile of Soil Borings with EW RAL Screening – SVOCs

Location ID	T25-SB09	T25-SB10	T25-SB11	T25-SB12	T25-SB13	T25-SB17	T25-SB18	T25-SB19	T25-SB20	T25-SB21	T25-SB22B	T25-SB23	T25-SB29C	T25-SB34
Location within Focused Investigation Area	--	--	--	--	--	--	--	--	--	--	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Riparian	Riparian/ Stormwater Bioswale	Riparian/ Stormwater Bioswale	Marsh	Marsh	Stormwater swale	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	15.6	16.4	17.0	16.8	13.9	12.0	12.4	17.1	13.0	11.8	15.4	14.6	16.2	16.5
Habitat Restoration Design Elevation (ft MLLW)	6.7	11.6	16.6	16.8	13.9	11.4	11.6	17.0	9.6	9.7	10.4	10.0	9.6	9.3
Removal Depth Required to Get to Habitat (ft)	8.9	4.8	0.4	0.0	0.0	0.7	0.8	0.1	3.4	2.1	5.0	4.6	6.6	7.2
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	10.9	6.8	2.4	2.0	2.0	2.7	2.8	2.1	5.4	4.1	7.0	6.6	8.6	9.2
0–1 ft														
1–2 ft														
2–3 ft														
3–4 ft														
4–5 ft														
5–6 ft														
6–7 ft														
7–8 ft														
8–9 ft														
9–10 ft														
10–11 ft														
11–12 ft														
12–13 ft														
13–14 ft														
14–15 ft														
15–16 ft														
16–17 ft														
17–18 ft														
18–19 ft														
19–20 ft														

Table 2-7f
Vertical Profile of Soil Borings with EW RAL Screening – SVOCs

Location ID	T25-SB35	T25-SB36	T25-SB37	T25-SB38	T25-SB39	T25-SB42A	T25-SB46	T25-SB47	T25-SB48	T25-SB49	T25-SB50	T25-SB51
Location within Focused Investigation Area	Yes	--	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Expected Habitat Type	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	16.5	16.2	16.2	15.8	16.2	15.6	14.6	15.5	15.5	15.8	14.5	14.8
Habitat Restoration Design Elevation (ft MLLW)	9.1	10.8	8.6	10.2	10.1	9.7	10.5	10.4	10.5	10.4	10.9	9.6
Removal Depth Required to Get to Habitat (ft)	7.4	5.3	7.6	5.6	6.2	5.9	4.1	5.1	5.0	5.4	3.5	5.2
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	9.4	7.3	9.6	7.6	8.2	7.9	6.1	7.1	7.0	7.4	5.5	7.2
0–1 ft												
1–2 ft												
2–3 ft												
3–4 ft												
4–5 ft												
5–6 ft												
6–7 ft												
7–8 ft												
8–9 ft												
9–10 ft												
10–11 ft												
11–12 ft												
12–13 ft												
13–14 ft												
14–15 ft												
15–16 ft												
16–17 ft												
17–18 ft												
18–19 ft												
19–20 ft												

Table 2-7f
Vertical Profile of Soil Borings with EW RAL Screening – SVOCs

Notes:

(grey)	No Data Available
(green)	Below RAL
(yellow)	RAL Exceedance

Red line indicates approximate depth of habitat subgrade at each boring location, actual planned habitat subgrade values are provided in the header.

SVOCs with RALs include 1,4-dichlorobenzene and butylbenzyl phthalate.

1,4-dicholorobenzene is reported under two methods, most frequently under the semivolatile organic method (SW8270). Results from the volatile organic method (SW8260) are also presented.

EW: East Waterway

ft: feet

MLLW: mean lower low water

RAL: remedial action level

SVOCs: semivolatile organic compounds

Table 2-7g
Vertical Profile of Soil Borings with EW RAL Screening – TBT

Location ID	T25-GW-02	T25-GW-03	T25-GW-05	T25-SB17	T25-SB19	T25-SB21	T25-SB24	T25-SB37
Location within Focused Investigation Area	--	--	--	--	--	--	Yes	--
Expected Habitat Type	Marsh	Riparian	Riparian	Marsh	Stormwater swale	Marsh	Marsh	Marsh
Current Elevation (ft MLLW)	13.6	16.3	17.1	12.0	17.1	11.8	15.5	16.2
Habitat Restoration Design Elevation (ft MLLW)	10.9	12.8	15.6	11.4	17.0	9.7	9.9	8.6
Removal Depth Required to Get to Habitat (ft)	2.6	3.6	1.5	0.7	0.1	2.1	5.5	7.6
Removal Depth Required to Get to Habitat Subgrade (2 ft below habitat restoration design elevation)	4.6	5.6	3.5	2.7	2.1	4.1	7.5	9.6
0–1 ft								
1–2 ft								
2–3 ft								
3–4 ft								
4–5 ft								
5–6 ft								
6–7 ft								
7–8 ft								
8–9 ft								
9–10 ft								
10–11 ft								
11–12 ft								

Table 2-7g
Vertical Profile of Soil Borings with EW RAL Screening – TBT

Notes:

(gray)	No Data Available
(green)	Below RAL
(yellow)	RAL Exceedance

Red line indicates approximate depth of habitat subgrade at each boring location, actual planned habitat subgrade values are provided in the header.

EW: East Waterway

ft: feet

MLLW: mean lower low water

RAL: remedial action level

TBT: tributyltin

Table 2-8
NAPL Observations

Location ID	Sample Date	Attempt Number	Boring Depth (ft bgs)	Visual Observation Start Depth (ft bgs)	Visual Observation End Depth (ft bgs)	Shake Test Depth (ft bgs)	Shake Test Result (Positive or Negative)	Visual Observation Description	Observation Type based on Multiple Lines of Evidence[1]	Soil Type	Depth to Native Material (ft bgs)	NAPL Vertical Delineation Status
T25-SB22	10/5/2023	1	20	14	16	NA	NA	Interior of sample liner coated with NAPL (sample not processed)[2]	NAPL coated	Sand, wood, very wet (fill)	Not identified	Delineated
T25-SB22B	1/26/2024	1	20	7	8	7-8	Positive	Shake test performed due to elevated PID readings and petroleum-like odor	Sheen to NAPL blebs	Silt, 30-50% wood, dry to moist (fill)	16.4	Delineated
				NA	NA	10-11	Negative	None	NA	NA		
				14	16	NA	NA	Rainbow sheen observed on sampling spoon and bowl during decontamination (visible in field photos)	NAPL blebs	50-60% wood, M-F sand, moist (fill)		
T25-SB33	10/4/2023	2	20	9	10	NA	NA	Silvery sheen visible in field photos	Sheen	Wood with silt, dry to moist (fill)	17.2	Delineated
				12.5	14	NA	NA	Silvery sheen observed on sample, petroleum-like odor; silvery sheen visible in field photos	Sheen	Wood with silt, dry to wet (fill)		
T25-SB38	1/22/2024	1	20	5	6.6	5-6	Positive	Shake test performed due to elevated PID readings; silvery sheen visible in field photos	Sheen to NAPL blebs	M-F sand, dry to moist (fill)	15.0	Delineated
				13	15	13-14	Positive	Shake test performed due to elevated PID readings and petroleum-like odor; possible small (less than 0.25 millimeter in diameter) spots of NAPL staining on sample liner in field photos	NAPL blebs	M-F sand, moist to wet (fill)		
T25-SB46	2/1/2024	1	20	11.2	14.5	NA	NA	Silvery to rainbow sheen observed on sample; amber NAPL blebs observed during borehole cleanout from 10-15 ft; silvery sheen visible in field photos	Sheen to NAPL blebs	30-90% wood, silt, wet to very wet (fill)	14.5	Delineated
T25-SB47	1/22/2024	1	25	13	15	NA	NA	Silvery sheen visible in field photos	Sheen	Silty M-F sand, 20-95% wood, moist to wet (fill)	15.0	Delineated
				17	20	19-20	Positive	Rainbow sheen observed on sample, NAPL staining on sample liner; sheen visible in field photos	NAPL blebs	F sand, trace wood, very wet (native material)		
T25-SB48	1/24/2024	1	20	9	10	NA	NA	Sheen observed on sampling spoon and bowl decontamination water	Sheen	60% wood, silt with gravel, dry to moist	16.0	Delineated
				11.7	13.3	NA	NA	Silvery sheen observed on sample, odor; sheen and NAPL observed during borehole cleanout from 10-20 ft	Sheen to NAPL blebs	Sand with silt, 20-40% wood, moist (fill)		
				NA	NA	14-14.5	Negative	None	NA	NA		
				15	16	15-15.6	Negative	Silvery sheen observed on sample, petroleum-like odor (shake test negative for NAPL); sheen and NAPL observed during borehole cleanout from 10-20 ft	Sheen	40-60% wood, silt, moist (fill)		

Table 2-8
NAPL Observations

Location ID	Sample Date	Attempt Number	Boring Depth (ft bgs)	Visual Observation Start Depth (ft bgs)	Visual Observation End Depth (ft bgs)	Shake Test Depth (ft bgs)	Shake Test Result (Positive or Negative)	Visual Observation Description	Observation Type based on Multiple Lines of Evidence[1]	Soil Type	Depth to Native Material (ft bgs)	NAPL Vertical Delineation Status
T25-SB49	1/31/2024	1	20	1	3.5	1-2	Positive	Shake tests performed due to elevated PID readings and petroleum-like odor; staining and silvery sheen visible in field photos	NAPL blebs	Silty sand with gravel, dry to moist (fill)	17.5	Delineated
						2-3	Positive					
						3-3.5	Positive					
				11.3	13	12-13	Positive	Shake test performed due to elevated PID readings; silvery sheen visible in field photos	Sheen to NAPL blebs	95-100% wood, moist (fill)		
				NA	NA	13-14	Negative	None	NA	NA		
						14-15	Negative					
T25-SB50	1/24/2024	1	20	7.9	17	9-10	Positive	Shake test performed due to elevated PID readings and petroleum-like odor; sheen observed on sample from 15-17 ft; silvery sheen visible in field photos	Sheen to NAPL blebs	85-100% wood, silt, moist (fill)	17.0	Delineated
T25-SB51	1/31/2024	1	20	10	14	10-11	Positive	Silvery sheen observed on sample and in field photos	Sheen to NAPL blebs	Silt, 50% wood, wet (fill)	18.3	Delineated
				17.3	18.3	NA	NA	Silvery sheen visible in field photos	Sheen	Silt and wood, very wet (fill)		
T25-SB52	2/1/2024	1	20	6	7	NA	NA	Silvery sheen observed on sample and in field photos	Sheen	Cobbles, F gravel, C-F sand, wood, very wet (fill)	15.3	Delineated
				10	12	NA	NA	Silvery sheen observed on sample and in field photos	Sheen	Wood, 20% silt, very wet (fill)		

Notes:
1. Observations were classified based on a combination of direct visual observations of the sample, shake test results, and indirect observations (i.e., observations made from sample liners, decontamination water, drill water, or field photographs). Where indirect observations indicate the presence of some degree of sheen or NAPL, the observation type is provided as a range, reflecting that the quantity of NAPL present in the sample is an estimate.
2. The sample liner for T25-SB22 was not opened due to health and safety concerns relating to strong odor and visible NAPL in the sample. The observations reported here were made from the outside of the unopened sample liner.
bgs: below ground surface
C: coarse
F: fine
ft: feet
M: medium
NA: not applicable
NAPL: non-aqueous phase liquid

Table 2-9
Vertical Profile of Soil Borings with NAPL Observations

Location ID	T25-SB22	T25-SB22B	T25-SB33	T25-SB38	T25-SB46	T25-SB47	T25-SB48	T25-SB49	T25-SB50	T25-SB51	T25-SB52
Expected Habitat Type	**Marsh**	**Marsh**	**Marsh**	**Marsh**	**Marsh**	**Marsh**	**Marsh**	**Marsh**	**Marsh**	**Marsh**	**Marsh**
Current Elevation (ft MLLW)	**15.4**	**15.4**	**15.7**	**15.8**	**14.6**	**15.5**	**15.5**	**15.8**	**14.5**	**14.8**	**15.0**
Total Depth of Observations (ft)	**20**	**20**	**20**	**20**	**20**	**25**	**20**	**20**	**20**	**20**	**20**
0–1 ft											
1–2 ft											
2–3 ft											
3–4 ft											
4–5 ft											
5–6 ft											
6–7 ft											
7–8 ft											
8–9 ft											
9–10 ft											
10–11 ft											
11–12 ft											
12–13 ft											
13–14 ft											
14–15 ft											
15–16 ft											
16–17 ft											
17–18 ft											
18–19 ft											
19–20 ft											
20–21 ft											
21–22 ft											
22–23 ft											
23–24 ft											
24–25 ft											

Notes:

Thick black line indicates approximate fill/native interface, rounded to the deepest whole foot. The depth value for T25-SB22 is not included as the sample liner was not opened due to health and safety concerns relating to strong odor and visible NAPL in the sample.

Observations were classified based on a combination of direct visual observations of the sample, shake test results, and indirect observations (i.e., observations made from sample liners, decontamination water, drill water, or field photographs). Where indirect observations indicate the presence of some degree of sheen or NAPL, the observation type is provided as a range, reflecting that the quantity of NAPL present in the sample is an estimate.

ft: feet

MLLW: mean lower low water

NAPL: non-aqueous phase liquid

NAPL coated
NAPL blebs
Sheen to NAPL blebs
Sheen
No NAPL or sheen observed

Table 2-10
TPH and BTEX Sample Data

Location ID	Sample ID	PID Reading (ppm)	Total Petroleum Hydrocarbons (mg/kg)			BTEX (µg/kg)					
			Diesel range hydrocarbons	Gasoline range hydrocarbons	Motor oil range hydrocarbons	Benzene	Ethylbenzene	m,p-Xylene	o-Xylene	Toluene	Total BTEX (U=0)
T25-SB22	T25-SB22-9-10	507	--	--	--	ND	ND	ND	ND	6.3	6.3
T25-SB22B	T25-SB22B-9-10-240126	56	ND	ND	ND	ND	ND	ND	ND	3.3	3.3
T25-SB27	T25-SB27-8-9-240126	0.0	2600	ND	18000	2.5	2.7	11	8.4	1.9	27
	T25-SB27-9-10-240126	0.0	1600	ND	11000	ND	ND	ND	1.2	ND	1.2
	T25-SB27-10-11-240126	0.0	190	ND	680	ND	ND	ND	ND	ND	0
T25-SB28	T25-SB28-8-9-240125	0.7	1000	ND	4600	1.7	2.4	2.5	2.7	ND	9.3
	T25-SB28-9-10-240125	0.0	ND	ND	640	ND	ND	ND	ND	ND	0
	T25-SB28-10-11-240125	0.0	ND	ND	ND	ND	ND	ND	ND	ND	0
T25-SB29	T25-SB29-6.5	>15,000[1]	--	--	--	ND	5000	8500	1900	ND	15400
T25-SB29C	T25-SB29C-1-2-240130	16	ND	55	ND	ND	51	2.5	ND	ND	54
	T25-SB29C-8-9-240130	0.8	--	--	--	560	690	1000	53	3.9	2307
T25-SB30	T25-SB30-6-7	3,754	--	--	--	ND	ND	ND	ND	ND	0
	T25-SB30-7-8	2,007	--	--	--	ND	ND	ND	ND	ND	0
T25-SB35	T25-SB35-11-12-240129	83	200	8	ND	2.4	8.4	3.7	3.1	1.1	19
T25-SB38	T25-SB38-5-6-240122	143	730	1400	ND	ND	8.8	ND	2	ND	11
	T25-SB38-13-14-240122	36	190	250	ND	ND	ND	ND	ND	ND	0
	T25-SB38-15-16-240122	0.6	--	ND	--	--	--	--	--	--	--
	T25-SB38-16-17-240122	0.0	--	ND	--	--	--	--	--	--	--
T25-SB43	T25-SB43-6-7-240123	7.8	--	ND	--	ND	12	2.2	ND	ND	14
	T25-SB43-10-11-240123	2.3	--	ND	--	ND	ND	ND	ND	ND	0
T25-SB48	T25-SB48-5-6-240124	0.0	--	ND	--	ND	ND	ND	ND	ND	0
	T25-SB48-9-10-240124	1.0	--	ND	--	ND	ND	3.1	2.3	ND	5.4
T25-SB49	T25-SB49-12-13-240131	41	1600	620	2500	ND	ND	ND	ND	ND	0
	T25-SB49-14-15-240131	318	300	ND	2800	ND	ND	ND	ND	1.3	1.3
T25-SB50	T25-SB50-7-8-240124	0.3	740	--	2200	--	--	--	--	--	--
	T25-SB50-9-10-240124	0.4	2100	ND	3900	ND	ND	ND	ND	ND	0
	T25-SB50-10-11-240124	2.7	6400	--	15000	--	--	--	--	--	--
	T25-SB50-11-12-240124	11	4400	--	8800	--	--	--	--	--	--
T25-SB51	T25-SB51-10-11-240131	112	120	860	ND	ND	ND	ND	ND	ND	0
	T25-SB51-11-12-240131	112	--	ND	--	ND	ND	ND	ND	1.3	1.3
	T25-SB51-12-13-240131	1.0	--	ND	--	ND	ND	ND	ND	ND	0

Notes:
1. 15,000 ppm is the limit for the PID unit utilized in the field.
--: no data
µg/kg: microgram per kilogram
BTEX: benzene, toluene, ethylbenzene and xylene compounds
mg/kg: milligrams per kilogram
ND: non-detect result
PID: photoionization detector
ppm: parts per million
TPH: total petroleum hydrocarbons

Table 2-11
VOC Data Summary and PCB RAL Exceedance Status

Sample ID	PID Reading	Total VOCs (μg/kg)[a]	Number of Detected VOCs	PCB Exceedances in Boring
T25-SB07-13.4-13.5	13.6	16000	2	No exceedance
T25-SB07-16-16.1	0.1	81	3	No exceedance
T25-SB09-15.5-15.6	--	40	3	>RAL
T25-SB09-9.9-10	100.7	76000	8	>RAL
T25-SB22-9-10	507	4000	2	>RAL
T25-SB22B-9-10-240126	56	310	3	>RAL
T25-SB1023-14-16	1.0	120	1[b]	--
T25-SB27-8-9-240126	0	100	6	>RAL
T25-SB1027-8-9-240126	0	160	6	>RAL
T25-SB27-9-10-240126	0	13	2	>RAL
T25-SB1027-9-10-240126	0	26	4	>RAL
T25-SB28-8-9-240125	0.7	900	5	>RAL
T25-SB1028-8-9-240125	0.7	1100	5	>RAL
T25-SB28-9-10-240125	0	110	1	>RAL
T25-SB29-6.5	--	340000	10	>RAL
T25-SB29C-1-2-240130	16	940	6	>RAL
T25-SB29C-8-9-240130	0.8	3800	9	>RAL
T25-SB30-6-7	--	140	2	>RAL
T25-SB35-11-12-240129	83	4800	7	>RAL
T25-SB37-10-12	--	140	1[b]	>RAL
T25-SB38-13-14-240122	36	570	4	>RAL
T25-SB38-5-6-240122	143	3800	8	>RAL
T25-SB39-15-16-240123	0	64	1	>RAL
T25-SB43-10-11-240123	2	670	2	--
T25-SB43-6-7-240123	8	230	4	--
T25-SB48-9-10-240124	1.0	340	3	>RAL
T25-SB49-12-13-240131	41	520	1	>RAL
T25-SB49-14-15-240131	318	450	2	>RAL
T25-SB50-9-10-240124	0	660	1	>RAL
T25-SB51-10-11-240131	112	110000	1	>RAL
T25-SB51-11-12-240131	112	14000	2	>RAL
T25-SB51-12-13-240131	1.0	1700	2	>RAL

Table 2-11
VOC Data Summary and PCB RAL Exceedance Status

Notes:

RAL indicates the boring had PCB concentrations greater than the EW RAL (130 μg/kg or 12 mg/kg-OC)

--: indicates no PCB data is available for the boring

a. Total VOCs is the sum of all VOCs detected via method SW8260 rounded to two significant figures.

b. Only 4-isopropyltoluene data available for this sample.

μg/kg: microgram per kilogram

mg/kg-OC: milligrams per kilogram-organic carbon

EW: East Waterway

PCB: polychlorinated biphenyl

PID: photoionization detector

RAL: remedial action levels

VOC: volatile organic compound

Table 2-12

Summary of EW RAL Exceedances in Soil and Sediment

Analyte	EW RAL Exceedances in Soil[1]	EW RAL Exceedances in Sediment[1]
Metals		
Arsenic	No	No
Mercury	No	Yes
Organometals		
Tributyltin (ion)	Yes (non-detect only)	Yes
Semivolatile Organics		
1,4-Dichlorobenzene	Yes	Yes
Butylbenzyl phthalate	Yes (non-detect only)	Yes
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	Yes	Yes
Fluoranthene	Yes	Yes
Fluorene	Yes	Yes
Phenanthrene	Yes	Yes
Dioxins/Furans		
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 max limit)	Yes	Yes
PCB Aroclors		
Total PCB Aroclors (SMS Marine 2019) (U = 0 max limit)	Yes	Yes

Notes:

1. If only non-detect exceedances were identified for a given analyte, "non-detect only" is noted parenthetically.

EW: East Waterway

PCB: polychlorinated biphenyl

RAL: remedial action level

SMS: sediment management standards

TEQ: toxic equivalents quotient

Table 2-13

Sediment Summary Statistics and RAL Exceedances

Analyte	Number of Locations[1]	Number of Samples	Number of Detections	Number of Samples In or Out of TOC Range[2]	Maximum Detected Result	Maximum Exceedance Ratio[3]	Minimum Detected Result	Units	East Waterway RAL	Number of Detections > East Waterway RAL[2]	Number of Non-Detects > East Waterway RAL[2]
Metals											
Arsenic	46	106	105	--	32.4	0.6	1.11	mg/kg	57	0	0
Mercury	46	125	113	--	2.35	6	0.00541	mg/kg	0.41	38	0
Organometals											
Tributyltin (ion)	9	12	7	--	8.5	1	0.061	mg/kg-OC	7.5	1	2
Semivolatile Organics											
1,4-Dichlorobenzene	46	118	44	In range: 59	8.79	3	0.1	mg/kg-OC	3.1	1	0
				Out of range: 59	2,300	20	1.1	µg/kg	110	2	0
Butylbenzyl phthalate	46	118	19	In range: 59	9.01	2	0.77	mg/kg-OC	4.9	1	0
				Out of range: 59	76	1	47	µg/kg	63	1	5
Polycyclic Aromatic Hydrocarbons											
Acenaphthene	46	139	105	In range: 67	462	30	0.697	mg/kg-OC	16	15	0
				Out of range: 72	8,620	20	8.2	µg/kg	500	14	0
Fluoranthene	46	136	115	In range: 66	3,910	20	0.834	mg/kg-OC	160	7	0
				Out of range: 70	33,900	20	8.3	µg/kg	1,700	28	0
Fluorene	46	139	101	In range: 67	500	20	0.86	mg/kg-OC	23	11	0
				Out of range: 72	5,540	10	15.8	µg/kg	540	13	0
Phenanthrene	46	136	114	In range: 66	4,470	50	0.855	mg/kg-OC	100	7	0
				Out of range: 70	10,600	7	9.7	µg/kg	1,500	15	0
Dioxins/Furans											
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 max limit)	31	93	74	--	890	40	0.22	ng/kg	25	31	0
PCB Aroclors											
Total PCB Aroclors (SMS Marine 2019) (U = 0 max limit)	46	126	102	In range: 64	300	30	0.059	mg/kg-OC	12	26	0
				Out of range: 62	16,800	100	0.8	µg/kg	130	28	0

Notes:

1. Locations may have multiple sample intervals; therefore, there may be multiple SL exceedances at the same location.
2. For chemicals and chemical totals with a dry-weight and OC-normalized SL, samples with OC between 0.5 to 3.5 percent are screened against the OC-normalized SL, while samples outside this range are screened against the dry-weight SL. Non-detects are also screened against the dry-weight SL. The dry-weight SL for these chemicals is equivalent to the RALs on a dry-weight basis (e.g., 130 µg/kg is equivalent to the 12 mg/kg-OC RAL).
3. Maximum exceedance ratios are rounded to show one significant figure.

--: not applicable
µg/kg: micrograms per kilogram
mg/kg: milligrams per kilogram
mg/kg-OC: milligrams per kilogram-organic carbon
ng/kg: nanograms per kilogram
OC: organic carbon
PCB: polychlorinated biphenyl
RAL: remedial action level
SL: screening level
SMS: sediment management standards
TEQ: toxic equivalents quotient
TOC: total organic carbon
U = 1/2: totals are calculated as the sum of all detected results and half of the reporting limit of nondetect results. If all results are not detected, the highest limit value is reported as the sum.
U = 0: totals are calculated as the sum of all detected results. If all results are not detected, the highest limit value is reported as the sum.

Table 2-14
Summary of Groundwater Results and Screening

	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CCC (chronic)[b]	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CMC (acute)[b]	National Recommended Water Quality Criteria – Human Health for the Consumption of Organisms (CWA304)[b]	EPA Human Health SW Criteria - Marine Organisms Only (EPA 40 CFR 131.45)[b]	T25-GW-01	T25-GW-01	T25-GW-01	T25-GW-02	T25-GW-02	T25-GW-03
				Sample ID	T25-GW01-230928	T25-GW1001-230928	T25-GW01-240110	T25-GW02-230929	T25-GW02-240109	T25-GW03-230930
				Sample Date	9/28/2023	9/28/2023	1/10/2024	9/29/2023	1/9/2024	9/30/2023
				Sample Type	Normal	Field Duplicate	Normal	Normal	Normal	Normal
				Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
				X	1267960.88	1267960.88	1267960.88	1267960.66	1267960.66	1267942.43
				Y	212761.87	212761.87	212761.87	212532.51	212532.51	212278.58
Metals (µg/L)										
Arsenic	36	69	0.14	0.14	**48.1**	**47.3**	**16.2 J**	**6.3**	**5.2**	2.0 U
Mercury	0.94	1.8	--	--	0.020 UJ	0.020 UJ	0.020 U	0.020 U	0.040 U	0.020 UJ
Metals, Dissolved (µg/L)										
Arsenic	36	69	0.14	0.14	**52.4**	**49.4**	**22.3 J**	**6.45**	**3.87**	2.0 U
Mercury	0.94	1.8	--	--	0.020 UJ	0.020 UJ	0.020 U	0.020 U	0.040 U	0.020 UJ
Semivolatile Organics (µg/L)										
1,4-Dichlorobenzene	--	--	900	200	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Butylbenzyl phthalate	--	--	0.1	0.013	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Polycyclic Aromatic Hydrocarbons (µg/L)										
Acenaphthene	--	--	90	30	**0.015**	**0.013**	0.010 U	0.010 U	**0.015**	**0.27**
Fluoranthene	--	--	20	6	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Fluorene	--	--	70	10	0.015 U	0.015 U	0.010 U	0.015 U	0.010 U	0.058 U
Phenanthrene	--	--	--	--	0.030 U	0.030 U	0.010 U	0.030 U	**0.016**	0.035 U
PCB Aroclors (µg/L)										
Aroclor 1016	--	--	--	--	0.050 UJ	0.050 UJ	0.050 U	0.050 UJ	0.050 UJ	0.050 U
Aroclor 1221	--	--	--	--	0.050 UJ	0.050 UJ	0.050 U	0.050 UJ	0.050 UJ	0.050 U
Aroclor 1232	--	--	--	--	0.050 UJ	0.050 UJ	0.050 U	0.050 UJ	0.050 UJ	0.050 U
Aroclor 1242	--	--	--	--	0.050 UJ	0.050 UJ	0.050 U	0.050 UJ	0.050 UJ	0.050 U
Aroclor 1248	--	--	--	--	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1254	--	--	--	--	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1260	--	--	--	--	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1262	--	--	--	--	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1268	--	--	--	--	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Total PCB Aroclors (U = 0 max limit)	0.03	--	0.000064	0.000007	0.05 UJ	0.05 UJ	0.05 U	0.05 UJ	0.05 UJ	0.05 U

Table 2-14
Summary of Groundwater Results and Screening

	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CCC (chronic)[b]	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CMC (acute)[b]	National Recommended Water Quality Criteria – Human Health for the Consumption of Organisms (CWA304)[b]	EPA Human Health SW Criteria - Marine Organisms Only (EPA 40 CFR 131.45)[b]	T25-GW-03	T25-GW-04	T25-GW-04	T25-GW-05	T25-GW-05	T25-GW-05
				Sample ID	T25-GW03-240108	T25-GW04-230929	T25-GW04-240108	T25-GW05-230930	T25-GW05-240109	T25-GW105-240109
				Sample Date	1/8/2024	9/29/2023	1/8/2024	9/30/2023	1/9/2024	1/9/2024
				Sample Type	Normal	Normal	Normal	Normal	Normal	Field Duplicate
				Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
				X	1267942.43	1267801.88	1267801.88	1267638.99	1267638.99	1267638.99
				Y	212278.58	212241.07	212241.07	212236.69	212236.69	212236.69
Metals (μg/L)										
Arsenic	36	69	0.14	0.14	2.0 U	**1.92**	**1.74**	5.0 U	**4.68 J**	**2.24 J**
Mercury	0.94	1.8	--	--	0.020 U	0.020 U	0.020 U	0.020 UJ	0.040 U	0.040 U
Metals, Dissolved (μg/L)										
Arsenic	36	69	0.14	0.14	2.0 U	**1.83**	**1.3**	5.0 U	**1.88**	**1.88**
Mercury	0.94	1.8	--	--	0.020 U	0.020 U	0.020 U	0.020 UJ	0.040 U	0.040 U
Semivolatile Organics (μg/L)										
1,4-Dichlorobenzene	--	--	900	200	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Butylbenzyl phthalate	--	--	0.1	0.013	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Polycyclic Aromatic Hydrocarbons (μg/L)										
Acenaphthene	--	--	90	30	**0.32**	0.010 U	0.10 U	**0.018**	**0.037 J**	**0.018 J**
Fluoranthene	--	--	20	6	**0.011**	**0.011**	**0.012**	0.010 U	**0.031 J**	0.010 UJ
Fluorene	--	--	70	10	0.10 U	0.015 U	0.10 U	0.010 U	**0.026 J**	0.010 UJ
Phenanthrene	--	--	--	--	**0.052**	0.030 U	**0.021**	0.015 U	**0.074 J**	0.010 UJ
PCB Aroclors (μg/L)										
Aroclor 1016	--	--	--	--	0.050 UJ	0.050 UJ	0.050 UJ	0.050 U	0.050 UJ	0.050 UJ
Aroclor 1221	--	--	--	--	0.050 UJ	0.050 UJ	0.050 UJ	0.050 U	0.050 UJ	0.050 UJ
Aroclor 1232	--	--	--	--	0.050 UJ	0.050 UJ	0.050 UJ	0.050 U	0.050 UJ	0.050 UJ
Aroclor 1242	--	--	--	--	0.050 UJ	0.050 UJ	0.050 UJ	0.050 U	0.050 UJ	0.050 UJ
Aroclor 1248	--	--	--	--	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1254	--	--	--	--	0.050 U	0.050 U	0.050 U	**0.096**	0.050 U	0.050 U
Aroclor 1260	--	--	--	--	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1262	--	--	--	--	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor 1268	--	--	--	--	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Total PCB Aroclors (U = 0 max limit)	0.03	--	0.000064	0.000007	0.05 UJ	0.05 UJ	0.05 UJ	**0.096**	0.05 UJ	0.05 UJ

Table 2-14
Summary of Groundwater Results and Screening

	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CCC (chronic)[b]	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CMC (acute)[b]	National Recommended Water Quality Criteria – Human Health for the Consumption of Organisms (CWA304)[b]	Location ID / Sample ID / Sample Date / Sample Type / Matrix / X / Y / EPA Human Health SW Criteria - Marine Organisms Only (EPA 40 CFR 131.45)[b]	T25-GW-06 / T25-GW06-230930 / 9/30/2023 / Normal / Groundwater / 1267508.71 / 212247.54	T25-GW-06 / T25-GW06-240109 / 1/9/2024 / Normal / Groundwater / 1267508.71 / 212247.54
Metals (µg/L)						
Arsenic	36	69	0.14	0.14	**29.6**	**22.2**
Mercury	0.94	1.8	--	--	0.020 UJ	0.040 U
Metals, Dissolved (µg/L)						
Arsenic	36	69	0.14	0.14	**28.1**	**20.8**
Mercury	0.94	1.8	--	--	0.020 UJ	0.20 U
Semivolatile Organics (µg/L)						
1,4-Dichlorobenzene	--	--	900	200	0.10 U	0.10 U
Butylbenzyl phthalate	--	--	0.1	0.013	1.0 U	1.0 U
Polycyclic Aromatic Hydrocarbons (µg/L)						
Acenaphthene	--	--	90	30	0.010 U	0.010 U
Fluoranthene	--	--	20	6	0.010 U	0.010 U
Fluorene	--	--	70	10	0.010 U	0.010 U
Phenanthrene	--	--	--	--	0.010 U	0.010 U
PCB Aroclors (µg/L)						
Aroclor 1016	--	--	--	--	0.050 U	0.050 UJ
Aroclor 1221	--	--	--	--	0.050 U	0.050 UJ
Aroclor 1232	--	--	--	--	0.050 U	0.050 UJ
Aroclor 1242	--	--	--	--	0.050 U	0.050 UJ
Aroclor 1248	--	--	--	--	0.050 U	0.050 UJ
Aroclor 1254	--	--	--	--	0.050 U	0.050 UJ
Aroclor 1260	--	--	--	--	0.050 U	0.050 UJ
Aroclor 1262	--	--	--	--	0.050 U	0.050 UJ
Aroclor 1268	--	--	--	--	0.050 U	0.050 UJ
Total PCB Aroclors (U = 0 max limit)	0.03	--	0.000064	0.000007	0.05 U	0.05 UJ

Table 2-14
Summary of Groundwater Results and Screening

	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CCC (chronic)[b]	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CMC (acute)[b]	National Recommended Water Quality Criteria – Human Health for the Consumption of Organisms (CWA304)[b]	EPA Human Health SW Criteria - Marine Organisms Only (EPA 40 CFR 131.45)[b]	T25-GW-01	T25-GW-01	T25-GW-01	T25-GW-02	T25-GW-02	T25-GW-03
Sample ID					T25-GW01-230928	T25-GW1001-230928	T25-GW01-240110	T25-GW02-230929	T25-GW02-240109	T25-GW03-230930
Sample Date					9/28/2023	9/28/2023	1/10/2024	9/29/2023	1/9/2024	9/30/2023
Sample Type					Normal	Field Duplicate	Normal	Normal	Normal	Normal
Matrix					Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
X					1267960.88	1267960.88	1267960.88	1267960.66	1267960.66	1267942.43
Y					212761.87	212761.87	212761.87	212532.51	212532.51	212278.58
Dioxins/Furans (ng/L)										
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	0.00124 U	0.00095 U	0.00105 U	0.00241 U	0.00219 U	0.00134 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0.00160 U	0.00142 U	0.00155 U	0.00320 U	0.00466 U	0.00190 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.00131 U	0.00141 U	0.00133 U	0.00270 U	0.00562 U	0.00162 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.00137 U	0.00151 U	0.00128 U	0.00283 U	0.00543 U	0.00168 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.00153 U	0.00167 U	0.00142 U	0.00316 U	0.00554 U	0.00189 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	0.00178 U	0.00194 U	**0.00177 J**	0.00407 U	0.00538 U	0.00479 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	0.0258 U	0.0196 U	0.0301 U	0.0998 U	0.0260 U	0.0365 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	0.00129 U	0.00101 U	0.00125 U	0.00271 U	0.00188 U	0.00140 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.00141 U	0.00143 U	0.00162 U	0.00314 U	0.00271 U	0.00160 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.00138 U	0.00142 U	0.00154 U	0.00314 U	0.00258 U	0.00163 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00117 U	0.00117 U	0.00108 U	0.00271 U	0.00321 U	0.00162 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00121 U	0.00124 U	0.00107 U	0.00295 U	0.00320 U	0.00157 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00166 U	0.00172 U	0.00141 U	0.00433 U	0.00482 U	0.00251 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00120 U	0.00131 U	0.00109 U	0.00317 U	0.00334 U	0.00182 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.00255 U	0.00158 U	0.00099 U	0.00327 UJ	0.00367 U	0.00164 UJ
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.00302 U	0.00275 U	0.00136 U	0.00551 UJ	0.00631 U	0.00291 UJ
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	0.00395 U	0.00343 U	0.00261 U	0.00723 U	0.00947 U	0.00386 U
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	**0.00653 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 max limit)	--	--	0.0000051	--	0.00160 U	0.00142 U	**0.00209 J**	0.00320 UJ	0.00466 U	0.00190 UJ

Table 2-14
Summary of Groundwater Results and Screening

	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CCC (chronic)[b]	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CMC (acute)[b]	National Recommended Water Quality Criteria – Human Health for the Consumption of Organisms (CWA304)[b]	EPA Human Health SW Criteria - Marine Organisms Only (EPA 40 CFR 131.45)[b]						
				Location ID	T25-GW-03	T25-GW-04	T25-GW-04	T25-GW-05	T25-GW-05	T25-GW-05
				Sample ID	T25-GW03-240108	T25-GW04-230929	T25-GW04-240108	T25-GW05-230930	T25-GW05-240109	T25-GW105-240109
				Sample Date	1/8/2024	9/29/2023	1/8/2024	9/30/2023	1/9/2024	1/9/2024
				Sample Type	Normal	Normal	Normal	Normal	Normal	Field Duplicate
				Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
				X	1267942.43	1267801.88	1267801.88	1267638.99	1267638.99	1267638.99
				Y	212278.58	212241.07	212241.07	212236.69	212236.69	212236.69
Dioxins/Furans (ng/L)										
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	0.00105 U	0.00114 U	0.00131 U	0.00074 U	0.00154 U	0.00128 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0.00213 U	0.00154 U	0.00266 U	0.00132 U	0.00350 U	0.00306 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.00265 U	0.00152 U	0.00283 U	0.00134 U	0.00321 U	0.00353 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.00242 U	0.00153 U	0.00267 U	0.00140 U	0.00311 U	0.00311 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.00253 U	0.00174 U	0.00275 U	0.00157 U	0.00316 U	0.00332 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	0.00292 U	0.00467 U	0.00306 U	0.00689 U	0.00294 U	0.00370 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	0.0128 U	0.0370 U	0.0259 U	0.0470 U	0.0364 U	0.0232 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	0 U	**0.00467 J**	0 U	**0.00689 J**	0 U	0 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	0.00103 U	0.00133 U	0.00096 U	0.00088 U	0.00100 U	0.00124 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.00140 U	0.00183 U	0.00186 U	0.00114 U	0.00144 U	0.00168 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.00132 U	0.00177 U	0.00174 U	0.00111 U	0.00134 U	0.00155 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00125 U	0.00126 U	0.00148 U	0.00110 U	0.00165 U	0.00176 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00120 U	**0.00135 J**	0.00147 U	0.00108 U	0.00154 U	0.00169 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00170 U	0.00186 U	0.00213 U	0.00166 U	0.00237 U	0.00241 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00128 U	0.00144 U	0.00165 U	0.00121 U	0.00153 U	0.00190 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.00155 U	0.00206 UJ	0.00177 U	0.00239 UJ	0.00207 U	**0.00205 J**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.00265 U	0.00329 UJ	0.00279 U	0.00212 UJ	0.00359 U	0.00376 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	0.00309 U	**0.00472 J**	0.00412 U	0.00306 U	0.00478 U	0.00534 U
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	0 U	0 U	0 U	0 U	0 U	0 U
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0 U	0 U	0 U	**0.00091 J**	0 U	0 U
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0 U	**0.00135 J**	0 U	0 U	0 U	0 U
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0 U	0 U	0 U	0 U	**0.00233 J**	**0.00205 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 max limit)	--	--	0.0000051	--	0.00213 U	**0.00236 J**	0.00266 U	0.00132 UJ	0.00350 U	**0.00344 J**

Table 2-14
Summary of Groundwater Results and Screening

	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CCC (chronic)[b]	National Recommended Water Quality Criteria – Aquatic Life Criteria – Saltwater CMC (acute)[b]	National Recommended Water Quality Criteria – Human Health for the Consumption of Organisms (CWA304)[b]	EPA Human Health SW Criteria - Marine Organisms Only (EPA 40 CFR 131.45)[b]	T25-GW-06	T25-GW-06
				Location ID	T25-GW-06	T25-GW-06
				Sample ID	T25-GW06-230930	T25-GW06-240109
				Sample Date	9/30/2023	1/9/2024
				Sample Type	Normal	Normal
				Matrix	Groundwater	Groundwater
				X	1267508.71	1267508.71
				Y	212247.54	212247.54
Dioxins/Furans (ng/L)						
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	0.00091 U	0.00154 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0.00156 U	0.00276 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.00123 U	0.00385 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.00130 U	0.00354 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.00145 U	0.00369 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	0.00466 U	0.00307 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	0.0260 U	0.0288 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	0 U	0 U
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0 U	0 U
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0 U	0 U
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	0 U	0 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	0.00098 U	0.00125 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.00150 U	0.00162 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.00147 U	0.00156 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00119 U	0.00182 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00127 U	0.00173 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00172 U	0.00240 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.00130 U	0.00190 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.00306 UJ	0.00185 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.00237 UJ	0.00296 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	0.00231 U	0.00590 U
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	0 U	0 U
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0 U	0 U
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0 U	0 U
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0 U	0 U
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 max limit)	--	--	0.0000051	--	0.00156 UJ	0.00276 U

Table 2-14
Summary of Groundwater Results and Screening

Notes:

Detected concentration is greater than the National Recommended Water Quality Criteria for Aquatic Life (chronic)

Detected concentration is greater than the National Recommended Water Quality Criteria for Aquatic Life (acute)

Detected concentration is greater than the National Recommended Water Quality Criteria for Human Health Consumption

Detected concentration is greater than the EPA Human Health Surface Water Criteria (marine organisms)

Bold = Detected result

a. Aquatic protection criteria for metals and mercury are expressed in terms of dissolved metal in the water column. For human health, CWA 304 and EPA 40 CFR 131.45 criteria do not specify which fraction the criteria applies to.

b. Calculated values have been rounded to laboratory-reported significant digits.

µg/L: microgram per liter

CCC: Criterion Continuous Concentration

CMC: Criterion Maximum Concentration

CWA: Clean Water Act

J: Estimated value

mg/L: milligrams per liter

ng/L: nanogram per liter

PCB: polychlorinated biphenyls

TEQ: toxic equivalents quotient

U: Compound analyzed, but not detected above detection limit

UJ: Compound analyzed, but not detected above estimated detection limit

Table 3-1
Applicable or Relevant and Appropriate Requirements for the T-25S Site

Chemical-Specific ARAR/TBCs			
Requirement	**Citation**	**Comments**	**Status**
Recommended water quality criteria and other information is published at: https://www.epa.gov/wac/national-recommended-water-quality-criteria-tables.	Clean Water Act Section 304(a) 33 USC Section 1314(a) EPA develops and publishes recommended water quality criteria and other information that may be used for the establishment of state water quality standards to protect, restore, and maintain surface water.	The recommended water quality criteria and other information are important to follow if doing so during dredging and other removal activities will improve water quality.	TBC

Location-Specific ARAR/TBCs			
Requirement	**Citation**	**Comments**	**Status**
Provides best management practices during activities that may impact sediment quality.	State Antidegradation and Designated Use Policies WAC 173-204-120	To the extent practicable employ these best management practices during performance of the remedial action.	TBC
Provides for obtaining recommendation from U.S. Fish and Wildlife Service on avoiding, minimizing, and mitigating adverse impacts of land and water development projects on fish, wildlife, plants, and habitats.	U.S. Fish and Wildlife Service Mitigation Policy, as revised 81 FR 83440 (November 21, 2016)	Consult with U.S. Fish and Wildlife Service in order to obtain recommendations on ways to avoid, minimize, and mitigate damage to natural resources, including fish, wildlife, plants, and habitats, during implementation of the remedial action.	TBC
Provides U.S. Fish and Wildlife Service with authority to investigate and report on proposed federal action that affects a stream or other body of water, and to provide recommendations to minimize impacts to fish and wildlife resources. Channel deepening or other modifications to a body of water are subject to this law.	U.S. Fish and Wildlife Coordination Act 16 USC Sections 661, 662(a)	Consult with U.S. Fish and Wildlife Service and obtain its recommendations on how to conserve wildlife resources and prevent loss or damage to such resources during implementation of the remedial action.	Applicable

Table 3-1
Applicable or Relevant and Appropriate Requirements for the T-25S Site

Location-Specific ARAR/TBCs			
Requirement	**Citation**	**Comments**	**Status**
Prohibits the killing, capturing, selling, trading or transporting of protected migratory bird species without prior authorization of the U.S. Fish and Wildlife Service. Applies to migratory birds native to the U.S. or U.S. territories, and to any part, nest, egg, or product associated with such migratory birds. 50 CFR Section 10.13 (provides list of protected migratory bird species)	Migratory Bird Treaty Act of 1918, as amended. 16 USC Sections 703, 704, 705	Consult with U.S. Fish and Wildlife Service to identify protected migratory bird species and their nests that may be present during implementation of the removal action, and to obtain recommendations for protecting such species and their nests.	Applicable
Provides a program for conservation of threatened and endangered plants and animals and their habitats. Requires consultation by a federal agency with U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries Service to ensure action taken by such agency is not likely to jeopardize the continued existence of listed endangered or threatened species or result in destruction or adverse modification of their critical habitat.	Endangered Species Act of 1973 Sections 2(c), 3, 7(a)(1)-(4), 7(b)(1)(A), 7(b)(3), 7(b)(4), 7(c), 9 16 USC Section 1531(c), 1532, 1536(a)(1)-(4), 1536(b)(1)(A), 1536(b)(3), 1536(b)(4), 1536(c), 1538 50 CFR Sections 17.3, 17.11, 17.12, 17.21(c), 17.21(d), 17.31, 17.51, 17.61(c), 17.71(a), 17.71(c)	Consult with U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries Service to ensure removal activities do not jeopardize threatened or endangered species or destroy or adversely modify the habitat of such species. May include the preparation of a biological assessment which assesses such removal action and its effects on protected species and their habitats.	Applicable
Promotes the protection of Essential Fish Habitat through coordination and consultation between the National Marine Fisheries Service, the Regional Fishery Management Council, and each federal agency whose action or proposed actions may adversely affect such habitat.	Magnuson-Stevens Fishery Conservation and Management Act Sections 305(b)(1)(D); 305(b)(2-4) 16 USC Sections 1855(b)(1)(D), 1855 (b)(2-4) 50 CFR Section 600.920	Provide notice to the National Marine Fisheries Service and Regional Fishery Management Council of the planned removal action and consider their comments and recommendations for conserving essential fish habitat. Implement measures to conform to the recommendations designed to avoid, mitigate, or otherwise offset any adverse effects on essential fish habitat or provide reasons for not following the recommendations.	Applicable

Table 3-1
Applicable or Relevant and Appropriate Requirements for the T-25S Site

Location-Specific ARAR/TBCs			
Requirement	**Citation**	**Comments**	**Status**
Establishes regulations, goals, policies and objectives for protecting and enhancing state of Washington shoreline areas.	Shoreline Management Act of 1971 WAC 173-18-020, -030, -040 WAC 173-27-060 King County Shoreline Management Master Program, Ordinance 3688, Sections 325, 412, 413, 414	Consider the implications of the King County preferred practices and restrictions in undertaking removal action that may impact shoreline areas.	TBC
Provides for authorized work times, construction techniques, shoreline stabilization requirements, and test boring requirements in saltwater areas.	State Hydraulic Code Rules WAC 220-660-330, Table 4; 220-660-360; 220-660-370; 220-660-410; 220-660-450(1), (2), (3)(b), (3)(c).	Adhere to the directions in these provisions of State law during implementation of the removal action.	Applicable
Establishes maximum permissible noise levels in identified environments at specified times.	State Noise Control RCW 70A.20.010, 70A.20.020 WAC 173-60-010, 173-60-020, 173-60-030, 173-60-040,173.60-050, 173-60-120	Protect workers and others from experiencing excessive noise during removal activities.	Applicable
Requires federal agencies which have possession of or control over Native American cultural items (including human remains, associated and unassociated funerary objects, sacred objects and objects of cultural patrimony) located on federal land or tribal lands to compile an inventory of such items and consult with affected tribes. Prescribes when federal agencies must return such Native American cultural items.	Native American Graves Protection and Repatriation Act 25 USC Sections 3001-3006, 3009, 3011	Should Native American items be discovered during removal activities, an inventory will be created to document these items and, if possible, the items will be secured. In addition, upon such discovery, the Muckleshoot and Suquamish Tribes and Yakama Nation will be informed of the discovery and consulted as to the handling and disposition of such items.	Relevant and appropriate
It is the policy of the United States protect and preserve for Native Americans certain rights, including but not limited to, access to sites and use and possession of sacred objects.	American Indian Religious Freedom Act 42 USC Section 1996	Should Native American sacred objects to discovered, an effort will be made to safely secure these objects, and the Muckleshoot and Suquamish Tribes and Yakama Nation will be notified of the discovery and provided an opportunity to obtain possession of the objects.	TBC

Table 3-1
Applicable or Relevant and Appropriate Requirements for the T-25S Site

Location-Specific ARAR/TBCs			
Requirement	**Citation**	**Comments**	**Status**
Requires a federal agency to: 1) identify historic properties potentially affected by an agency undertaking; 2) assess the potential effects on such properties from the undertaking; 3) provide the Advisory Council on Historic Preservation an opportunity to comment on the agency decision regarding the properties; and 4) consider ways to avoid, minimize or mitigate potential effects on the properties. Historic properties include any district, site, building, structure, archaeological site, traditional cultural landscape, traditional cultural property, or object included in or eligible for the National Register of Historic Places, including artifacts, records, and material remains related to such properties.	National Historic Preservation Act 16 USC Section 470f 36 CFR Sections 60.2(a), 60.3, 60.4, 800.2(c)(1)(i), 800.2(c)(2)(ii), 800(c)(3), 800(c)(4), 800(c)(5), 800.2(d), 800.3(c), 800.3(e), 800.3(f),800.3(g), 800.4(d)(2), 800.5(a), 800.6(a), 800.6(b)	Although no historic properties have been identified at the site, should such properties be encountered during remedial activities, assess the potential effects on the properties from the remedial activities, provide the Advisory Council on Historic Preservation or its designee (often the State Historic Preservation Officer), and perhaps other interested parties, an opportunity to comment on the potential effects, and decide how to proceed in a way that, if possible, avoids, minimizes or mitigates the potential effects on the properties.	Applicable
Federal agencies need to evaluate actions and impacts on flood plains and mitigate such impacts. Criteria established for best management of flood prone areas.	42 FR 26951, 3 CFR 1977 Comp. p. 77	If the site is determined to be within a floodplain or flood-prone area, actions should be taken to prevent the risk of floods due to remedial activities.	TBC

Action-Specific ARAR/TBCs			
Requirement	**Citation**	**Comments**	**Status**
Provides disposal requirements of PCB-contaminated material.	Toxic Substances Control Act Section 6(e) 15 USC Section 2605(e) 40 CFR Sections 761.61(a)(4), 761.61(a)(5); or Section 761.61(b)	Actions handling PCB remediation wastes and PCB containing material.	Applicable

Table 3-1
Applicable or Relevant and Appropriate Requirements for the T-25S Site

Action-Specific ARAR/TBCs			
Requirement	**Citation**	**Comments**	**Status**
Assures that alteration or use of a federal civil works project will not impair the usefulness of that project or be injurious to the public.	Rivers and Harbors Act of 1899 Section 14(a) 33 USC Section 408(a)	Should it be determined that any portion of the removal action may impair the usefulness of a structure or project of USACE, there will be consultation with USACE to determine how to best avoid or mitigate such impairment.	Applicable
Provides regulatory requirements for generators and transporters of hazardous waste. Also provides regulatory standards for owners and operators of hazardous waste treatment, storage or disposal facilities.	RCRA (a.k.a. Solid Waste Disposal Act) Sections 3002, 3003, 3004 42 USC Sections 6922, 6923, 6924 40 CFR Part 262, Subparts A-D, L, M (generators) 40 CFR Part 263, Subparts A-C (transporters) 40 CFR Parts 264 to 270 (owners and operators)	Comply with the generator and transporter requirements for all hazardous waste generated and transported as part of the removal action. Confirm there is compliance with owner and operator regulations for each hazardous waste treatment, storage, or disposal facility which is to receive hazardous waste as a result of implementation of the removal action. See, also, Section 121(d)(3) of CERCLA, 42 USC Section 9621(d)(3), which requires that each treatment, storage or disposal facility which is to receive hazardous waste must first be deemed to be in compliance with the Solid Waste Disposal Act.	Applicable as to on-site generator and transporter requirements, and otherwise CERCLA requires that a receiving facility be in compliance with the owner and operator standards of RCRA.

Table 3-1
Applicable or Relevant and Appropriate Requirements for the T-25S Site

Action-Specific ARAR/TBCs			
Requirement	**Citation**	**Comments**	**Status**
Provides requirements for handling, management, transport, and disposal of dangerous waste and extremely hazardous waste.	State Dangerous or Extremely Hazardous Waste Regulations WAC 173-303-010, 173-303-016, 173-303-020, 174-303-040, 173-303-060, 173-303-070, 173-303-071, 173-303-072, 173-303-073, 173-303-075, 173-303-077, 173-303-080, 173-303-081, 173-303-082, 173-303-083, 173-303-090, 173-303-100, 173-303-140, 173-303-141, 173-303-145, 173-303-150, 173-303-1600, 173-303-161, 173-303-169, 173-303-170, 173-303-171, 173-303-172, 173-303-173, 173-303-174, 173-303-180, 173-303-190, 173-303-200, 173-303-201, 173-303-210, 173-303-220, 173-303-230, 173-303-240, 174-303-250, 173-303-260, 173-303-270, 173-303-355, 173-303-630, 173-303-280(6)	Comply with these regulations to the extent they are more stringent than federal RCRA requirements for the designated waste.	Applicable
Provides requirements for onsite storage, collections and transportation of solid waste.	State Solid Waste Handling Standards WAC 173-350-300	Adhere to these requirements during performance of the removal action.	Applicable

Notes:
ARAR/TBCs table as in the East Waterway Interim Record of Decision correction (Errata #1; EPA 2025).
Source: EPA (U.S. Environmental Protection Agency), 2025. East Waterway Interim Record of Decision correction (Errata #1). p. 103.
ARAR: Applicable or Relevant and Appropriate Requirement
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CFR: *Code of Federal Regulations*
EPA: U.S. Environmental Protection Agency
FR: *Federal Register*
PCB: polychlorinated biphenyl
RCRA: Resource Conservation and Recovery Act
RCW: Revised Code of Washington
TBC: to be considered
USACE: U.S. Army Corps of Engineers
USC: *United States Code*
WAC: Washington Administrative Code

Table 4-1
Technologies Applicable to the T-25S Site

Category	Technology	Applicable Area in T-25S	Description
In-water Technologies (selected in the EW IROD for the T-25S Site portion of the EW OU)	Mechanical Dredging	Nearshore and open-water areas	Technology is proven and available within the project area. Special bucket designs and operating procedures can be used to limit release of solids.
	Residuals Management Cover	Open-water area	Technology is appropriate and cost-effective for mitigating dredge residuals and achieving post-dredging performance goals. This technology would be applied following dredging.
	Backfill	Nearshore area	Technology is appropriate to insure that clean material is placed to meet habitat design elevations.
Upland Technologies (retained per Section 4.3)	Excavation	Upland area	Technology is appropriate and readily available for the scale and site-specific conditions at the T-25S Site.
	Engineered Capping with Amendments	Upland area	Technology is appropriate to prevent or reduce the exposure and mobility of contaminants for the upland area that will become intertidal marsh. Soil amendments of activated carbon and organoclay are readily available and appropriate as in situ treatment technology to reduce levels or mobility of soil contaminants while leaving soils in place.
	Backfill	Upland area	Technology is appropriate to ensure that clean material is placed to meet habitat design elevations.
	Sheetpile Wall	Upland area	Technology is appropriate to facilitate the diversion of water from the excavation area, through installation of individual steel sheets that are connected by interlocks and driven into the soil.
	Soil Berm	Upland area	Technology is appropriate to isolate the working areas in the upland from the river, to minimize the potential of release from the upland area and limit tidal inundation of upland areas.
	Silt Fence	Upland area	Technology is appropriate to minimize the release of excavated soils from upland to the in-water area.

Table 4-1
Technologies Applicable to the T-25S Site

Category	Technology	Applicable Area in T-25S	Description
Common Technologies to In-water and Upland Portions of the T-25S Site	Ex situ Treatment	Upland area	Technology is appropriate to immobilize, or destroy contaminants after removal but prior to off-site disposal. Technology is currently undergoing a treatability study to determined implementability.
	Subtitle C Landfill Disposal	Soil with highest concentrations of PCBs in upland area	Subtitle C landfill will be used for hazardous or dangerous materials, including soil with PCB concentrations that exceed TSCA-specified limits (i.e., equal to or greater than 50 mg/kg).
	Subtitle D Landfill Disposal	Non-hazardous or non-dangerous designated waste soil and sediment in in-water and upland areas	Subtitle D landfill will be used for dredge/excavated material that are not designated has hazardous or dangerous wastes.
	Beneficial Use	Non-hazardous or non-dangerous designated waste soil and sediment in in-water and upland areas	Method is available for removed sediments/soils that are below criteria for beneficial reuse. A portion of the excavated soil from the T-25S Site is anticipated to be clean material and may be feasible for beneficial reuse without treatment.
	Open-water Disposal	Upland area	Applicable to soils removed to support waterway expansion that meet screening criteria that is based on chemistry, bioassay, and/or bioaccumulation testing.

Table 4-1
Technologies Applicable to the T-25S Site

Category	Technology	Applicable Area in T-25S	Description
Institutional Controls	Informational Devices	All areas of the T-25S Site	Applicable options include seafood consumption advisories and educational outreach, monitoring and notification of waterway users, enforcement tools, and environmental covenants registry.
	Proprietary Controls	All areas of the T-25S Site	Applicable option includes environmental covenants.

Notes:

mg/kg: milligrams per kilogram

PCB: polychlorinated biphenyl

T-25S Site: Terminal 25 South Site

TSCA: Toxic Substances Control Act

Table 4-2
Technologies Considered But Not Retained for the Upland Portion of the T-25S Site

Technology	Description	Contaminants Typically Treated	Screening Decision
In Situ Treatment			
Biological			
Aerobic biodegradation	Degradation of organic contaminants in the soil using microbes in the presence of oxygen. Enhanced bioremediation includes the injection of nutrients, oxygen or other amendments.	Effective principally to PAHs, other non-halogenated SVOCs, and BTEX. Biodegradation of PCBs not feasible.	Not applicable: Not feasible for PCB-contaminated soils, site hydrologic characteristics of the fill (potential preferential flow pathways) not conducive to treatment. Too much treatment time would be required.
Anaerobic biodegradation	The injection of a methanogenic culture, anaerobic mineral medium and routine supplements of glucose to maintain methanogenic activity. Nutrients and pH are controlled to enhance degradation.	Effective principally on chlorinated VOCs. Biodegradation of PCBs is not proven.	Not applicable: Not effective for PCB-contaminated soils, site hydrologic characteristics of the fill (potential preferential flow pathways) not conducive to treatment; treatment time constraints.
Phyto-remediation	A process that uses plants to remove, transfer, stabilize, and destroy contaminants in soil.	Used to address metals, pesticides, solvents, explosives, crude oil, PAHs, and landfill leachate. Effective at uptaking PCBs in shallow soils (surface to 3-foot depths) and low concentrations, but not proven to meet RALs for higher concentrations of PCBs.	Not applicable: Not proven to clean up PCBs to site RALs, unable to remediate to necessary depth.
Chemical			
Chemical oxidation	Delivery of oxidizers into soils using injection wells in contaminated soils. Oxidation of organics using oxidizing agents such as ozone, peroxide, permanganate, or Fenton's reagent.	Used to treat VOCs. Oxidation is less efficient with SVOCs including pesticides, PAHs, and PCBs.	Not applicable: Not effective for PCB-contaminated soils, for site soil characteristics and may pose additional site risks.
Physical-Extractive Processes			
Soil vapor extraction	Vacuum is applied to the vadose zone soil to induce the controlled flow of air and remove VOCs and some SVOCs.	Effective at extracting VOCs. Not effective at extracting PCBs.	Not applicable: Not appropriate PCBs in contaminated soils due to extremely low vapor pressure.
Soil flushing	Water or water containing an additive to enhance contaminant solubility is applied to the soil or injected into the groundwater to raise the water table into the contaminated soil zone. Contaminants are leached into the groundwater, which is extracted and treated.	The technology can be used to treat VOCs, SVOCs, fuels, and pesticides. Technology unproven to treat PCBs to 1 mg/kg.	Not applicable: Unproven technology, possible contaminant migration to surface waters and heterogeneous fill soils. PCBs are strongly adsorbed onto soil particles.
Fracturing	Cracks are developed by fracturing beneath the surface in low permeability soils to open new passageways that increase the effectiveness of many in-situ processes and enhance extraction efficiencies.	Used on a variety of COCs, depending on the in situ process it is used in conjunction with.	Not applicable: Most site soils are sandy and have high permeability.
Thermal treatment	Steam injection, hot air injection, electrical resistance heating, electromagnetic heating, fiber optic heating, or radio frequency heating is used to increase the volatilization rate of SVOCs and facilitate extraction.	Applicable primarily to VOCs, also used for SVOCs, pesticides and fuels. Less effective for PCBs.	Not applicable: Site properties such as debris (e.g., riprap, pilings) make effective application infeasible, Not applicable to PCB contaminated soils, lack of full scale demonstration.
Electro kinetic separation	Removes metals and polar organic contaminants from low permeability soil, mud, sludge, and marine dredging through the application of a low intensity direct current between ceramic electrodes that are divided into a cathode array and an anode array.	Typically used for heavy metals, anions, and polar organics. Limited applicability to PCBs.	Not applicable: Technology is not applicable to PCBs and TPH contaminated soils, or to highly permeable soils and buried debris.

Table 4-2
Technologies Considered But Not Retained for the Upland Portion of the T-25S Site

Technology	Description	Contaminants Typically Treated	Screening Decision
Physical Immobilization			
Soil solidification	Traps or immobilizes hazardous substances using physical or chemical means.	Generally used for inorganics, solidification for organics is not a proven technology.	Not applicable to PCB-contaminated soils and contamination below the water table, heterogeneous soils, and leaching potential of solidified soils.
Vitrification	Uses an electric current *in situ* to melt sediment or other earthen materials at extremely high temperatures (2,900-3,650 °F). Inorganic compounds are incorporated into the vitrified glass and crystalline mass and organic pollutants are destroyed.	Applicable to inorganic and organic chemicals. Has been tested on PCBs, but not at a full scale and at action levels of 1 mg/kg.	Not applicable: Remediation of PCB-contaminated soils to 1 mg/kg is unproven. Additional challenges include heterogeneous soils, buried debris, and dewatering of saturated soils. Risks include possibility of generating dioxins and furans as by-products due to high treatment temperatures.
Ex Situ Treatment			
Biological			
Biopiles	Excavated soils are mixed with amendments and placed in aerated aboveground enclosures. Moisture, heat, nutrients, oxygen, and pH can be controlled to enhance biodegradation.	Not applicable to PCBs. Biopile treatment has been applied to treatment of non-halogenated VOCs and fuel hydrocarbons.	Not applicable: Not a technology that is applied to PCB- contaminated soils.
Land farming/ composting	Soil is mixed with amendments and placed on a treatment area that typically includes leachate collection. The soil and amendments are mixed using conventional tilling equipment or other means to provide aeration. Moisture, heat, nutrients, oxygen, and pH can be controlled to enhance biodegradation. Other organic amendments such as wood chips, potato waste, or alfalfa are added to composting systems.	Not applicable to PCBs. Contaminants that have been successfully treated using land farming include diesel fuel, No. 2 and No. 6 fuel oils, JP-5, oily sludge, wood preserving wastes (pentachlorophenol and creosote), coke wastes, and certain pesticides.	Not applicable: Degradation rates not in keeping with NTCRA objectives. Requires long processing time and large processing area.
Fungal biodegradation	Fungal biodegradation refers to the degradation of a wide variety of organic pollutants by using fungal lignin-degrading or wood-rotting enzyme systems (example: white rot fungus).	Bench scale studies indicate a destruction of PCBs between 29 and 70%. Limited full scale application data.	Not applicable: Limited full scale experience and limited applicability to PCBs.
Slurry-phase biological treatment	An aqueous slurry is created by combining soil with water and other additives. The slurry is mixed to keep solids suspended and microorganisms in contact with the contaminants. Upon completion of the process, the slurry is dewatered and the treated soil is removed for disposal. Sequential anaerobic/aerobic slurry-phase bioreactors are used to treat PCBs.	Techniques have been successfully used to remediate soils, sludges, and sediments contaminated by explosives, petroleum hydrocarbons, petrochemicals, solvents, pesticides, wood preservatives, and other organic chemicals. Effective on PCBs when a sequential anaerobic/aerobic slurry-phase bioreactor is used, but limited in full scale demonstrations.	Not applicable: Technology for remediation of PCBs is still developing, and low throughput of available equipment.
Chemical			
Reduction/oxidation	Reduction/oxidation chemically converts hazardous contaminants to nonhazardous or less toxic compounds that are more stable, less mobile, and/or inert. The oxidizing agents most commonly used are hypochlorites, chlorine, and chlorine dioxide.	Reduction/oxidation is effective for inorganics and is less effective for SVOCs such as PCBs or soils with high levels of oil and grease; not applicable to the site COCs.	Not applicable to PCBs and TPH contaminated soils.
Dehalogenation	Contaminated soils and the reagent (typically potassium polyethylene glycol) are mixed and heated in a treatment vessel. The reaction causes the polyethylene glycol to replace halogen molecules and render the compound nonhazardous or less toxic.	Applicable to treating PCBs.	Not applicable due to infrastructure requirements and reagent and process wastes.
Solvent extraction	Contaminated soil and solvent extractant are mixed in an extractor, dissolving the contaminants. The extracted solution is then placed in a separator, where the contaminants and extractant are separated for treatment and further use (example: B.E.S.T.™ and propane extraction process).	Effective in treating soils containing primarily organic contaminants such as PCBs, petroleum wastes, and VOCs.	Not applicable: Due to infrastructure needs, and fate of solvents in soil.

Table 4-2
Technologies Considered But Not Retained for the Upland Portion of the T-25S Site

Technology	Description	Contaminants Typically Treated	Screening Decision
Soil washing (biogenesis)	Multistep process of preprocessing, aeration, sediment washing, cavitation and oxidation and liquid/solid separation.	Applicable to treating PCBs, but unproven at full scale to meet RALs.	Not applicable: Unproven technology, time for approval, and necessary infrastructure.
Physical			
Separation	Contaminated fractions of solids are concentrated through gravity, magnetic or sieving separation processes.	Applicable to SVOCs, fuels, inorganics, and selected VOCs and pesticides. Only applicable to adsorptive COCs that would adhere to the fine-grained soil.	Not applicable: Does not destroy contaminants; must be used in conjunction with other technologies; slow throughput; and extensive infrastructure necessary.
Solar detoxification	Ultraviolet energy in sunlight destroys contaminants through photochemical and thermal reactions.	Limited information on destruction efficiency of PCBs at previous site applications.	Not applicable: Unproven technology in large scale application.
Solidification/vitrification	The mobility of constituents in a solid medium is reduced through addition of immobilization additives. Various additives and processes are available for different COCs.	Primarily used for inorganics; vitrification is effective for organics. Not proven to meet action levels at full scale implementation of PCBs.	Not applicable: Slow throughput of available equipment, unpredictable leaching characteristics of solidified PCB-contaminated soils.
Thermal			
On-site incineration	Temperatures greater than 1,400°F are used to volatilize and combust organic chemicals. Commercial incinerator designs are rotary kilns equipped with an afterburner, a quench, and an air pollution control system.	Applicable to site COCs where concentrations exceed the hazardous waste designation. Would also be effective at destruction of petroleum waste.	Not applicable: Incineration is too expensive, insufficient on-site area to stage system, and need to meet substantive requirements of PSCAA new source permits.
Low-temperature thermal desorption	Temperatures in the range of 200°F to 600°F are used to volatilize and combust organic chemicals. These thermal units are typically equipped with an afterburner and baghouse for treatment of air emissions.	Used to treat non-halogenated VOCs and fuels and SVOCs at reduced effectiveness.	Not applicable: Not effectively applied to PCB-contaminated soils.
High-temperature thermal desorption then destruction	Temperatures in the range of 600°F to 1,200°F are used to volatilize organic chemicals. These thermal units are typically equipped with an afterburner and baghouse for destruction of air emissions.	Applicable to SVOCs, PAHs, PCBs, pesticides, volatile metals, VOCs. Limited full scale demonstrability for PCBs. The process is applicable for the separation of organics from refinery wastes, coal tar wastes, wood-treating wastes, creosote-contaminated soils, hydrocarbon-contaminated soils, mixed (radioactive and hazardous) wastes, synthetic rubber processing waste, pesticides and paint wastes.	Not applicable: May increase toxicity due to thermally generated byproducts (Sato et al. 2010)
Pyrolysis	Chemical decomposition is induced in organic materials by heat in the absence of oxygen. Organic materials are transformed into gaseous components and a solid residue (coke) containing fixed carbon and ash.	The target contaminant groups are SVOCs and pesticides	Not applicable: Due to requiring specific feed size and materials handling requirements, and dewatering of soil. Does not destroy metals.
Disposal			
Confined aquatic disposal	Underwater sediment disposal at a confined aquatic disposal site.	--	Not applicable: logistically challenging and likely technically and administratively infeasible.
Nearshore confined disposal facility	Off-site disposal at a nearshore confined disposal facility.	--	Not applicable: Due to administrative implementability issues.

Notes:
--: not applicable
BTEX: benzene, toluene, ethylbenzene, and xylene
COC: contaminant of concern
FRTR: Federal Remediation Technologies Roundtable
mg/kg: milligrams per kilogram
NTCRA: Non-Time Critical Removal Action
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
PSCAA: Puget Sound Clean Air Agency
RAL: Remedial Action Level
SVOC: semivolatile organic compound
T-25S Site: Terminal 25 South Site
TPH: total petroleum hydrocarbon
VOC: volatile organic compound

Table 5-1
Data Evaluation for Sediment Area Dredge Depth Determination

Location	EW RAL Exceedance (Yes/No)	Sample Interval		Bounded/ Unbounded[1]	Core Recovery Information	Depth of Contamination (ft below mudline)	Uncertainity Addition[2] (ft)	Proposed DU Dredge Depth (ft below mudline)	Proposed Dredge Unit (DU)	Notes
		Start Depth (ft below mudline)	End Depth (ft below mudline)							
T25-SC-13_2021	Yes	6.5	7.5	Bounded	--	7.5	--	7.5	DU-18	Applied 5-ft dredge depth for constructability purposes to locations T25-SC-13_2021 and EW10-SC09 that is outside of the T-25S Site boundary, with a very small footprint interpolated within project footprint.
EW10-SC09	Yes	6	7.2	Bounded	--	7.2	--	7.2		
T25-SC-09B	Yes	3	4	Unbounded	4 ft recovered, 5 ft drive	4	1	5.0		
T25-SC02	Yes	4.6	5.6	Unbounded	core to 7 ft, only ran 4.6-5.6	5.6	1	6.6	DU -17	--
T25-SC-12_2021	Yes	8.4	9.4	Bounded	--	9.4	--	9.4	DU -16	Applied 11-ft dredge depth for constructability purposes to Location T25-SC-12_2021 that is outside of the T-25S Site boundary with a very small footprint interpolated within project footprint.
T25-SC08	Yes	9	10	Unbounded	10 ft recovered, 12 ft drive	10	1	11		
T25-SC-14_2021	Yes	8.7	9.7	Bounded	--	9.7	--	9.7	DU-15	--
T25-SC03	Yes	4.7	5.7	Bounded	--	5.7	--	5.7	DU-14	--
T25-SC-15_2021	Yes	7	8	Bounded	--	8	--	8.0	DU-13	--
T25-SC-16_2021	Yes	10.3	11.3	Unbounded	11.3 ft recovered, drove 14 ft	11.3	1	12.3	DU-12	--
T25-SC-11_2021	Yes	7	8	Bounded	--	8	--	8.0	DU-11	--
EW10-SC08	Yes	6	8	Bounded	--	8	--	8.0		
T25-SC-17_2021	Yes	7	8	Bounded	--	8	--	8.0		
T25-SC07	Yes	6	7	Unbounded	7 ft recovered, 9.5 ft drive	7	1	8.0		
T25-SC-18_2021	Yes	6	7	Bounded	--	7	--	7.0	DU-10	--
EW-167	Yes	2.5	3.5	Unbounded	--	3.5	1	4.5	DU-9	--
T25-SC-19_2021	Yes	3	4.3	Bounded	--	4.3	--	4.5		
T25-SC-20_2021	Yes	6.5	7.5	Unbounded	8.1 ft recovered, drove 10 ft	7.5	1	8.5	DU-8	--
T25-SC04	Yes	6	6.7	Unbounded	8 foot core	6.7	1	7.7	DU -7	--
T25-SC-21_2021	Yes	5	6	Bounded	--	6	--	6.3	DU-6	Assumed a proposed dredge depth of 6.3 ft for locations T25-SC-21-2021 and EW10-SC06 for constructability purposes
EW10-SC06	Yes	4	6	Bounded	--	6	--	6.3		
T25-SC-22_2021	Yes	4.3	5.3	Unbounded	5.0 ft recovered, drove 7.7 ft	5.3	1	6.3		
T25-SC-06	Yes	2.5	3.3	Unbounded	Refusal at 4 ft	3.3	1	4.3	DU- 5	--
T25-SC-23_2021	Yes	8	9	Bounded	--	9	--	9.0	DU -4	--
T25-SC-25_2021	Yes	6	7	Bounded	--	7	--	7.0	DU -3	--
T25-SC-26_2021	Yes	4	5	Bounded	--	5	--	5.0	DU-2	--
T25-SC-24_2021	No		--	--	--	0	--	3.0	DU-1	Location T25-SC-24_2021 does not have any EW RAL exceedances and includes a proposed dredge depth of 3 ft for constructability purposes. Does not include side slope near the bridge
T25-SC-05	Yes	1	2	Unbounded	Refusal at 2 ft	2	1	3.0		
T25-SC-28_2021	Yes	2	3	Bounded	--	3	--	3.0		
T25-SC-29_2021	Yes	2	3	Bounded	--	3	--	3.0		

Notes:
1. Bounded is defined by at least one sample interval having no EW RAL exceedances.
2. Cores with insufficient data at depth or an unbounded core include an additional 1-ft of removal to address uncertainty associated with RAL exceedances below the deepest interval with EW RAL exceedance.
--: not available/not applicable
DU: dredge unit
EW: East Waterway
ft: feet/ foot
RAL: remedial action level

Table 5-2
Data Evaluation for Upland Area Excavation Depth Determination

Data Evaluation							
Location	EW RAL Exceedance (Yes/No)	Sample Interval (ft bgs)	Bounded / Unbounded[1]	NAPL Observations[2]	Depth to Contamination (ft bgs)	Removal Depth Required to Habitat Subgrade Elevation (ft bgs)	Elevation 2 ft Below Habitat Subgrade Elevation (Post-Excavation Depth; ft bgs)
T25-SB-03B	Yes	9-10	Unbounded	--	10	5.7	7.7
T25-SB-03E	Yes	10-11	Unbounded	--	11	6.1	8.1
T25-SB-03F	Yes	10-11	Unbounded	--	11	5.9	7.9
T25-SB-03G	Yes	9-10	Unbounded	--	10	6.8	8.8
T25-SB03/T25-SB42A	Yes	14.2-16.2	Unbounded	--	16.2	6.0	8.0
T25-SB22/T25-SB22B	Yes	8-9	Bounded	SB22: Visible NAPL Coated Sample Liner 14-16 ft bgs SB22B: Sheen and NAPL Blebs in rinse water 14-16 ft bgs	9	5.0	7.0
T25-SB24	Yes	11-12	Unbounded	--	12	5.5	7.5
T25-SB25	Yes	11-12	Unbounded	--	12	6.1	8.1
T25-SB26	Yes	11-12	Unbounded	--	12	5.6	7.6
T25-SB27	Yes	11-12	Unbounded	--	12	6.0	8.0
T25-SB28	Yes	11-12	Unbounded	--	12	6.4	8.4
T25-SB29/T25-SB29C	Yes	12-13	Unbounded	--	13	6.8	8.8
T25-SB30	Yes	11-12	Unbounded	--	12	6.8	8.8
T25-SB31	Yes	10-11	Unbounded	--	11	5.5	7.5
T25-SB32	Yes	10-11	Bounded	--	11	5.2	7.2
T25-SB33	Yes	9-10	Unbounded	Visible NAPL blebs observed in rejected core at 12 ft bgs	11	5.3	7.3
T25-SB34	Yes	9-10	Unbounded	--	10	7.2	9.2
T25-SB35	Yes	9-10	Unbounded	--	10	7.4	9.4
T25-SB38	Yes	10-11	Unbounded	Positive NAPL Shake Test: 5-6 and 13-14 ft bgs	11	5.6	7.6
T25-SB39	Yes	9-10	Unbounded	--	10	6.2	8.2
T25-SB40	Yes	9-10	Unbounded	--	10	6.7	8.7
T25-SB43	No	--	--	--	--	6.7	8.7
T25-SB44	Yes	9-10	Unbounded	--	10	6.3	8.3
T25-SB47	Yes	8-9	Unbounded	Visible NAPL-like substance and amber staining on sample liner, Postive shake test at 20 ft bgs	9	5.1	7.1
T25-SB46	--	--	--	NAPL blebs observed in drill cuttings from 10-15 ft bgs	--	4.1	6.1
T25-SB48	Yes	--	--	NAPL blebs observed in drill cuttings from 10-15 ft bgs	13	5.0	7.0
T25-SB49	Yes	--	--	Positive NAPL Shake Test: 1-2, 2-3, 3-3.5, and 12-13 ft bgs	13	5.4	7.4
T25-SB50	Yes	7-8	--	Positive NAPL Shake Test: 9-10 ft bgs	8	3.5	5.5
T25-SB52	Yes	8-9	Unbounded	--	9	4.8	6.8
T25-SB51	Yes	8-9	Unbounded	Positive NAPL Shake Test: 10-11 ft bgs	9	5.2	7.2
T25-SB08/T25-SB36	Yes	12-14	Bounded	--	14	5.2	7.2
T25-SB37	Yes	12-14	Unbounded	--	14	7.6	9.6

Table 5-2
Data Evaluation for Upland Area Excavation Depth Determination

Data Evaluation							
Location	EW RAL Exceedance (Yes/No)	Sample Interval (ft bgs)	Bounded / Unbounded[1]	NAPL Observations[2]	Depth to Contamination (ft bgs)	Removal Depth Required to Habitat Subgrade Elevation (ft bgs)	Elevation 2 ft Below Habitat Subgrade Elevation (Post-Excavation Depth; ft bgs)
T25-GW-04	Yes	6-8	Unbounded	--	8	0.7	2.7
T25-GW-05/T25-SB11	Yes	9-11	Bounded	--	11	1.5	3.5
T25-SB12/T25-SB19	Yes	0-2	Bounded	--	2	0.1	2.1
T25-SB09	Yes	9.1-10	Unbounded	--	10	8.9	10.9
T25-SB-03D	Yes	9-10	Unbounded	--	10	6.0	8.0
T25-SB20	Yes	2-4	Bounded	--	4	3.4	5.4
T25-SB06	Yes	0-2	Unbounded	--	2	0.0	2.0
T25-SB02	Yes	3-5	Bounded	--	5	4.5	6.5
T25-GW-01	No	--	Bounded	--	0	0.0	1.0
T25-GW-02	No	--	Bounded	--	0	2.6	4.6
T25-GW-03	No	--	Bounded	--	0	3.6	5.6
T25-GW-06	No	--	Bounded	--	0	4.1	6.1
T25-SB01	No	--	Bounded	--	0	5.0	7.0
T25-SB04B	No	--	Bounded	--	0	5.6	7.6
T25-SB05	No	--	Bounded	--	0	0.0	1.7
T25-SB07	No	--	Bounded	--	0	4.7	6.7
T25-SB10	No	--	Bounded	--	0	4.8	6.8
T25-SB13	No	--	Bounded	--	0	0.0	2.0
T25-SB17	No	--	Bounded	--	0	0.7	2.7
T25-SB18	No	--	Bounded	--	0	0.8	2.8
T25-SB21	No	--	Bounded	--	0	2.1	4.1
T25-SB23	No	--	Bounded	--	0	4.6	6.6

Notes:

1. Bounded is defined by at least one sample interval having no EW RAL exceedances.
2. Soil-water shake tests (NAPL shake tests) where used when PID readings were greater than 50 ppm and no other visual observations of NAPL were present.

bgs: below ground surface

EW: East Waterway

ft: feet/ foot

NAPL: non-aqueous phase liquid

PID: photoionization detector

RAL: remedial action level

Table 5-3a
Alternative 1 Upland Area Proposed Excavation Depths

Alternative 1				
Excavation Unit (EU)	Station ID	Uncertainty Addition[1] (ft)	Proposed EU Excavation Depth (ft bgs)	Notes
1	T25-SB-03B	--	11.5	Applied a 11.5 ft excavation cut depth bgs to remove a majority of highest EW RAL exceedances (primarily the highest PCB RAL exceedances) soils with an additional 1.5 ft for constructability of an amended cap
	T25-SB-03E			
	T25-SB-03F			
	T25-SB-03G			
	T25-SB03/T25-SB42A			
	T25-SB42A			
	T25-SB42			
	T25-SB22/T25-SB22B			
	T25-SB22			
	T25-SB22B			
	T25-SB24			
	T25-SB25			
	T25-SB26			
	T25-SB27			
	T25-SB28			
	T25-SB29/T25-SB29C			
	T25-SB29			
	T25-SB29C			
	T25-SB30			
	T25-SB31			
	T25-SB32			
	T25-SB33			
	T25-SB34			
	T25-SB35			
	T25-SB38			
	T25-SB39			
	T25-SB40			
	T25-SB43			
	T25-SB44			
	T25-SB47			
	T25-SB46			
	T25-SB48			
	T25-SB49			
	T25-SB50			
	T25-SB52			
	T25-SB51			

Table 5-3a
Alternative 1 Upland Area Proposed Excavation Depths

Alternative 1				
Excavation Unit (EU)	**Station ID**	**Uncertainty Addition[1] (ft)**	**Proposed EU Excavation Depth (ft bgs)**	**Notes**
2	T25-SB08/T25-SB36	--	7.2	Applied excavation cut depth bgs to reach habitat subgrade elevation
	T25-SB37		9.6	
	T25-GW-04		2.7	
	T25-GW-05/T25-SB11		3.5	
	T25-SB12/T25-SB19		2.1	
	T25-SB09		10.9	
	T25-SB-03D		8.0	
	T25-SB20		5.4	
	T25-SB06		2.0	
	T25-SB02		6.5	
3	T25-GW-01	--	1.0	Applied excavation cut depth bgs to reach habitat subgrade elevation
	T25-GW-02		4.6	
	T25-GW-03		5.6	
	T25-GW-06		6.1	
	T25-SB01		7.0	
	T25-SB04B		7.6	
	T25-SB05		1.7	
	T25-SB07		--	
	T25-SB10		6.8	
	T25-SB13		2.0	
	T25-SB17		2.7	
	T25-SB18		2.8	
	T25-SB21		4.1	
	T25-SB23		6.6	

Notes:

1. Cores with insufficient data at depth or an unbounded core include an additional 1-ft of removal to address uncertainty associated with RAL exceedances below the deepest interval with EW RAL exceedance.

bgs: below ground surface

EU: excavation unit

EW: East Waterway

ft: foot

RAL: Remedial Action Level

Table 5-3b
Alternative 2 Upland Area Proposed Excavation Depths

Alternative 2				
Excavation Unit (EU)	**Station ID**	**Uncertainty Addition[1] (ft)**	**Proposed EU Excavation Depth (ft bgs)**	**Notes**
1	T25-SB-03B	--	13.5	Applied a 13.5 ft excavation cut depth bgs to remove all highest EW RAL exceedances (primarily the highest PCB RAL exceedances) soils with an additional 1.5 ft for constructability of an amended cap
	T25-SB-03E			
	T25-SB-03F			
	T25-SB-03G			
	T25-SB03/T25-SB42A			
	T25-SB42A			
	T25-SB42			
	T25-SB22/T25-SB22B			
	T25-SB22			
	T25-SB22B			
	T25-SB24			
	T25-SB25			
	T25-SB26			
	T25-SB27			
	T25-SB28			
	T25-SB29/T25-SB29C			
	T25-SB29			
	T25-SB29C			
	T25-SB30			
	T25-SB31			
	T25-SB32			
	T25-SB33			
	T25-SB34			
	T25-SB35			
	T25-SB38			
	T25-SB39			
	T25-SB40			
	T25-SB43			
	T25-SB44			
	T25-SB47			
	T25-SB46			
	T25-SB48			
	T25-SB49			
	T25-SB50			
	T25-SB52			
	T25-SB51			

Table 5-3b

Alternative 2 Upland Area Proposed Excavation Depths

<table>
<tr><th colspan="5">Alternative 2</th></tr>
<tr><th>Excavation Unit (EU)</th><th>Station ID</th><th>Uncertainty Addition[1] (ft)</th><th>Proposed EU Excavation Depth (ft bgs)</th><th>Notes</th></tr>
<tr><td rowspan="3">2</td><td>T25-SB08/T25-SB36</td><td rowspan="3">--</td><td rowspan="3">8.2</td><td rowspan="6">Applied excavation cut depth bgs to reach habitat subgrade elevation, plus an additional foot for constructabilty of an amended cap</td></tr>
<tr><td>T25-SB08</td></tr>
<tr><td>T25-SB36</td></tr>
<tr><td>3</td><td>T25-SB37</td><td>--</td><td>10.6</td></tr>
<tr><td rowspan="2">4</td><td>T25-GW-04</td><td rowspan="2">--</td><td rowspan="2">4.5</td></tr>
<tr><td>T25-GW-05/T25-SB11</td></tr>
<tr><td rowspan="6">5</td><td>T25-SB12/T25-SB19</td><td>--</td><td>2.1</td><td rowspan="6">Applied excavation cut depth bgs to reach habitat subgrade elevation</td></tr>
<tr><td>T25-SB09</td><td>--</td><td>10.9</td></tr>
<tr><td>T25-SB-03D</td><td>--</td><td>8.0</td></tr>
<tr><td>T25-SB20</td><td>--</td><td>5.4</td></tr>
<tr><td>T25-SB06</td><td>--</td><td>2.0</td></tr>
<tr><td>T25-SB02</td><td>--</td><td>6.5</td></tr>
<tr><td rowspan="14">6</td><td>T25-GW-01</td><td>--</td><td>1.0</td><td rowspan="7">Applied excavation cut depth bgs to reach habitat subgrade elevation</td></tr>
<tr><td>T25-GW-02</td><td>--</td><td>4.6</td></tr>
<tr><td>T25-GW-03</td><td>--</td><td>5.6</td></tr>
<tr><td>T25-GW-06</td><td>--</td><td>6.1</td></tr>
<tr><td>T25-SB01</td><td>--</td><td>7.0</td></tr>
<tr><td>T25-SB04B</td><td>--</td><td>7.6</td></tr>
<tr><td>T25-SB05</td><td>--</td><td>1.7</td></tr>
<tr><td>T25-SB07</td><td>--</td><td>--</td><td>No excavation cut depth applied, within daylight area of EU-1</td></tr>
<tr><td>T25-SB10</td><td>--</td><td>6.8</td><td rowspan="6">Applied excavation cut depth bgs to reach habitat subgrade elevation</td></tr>
<tr><td>T25-SB13</td><td>--</td><td>2.0</td></tr>
<tr><td>T25-SB17</td><td>--</td><td>2.7</td></tr>
<tr><td>T25-SB18</td><td>--</td><td>2.8</td></tr>
<tr><td>T25-SB21</td><td>--</td><td>4.1</td></tr>
<tr><td>T25-SB23</td><td>--</td><td>6.6</td></tr>
</table>

Notes:

1. Cores with insufficient data at depth or an unbounded core include an additional 1-ft of removal to address uncertainty associated with RAL exceedances below the deepest interval with EW RAL exceedance.

bgs: below ground surface

EU: excavation unit

EW: East Waterway

ft: foot

RAL: Remedial Action Level

Table 5-3c
Alternative 3 Upland Area Proposed Excavation Depths

Alternative 3				
Excavation Unit (EU)	Station ID	Uncertainty Addition[1] (ft)	Proposed EU Excavation Depth (ft bgs)	Notes
1	T25-SB-03B	--	16.0	Applied a 16 ft excavation cut depth bgs to reach the average native depth.
	T25-SB-03E			
	T25-SB-03F			
	T25-SB-03G			
	T25-SB03/T25-SB42A			
	T25-SB42A			
	T25-SB42			
	T25-SB22/T25-SB22B			
	T25-SB22			
	T25-SB22B			
	T25-SB24			
	T25-SB25			
	T25-SB26			
	T25-SB27			
	T25-SB28			
	T25-SB29/T25-SB29C			
	T25-SB29			
	T25-SB29C			
	T25-SB30			
	T25-SB31			
	T25-SB32			
	T25-SB33			
	T25-SB34			
	T25-SB35			
	T25-SB38			
	T25-SB39			
	T25-SB40			
	T25-SB43			
	T25-SB44			
	T25-SB47			
	T25-SB46			
	T25-SB48			
	T25-SB49			
	T25-SB50			
	T25-SB52			
	T25-SB51			
2	T25-SB08/T25-SB36	--	14	Applied a 14 ft
	T25-SB37	1		--
3	T25-GW-04	--	9	--

Table 5-3c
Alternative 3 Upland Area Proposed Excavation Depths

Alternative 3				
Excavation Unit (EU)	Station ID	Uncertainty Addition[1] (ft)	Proposed EU Excavation Depth (ft bgs)	Notes
4	T25-GW-05/T25-SB11	--	11	--
5	T25-SB12/T25-SB19		2.1	Applied a 2.1 ft
6	T25-SB09	1	11	--
	T25-SB-03D	1		--
7	T25-SB20	--	5.4	Applied a 5.4 ft excavation cut depth bgs to reach habitat subgrade elevation
	T25-SB06	--		Applied a 5.4 ft excavation cut depth for constructability purposes
8	T25-SB02	--	6.5	Applied a 6.5 ft excavation cut thickness to reach habitat subgrade elevation
9	T25-GW-01	--	1.0	Applied excavation cut depth bgs to reach habitat subgrade elevation
	T25-GW-02	--	4.6	
	T25-GW-03	--	5.6	
	T25-GW-06	--	6.1	
	T25-SB01	--	7.0	
	T25-SB04B	--	7.6	
	T25-SB05	--	1.7	
	T25-SB07	--	--	No excavation cut depth bgs applied, within daylight area of EU-1
	T25-SB10	--	6.8	Applied excavation cut depth bgs to reach habitat subgrade elevation
	T25-SB13	--	2.0	
	T25-SB17	--	2.7	
	T25-SB18	--	2.8	
	T25-SB21	--	4.1	
	T25-SB23	--	6.6	

Notes:

1. Cores with insufficient data at depth or an unbounded core include an additional 1-ft of removal to address uncertainty associated with RAL exceedances below the deepest interval with EW RAL exceedance.

bgs: below ground surface

EU: excavation unit

EW: East Waterway

ft: foot

RAL: Remedial Action Level

Table 5-4
Summary of Alternatives

Alternative	Removal Action Areas		Description of Alternatives	Surface Area (SF)	Piling Removal (EA)	Removal Volumes[1] (CY)		Placement Volumes[3] (CY)				
						Dredge / Excavation Volumes	Allowance Volumes[2]	Amended Cap[4]	RMC	Slope Backfill[5]	Backfill in the Upland Area (including to construct Berm)[6]	Backfill to Construct Berm in the In-Water Area[7]
1	In-Water Action	DU-1 through DU-18	Dredging of sediments to address EW RAL exceedances; placement of 1.5-ft of RMC, a sloped backfill with an armor rock layer and clean backfill	183,240	1,718	64,600	4,450	--	7,980	20,630	--	--
	Upland Action	EU-1	Partial excavation down to 11.5 ft bgs; placement of 1.5 ft amended cap and backfill to final habitat design grade	43,340	--	24,760	800	3,130	--	--	9,280	17,330
		EU-2	Partial excavation of EW RAL exceedances down to habitat subgrade elevations; backfill to final habitat design grade	81,410	--	22,890	0	0	--	--	7,840	
		EU-3	Excavation of material without EW RAL exceedances down to habitat subgrade elevations; backfill to final habitat design grade	87,390	--	16,410		0	--	--	7,750	
2	In-Water Action	DU-1 through DU-18	Dredging of sediments to address EW RAL exceedances; placement of 1.5-ft of RMC, a sloped backfill with an armor rock layer and clean backfill	183,240	1,718	64,600	4,450	--	7,980	20,630	--	--
	Upland Action	EU-1	Partial excavation down to 13.5 ft bgs; placement of 1.5 ft amended cap and backfill to final habitat design grade	43,340	--	28,880	800	3,130	--	--	13,440	17,330
		EU-2	Partial excavation of EW RAL exceedances down to 1 ft below habitat subgrade elevations; placement of 1 ft amended cap and backfill to final habitat design grade	11,890	--	4,610	0	570	--	--	2,640	
		EU-3		12,510	--	6,260		600	--	--	1,030	
		EU-4		12,200	--	1,950		590	--	--	820	
		EU-5	Excavation of EW RAL exceedances down to habitat subgrade elevations; backfill to final habitat design grade	44,810	--	9,460	240	0	--	--	3,990	
		EU-6	Excavation of material without EW RAL exceedances down to habitat subgrade elevations; backfill to final habitat design grade	87,390	--	15,700	0	0	--	--	7,750	

Table 5-4
Summary of Alternatives

Alternative	Removal Action Areas		Construction Duration (work days[8]) Mobilization/ Demobilization	Piling Removal	Removal	Placement	Total Construction Duration (work months)	In-Water / Upland Costs (9a-9e) ($ Million)	Total Cost(9a-9e) ($ Million)
1	In-Water Action	DU-1 through DU-18	15	86	99	48	14.0	$46.1	$88.5
	Upland Action	EU-1		--	115	64		$42.4	
		EU-2							
		EU-3							
2	In-Water Action	DU-1 through DU-18	15	86	99	48	14.6	$46.1	$91.9
	Upland Action	EU-1		--	122	74		$45.8	
		EU-2							
		EU-3							
		EU-4							
		EU-5							
		EU-6							

Table 5-4
Summary of Alternatives

Alternative	Removal Action Areas		Description of Alternatives	Surface Area (SF)	Piling Removal (EA)	Removal Volumes[1] (CY)		Placement Volumes[3] (CY)				
						Dredge / Excavation Volumes	Allowance Volumes[2]	Amended Cap[4]	RMC	Slope Backfill[5]	Backfill in the Upland Area (including to construct Berm)[6]	Backfill to Construct Berm in the In-Water Area[7]
3	In-Water Action	DU-1 through DU-18	Dredging of sediments to address EW RAL exceedances; placement of 1.5-ft of RMC, a sloped backfill with an armor rock layer and clean backfill	183,240	1,718	64,600	4,450	--	7,980	20,630	--	--
	Upland Action	EU-1	Full excavation down to 16 ft bgs; backfill to final habitat design grade	43,340	--	35,170	800	0	--	--	21,780	17,330
		EU-2	Full excavation down to the deepest EW RAL exceedances; backfill to final habitat design grade	24,400	--	15,820	240	0	--	--	10,130	
		EU-3		5,850	--	1,150		0	--	--	900	
		EU-4		6,350	--	3,230		0	--	--	1,680	
		EU-5	Partial excavation of EW RAL exceedances down to habitat subgrade elevations; backfill to final habitat design grade	3,410	--	330	240	0	--	--	330	
		EU-6		12,910	--	3,710		0	--	--	2,690	
		EU-7		16,580	--	3,810		0	--	--	3,650	
		EU-8		11,910	--	2,600		0	--	--	2,160	
		EU-9	Excavation of material without EW RAL exceedances down to habitat subgrade elevations; backfill to final habitat design grade	87,390	--	14,630	0	0	--	--	7,750	

Table 5-4
Summary of Alternatives

Alternative	Removal Action Areas		Construction Duration (work days[8]) Mobilization/ Demobilization	Piling Removal	Removal	Placement	Total Construction Duration (work months)	In-Water / Upland Costs (9a-9e) ($ Million)	Total Cost(9a-9e) ($ Million)
3	In-Water Action	DU-1 through DU-18	15	86	99	48	16.1	$46.1	$99.0
	Upland Action	EU-1		--	147	95		$52.9	
		EU-2							
		EU-3							
		EU-4							
		EU-5							
		EU-6							
		EU-7							
		EU-8							
		EU-9							

Table 5-4
Summary of Alternatives

Notes:

1. Removal volumes associated with either dredging in in-water areas or excavation in upland areas. The in-water dredge volume includes a 1.5x constructability factor and the upland excavation volume includes a 1.3x constructability factor. The constructability factor accounts for additional dredge/ excavation volume required to perform dredging/ excavation in practice, for overdredge/ overexcavation volumes allowances, and for additional volume to design elevation-based dredge/excavation prisms.

2. Allowance volumes are associated with either contingency re-dredging in in-water areas or contingency re-excavation in upland areas, based on confirmational sampling conducted during construction. Contingency re-dredging volume is based re-dredging conducted over a portion of the total in-water dredge area, applied to a 1-ft thickness to address generated residuals (15% of area; 1-ft thickness) and 2.5-ft thickness to remove missed inventory (20% of area; 2.5-ft thickness). Contingency re-excavation for the remaining upland area (outside of TSCA and NAPL Area) assumes re-excavation conducted over 20% of the remaining upland area (outside of EU-1), applied at a 1-ft thickness to address missed inventory; and for EU-1, assumes re-excavation conducted over 50% of EU-1, applied at a 1-ft thickness to address missed inventory.

3. Placement volumes include placement of RMC and In-Water Slope Backfill in the in-water areas and in the upland portion, placement of Amended Cap, and Backfill, and Berm Backfill. The in-water placement volumes includes a 1.5x constructability factor and the upland placement volume includes a 1.3x (with the exception of Berm Backfill that assumes a 1.5x) constructability factor. The constructability factor accounts for additional placement volume required offset the total removal volume (required to perform dredging/ excavation in practice, for overplacement allowances, and for additional volume to design elevation- based dredge/ excavation prisms).

4. Amended Cap for EU-1 is assumed to be composed of a 0.5 foot thick organoclay- amended sand cap layer (6% by weight organoclay) and a 1.0 foot thick GAC- amended sand cap layer (1% by weight GAC). The Amended Cap for EU-2, EU-3, and EU-4 for Alternative 2 is assumed to be composed of a 1.0-ft thick GAC - amended sand layer (4% by weight GAC).

5. Slope Backfill volume includes volume for placement from post-dredge surface up to 0 ft MLLW.

6. Backfill volume includes the volume includes to restore to habitat design elevations in the upland area.

7. Backfill volume includes volume for placement above 0 feet MLLW to required final design habitat elevations.

9. Work days required to complete the construction (i.e., not including weekends, holidays, or any other non-working periods).

9a. Costs are presented in 2025 dollars (see Appendix D for alternative detailed cost estimates).

9b. Sales tax is included at 10.35% (to account for Washington State [6.5%] and the City of Seattle [3.85%] taxes) and it is applied only to direct construction costs.

9c. Project costs include contingency (+30%), applied to both direct and indirect construction costs.

9d. Total project costs for each alternative represent the upper end of the costs for planning purposes and are considered accurate to approximately +30% and -30%, consistent with other environmental remediation projects at the EE/CA phase.

9e. Long-term monitoring costs (included as part of the indirect construction costs) are also provided with 7% and 2.3% NPV discount rates in Appendix D.

--: not applicable

bgs: below ground surface

CY: cubic yard

DU: dredge unit

EA: each

EE/CA: Engineering Evaluation and Cost Analysis

EU: excavation unit

EW: East Waterway

ft: feet

GAC: granular activated carbon

NAPL: non-aqueous phase liquid

NPV: net present value

RAL: Remedial Action Level

RMC: residuals management cover

SF: square feet

Table 6-1
Comparative Analysis - Ranking of Alternatives

<table>
<tr><th rowspan="2">Evaluation Criteria</th><th colspan="2">Alternative 1</th></tr>
<tr><td>In-Water Action:
- Piling Removal to the Maximum Extent Practicable
- Dredging, Navigation Channel RMC, Slope Backfill, and Armor</td><td>Upland Action:
- Focused Highest EW RAL Exceedance Area Removal (EU-1) and Off-Site Disposal
- Removal of Soil with EW RAL exceedances (EU-2) Sufficiently to accommodate Habitat Areas
- Removal of Soil with no EW RAL exceedances (EU-3) Sufficiently to accomodate Habitat Area
- Capping with Amendment in EU-1
- Backfill in Remaining Areast of T-25S Site to Final Habitat Design Elevations</td></tr>
<tr><td>Summary of Effectiveness[1]</td><td>- All contaminated sediment and piling will be removed eliminating all existing contamination providing maximum protectiveness and long-term effectiveness. Risk of re-contamination from generated residuals and dredge residuals spreading outside the project area will be managed by placement of thin sand cover (RMC).
- Short-term impacts from dredging in the in-water area to water quality will be managed through operational BMPs.
- Sediment maybe be loaded onto trucks from barges before being transported to a transfer facility. Transportation of sediment for disposal and import material (sand and armor stone) through the community and for long distances poses additional risk of exposure to airborne contaminants and dust and local truck traffic could be impacted.</td><td>- EU-1: The focused removal action in Alternative 1 substantially reduces the mass of contaminated soil in the future intertidal aquatic environment. Placement of an amended cap is expected to be protective, as chemical isolation and NAPL sorption layers isolate remaining residual and deeper PCBs beneath the future marsh the mobility and toxicity of contaminants present. The range of PCB concentration remaining after removal is between 179 mg/kg to 0.004 mg/kg, averaging at 11.8 mg/kg.
- EU-2: Partial excavation of soils with EW RAL exceedances (down to habitat subgrade) followed by placement of clean backfill immediately reduces the risks from the future marsh environment. There are however residual risks remaining.
- EU-3: Soils in EU-3 does not exceed EW RALs, but are excavated and backfilled to final habitat design elevations to accomodate a marsh.
- Excavation of soil within EU-1 is assumed to be sequenced first as the material can be segregated adequately and loaded into trucks for off-site disposal, under tightly controlled conditions, reducing the short-term potential for release and cross-contamination to surrounding areas.
- Transportation of soils and import material (gravelly sand, activated carbon, and organoclay) through the community and for long distances poses additional risk of exposure to airborne contaminants and dust and local truck traffic could be impacted.
- Long-term effectiveness of Alternative 1 is dependent on long-term operation, inspection and maintenance to ensure proper function and continuous performance. In addition, institutional controls (administrative and legal) will be required to minimize the potential for ecological and human exposure to residual contamination that will remain below the cap installed within EU-1.</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td>Summary of Implementability[2]</td><td>- Moderate technical challenges are proportional to the magnitude of sediment dredging volume of 64,600 cy
- Dewatering sediment, transport/off-site disposal will be critical components of this work.
- Risks associated with technical implementability can be minimized with pre-mobilization planning, oversight, and close implementation management.
- Dredging will be subject to the in-water construction window
- Coordination is necessary with the tribes, Port tenants, and other waterway users to ensure that impacts to their activities are minimized during remediation because the East Waterway is a busy working industrial waterway and used by tribes for a commercial salmon net fishery.</td><td>- Moderate technical challenges are proportional to the magnitude of soil excavation volume of 64,100 cy.
- Dewatering soil, soil management/transport/off-site disposal will be critical components of this work.
- Soil management requires segregation of the overburden soil layers located above and below the highest EW RAL exceedance material, to applicable off-site disposal category. It is anticipated that the highest PCB-contaminated soils will also be directly loaded into trucks (lined and sealed) for off-site transportation and disposal to avoid material re-handling within the T-25S Site.
- Large number of trucks with liners and covers will be required for transportation of excavated material and off-site disposal
- Although easily implementable, some potential challenges associated with amended cap is blending materials to the desired dosage requirements. cap placement and, maintenance
- Risks associated with technical implementability can be minimized with pre-mobilization planning, oversight, and close implementation management.</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td rowspan="2">Total Project Costs[3]</td><td>$46,129,100</td><td>$42,441,700</td></tr>
<tr><td colspan="2">$88,570,800</td></tr>
</table>

Table 6-1
Comparative Analysis - Ranking of Alternatives

Evaluation Criteria	Alternative 2	
	In-Water Action: - Piling Removal to the Maximum Extent Practicable - Dredging, Navigation Channel RMC, Slope Backfill, and Armor	**Upland Action:** - Expanded Highest EW RAL Exceedance Area (EU-1) and Off-Site Disposal - Removal of Soil with EW RAL Exceedances (EU-2, EU-3, EU-4) Sufficiently to Accommodate Expanded Capping and Habitat Areas - Removal of Soil with EW RAL Exceedances (EU-5) Sufficiently to accomodate Habitat Area - Removal of Soil without EW RAL exceedances (EU-6) Sufficiently to accomodate Habitat Areas - Backfill in Remaining Areas of T-25S Site to Final Habitat Design Elevations
Summary of Effectiveness[1]	Same as Alternative 1	- **EU-1:** In addition to the effectiveness elements of Alternative 1, Alternative 2's expanded deeper removal in EU-1 area immediately eliminates risks from the future marsh environment. The range of PCB concentrations remaining after removal is between 0.35 mg/kg and 0.004 mg/kg, averaging at 0.07 mg/kg. **- EU 2, EU-3, and EU-4:** EW RAL exceedances within these EUs are addressed through deeper partial excavation of soils, thereby incrementally reducing the mass of contaminanats present. Placement of an amended cap is expected to be protective, as chemical isolation will successfully isolate the remaining residual contaminants. - **EU-5**: Excavation of soils with EW RAL exceedances down to habitat subgrade elevation eliminates all existing contamination in this unit, thus eliminating residual risk. - **EU-6**: Soils in EU-6 does not exceed EW RALs and the soil is excavated and backfilled to final habitat design elevation to accomodate a marsh. - In addition to the short term impacts of Alternative 1, Alternative 2's incremental increase in removal soil volume and import of clean fill materials requires more trucks/railcars for upland transportation, resulting in increased emissions and impacts to the community. - EU-2 to EU-4, in addition to EU-1, will have the same requirements for long-term operation, inspection and maintenance and institutional controls as Alternative 1, to ensure the long-term effectiveness of Alternative 2. In addition, institutional controls (administrative and legal) will be required to minimize the potential for ecological and human exposure to residual contamination that will remain below the cap installed within EU-1- to EU-4.
Summary of Implementability[2]	In addition to the implementability challenges of Alternative 1, Alternative 2 includes an incremental soil removal volume of 2,800 cy and expanded cap placement outside of EU-1.	
Total Project Costs[3]	**$46,129,100**	**$45,829,200**
	$91,958,300	

Table 6-1
Comparative Analysis - Ranking of Alternatives

Evaluation Criteria	Alternative 3	
	In-Water Remedial Action: - Piling Removal to the Maximum Extent Practicable - Dredging, Navigation Channel RMC, Slope Backfill, and Armor	**Upland Removal Action:** - Maximum Soil Removal with EW RAL Exceedance and Off-Site Disposal (EU-1, EU-2, EU-3, EU-4, EU-5, EU-6, EU-7, EU-8) to Sufficiently to Accommodate Expanded Capping and Habitat Areas - Removal of Soils without EW RAL exceedances (EU-9) Sufficiently to accomodate Habitat Areas - Backfill in Remaining Areas of T-25S Site to Final Habitat Design Elevations
Summary of Effectiveness[1]	Same as Alternatives 1 and 2	- **EU-1 to EU-8**: All contaminated soils with EW RAL exceedaces will be removed under Alternative 3, eliminating all existing contamination and any potential residual risk. - **EU-9**: Soils in EU-9 does not exceed EW RALs and is excavated and backfilled to final habitat design elevation to accomodate a marsh. - Alternative 3 has the most potential short-term risks due to incrementally larger excavation and import volumes compared to Alternatives 1 and 2. - Alternative 3 provides the greatest protectiveness and will not require cap compliance monitoring nor ICs to ensure the long-term effectiveness.
Summary of Implementability[2]	Technical challenges associated with Alternative 3 includes an incremental soil removal volume of 13,600 cy from Alternative 2 and 16,400 cy from Alternative 1. However, Alternative 3's full removal scenario in the upland area, eliminates the requirement for an amended cap and thus the requirement for ICs.	
Total Project Costs[3]	**$46,129,100**	**$52,852,200**
	$98,981,300	

Table 6-1
Comparative Analysis - Ranking of Alternatives

Notes:
1. Effectiveness criterion relates to the overall protectiveness to human health and the environment, both is the short -term and long-term.
2. Implementability criterion refers to the ability and feasibility of the alternative to be constructed and its degree of difficulty and considers technical and administrative implementabilities as primary factors.
3. Cost criterion evaluates the total project costs (including direct and indirect construction) incurred with the implementation of each removal alternative; expressed as 2025 dollars.

BMPs: best management practices
cy: cubic yards
EW: East Waterway
ICs: institutional controls
PCBs: polychlorinated biphenyls
ppm: parts per million
RAL: remedial action level

RMC: residuals management cover

Table 6-2
Alternative Cost Comparison

Task ID	Task Description	Alternative 1			Alternative 2			Alternative 3		
		In-Water Costs	Upland Costs	Total Project Costs	In-Water Costs	Upland Costs	Total Project Costs	In-Water Costs	Upland Costs	Total Project Costs
DIRECT CONSTRUCTION COSTS										
1	Mobilization/Demobilization	$ 1,430,000.00	$ 780,000.00	$ 2,210,000.00	$ 1,430,000.00	$ 780,000.00	$ 2,210,000.00	$ 1,430,000.00	$ 780,000.00	$ 2,210,000.00
2	Site Preparation	$ 250,000.00	$ 769,100.00	$ 1,019,100.00	$ 250,000.00	$ 769,100.00	$ 1,019,100.00	$ 250,000.00	$ 769,100.00	$ 1,019,100.00
3	Surveys	$ 796,461.00	$ 762,927.00	$ 1,559,388.00	$ 796,461.00	$ 845,119.00	$ 1,641,580.00	$ 796,461.00	$ 1,008,812.00	$ 1,805,273.00
4	In-Water Structural Work	$ 3,760,913.00	$ -	$ 3,760,913.00	$ 3,760,913.00	$ -	$ 3,760,913.00	$ 3,760,913.00	$ -	$ 3,760,913.00
5	Dredging, Transloading, Upland Transportation, and Disposal	$ 20,138,432.00	$ -	$ 20,138,432.00	$ 20,138,432.00	$ -	$ 20,138,432.00	$ 20,138,432.00	$ -	$ 20,138,432.00
6	Excavation, Transfer, Upland Transportation, and Disposal	$ -	$ 22,501,542.00	$ 22,501,542.00	$ -	$ 23,914,177.00	$ 23,914,177.00	$ -	$ 28,398,037.00	$ 28,398,037.00
7	In-Water Material Placement	$ 2,929,762.00	$ -	$ 2,929,762.00	$ 2,929,762.00	$ -	$ 2,929,762.00	$ 2,929,762.00	$ -	$ 2,929,762.00
8	Upland Material Placement	$ -	$ 3,883,269.00	$ 3,883,269.00	$ -	$ 4,722,606.00	$ 4,722,606.00	$ -	$ 5,015,953.00	$ 5,015,953.00
9	Environmental Controls	$ 500,000.00	$ 150,000.00	$ 650,000.00	$ 500,000.00	$ 150,000.00	$ 650,000.00	$ 500,000.00	$ 150,000.00	$ 650,000.00
	Direct Construction Costs Subtotal	**$ 29,805,568.00**	**$ 28,846,838.00**	**$ 58,652,406.00**	**$ 29,805,568.00**	**$ 31,181,002.00**	**$ 60,986,570.00**	**$ 29,805,568.00**	**$ 36,121,902.00**	**$ 65,927,470.00**
10	**Direct Cleanup Construction Contingency (30%)**	$ 8,941,670.00	$ 8,654,051.00	$ 17,595,722.00	$ 8,941,670.00	$ 9,354,301.00	$ 18,295,971.00	$ 8,941,670.00	$ 10,836,571.00	$ 19,778,241.00
	Direct Construction Cost Subtotal with Contingency	**$ 38,747,238.00**	**$ 37,500,889.00**	**$ 76,248,128.00**	**$ 38,747,238.00**	**$ 40,535,303.00**	**$ 79,282,541.00**	**$ 38,747,238.00**	**$ 46,958,473.00**	**$ 85,705,711.00**
11	**Sales Tax (10.35%)**	$ 4,010,339.00	$ 3,881,342.00	$ 7,891,681.00	$ 4,010,339.00	$ 4,195,404.00	$ 8,205,743.00	$ 4,010,339.00	$ 4,860,202.00	$ 8,870,541.00
	Total Direct Construction Costs (with Contingency and Sales Tax) - Rounded	**$ 42,757,600.00**	**$ 41,382,200.00**	**$ 84,139,800.00**	**$ 42,757,600.00**	**$ 44,730,700.00**	**$ 87,488,300.00**	**$ 42,757,600.00**	**$ 51,818,700.00**	**$ 94,576,300.00**
INDIRECT CONSTRUCTION COSTS										
12	Indirect Construction Costs	$ 2,593,484.00	$ 815,000.00	$ 3,408,484.00	$ 2,593,484.00	$ 845,000.00	$ 3,438,484.00	$ 2,593,484.00	$ 795,000.00	$ 3,388,484.00
	Indirect Construction Costs Subtotal	**$ 2,593,484.00**	**$ 815,000.00**	**$ 3,408,484.00**	**$ 2,593,484.00**	**$ 845,000.00**	**$ 3,438,484.00**	**$ 2,593,484.00**	**$ 795,000.00**	**$ 3,388,484.00**
13	**Indirect Construction Contingency (30%)**	$ 778,045.00	$ 244,500.00	$ 1,022,545.00	$ 778,045.00	$ 253,500.00	$ 1,031,545.00	$ 778,045.00	$ 238,500.00	$ 1,016,545.00
	Indirect Construction Costs Subtotal with Contingency	**$ 3,371,529.00**	**$ 1,059,500.00**	**$ 4,431,029.00**	**$ 3,371,529.00**	**$ 1,098,500.00**	**$ 4,470,029.00**	**$ 3,371,529.00**	**$ 1,033,500.00**	**$ 4,405,029.00**
	Total Indirect Construction Costs (with Contingency) - Rounded	**$ 3,371,500.00**	**$ 1,059,500.00**	**$ 4,431,000.00**	**$ 3,371,500.00**	**$ 1,098,500.00**	**$ 4,470,000.00**	**$ 3,371,500.00**	**$ 1,033,500.00**	**$ 4,405,000.00**
	Total Project Cost - Rounded	**$ 46,129,100.00**	**$ 42,441,700.00**	**$ 88,570,800.00**	**$ 46,129,100.00**	**$ 45,829,200.00**	**$ 91,958,300.00**	**$ 46,129,100.00**	**$ 52,852,200.00**	**$ 98,981,300.00**

Notes:

1. In providing this Opinion of Probable Cost, the Client understands that the Consultant (Anchor QEA) has no control over the cost or availability of labor, equipment, or materials, or over market condition or the Contractor's method of pricing, and the Consultant's opinions of probable construction costs are made on the basis of the Consultant's professional judgment and experience. The Consultant makes no warranty, express or implied, that the bids or the negotiated cost of the work will not vary from the Consultant's opinion of probable construction cost.
2. Costs are presented in present-day US dollars (i.e., 2025).
3. Sales tax is included at 10.35% (to account for Washington State [6.5%] and the City of Seattle [3.85%] taxes) and is applied only to direct construction costs.
4. A 30% contingency is applied to both total direct construction and total indirect construction costs based on consideration of potential cost uncertainty associated with the level of information currently available and engineering best professional judgment. Due to the nature of the project (i.e., environmental sediment remediation), additional factors that cannot be forecasted at this time—such as scope unknowns (i.e., significant changes in site conditions or quantities), price uncertainty (i.e., varying market conditions, increasing inflation, fuel and labor changes), or any other unforeseen circumstances (i.e., additional design requirements)—may influence contractor bidding prices and impact the final project costs outside, in excess, or below this contingency.

Figures

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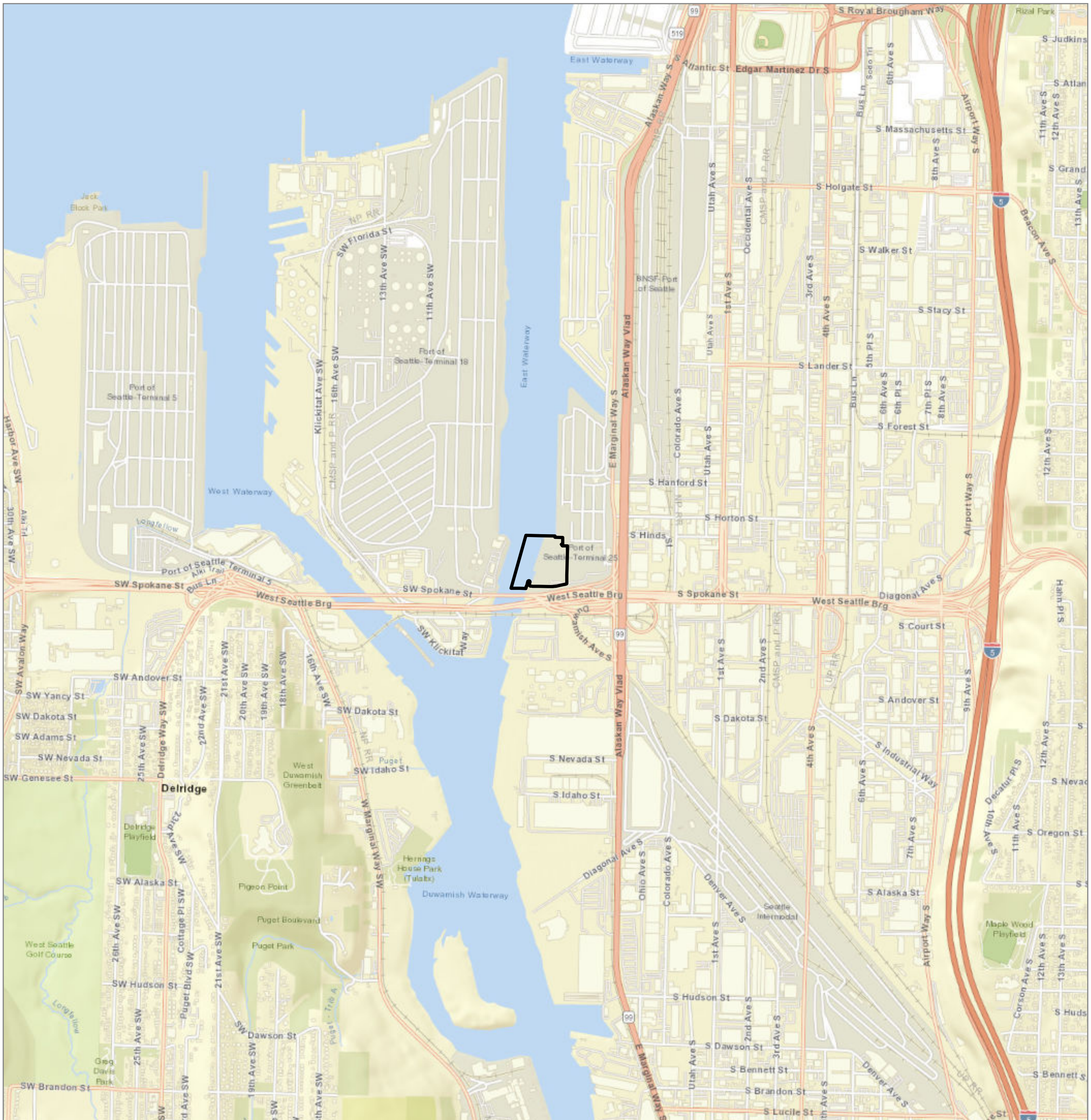

LEGEND:

▭ Project Boundary

NOTE:
1. Basemap source: Esri Streets

0 2,000
Feet

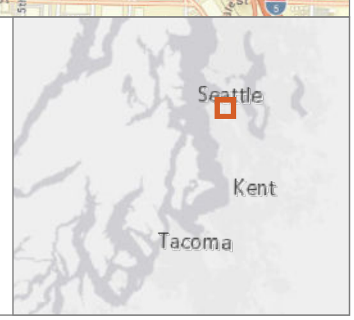

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Figure 1-1
Terminal 25 South Site Vicinity Map
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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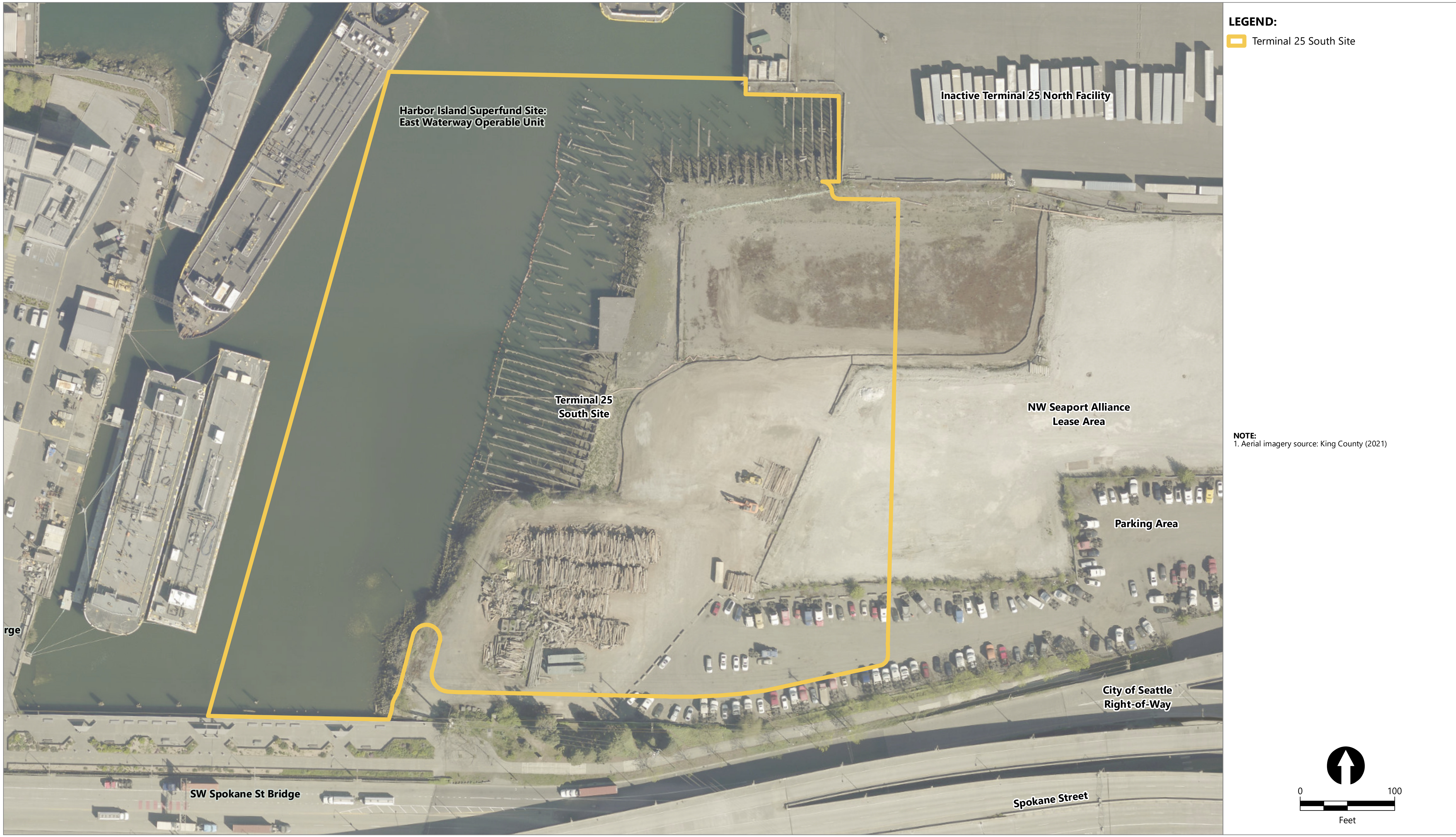

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Figure 1-2
Terminal 25 South Site
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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Figure 1-3
Restoration Conceptual Site Plan
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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NOTES:
1. Aerial imagery source: King County (2021)

SSA: Stevedoring Services of America

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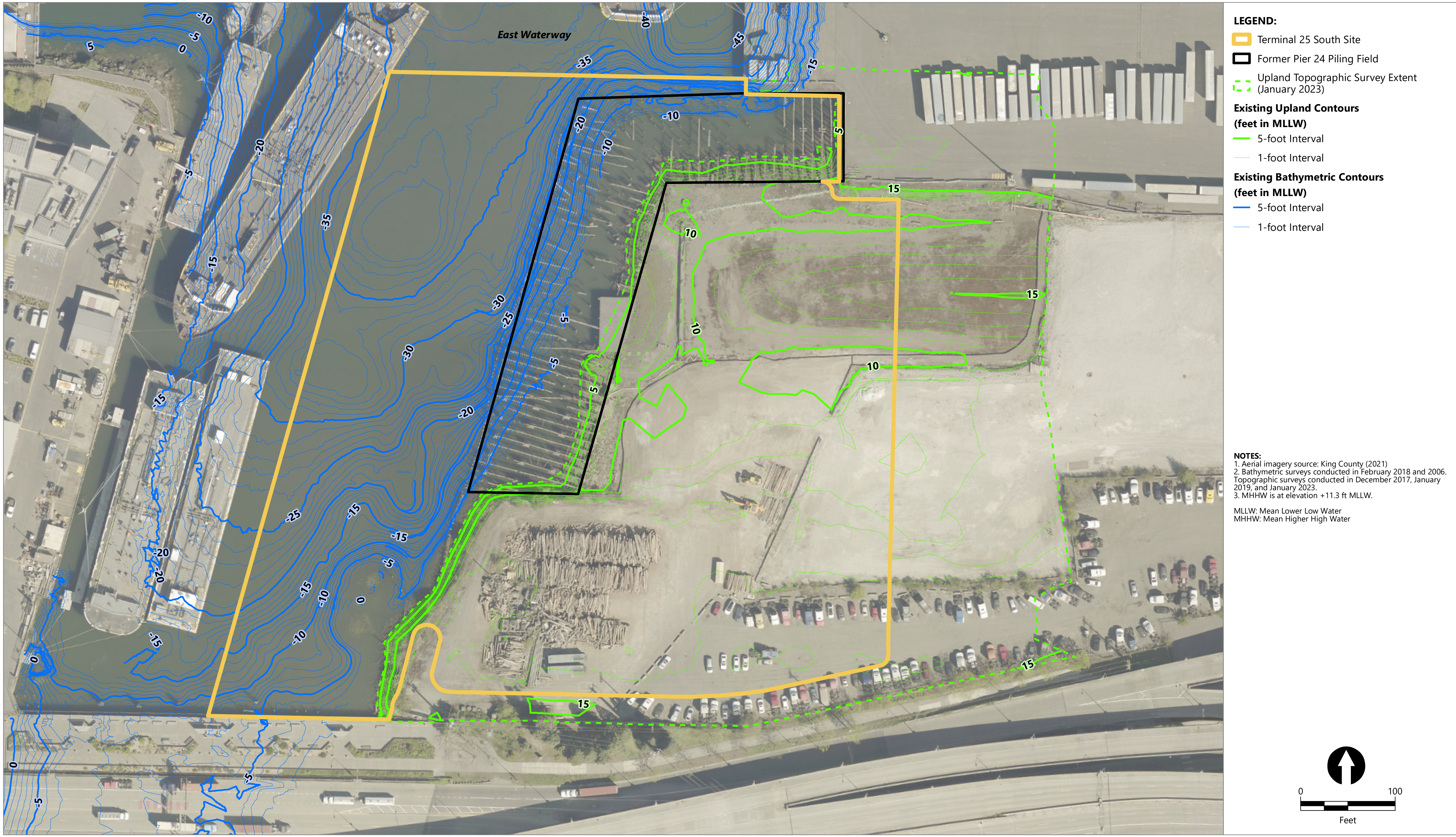
Figure 2-1
Terminal 25 South Site Location and Area Zoning Map
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



NOTES:
1. Aerial imagery source: King County (2021)
2. Bathymetric surveys conducted in February 2018 and 2006. Topographic surveys conducted in December 2017, January 2019, and January 2023.
3. MHHW is at elevation +11.3 ft MLLW.

MLLW: Mean Lower Low Water
MHHW: Mean Higher High Water

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Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_Report\AQ_POS_T25_EECA_Fig2-2_ExistingBathyTopo.mxd

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Figure 2-2
Existing Bathymetric and Topographic Contour Elevations
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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Figure 2-3
Historical Operations, Previous Remedial Actions, and Potential Source Areas
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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LEGEND:

- Terminal 25 South Site
- Approximate Location of City of Seattle/Herrera Bent 97 Investigation
- Hinds Outfall (City of Seattle)
- Public Bike Path
- Adjacent Sites of Interest
- Approximate Key Historical Building Footprint

NOTE:
1. Aerial imagery source: King County (2021)

SSA: Stevedoring Services of America

0 300
Feet

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Figure 2-4
Adjacent Sites of Interest
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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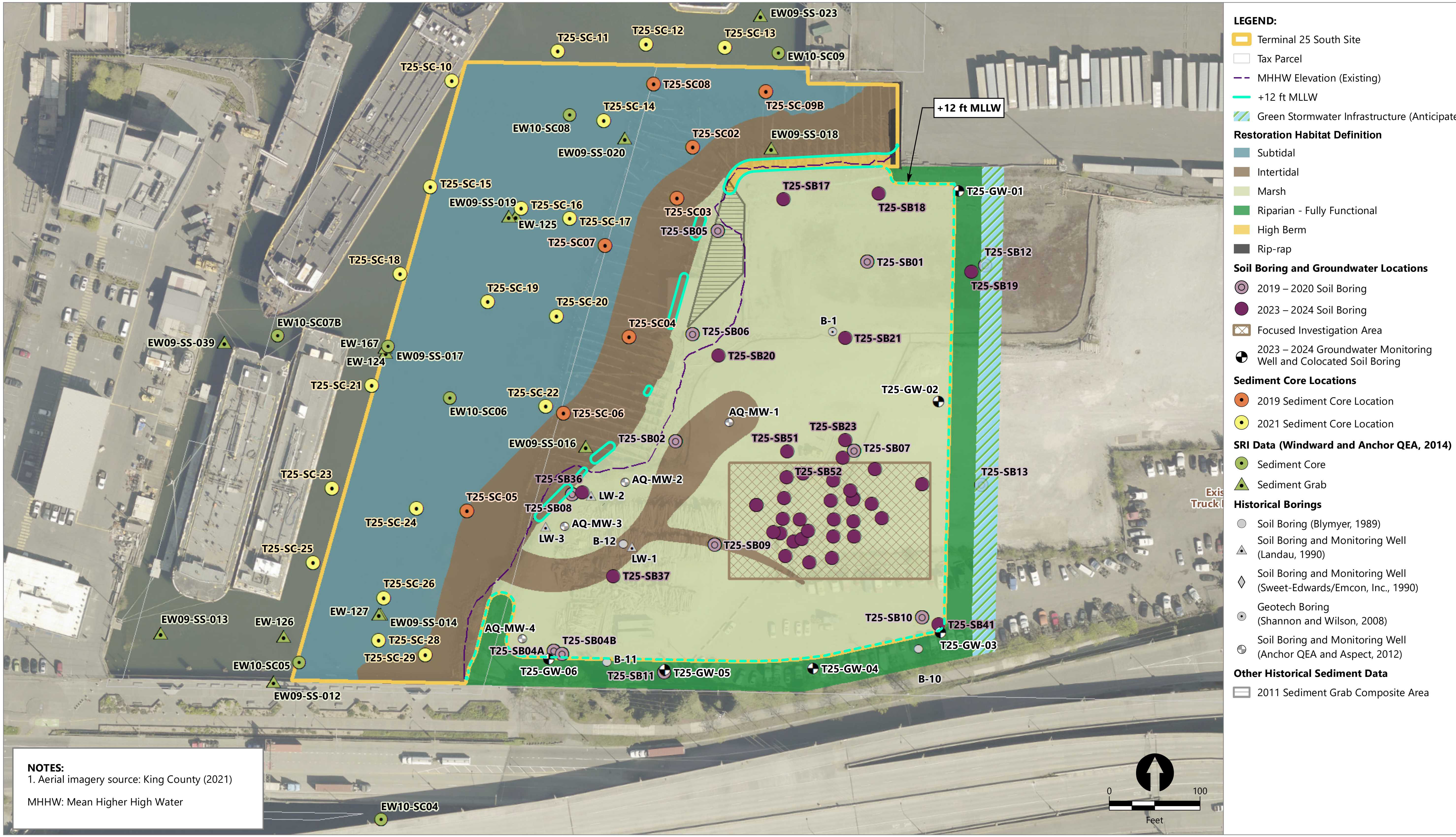

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Figure 2-5a
Sample Locations
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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NOTE:
1. Aerial imagery source: King County (2021)

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Figure 2-5b
Sample Locations - Focused Investigation Area
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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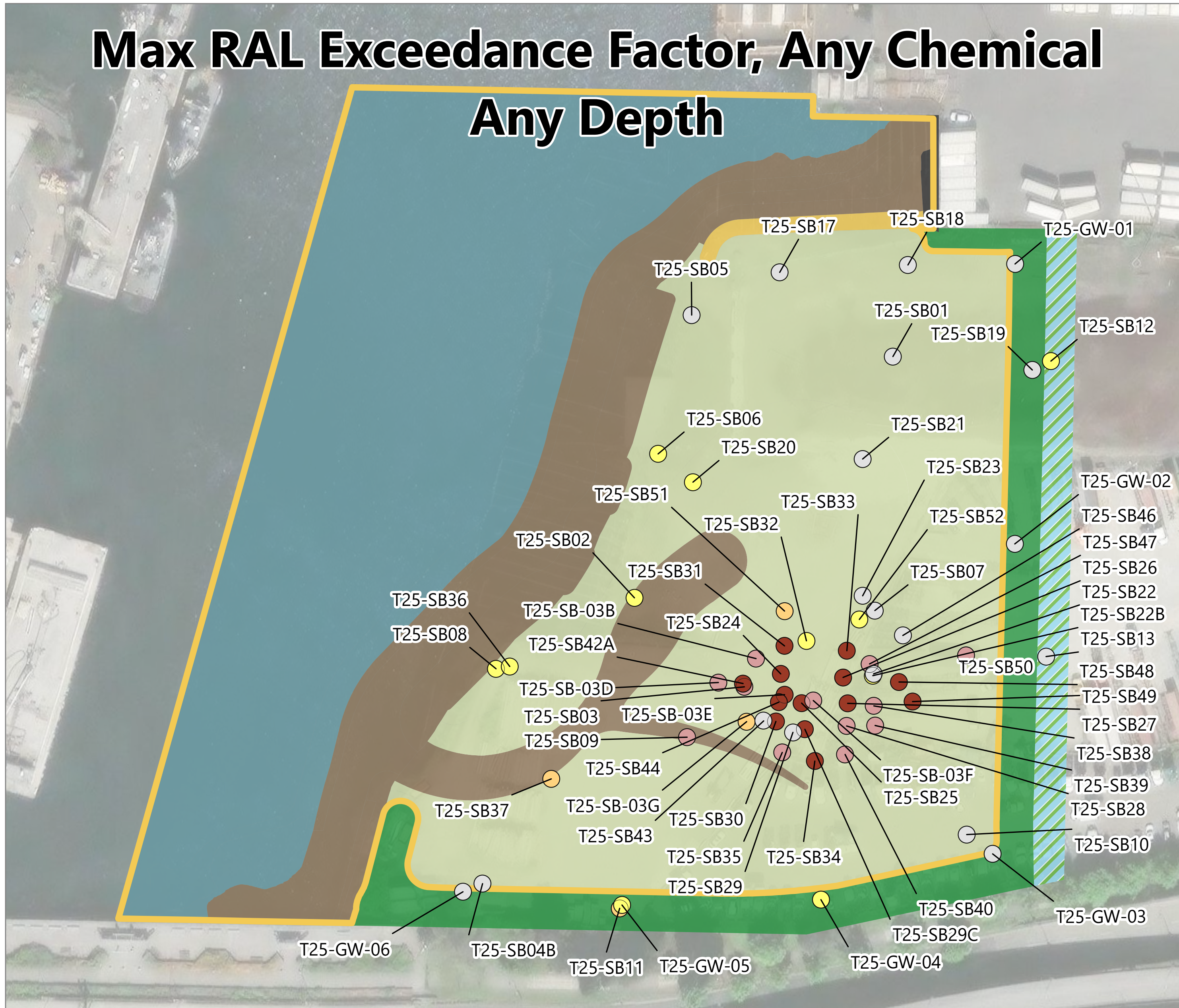

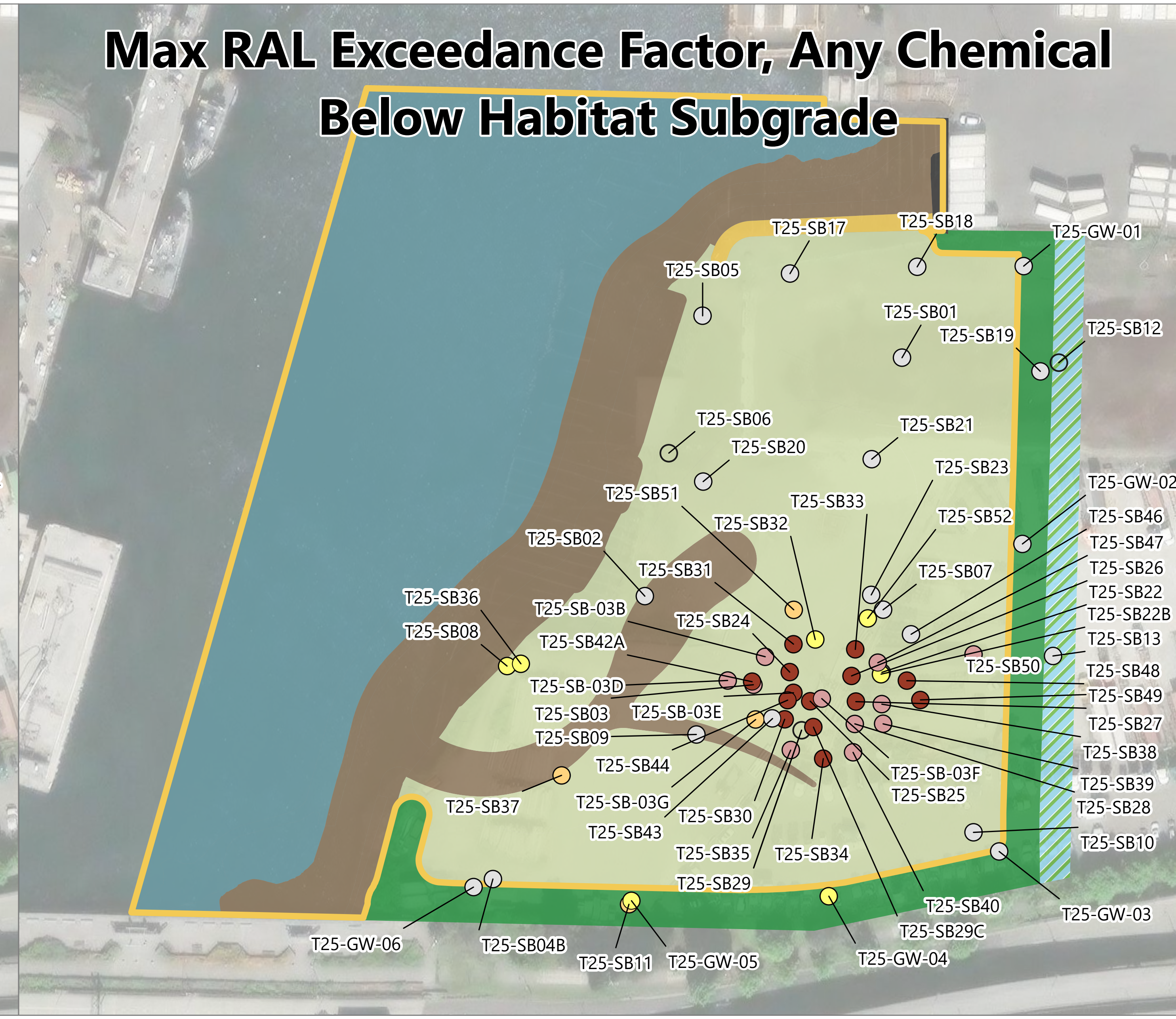

LEGEND:

Terminal 25 South Site

Maximum RAL Exceedance Factor, Any Chemical

- No RAL Exceedance
- 1-20
- 20-100
- 100-1000
- >1000
- No Data Available
- Green Stormwater Infrastructure (Anticipated)

Restoration Habitat Definition

- Subtidal
- Intertidal
- Marsh
- Riparian - Fully Functional
- High Berm
- Rip-rap

NOTE:

1. Aerial Imagery courtesy of ESRI.

RAL: Remedial Action Level

0 250
Feet

Publish Date: 2025/09/23, 10:06 AM | User: dmiller
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Figure 2-6a
Upland Soil East Waterway RAL Screening
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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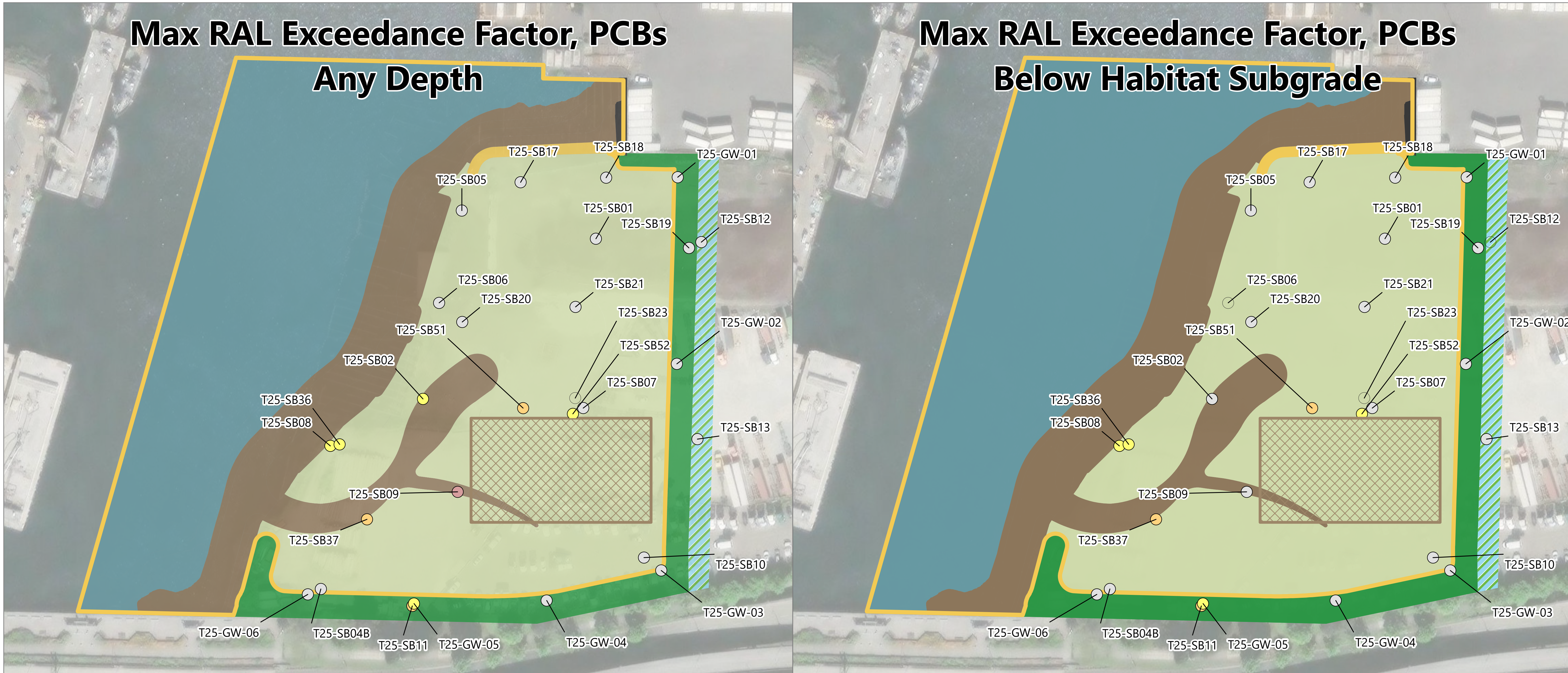

LEGEND:

Terminal 25 South Site

Focused Investigation Area

Maximum RAL Exceedance Factor, PCBs

- No RAL Exceedance
- 1-20
- 20-100
- 100-110
- No Data Available

Green Stormwater Infrastructure (Anticipated)

Restoration Habitat Definition

- Subtidal
- Intertidal
- Marsh
- Riparian - Fully Functional
- High Berm
- Rip-rap

NOTE:
1. Aerial Imagery courtesy of ESRI.

RAL: Remedial Action Level
PCB: Polychlorinated Biphenyl

0 250
Feet

Publish Date: 2025/09/12, 9:58 AM | User: emueller
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Figure 2-6b
Upland Soil East Waterway RAL Screening- PCBs
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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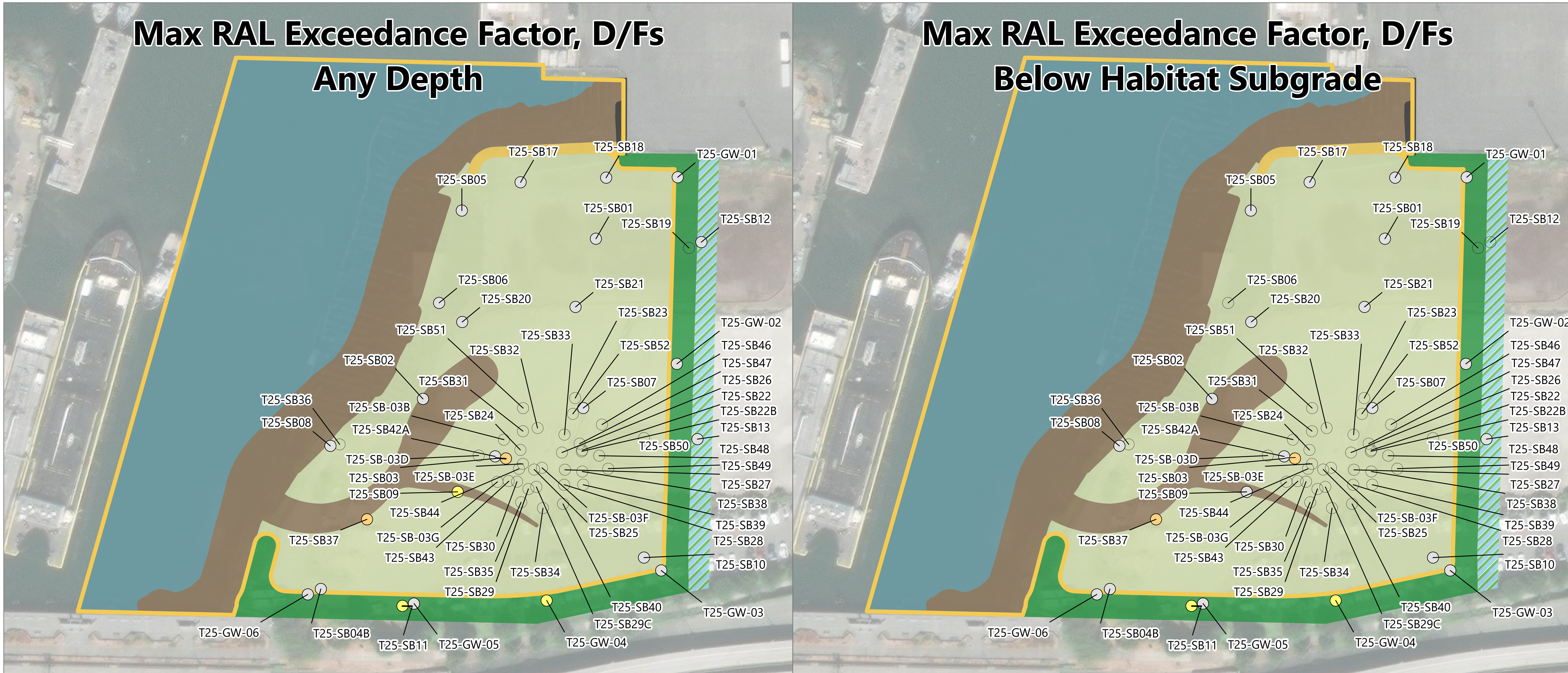

LEGEND:

Terminal 25 South Site

Maximum RAL Exceedance Factor, Dioxin/Furans
- No RAL Exceedance
- 1-20
- 20-100
- 100-500
- No Data Available
- Green Stormwater Infrastructure (Anticipated)

Restoration Habitat Definition
- Subtidal
- Intertidal
- Marsh
- Riparian - Fully Functional
- High Berm
- Rip-rap

NOTE:
1. Aerial Imagery courtesy of ESRI.

RAL: Remedial Action Level
D/F: Dioxin/Furans

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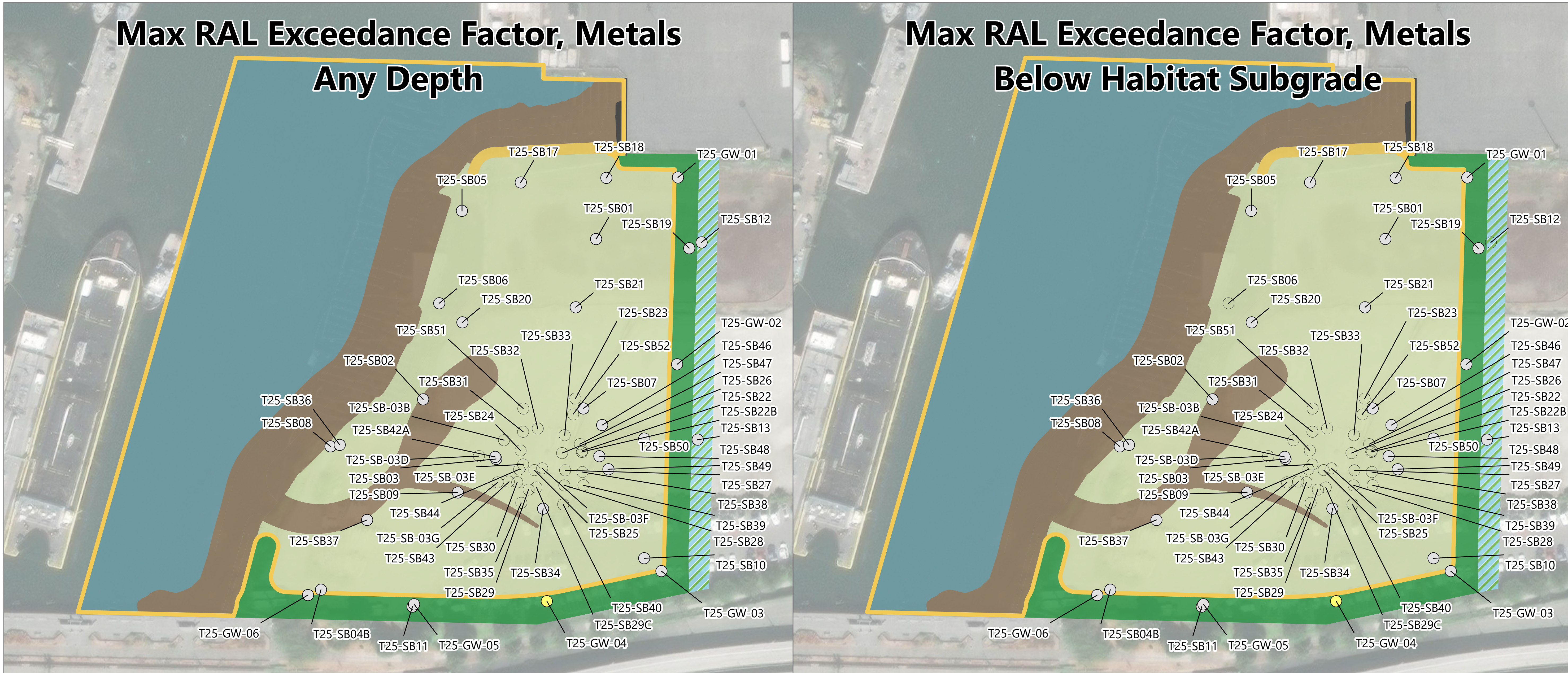
Figure 2-6c
Upland Soil East Waterway RAL Screening - D/F
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



LEGEND:

Terminal 25 South Site

Maximum RAL Exceedance Factor, Metals

- No RAL Exceedance
- 1-20
- 20-100
- 100-500
- No Data Available

Green Stormwater Infrastructure (Anticipated)

Restoration Habitat Definition

- Subtidal
- Intertidal
- Marsh
- Riparian - Fully Functional
- High Berm
- Rip-rap

NOTES:

1. Aerial Imagery courtesy of ESRI.
2. Metals with RALs include arsenic and mercury

RAL: Remedial Action Level

0 250
Feet

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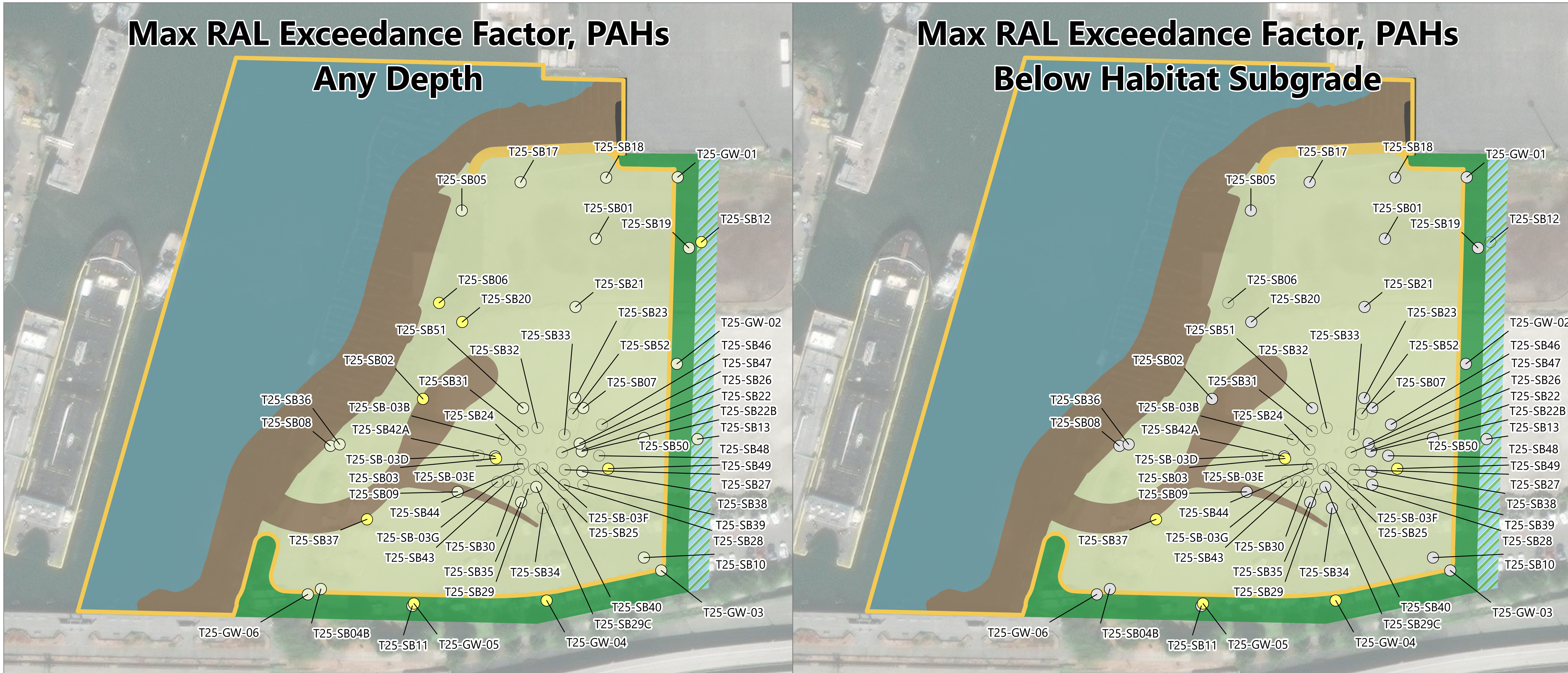
ANCHOR QEA

Figure 2-6d
Upland Soil East Waterway RAL Screening - Metals
Engineering Evaluation and Cost Analysis
Terminal 25 South Site



LEGEND:

Terminal 25 South Site

Maximum RAL Exceedance Factor, PAHs
- No RAL Exceedance
- 1-20
- 20-100
- 100-500
- No Data Available
- Green Stormwater Infrastructure (Anticipated)

Restoration Habitat Definition
- Subtidal
- Intertidal
- Marsh
- Riparian - Fully Functional
- High Berm
- Rip-rap

NOTE:
1. Aerial Imagery courtesy of ESRI.

RAL: Remedial Action Level
PAH: Polycyclic Aromatic Hydrocarbons

0 250
Feet

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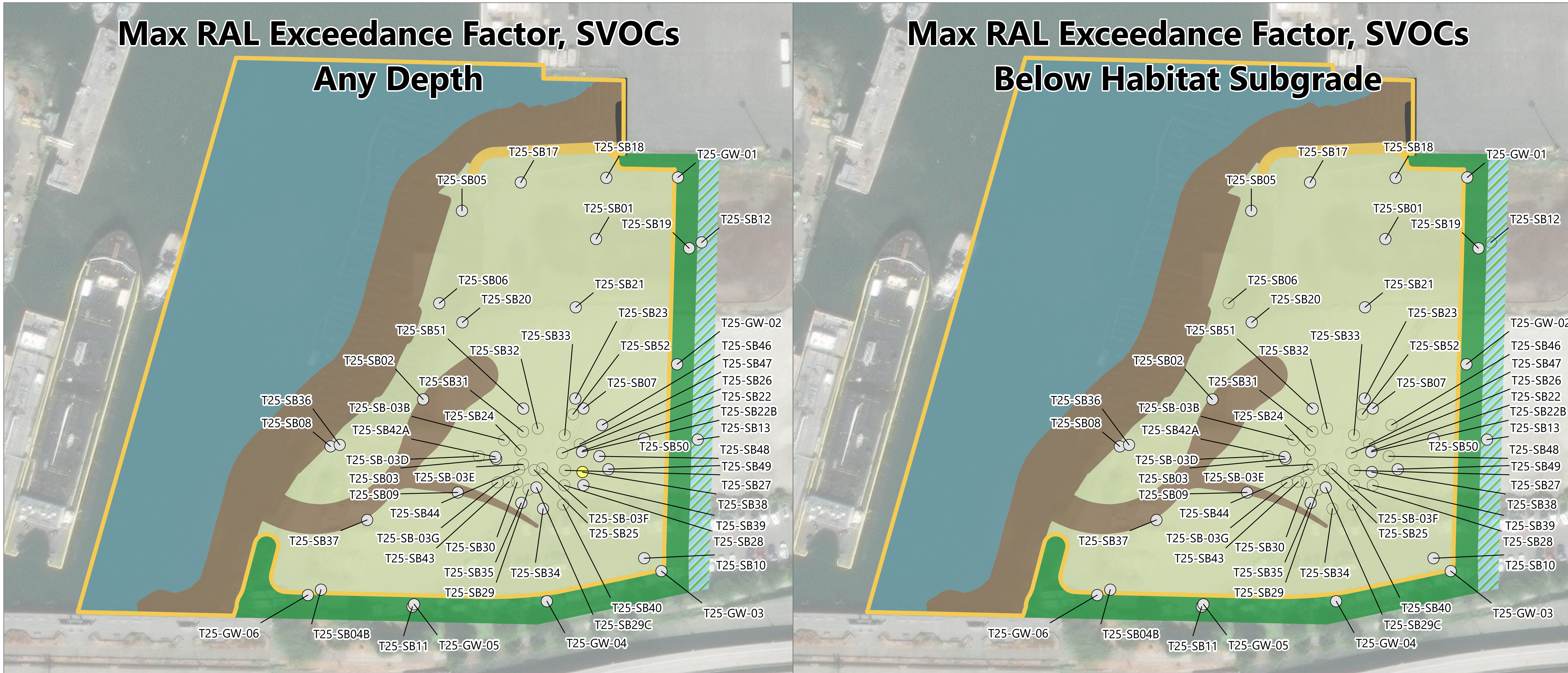
ANCHOR QEA

Figure 2-6e
Upland Soil East Waterway RAL Screening - PAHs
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



LEGEND:

Terminal 25 South Site

Maximum RAL Exceedance Factor, SVOCs

- No RAL Exceedance
- 1-20
- 20-100
- 100-500
- No Data Available

Green Stormwater Infrastructure (Anticipated)

Restoration Habitat Definition

- Subtidal
- Intertidal
- Marsh
- Riparian - Fully Functional
- High Berm
- Rip-rap

NOTES:

1. Aerial Imagery courtesy of ESRI.
2. SVOCs with RALs include 1,4-dichlorobenzene and butylbenzyl phthalate.

RAL: Remedial Action Level
SVOCs: Semi-Volatile Organic Compounds

0 250
Feet

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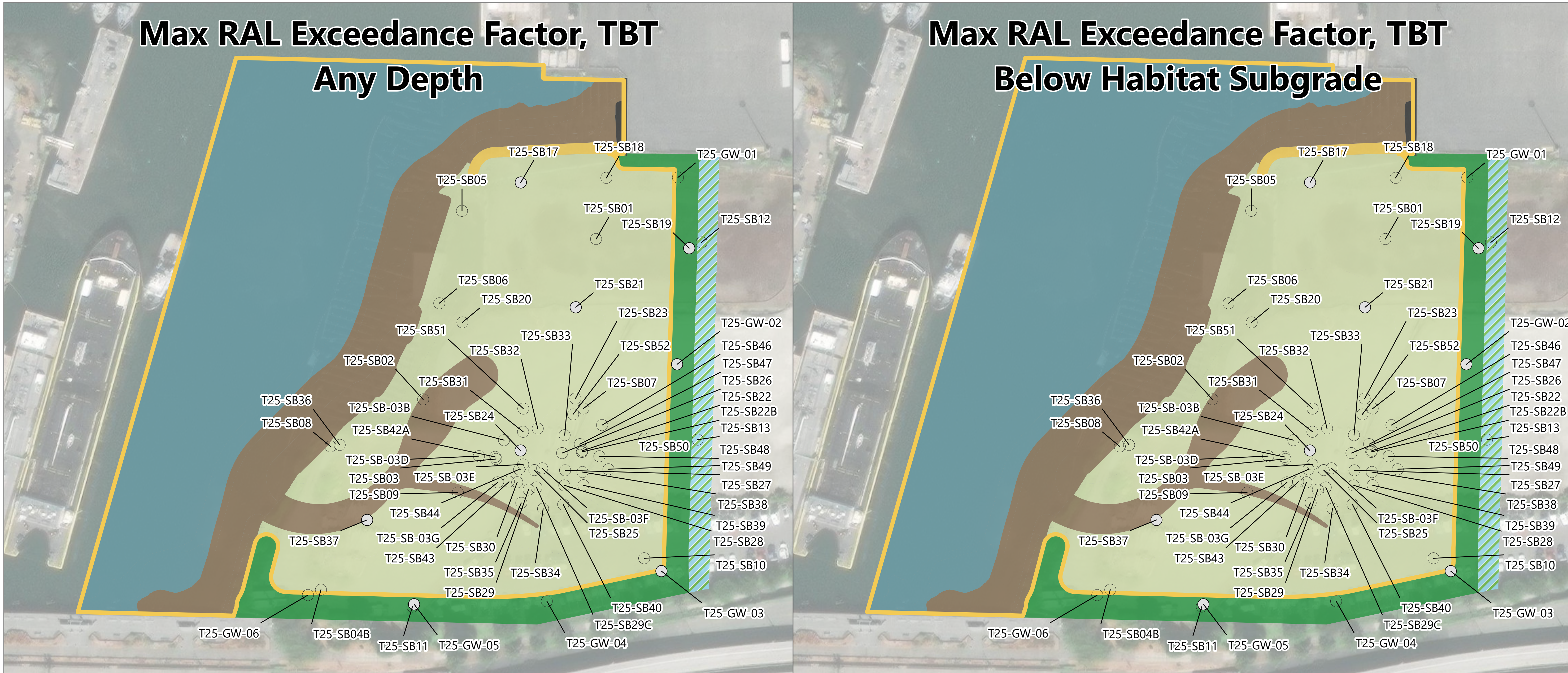
Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_WorkPlan\POS_EECAWP_Report.aprx | AQ_POS_EECA_F2-6f_UplandSoilEastWaterwayRALScreening_SVOCs

ANCHOR QEA

Figure 2-6f
Upland Soil East Waterway RAL Screening - SVOCs
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



LEGEND:

Terminal 25 South Site

Maximum RAL Exceedance Factor, TBT

- No RAL Exceedance
- 1-20
- 20-100
- 100-500
- No Data Available
- Green Stormwater Infrastructure (Anticipated)

Restoration Habitat Definition

- Subtidal
- Intertidal
- Marsh
- Riparian - Fully Functional
- High Berm
- Rip-rap

NOTE:

1. Aerial Imagery courtesy of ESRI.

RAL: Remedial Action Level
TBT: Tributyltin

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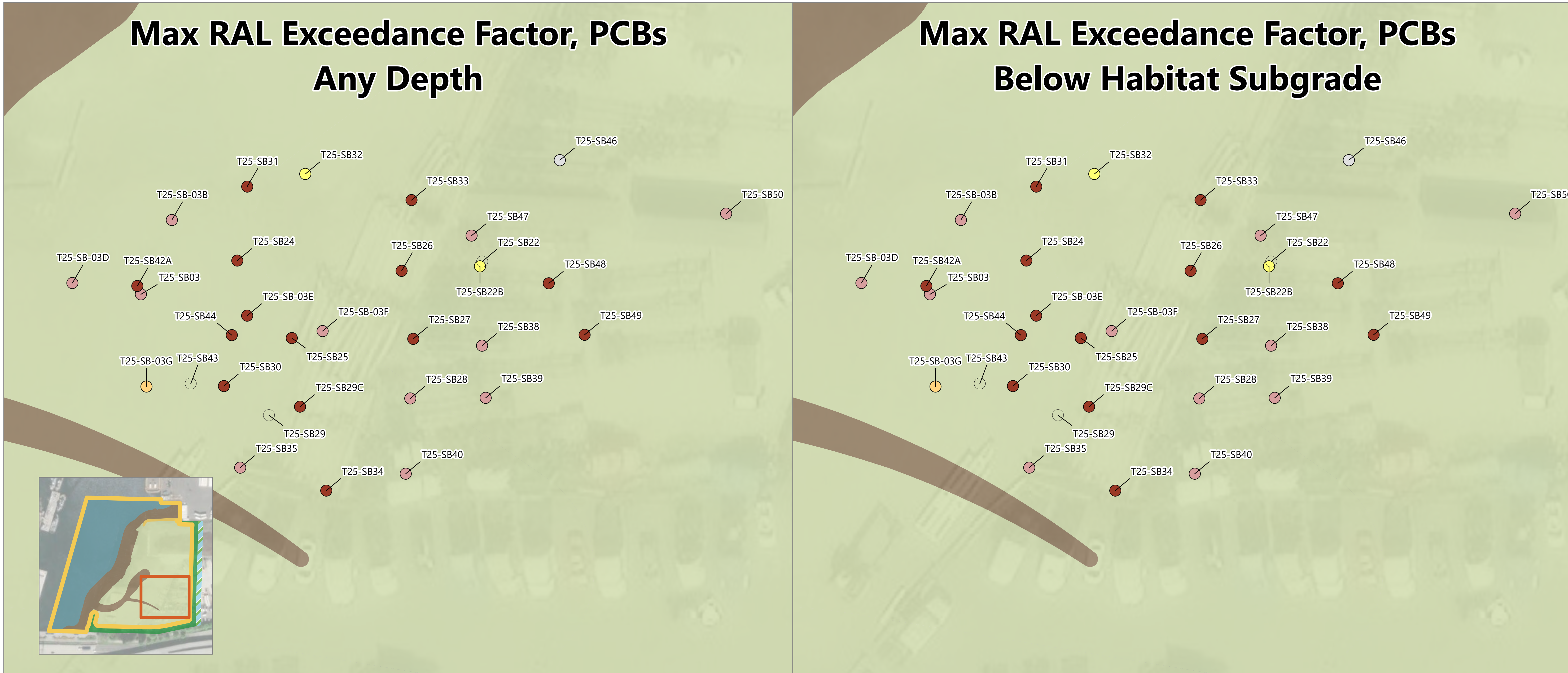
Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_WorkPlan\POS_EECAWP_Report.aprx | AQ_POS_EECA_F2-6g_UplandSoilEastWaterwayRALScreening_TBT

ANCHOR QEA

Figure 2-6g
Upland Soil East Waterway RAL Screening - TBT
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



LEGEND:

Terminal 25 South Site

Maximum RAL Exceedance Factor, PCBs

- No RAL Exceedance
- 1-20
- 20-100
- 100-1000
- >1000
- No Data Available
- Green Stormwater Infrastructure (Anticipated)

Restoration Habitat Definition

- Subtidal
- Intertidal
- Marsh
- Riparian - Fully Functional
- High Berm
- Rip-rap

NOTE:
1. Aerial Imagery courtesy of ESRI.

RAL: Remedial Action Level
PCB: Polychlorinated Biphenyl

0 50
Feet

Publish Date: 2025/09/12, 10:30 AM | User: emueller
Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_WorkPlan\POS_EECAWP_Report.aprx | AQ_POS_EECA_F2-6h_UplandSoilEastWaterwayRALScreening_PCBsInset

ANCHOR QEA

Figure 2-6h
Focused Investigation Area RAL Exceedances
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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LEGEND:

Terminal 25 South Site

Soil Boring and Groundwater Locations

2019 – 2020 Soil Boring

2023 – 2024 Soil Boring

NAPL Observed in Soil Boring

Restoration Habitat Definition

Intertidal

Marsh

NOTES:

1. Aerial imagery source: King County (2021)

NAPL: Non-Aqueous Phase Liquid

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Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_Report\AQ_POS_T25_EECA_Fig2-7_NAPL_Observations.mxd

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Figure 2-7
Focused Investigation Area NAPL Observations
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_Report\AQ_POS_T25_EECA_Fig2-8a_EW_deepestexceedance.mxd

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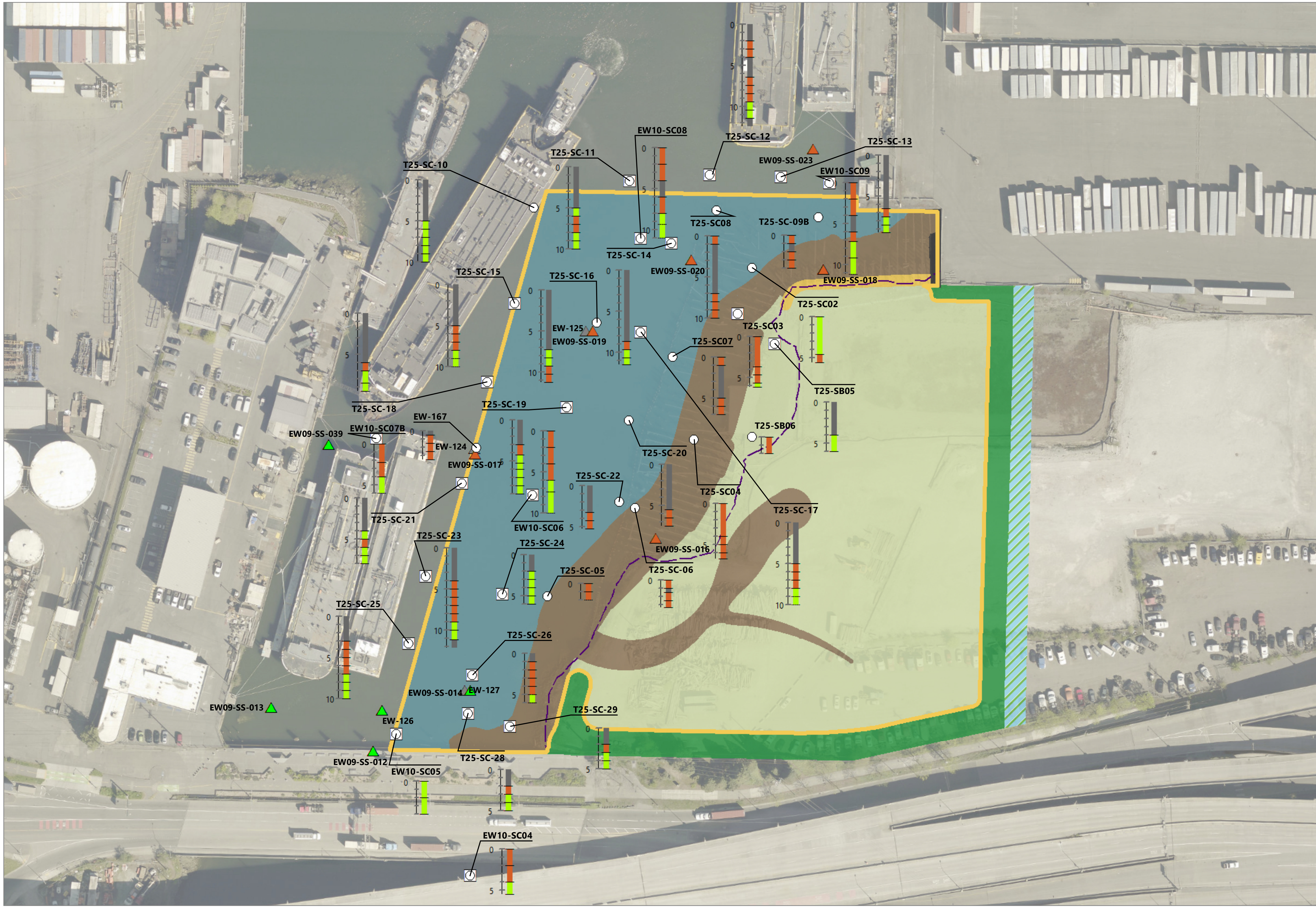
Figure 2-8a
East Waterway Sediments RAL Screening
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



LEGEND:

- Terminal 25 South Site
- MHHW Elevation (Existing)
- Green Stormwater Infrastructure (Anticipated)

Restoration Habitat Definition

- Subtidal
- Intertidal
- Marsh
- Riparian - Fully Functional
- High Berm
- Rip-rap

Sediment Sampling Location

- Grab
- Core

Sediment EW RAL Exceedance

- > RAL
- <= RAL
- No Data
- Deepest Sample Interval Does Not Exceed a Sediment EW RAL

Core Stick Scale Bar
(hatching in feet)

0
5

NOTES:
1. Aerial Imagery source: King County (2021)
2. SB05 and SB06 were collected as upland borings but are located below mean higher high water (+11.3' MLLW).

MLLW: Mean Lower Low Water
RAL: Remedial Action Level
EW: East Waterway

0 100
Feet

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Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_Report\AQ_POS_T25_EECA_Fig2-8b_EW_RAL_screeningSummary.mxd

ANCHOR QEA

Figure 2-8b
Vertical Profile of East Waterway Sediments RAL Screening
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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NOTE:
1. Aerial imagery source: King County (2021)

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Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_Report\AQ_POS_T25_EECA_Fig2-9_WaterQualityScreening.mxd

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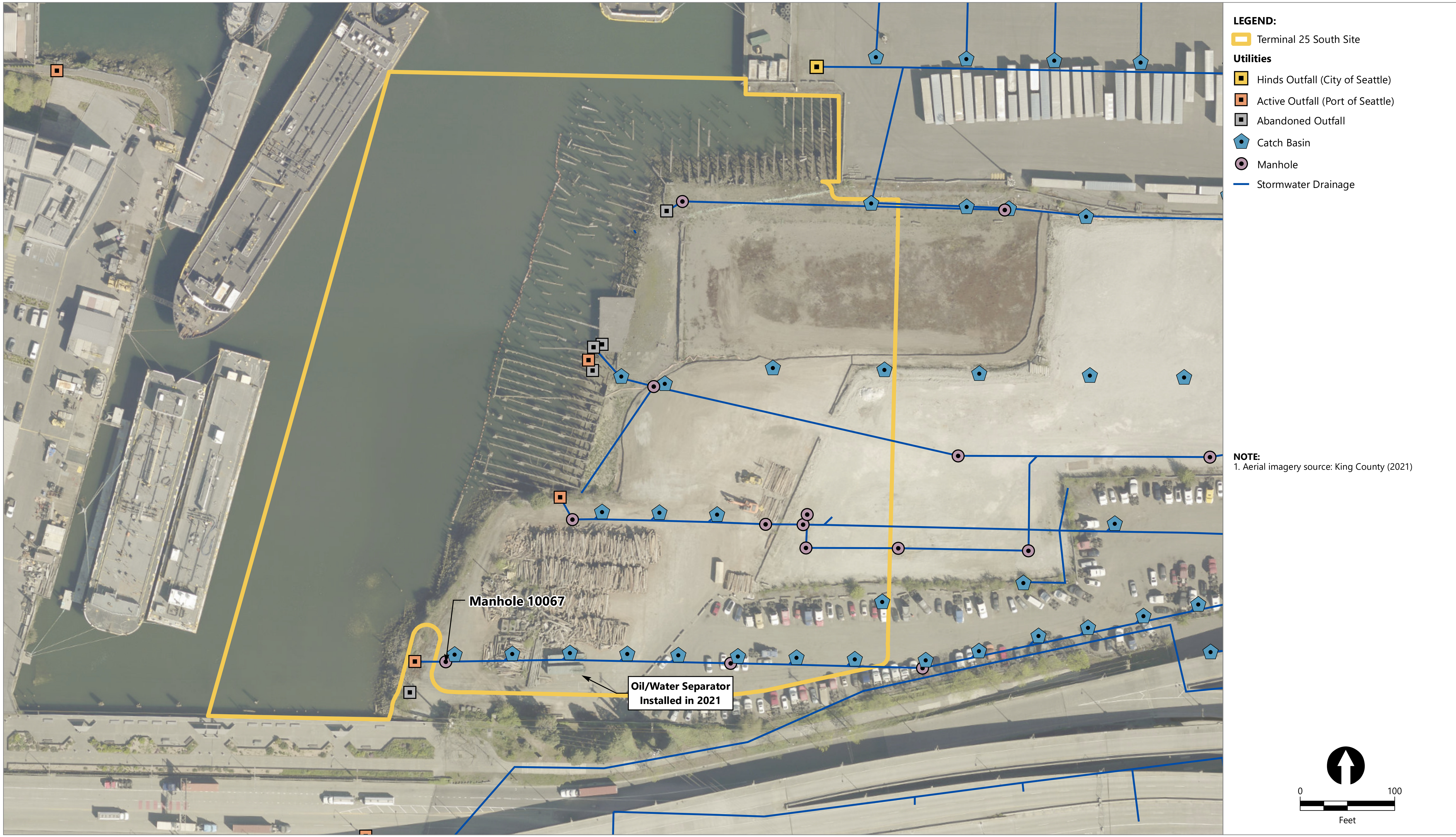
Figure 2-9
Groundwater Ambient Water Quality Criteria Screening
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



NOTE:
1. Aerial imagery source: King County (2021)

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Figure 2-10
Utilities and Storm Drain Solid Sample Locations
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

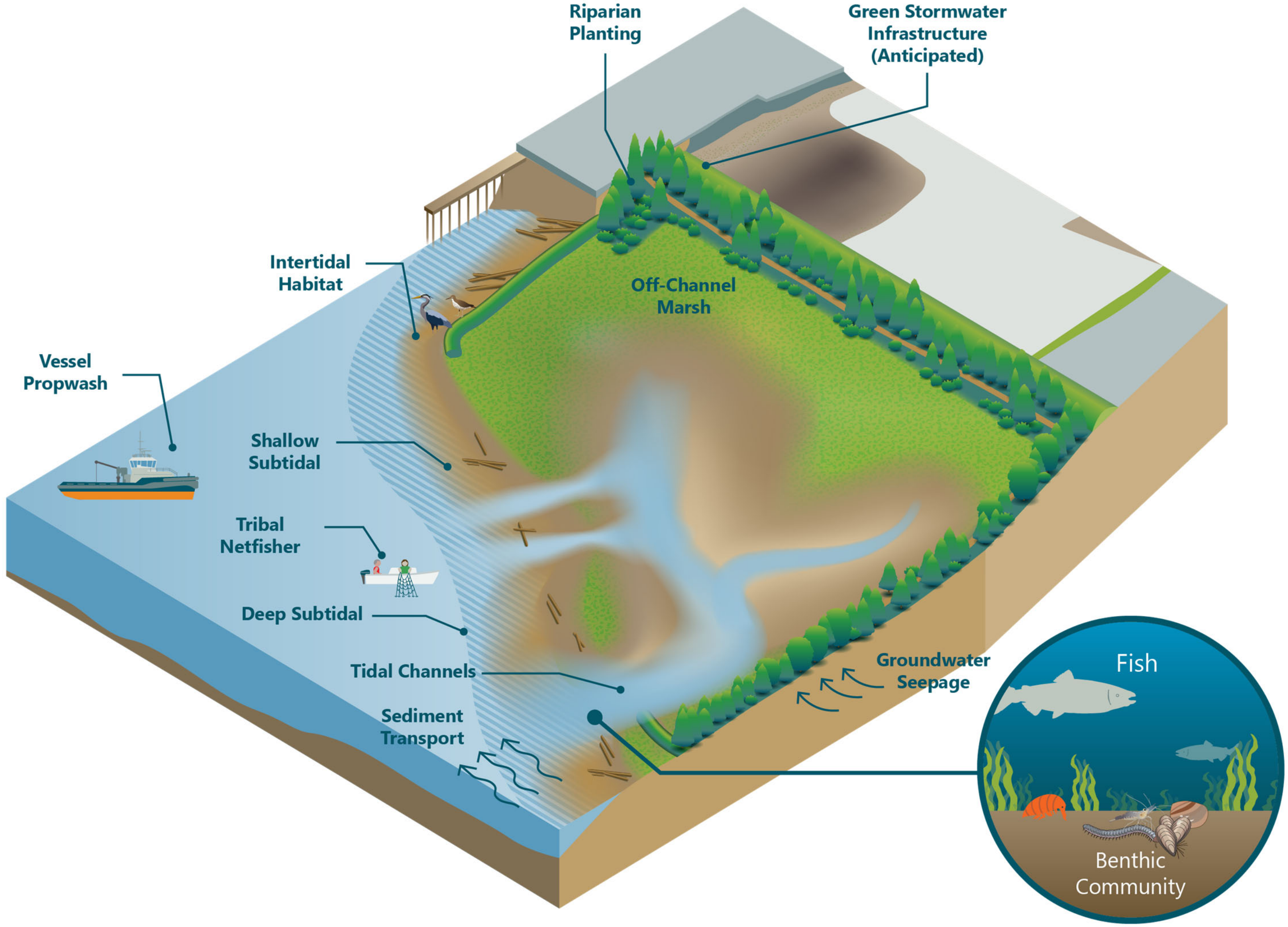

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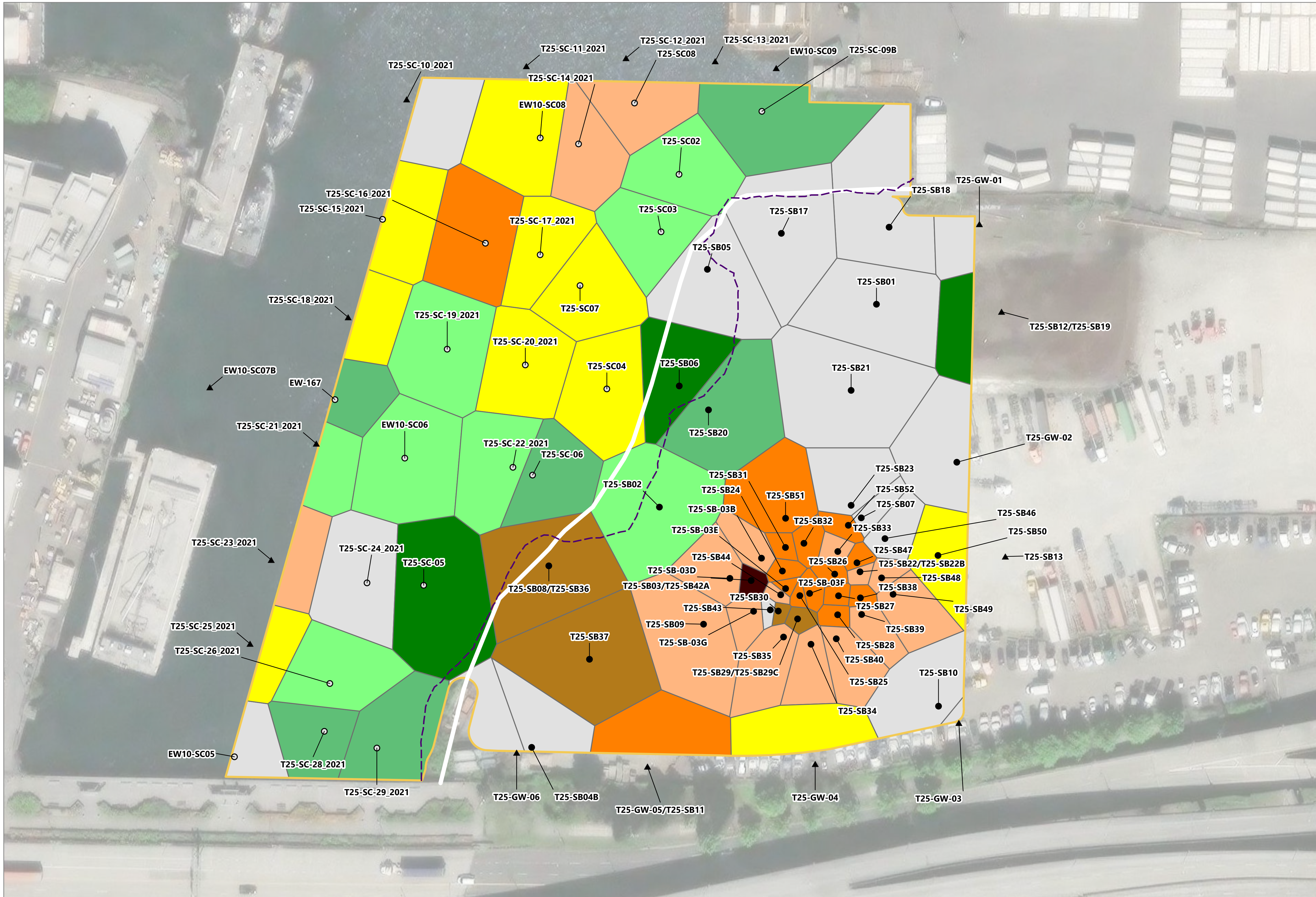
Figure 2-11
3-Dimensional Conceptual Site Model
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



LEGEND:

- Terminal 25 South Site
- Habitat Berm Midline
- MHHW Elevation (Existing)

Sample Location

- Sediment Sample
- Soil Sample
- Sample Location Outside Boundary

Deepest RAL Exceedance Factor by Sample Interval

- No Exceedance at Any Depth
- 0-2'
- 2-4'
- 4-6'
- 6-8'
- 8-10'
- 10-12'
- 12-14'
- 14-16.2'

NOTES:

1. Aerial imagery courtesy of ESRI.
2. Maximum RAL exceedance factor spatial distribution was created using a Thiessen interpolation method.

MHHW: Mean Higher High Water
RAL: Remedial Action Level

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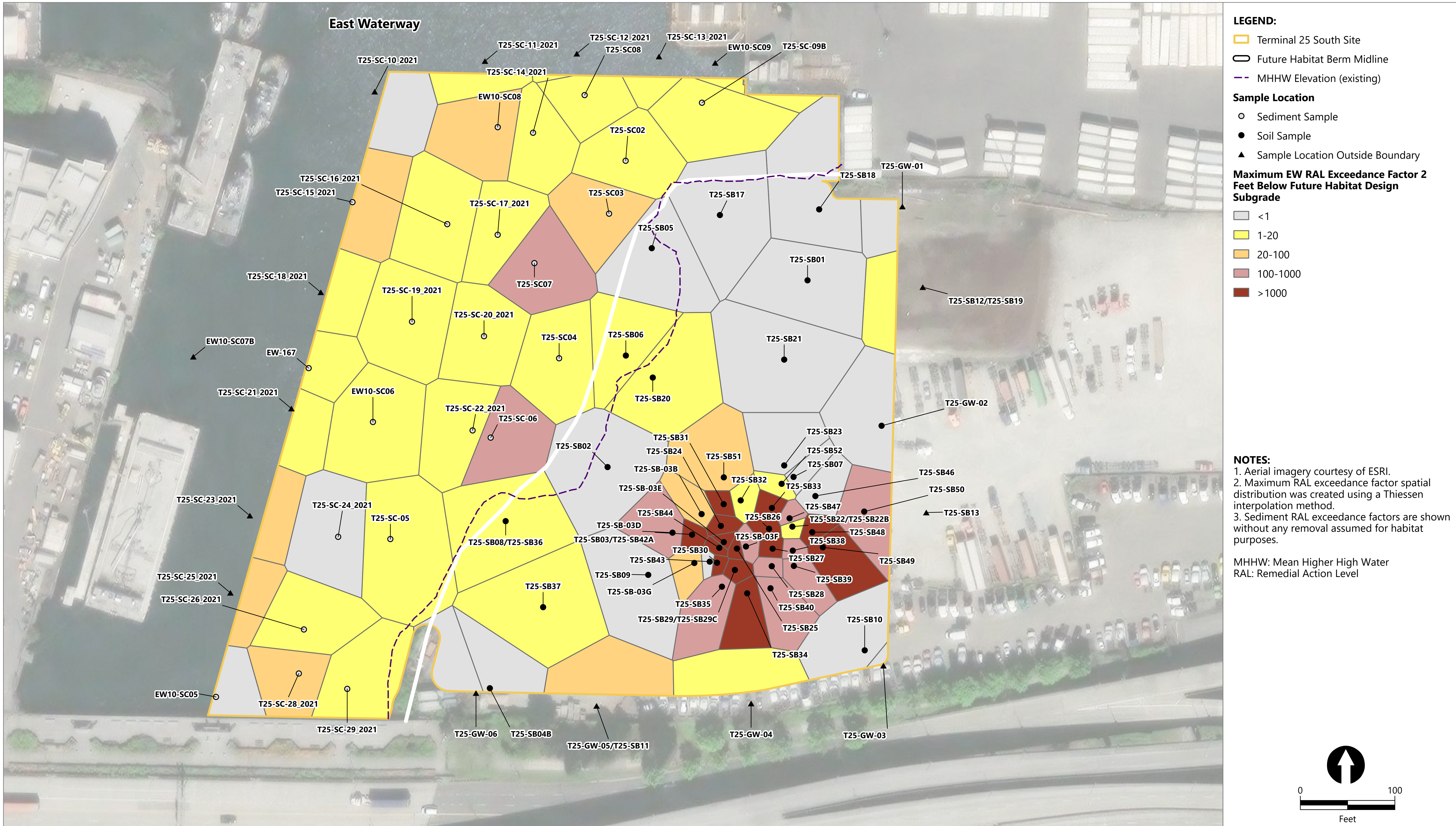
ANCHOR QEA

Figure 5-1
Thiessen Interpolation of Deepest Exceedances of East Waterway RALs
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



NOTES:
1. Aerial imagery courtesy of ESRI.
2. Maximum RAL exceedance factor spatial distribution was created using a Thiessen interpolation method.
3. Sediment RAL exceedance factors are shown without any removal assumed for habitat purposes.

MHHW: Mean Higher High Water
RAL: Remedial Action Level

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Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_WorkPlan\POS_EECAWP_Report.aprx | AQ_POS_EECA_F5-2_MaxExceedanceOfEastWaterwayRALsInFutureSedimentArea

ANCHOR QEA

Figure 5-2
Thiessen Interpolation of Maximum Exceedances of East Waterway RALs
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_WorkPlan\POS_EECAWP_Report.aprx | AQ_POS_EECA_F5-3a_Alternative_1_Removal_Plan_View

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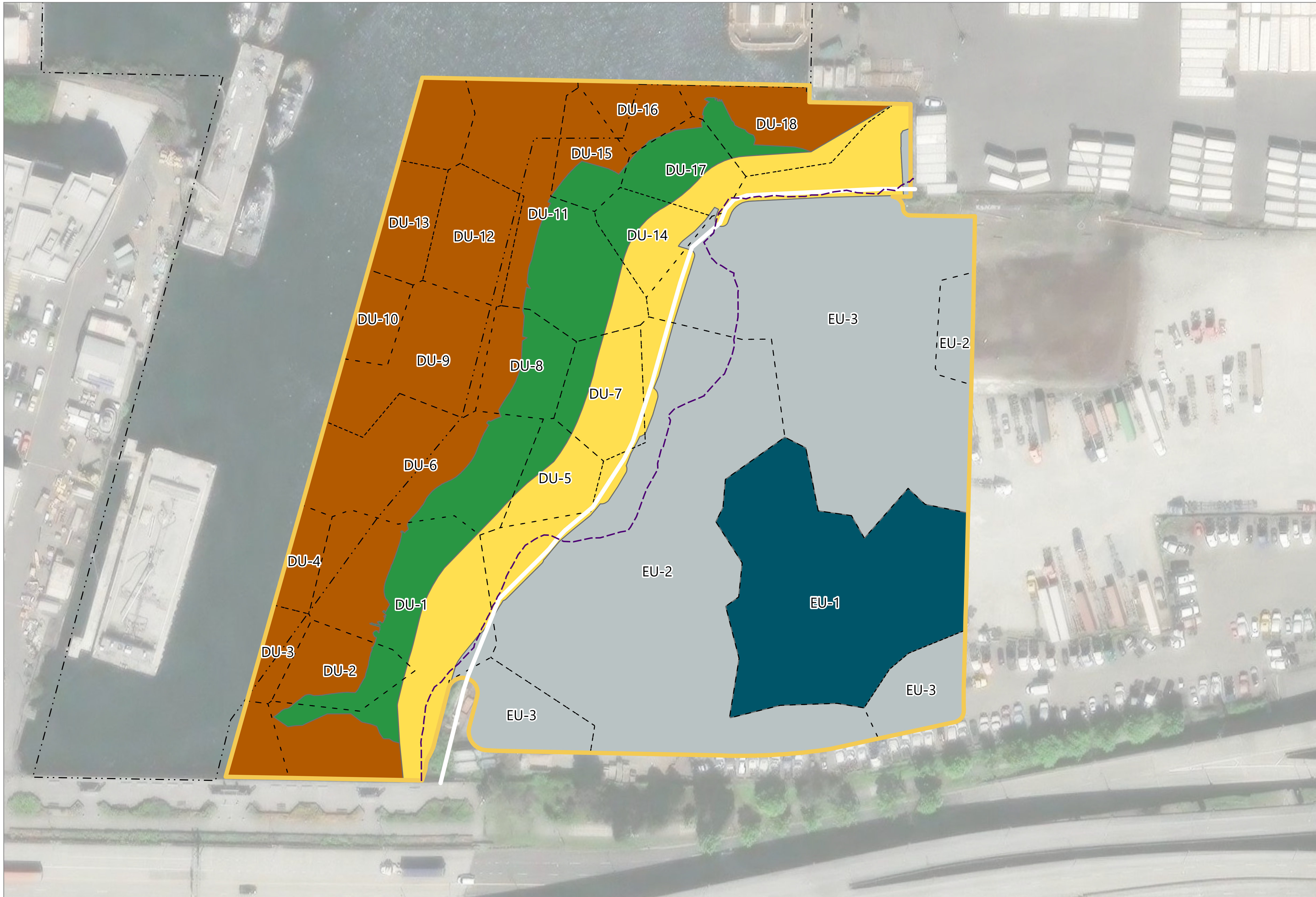
Figure 5-3a
Alternative 1 Removal - Plan View
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



LEGEND:

- Terminal 25 South Site
- Habitat Berm Midline
- EU/DU Boundary
- MHHW Elevation (Existing)
- Federal Navigation Channel

Placement Type

- RMC
- Slope Backfill with Armored Rock
- Backfill to Construct Habitat Berm
- Backfill to Habitat Elevations
- Amended Cap (Sorption and Chemical Isolation layers), followed by Backfill to Habitat Elevations

NOTES:

1. Aerial imagery courtesy of ESRI.

MHHW: Mean Higher High Water
EU: Excavation Unit
DU: Dredge Unit
RMC: Residuals Management Cover

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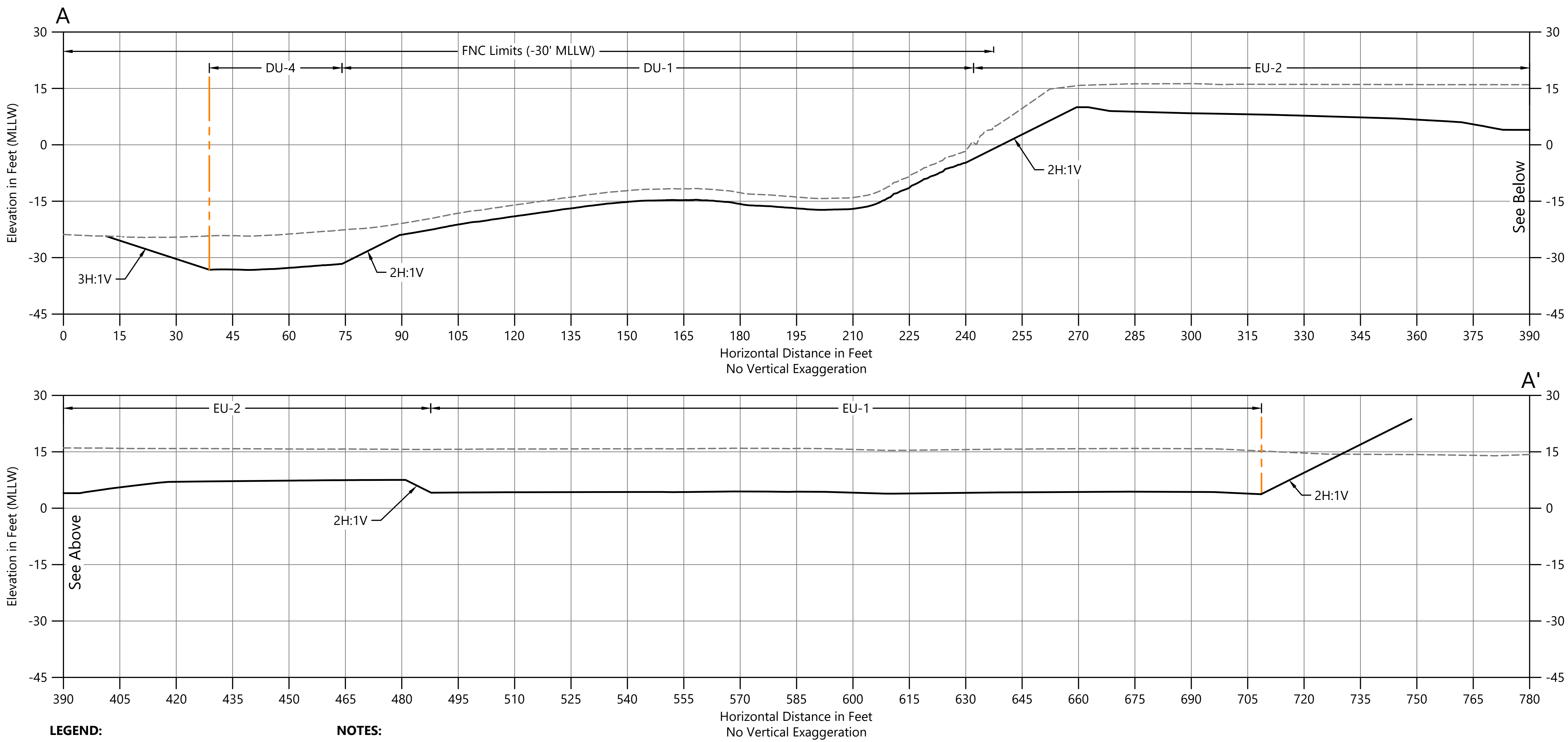
Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_WorkPlan\POS_EECAWP_Report.aprx | AQ_POS_EECA_F5-3b_Alternative_1_Placement_Plan_View

ANCHOR QEA

Figure 5-3b
Alternative 1 Placement- Plan View
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



LEGEND:

- Existing Mudline or Grade
- Required Dredge or Required Excavation Depth (Below Mudline)
- Terminal 25 South Site

NOTES:

DU: Dredge Unit
EU: Excavation Unit
FNC: Federal Navigation Channel

1. Required dredge/excavation depths are assumed to address contamination and to support habitat design.
2. Side slopes to be determined during design.

Publish Date: 2025/05/05 9:42 AM | User: tgriga
Filepath: K:\Projects\0003-Port of Seattle\POS SD-01 - T-25 Wetland\0003-WK-030 T25 Remedial Alternatives April 2025.dwg Figure 5-3c

ANCHOR QEA

Figure 5-3c
Alternative 1 – Conceptual Cross Section

DRAFT

LEGEND:

Terminal 25 South Site

MHHW Elevation (Existing)

Cross-Section B-B' (See Figure 5-4c)

Federal Navigation Channel

Excavation Units

Partial Excavation of Highest RAL Exceedances and NAPL

Partial Excavation of RAL Exceedances

Excavation of RAL Exceedances Down to Habitat Subgrade Elevations

Excavation of Material Without RAL Exceedances Down to Habitat Subgrade Elevations

Dredge Units

Dredge to Deepest RAL Exceedance

NOTES:

1. Aerial imagery courtesy of ESRI.

MHHW: Mean Higher High Water
RAL: Remedial Action Level
NAPL: Nonaqueous phase liquid
EU: Excavation Unit
DU: Dredge Unit

0 100
Feet

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Figure 5-4a
Alternative 2 Removal - Plan View
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

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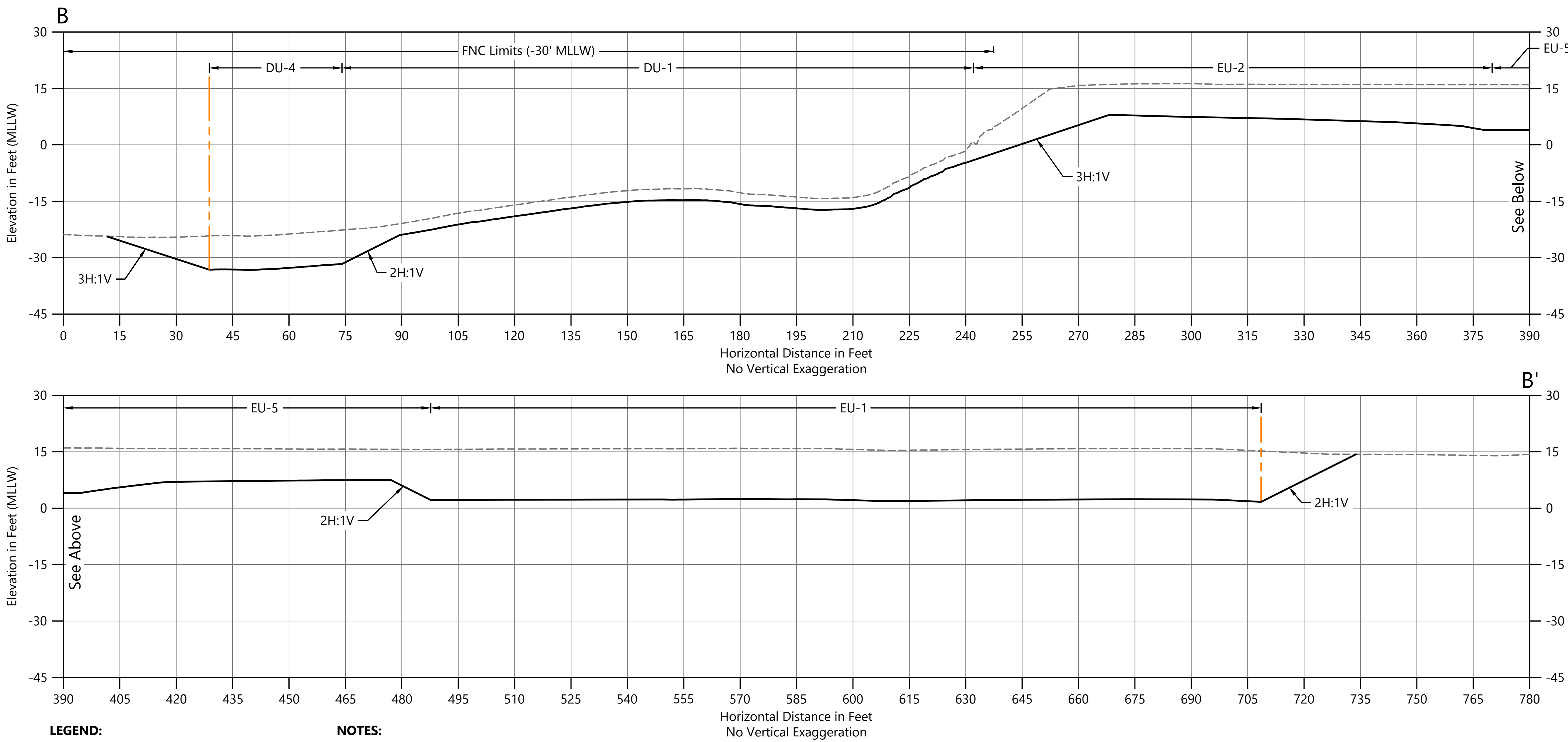
Filepath: \\GSTFile01\GIS\Jobs\PortofSeattle_0003\T25\Maps\Reports\EECA_WorkPlan\POS_EECAWP_Report.aprx | AQ_POS_EECA_F5-4b_Alternative_2_Placement_Plan_View

ANCHOR QEA

Figure 5-4b
Alternative 2 Placement - Plan View
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT



LEGEND:

- Existing Mudline or Grade
- Required Dredge or Required Excavation Depth (Below Mudline)
- Terminal 25 South Site

NOTES:

DU: Dredge Unit
EU: Excavation Unit
FNC: Federal Navigation Channel

1. Required dredge/excavation depths are assumed to address contamination and to support habitat design.
2. Side slopes to be determined during design.

Publish Date: 2025/05/05 9:43 AM | User: tgriga
Filepath: K:\Projects\0003-Port of Seattle\POS SD-01 - T-25 Wetland\0003-WK-030 T25 Remedial Alternatives April 2025.dwg Figure 5-4c

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Figure 5-4c
Alternative 2 – Conceptual Cross Section

Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT

LEGEND:

Terminal 25 South Site

Future Habitat Berm Midline

MHHW Elevation (Existing)

Federal Navigation Channel

Cross-Section C-C' (See Figure 5-5c)

Excavation Units

Full Excavation of Highest RAL Exceedances and NAPL Down to Native

Full Excavation of RAL Exceedances

Full Excavation of RAL Exceedances to Habitat Subgrade Elevations

Excavation of Material Without RAL Exceedances Down to Habitat Subgrade Elevations

Dredge Units

Dredge to Deepest RAL Exceedance

NOTES:

1. Aerial imagery courtesy of ESRI.

MHHW: Mean Higher High Water
RAL: Remedial Action Level
NAPL: Nonaqueous phase liquid
EU: Excavation Unit
DU: Dredge Unit

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ANCHOR QEA

Figure 5-5a
Alternative 3 Removal - Plan View
Engineering Evaluation and Cost Analysis
Terminal 25 South Site

DRAFT

LEGEND:

Terminal 25 South Site

Future Habitat Berm Midline

EU/DU Boundary

MHHW Elevation (existing)

Federal Navigation Channel

Placement Type

RMC

Slope Backfill with Armored Rock

Backfill to Construct Habitat Berm

Backfill to Habitat Elevations

NOTES:

1. Aerial imagery courtesy of ESRI.

MHHW: Mean Higher High Water
EU: Excavation Unit
DU: Dredge Unit
RMC: Residuals Management Cover

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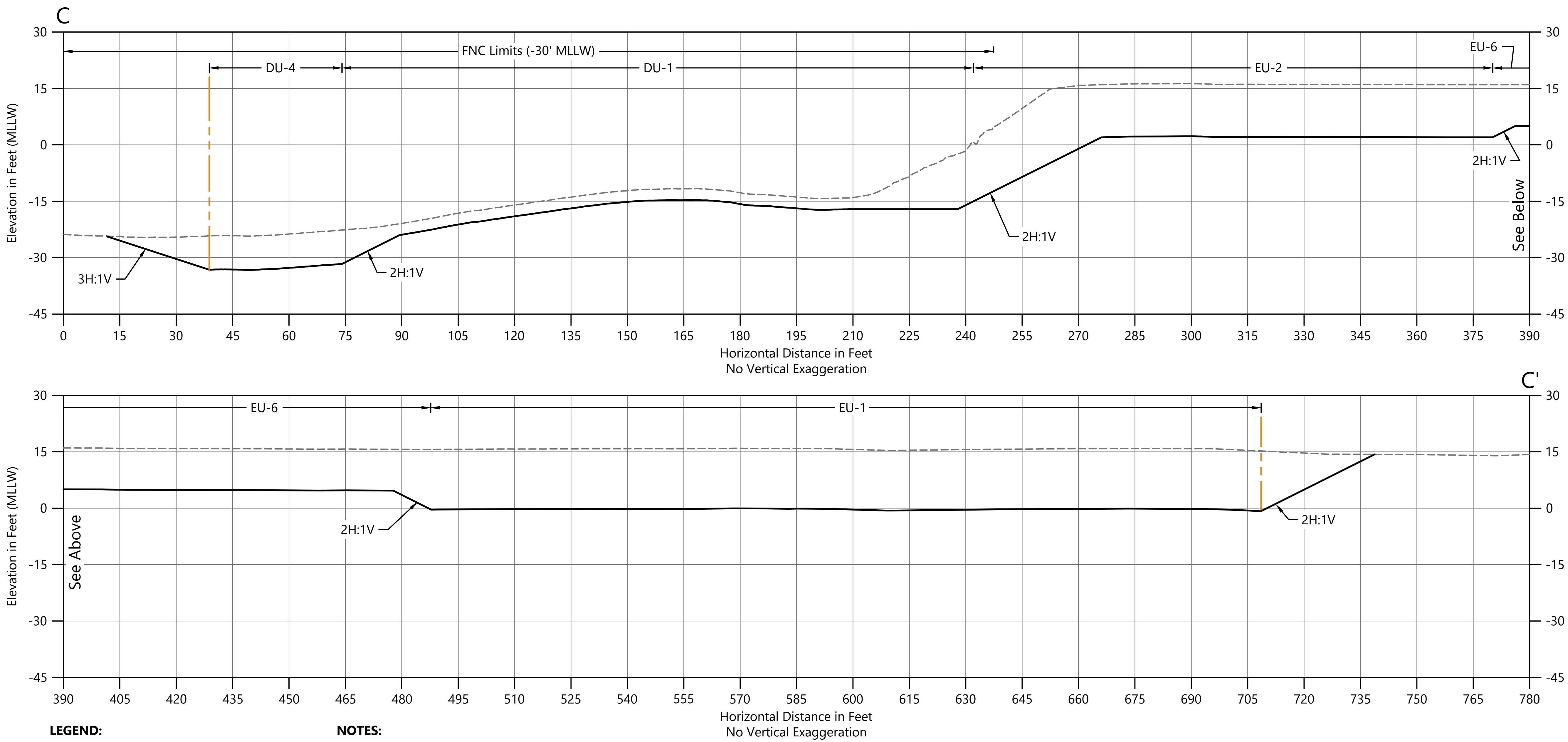
ANCHOR QEA

Figure 5-5b
Alternative 3 Placement - Plan View
Engineering Evaluation and Cost Analysis
Terminal 25 South Site



LEGEND:

- Existing Mudline or Grade
- Required Dredge or Required Excavation Depth (Below Mudline)
- Terminal 25 South Site

NOTES:

DU: Dredge Unit
EU: Excavation Unit
FNC: Federal Navigation Channel

1. Required dredge/excavation depths are assumed to address contamination and to support habitat design.
2. Side slopes to be determined during design.

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Filepath: K:\Projects\0003-Port of Seattle\POS SD-01 - T-25 Wetland\0003-WK-030 T25 Remedial Alternatives April 2025.dwg Figure 5-5c

Figure 5-5c
Alternative 3 – Conceptual Cross Section

Appendix A
Supplemental Data

Appendix B
Fate and Transport Model Analyses to Evaluate Feasibility of Chemical Isolation Caps in Proposed Capping Areas and Recontamination Potential of Backfill Material from Groundwater

Appendix C
Port of Seattle Terminal 25 South
Bench-Scale Treatability Study Report

Appendix D
Alternative Detailed Cost Summary