Engineering Design Report
Sediment Cleanup Action
Everett Shipyard Site
Everett, Washington

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Prepared for

Port of Everett

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LIST OF ABBREVIATIONS AND ACRONYMS

ARAR	Applicable or Relevant And Appropriate Requirement
BE	Biological Evaluation
BGS	Below Ground Surface
BMP	Best Management Practice
CAP	Cleanup Action Plan
cm	Centimeter
CSO	Combined Sewer Overflow
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbon
CQA	Construction Quality Assurance
CQC	Construction Quality Control
CUL	Cleanup Level
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
ESY	Everett Shipyard
FS	Feasibility Study
ft^2	Square Feet
H:V	Horizontal:Vertical
HASP	Health and Safety Plan
HPA	Hydraulic Project Approval
IBC	International Building Code
IHS	Indicator Hazardous Substance
JARPA	Joint Aquatic Resources Permit Application
mg/kg	Milligrams per Kilogram
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
MTCA	Model Toxics Control Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OHW	Ordinary High Water
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
Port	Port of Everett
POTW	Publicly Owned Treatment Works
PSO	Puget Sound Outfall
RCW	Revised Code of Washington
RI	Remedial Investigation
Site	Everett Shipyard
SMA	Shoreline Management Act
SMS	Sediment Management Standards
SPPC	Spill Prevention and Pollution Control
SVOC	Semivolatile Organic Compound
SWPPP	Stormwater Pollution Prevention Plan
TBT	Tributyltin
TESC	Temporary Erosion and Sediment Control
THM	Tidal Habitat Model
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish & Wildlife Service
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
WAC	Washington Administrative Code
WDFW	Washington Department of Fish & Wildlife
WQC	Water Quality Certification
yd^3	Cubic Yard

1.0 INTRODUCTION

This engineering design report (EDR) presents the design criteria and engineering justification for the planned cleanup action for the marine sediment portion of the Everett Shipyard site (Site) in Everett, Washington (See Figure 1). A cleanup action is also planned for the upland portion of the Site for which a separate EDR (Landau Associates 2013a) has been previously prepared and approved by the Washington State Department of Ecology (Ecology). However, an upland area of soil (referred to as Area A) located adjacent to the existing bulkhead near the northwest corner of the Site is contaminated with petroleum hydrocarbons and will be remediated in conjunction with the marine sediment cleanup action; therefore, the upland Area A soil cleanup action is included as a component of this EDR. This EDR also includes associated bulkhead replacement activities related to certain portions of the existing marine bulkhead system at the Site that need to be replaced to support the marine sediment and upland Area A soil cleanup actions.

The sediment cleanup action will be designed and implemented by the Port of Everett (Port) in accordance with Consent Decree (No. 12 2 034301) filed on March 7, 2012, and consistent with the Washington Model Toxics Control Act (MTCA) Cleanup Regulation [Washington Administrative Code (WAC) 173-340-340] and in compliance with the Washington State Sediment Management Standards (SMS; WAC 173-204).

1.1 SITE DESCRIPTION

The Site is owned by the Port and is generally located at 1016 14th Street west of West Marine View Drive, Everett, Washington (the northwest ¼ of Section 18, Township 29 North, Range 5 East), as shown on Figure 1. The Site includes approximately 5 acres of upland located west of West Marine View Drive, and adjacent in-water areas (see Figure 2) where the Port and Everett Shipyard, Inc. and its predecessors and subtenants (ESY) historically performed operations. The in-water areas are located within the Port's North Marina and consist of the intertidal (areas exposed to air at low tide) and sub-tidal (areas always covered by water) land west of the upland portion of the Site. A marine railway and the Port's Travel Lift/Boat Haul-Out facility are located within the in-water area, as shown on Figure 3. The upland portion of the Site is separated from the in-water area by several marine bulkhead segments constructed primarily with creosote-treated timber piles and lagging, as shown on Figure 3. The upland area is relatively flat and situated at approximately Elevation 15 feet (+/- 2 ft) Mean Lower Low Water (MLLW). Former structures/buildings on the Site have been demolished and most of the upland area is currently surrounded by temporary chain-link fencing. Additional details regarding the upland area is provided in the EDR for the upland cleanup action (Landau Associates 2013a).

1.2 SITE BACKGROUND

The Site was historically used for boat maintenance and repair by the Port's former tenant, ESY Inc., its predecessors, and subtenants. Three buildings (identified as the office/machine shop, Building 7, and Building 9) formerly located on the eastern portion of the property were subleased by Everett Engineering and used for machining operations. The Port also owned and/or operated vessel and marine-related services on the Site, including the in-water portion of the Site. The upland portion of the Site is currently vacant and no buildings are present. The in-water portion of the Site is currently used by the Port as a marina (North Marina); however, the marine railway and the Port's Travel Lift/Boat Haul-out facility will be decommissioned and removed as part of the sediment cleanup action. Following cleanup of the Site, the Port plans to redevelop the property. The Site is currently zoned Waterfront Commercial and the current redevelopment agreement with the city of Everett states the Site will be used for commercial and public access that may include residential use.

Between 2008 and 2010, a remedial investigation (RI) was conducted at the Site to identify the nature and extent of contamination. The results of the RI were documented in an RI/FS report (URS 2011) and, based on the results of the RI and previous investigations, it was determined historical activities had impacted soil and groundwater in the upland portion of the Site and sediment in the in-water portion of the Site. Based on the results of the RI, a feasibility study (FS) was conducted and a cleanup action was selected. In March 2012, the Port entered into a Consent Decree (Consent Decree No. 12 2 03430 1) with Ecology to remediate the Site based on the results of the RI/FS. A cleanup action plan (CAP) (Ecology 2012) was prepared and included as an attachment to the Consent Decree.

The Port intends to redevelop the Site in conjunction with redeveloping adjacent uplands and reconfiguration of the Marina. The timing for redevelopment is uncertain. Existing zoning maps identify the zoning of the Site as Waterfront Commercial, a designation that does not fit within MTCA's characteristics of Industrial Land Use. The City of Everett has approved a development plan that states the Site will be used for commercial and public access uses, which could include commercial development such as professional office space and retail shopping. However, the Port recently revised its development strategy for the North Marina area, including the Site. The new development strategy calls for multi-family residential usage on a portion of the Site. Although this revised development strategy has not yet been adopted by the Port through a revision to its master plan, it is assumed for planning purposes that the Site will include residential usage. Because the Site cleanup levels are based on unrestricted land use per WAC 173-340-740, the potential inclusion of residential use does not affect the design of the cleanup actions at the Site.

The first phase of redevelopment at the Site and the adjacent North Marina will be permitted in conjunction with the Site sediment cleanup action, and will be constructed within the authorized term of the resulting permit. Redevelopment elements that will be permitted concurrently with Site sediment cleanup include:

- Replacing the Segment C bulkhead to the south of the portion that will be replaced as part of the sediment cleanup action
- Constructing a public access viewing platform in the northeast corner of the North Marina, in the location currently occupied by the Port's haul-out facility
- Realigning the marina floats and associated gates in the portion of the marina adjacent to the Site uplands.

Although permitted concurrent with the sediment cleanup action, replacing the Segment C bulkhead and realignment of the marina floats and gates will not be conducted during the same in-water work window as the sediment cleanup. Additionally, the viewing platform may not be constructed during the sediment cleanup project, depending on cost. The scope of the redevelopment activities unrelated to the sediment cleanup action are discussed further in Section 6.0 (Permitting) to provide a complete description of the project from a permitting perspective.

1.3 OVERVIEW OF THE SEDIMENT CLEANUP ACTION

The cleanup action selected for the contaminated marine sediment is dredging and offsite disposal of the dredged material at a subtitle D solid waste facility. Additionally, to facilitate removal of contaminated sediment, the marine railway and the haul-out structure will be demolished, and portions of the existing bulkhead will be replaced. The cleanup action will include compliance monitoring consisting of protection monitoring, performance monitoring, and confirmation monitoring. Specific monitoring activities that will be implemented include surface water quality sampling, bathymetric surveys, and confirmation sediment quality monitoring. Because the cleanup action will remove contaminated sediment and not rely on capping with clean sediment, long-term monitoring and environmental covenants related to the marine component of the Site will not be needed.

The cleanup action selected for the petroleum-contaminated soil in upland Area A is excavation and offsite disposal of the impacted soil. The cleanup action for this area will also include compliance monitoring such as confirmation soil sampling and post-cleanup groundwater monitoring.

2.0 BASIS OF DESIGN

The CAP requires that sediment and soil containing contaminants exceeding the Site cleanup levels (CULs) be removed and disposed at an appropriate offsite location. Therefore, the nature and extent of contamination provides the primary basis of the design for cleanup of the marine sediment and upland Area A. Additionally, because the cleanup action requires removal of soil and sediment directly adjacent to portions of the existing bulkhead, the configuration and condition of the existing bulkhead segments affect the design of the cleanup actions. At three sections of the bulkhead, described below, some sediment containing indicator hazardous substances (IHS) exceeding the CULs will be left in place and capped because further removal would potentially cause failure of the bulkhead and require extensive shoring that would be impracticable to implement.

2.1 NATURE AND EXTENT OF CONTAMINATION

This section describes the extent of contaminants in sediment and in upland Area A soil at concentrations exceeding the Site CULs.

2.1.1 MARINE SEDIMENT

The RI and previous investigation results identified the presence of the following contaminants in marine sediment at concentrations above the CULs: arsenic, copper, lead, mercury, silver, and zinc, polycyclic aromatic hydrocarbons (PAHs), tributyltin (TBT), and polychlorinated biphenyls (PCBs). Tables summarizing the RI and pre-RI analytical results are provided in Appendix A. In 2012, additional sediment characterization was conducted by Landau Associates to establish the vertical/lateral limits of sediment contamination needed to develop a dredge prism to be used to design the sediment cleanup action. The results of the additional sediment characterization were documented in a technical memorandum to Ecology (Landau Associates 2013b). A table summarizing the analytical results for the 2012 pre-design sediment characterization investigation is also provided in Appendix A.

In 2012, five constituents were detected at concentrations above the CULs identified in the CAP: mercury; benzyl alcohol; 2,4-dimethylphenol; 4-methylphenol; and TBT. The mercury and TBT exceedances in conjunction with the exceedances identified in RI and pre-RI samples were used to define the sediment dredge prism presented in this EDR. The benzyl alcohol; 2,4-dimethylphenol; 4-methylphenol exceedances were not used to define the dredge prism because these constituents were determined by Ecology to not be IHS for the Site (Ecology 2013). The sediment sampling locations (pre-RI, RI, and 2012), where IHS were present in sediment at concentrations exceeding the cleanup levels, are shown on Figure 4 and summarized in Table 1. As shown on Figure 4, the exceedances of CULs occurred in nearshore sediment and along the marine railway. The depth of the CULs exceedances vary, but, typically, extend to an elevation of -12 ft MLLW, except along the marine railway where the exceedances extend to -14 ft MLLW and near Outfall C where the exceedances extend to -8 ft MLLW. Table 1 summarizes the depth of CULs exceedances in marine sediment.

In addition to the above CULs exceedances, sediment located near Outfall C failed one of three toxicity tests during the 2012 investigation. The sample location for the toxicity testing is identified as BA-1 on Figure 4.

During the RI, samples of the sediment present between the upper and lower bulkheads of Segment A were collected at 10 locations. The sample locations are identified as BC-1 through BC-10 and shown on Figure 4. At locations BC-1 through BC-6, samples were collected from 0 to 10 centimeters (cm) and 2 to 3 ft below the mudline. Exceedances of CULs occurred in all of the samples collected from 0 to 10 cm. Exceedances of CULs occurred in the samples collected from 2 to 3 ft at locations BC-1, BC-2, BC-5, and BC-6. The exceedances of CULs in the deeper samples were primarily PAHs; however, the TBT CUL was also exceeded at BC-2. No surface samples were collected at locations BC-7 through BC-10; the sample depth intervals collected were 1.5 to 4 ft (BC-7), 3 to 4 ft (BC-8), 1.5 to 2.5 ft (BC-9), and 0.5 to 1.5 ft (BC-10). The locations for these samples and samples collected at BC-1 and BC-2 are located immediately west of the upland soil cleanup Area A, as shown on Figures 4 and 5. Samples collected at BC-7 through BC-10 were only analyzed for petroleum hydrocarbons. Samples collected at BC-1, BC-2, and BC-4 were analyzed for petroleum hydrocarbons in addition to the sediment IHS. No SMS criteria are available for petroleum hydrocarbons, but a comparison of petroleum hydrocarbon results to the upland CUL [2,000 milligrams per kilogram (mg/kg) for diesel- and oil-range petroleum hydrocarbons] indicates that there are diesel-range petroleum hydrocarbons present in the sediment above the upland CUL at locations BC-7, BC-8, and BC-10, and that lube oil-range petroleum hydrocarbons are present in the sediment above the upland CUL at location BC-1. The concentrations exceeding the upland soil CUL ranged from 2,300 mg/kg to 7,800 mg/kg.

The initial dredge design included dredging to Elevation -12 ft MLLW or -8 ft MLLW westward of the 14th St. bulkhead and the Segment C bulkhead, depending on location. Dredging adjacent to these bulkheads without potentially compromising the integrity of the bulkheads would require extensive temporary shoring. To better delineate the depth of contamination adjacent to the bulkheads in these areas, additional sediment quality characterization was conducted by Landau Associates in May 2013 in the immediate vicinity of the 14th Street bulkhead and the Segment C bulkhead. This sediment characterization was undertaken to potentially reduce the temporary shoring requirements by reducing the required dredge depth in close proximity to the bulkhead. Sediment cores were advanced in six locations, as described below. Samples from these cores were analyzed for mercury, bulk organotins, and semivolatile organic compounds (SVOCs), the constituents driving the dredging limits for the cleanup. These constituents were used to define the sediment dredge prism adjacent to these bulkheads for complete removal of contaminated sediment. These additional sediment core locations are shown on Figure 4. A table summarizing the analytical results for the supplemental sediment characterization is provided in Appendix A.

Sediment samples were collected at 1-ft intervals, starting 1 ft below current mudline in the following manner:

- Adjacent to 14th Street Bulkhead: at one location (SC-69N) as close as possible to the 14th Street Bulkhead and at one location (SC-69S) approximately 15 ft south of the bulkhead
- Adjacent to Segment C Bulkhead (Northern Dredge Prism): at one location (SC-70E) as close as possible to the portion of the outer Segment C bulkhead located just south of the marine railway and at one location (SC-70W) approximately 15 ft west of this portion of the Segment C bulkhead
- Adjacent to Segment C Bulkhead (Southern Dredge Prism): at one location (SC-71E) as close as possible to the portion of the outer Segment C bulkhead located in the southern dredge prism and at one location (SC-71W) approximately 15 ft west of this portion of the Segment C bulkhead.

Detected constituents at these locations included mercury, bulk TBT, and SVOCs. Sample locations directly adjacent to the 14th Street Bulkhead (location SC-69N), and both sections of the Segment C Bulkhead (locations SC-70E and SC-71E), had exceedances of the Site CULs in the deepest sample interval analyzed (-5 to -6 ft MLLW).

Table 1 summarizes the depth of CULs exceedances in marine sediment in these areas. As indicated in Table 1, the depth of contamination adjacent to the bulkhead extends to at least elevation -6 ft MLLW at all locations, and likely deeper given that the deepest sample collected at most locations exhibited concentrations exceeding the Site sediment CULs. The evaluation of bulkhead stability and sediment dredging design on the bulkhead areas is addressed in Section 3.2.

2.1.2 UPLAND AREA A SOIL

The IHS for Site soil consist of arsenic, lead, antimony, copper, carcinogenic PAHs (cPAHs), PCBs, and petroleum hydrocarbons. Soil containing IHS above the CULs is laterally extensive, covering most of the upland portion of the Site, as shown on Figure 6. The contaminated soil area was subdivided into 22 cleanup excavation areas designated by letters "A" through "W", as shown on Figure 6. Cleanup of soil in Areas "B" through "W" is addressed in the EDR for the upland soil cleanup action (Landau Associates 2013a). Because of the depth of remediation and its proximity to the existing bulkhead, cleanup of soil in Area A is being addressed in this sediment EDR. Numerous soil borings have been advanced in the vicinity of the Area A cleanup area; the soil boring locations are shown on Figures 4 and 5, and the boring logs are presented in Appendix B.

The soil in Area A contains concentrations of diesel-range petroleum hydrocarbons above the CUL. The depths of the CULs exceedances vary across Area A. Tables summarizing the analytical results at these locations are provided in Appendix C. Soil borings SB-142 and SB-143 are located in the northern portion of Area A and the exceedances of CULs at these locations occurred as shallow as 3 ft below ground surface (BGS) and extended to a depth of at least 5.5 ft BGS. Soil borings SB-100, SB-101, and SB-141 are located in the center of Area A and the exceedances of CULs at these locations occurred at depths between 5 ft and 16 ft BGS. Nearest the bulkhead, at soil borings SB-95, SB-96, and SB-97, the exceedances of CULs occurred at 8 ft, 11 ft, and 14 ft, respectively. Based on the boring logs at these locations, petroleum hydrocarbons do not appear to be present in the upper 6 ft to 7 ft of soil. A summary of the depth of CULs exceedances in Area A is provided in Table 2. Except for a geophysical survey (described below), no subsurface explorations have been conducted in the southwestern portion of Area A where one or more underground storage tanks (USTs) may exist.

Soil in Area "A" is hydraulically placed fill material consisting of fine- to medium-grained sand and silty sand to a depth of approximately 15 ft BGS. Wood debris and sawdust is encountered at an average depth of 15 ft BGS within the planned excavation area and at shallower depths (6 ft to 9 ft BGS) on the eastern perimeter of the planned excavation area. The thickness of the wood waste was not determined at most locations; however, it may extend to depths of about 20 ft BGS.

Groundwater was encountered at depths generally ranging between 6 ft and 9 ft BGS during drilling of the soil borings located in and adjacent to Area A. Eight groundwater monitoring wells are present at the Site; the nearest groundwater monitoring well, MW-1, is located approximately 100 ft southeast of Area A (see Figure 4). Groundwater levels measured at this well during four quarterly events in 2009 ranged from about 3 ft to 9 ft BGS (URS 2011). Groundwater at the Site is tidally influenced. A table summarizing groundwater levels and elevations at each of the groundwater monitoring wells in 2009 is provided in Appendix D.

During the RI, a geophysical survey identified two strong magnetic anomalies in the eastern portion of Area A (URS 2011). One of the anomalies was located approximately 35 ft east of the bulkhead and the other was located approximately 50 ft east of the bulkhead. The survey also indicated that the top of these features appeared to be at a depth of approximately 2 ft BGS. The anomalies were tentatively identified as USTs. The locations of the anomalies/USTs are shown on Figures 4 and 5. The results of the geophysical survey are provided in Appendix E.

2.2 EXISTING BULKHEAD CONFIGURATION AND CONDITION

The 14th Street sheetpile and tieback bulkhead constructed in 2007 ends near the west side of the timber decking at the Travel Lift/Boat Haul-Out facility. The existing marine bulkhead system in the vicinity of the Site has four distinct areas (designated Segments A through D for Port planning purposes), as indicated on Figure 3; each bulkhead segment has a different type of construction. The three bulkhead types present within the Site are generally identified and described as:

- Segment A: Stepped timber pile bulkhead with timber lagging and tiebacks (present from the eastern termination of the 14th Street sheet pile bulkhead to about 120 ft north of the marine railway).
- Segment B: Vertical timber pile bulkhead with tiebacks and triangular shaped timber wedges behind the timber piles (present from about 120 ft north of the marine railway to about 30 ft south of the marine railway; M&N has noted that the majority of the Segment B bulkhead was in a deteriorated condition).
- Segment C: Stepped cantilever sheetpile and vertical timber- pile bulkhead with tiebacks and triangular shaped timber wedges behind the timber piles (present from about 30 ft south of the marine railway to about 40 ft north of the southwest corner of the Site).

The existing Segments A and B bulkheads are not considered structurally capable of supporting dredging (to as deep as approximately Elevation -14 ft MLLW) or upland excavation (down to approximately Elevation 2 ft MLLW) directly adjacent to the bulkhead without incurring damage or distress, or requiring an extensive temporary shoring system. An evaluation of temporary shoring costs compared to the cost for construction of a new bulkhead indicates that temporary shoring would be at least 50 percent more expensive than bulkhead replacement, as presented in Appendix F (Landau Associates 2013c) Based on the risk of bulkhead failure and the cost considerations discussed above, the Port and Ecology have agreed that existing bulkhead Segments A and B will be replaced with a permanent sheetpile bulkhead as part of the cleanup action rather than installing a temporary shoring system.

Additionally, the portions of bulkhead Segment C and the 14th Street bulkhead that fall within the planned dredging footprint would require shoring if dredging is extended to the planned dredge depths in front of these bulkhead sections. This is discussed further in Sections 3.1 and 3.2.

3.0 DREDGING, CAPPING, AND DISPOSAL DESIGN

This section presents the dredge prism and capping designs for achieving the goals of the cleanup action, including removal and relocation of structures to provide access for dredging, controls that will be used during dredging to minimize impacts to the environment, capping configuration and controls in the vicinity of the bulkheads, and management and disposal of the dredged material.

3.1 DREDGE PRISM DESIGN

This section presents the design for the dredge prism, exclusive of the areas adjacent to the bulkheads that will require capping, which are discussed in Section 3.2. Two dredge prisms, shown on Figure 4, were developed to encompass all of the sediment sampling locations with cleanup level exceedances and that failed a biological toxicity test (see Section 2.1.1). The dredge prisms also encompass an area within at least about a 20-ft radius from each cleanup level exceedance. In some cases, the dredge prism extends farther; for example, the northern dredge prism was extended about 55 ft west of sample location SC-63 to include the area surrounding the entire extent of the marine railway. The vertical extent of each dredge prism was designed to remove the deepest sediment with exceedances of CULs in the area.

As shown on Figure 4, there are three areas in the northern dredge prism (identified as Areas N-1, N-2, and N-3) where dredging will extend to -12 ft MLLW and one area (identified as Area N-4) where dredging will occur to -14 ft MLLW. The southern dredge prism, located in the vicinity of Outfall C, will be dredged to -8 ft MLLW. The depths of cleanup level exceedances within each dredge prism area are summarized in Table 1.

It is currently estimated that approximately 9,000 cubic yards (yd^3) of contaminated sediment will be removed from the marine area of the Site. This dredging volume is almost twice the estimated volume of contaminated sediment presented in the CAP (4,600 yd^3). The increase in volume results from increased delineation of the extent of sediment contamination, and the inclusion of an over-dredging allowance. This volume estimate is subject to change during detailed design based on further evaluation of available environmental data, the alignment of the replacement bulkhead, the dredge depth/slope adjacent to the bulkhead, and other factors.

3.1.1 NORTHERN DREDGE PRISM

The northern dredge prism encompasses an area of approximately 39,000 square ft (ft^2). The estimated volume of material to be dredged in the northern dredge prism is approximately 8,700 yd^3. The dredge prism design specific to each subarea (designated N-1, N-2, N-3, and N-4) is discussed below.

3.1.1.1 Area N-1

Area N-1 consists of marine sediment south of the existing 14th Street bulkhead, marine sediment west and south of the outer portion of the existing Segment A stepped timber pile bulkhead, marine sediment west of the existing Segment B vertical timber pile bulkhead, and marine sediment between the inner and outer portions of the Segment A stepped timber pile bulkhead. In general, the design dredge depth for Area N-1 is -12 ft MLLW. Based on the analytical results for samples collected at SC-6, which is located in Area N-1, exceedances of CULs occur to a depth of at least -9 ft MLLW and, based on the analytical results for samples collected at locations SC-51 and SC-52, no CULs exceedances occur below -12 ft MLLW. As indicated in Section 4.0, a new bulkhead will be constructed prior to dredging in front of existing bulkheads Segments A and B. The proposed location for the new bulkhead is shown on Figure 7. Sediment southward and westward of the new bulkhead will be dredged to a depth of -12 ft MLLW. An east-west trending cross-section illustrating the planned dredging cut through the Segment A bulkhead in Area N-1 is presented on Figure 8.

Approximately 4 ft of the sediment present between the upper and lower portions of the existing Segment A stepped timber bulkhead will be removed for offsite disposal. Four samples collected during the RI from a depth of 2 to 3 ft below mudline indicated contaminants are present in the sediment at concentrations above the CULs to a depth of at least 3 ft (approximately Elevation 5 ft MLLW). Tieback rods connecting the timbers piles supporting the upper and lower bulkheads may need to be cut to facilitate sediment removal in this area along the Segment A bulkhead, referred to on Figure 4 as Area N-1A. The design dredge depth in Area N-1A will be 4 ft to Elevation 4 ft MLLW. The planned dredging limits between the upper and lower portions of the existing Segment A bulkhead are illustrated on Figure 8.

Sediment adjacent to the 14th Street bulkhead at the western end of Area N-1 will be removed at a 2.5H:1V (horizontal:vertical) slope down to the planned dredge depth, starting at elevation – 3ft MLLW at the bulkhead. The remaining sediment slope will be capped as discussed in Section 3.2.

To limit sloughing, a 2 horizontal to 1 vertical (2H:1V) cut slope will be used along the western edges of Area N-1and between Area N-1 and Area N-4.

3.1.1.2 Area N-2

Area N-2 encompasses the western end of the marine railway. In this area, cleanup level exceedances occurred in the sample collected from -10.5 to -12 ft MLLW at location SC-63. No exceedances occurred in the sample collected from -12 ft to -14 ft MLLW; therefore, the design dredge depth for Area N-2 is -12 ft MLLW. To limit sloughing, a 2H:1V cut slope will be used along the outer edges of the dredge prism in Area N-2 and between Area N-2 and Area N-4.

3.1.1.3 Area N-3

Area N-3 is located adjacent to the existing Segment C bulkhead. In Area N-3, exceedances of CULs occurred in the sample collected from -10.5 to -12 ft MLLW at location SC-61. No exceedances occurred in the sample collected from -12 ft to -14 ft MLLW; therefore, the design dredge depth for Area N-3 is -12 ft MLLW. To limit sloughing, a 2H:1V cut slope will be used along the outer edges of the dredge prism in Area N-3 and between Area N-3 and Area N-4.

Sediment adjacent to the bulkhead will be removed at a 2.5H:1V slope down to the planned dredge depth, starting at elevation -3 ft MLLW at the bulkhead. The remaining sediment slope will be capped as discussed in Section 3.2.

3.1.1.4 Area N-4

Area N-4 is located adjacent to the southern portion of the existing Segment B bulkhead and encompasses the majority of the marine railway area. As indicated in Section 2.1.1, several samples collected from this area indicate that contaminants are present at concentrations exceeding the cleanup levels to depths of -13 to -14 ft MLLW. The overall dredge design depth for this area is -14 ft MLLW. As described previously, a new bulkhead will be constructed westward of the Segment B bulkhead prior to dredging (see Figure 7). Sediment westward of the new bulkhead in Area N-4 will be dredged to -14 ft MLLW. A cross-section illustrating the planned dredging cut in Area N-4 is presented on Figure 9.

Sediment adjacent to the bulkhead will be removed at a 2.5H:1V slope down to the planned dredge depth, starting at elevation -3 ft MLLW at the bulkhead. The remaining sediment slope will be capped as discussed in Section 3.2

A 2H:1V cut slope will also be used along the perimeter of Area N-4 to limit sloughing of the sediment outside of the dredge prism.

3.1.2 SOUTHERN DREDGE PRISM

The southern dredge prism is located adjacent to the Segment C bulkhead and encompasses a limited area of approximately 1,250 ft^2 in the vicinity of Outfall C. The estimated volume of material to be removed in the southern dredge area is approximately 200 yd^3.

Exceedances of CULs occurred in samples collected from up to 3 ft below the mudline at SC-5. No exceedances of CULS occurred in the sample collected from 3 to 5 ft below the mudline at SC-5, indicating that contaminated sediment is limited to a depth of approximately 3 ft below the mudline in this area. The mudline elevation at SC-5 is approximately -4 ft MLLW; therefore, the dredge prism in this area will extend to an elevation of -7 ft MLLW at the SC-5 location. A 2H:1V cut slope will be used along the northern and southern perimeter of the dredge prism to limit sloughing of sediment outside of the dredge prism.

Sediment adjacent to the bulkhead will be removed at a 2.5H:1V slope down to the planned dredge depth. The remaining sediment slope will be capped, as discussed in Section 3.2.

3.2 BULKHEAD AREA CAPPING DESIGN

As discussed in Section 2.1.1, additional delineation adjacent to the bulkheads identified that the extent of contamination extends down to at least elevation -6 ft MLLW immediately adjacent to the bulkheads. Stability analysis of the bulkheads indicated that contaminated sediment could be dredged to a depth of elevation -3 ft MLLW adjacent to the bulkheads without requiring temporary shoring for the bulkhead during dredging. Given that contamination extends at least to elevation -6 ft MLLW, complete removal of sediment contamination adjacent to the bulkheads could not be accomplished without extensive temporary shoring of the bulkheads during dredging.

Based on analysis of shoring versus bulkhead replacement costs (Landau Associates 2013c), Ecology previously determined that bulkhead temporary shoring to facilitate sediment dredging was impracticable relative to bulkhead replacement. Based on similar conditions, Ecology concurred with a Port-proposed modification to the sediment cleanup action to cap contaminated sediment adjacent to the bulkheads that could not be dredged without threatening the stability of the bulkheads, because the cost of temporary shoring would be impracticable.

The sediment cleanup design was modified to cap contaminated sediment in the three areas where contaminated sediment is present immediately adjacent to the 14th Street and Segment C bulkheads. The capping design includes a 3-ft clean sediment cap (nominal thickness, measured vertically) on a 2.5H:1V slope, with the sediment cut slope starting at elevation –3 ft MLLW at the bulkhead. The cap will consist of a clean, sandy gravel material obtained from an upland commercial borrow source. Plan and section views for the capping design from the 90 percent construction plans are provided in Appendix G; relevant sections are Sections A, E and F for Areas N-1, N-3, and S-1, respectively.

An analysis of the cap was conducted to confirm that it would remain stable under static and seismic loading conditions (Landau Associates 2013c). The slope stability analyses indicated that the capped sediment slopes have a calculated factor of safety against sliding greater than 1.5 under static loading conditions. Under seismic (pseudo-static) loading conditions, the capped sediment slopes have a calculated factor of safety against sliding greater than 1.0. The analyses further concluded that the addition of a shallow key (1- to 2-ft deep) at the toe of the capped slope would increase seismic slope stability by making the potential slope failure surfaces extend out and shear through additional granular material along the base of the capped slope. Accordingly, the sediment dredge prism and backfilling plans and sections were modified to include excavation and backfilling of an approximately 2-ft deep key trench in the three sediment dredging areas that will incorporate capping material. The stability analysis is provided in Appendix H.

3.3 RESIDUALS CAPPING

Minor recontamination of the sediment dredge surface often occurs from turbidity generated during the dredging process. These dredging residuals result in a thin veneer of surface sediment contamination that rapidly dissipates through natural recovery (i.e., deposition of clean sediment) for sites with high sedimentation rates such as this Site. If compliance monitoring indicates that recontamination of the sediment surface has occurred, a residuals cover of clean sediment will be placed over the portions of the dredged surface that exceed the sediment cleanup levels instead of re-dredging the surface. This thin layer cap would allow sediment cleanup standards to be achieved at the time of construction rather than at some point in the future. The residuals cover, if required, will consist of 6 inches of fine to medium sand placed over the portions of the dredge prism that exceed one or more of the sediment CULs.

3.4 REMOVAL/RELOCATION OF MARINE STRUCTURES

To facilitate dredging and bulkhead replacement activities, existing marine structures within and adjacent to the planned work area will need to be demolished or relocated. Boats, floats, and ramps located within the in-water work areas will be relocated, as needed, for marine equipment access.

The marine structures that will be demolished/deconstructed and size-reduced as required for disposal (or reuse/salvage if approved by the Port) include the following:

- **Marine Railway**: The over-water/in-water portion of the marine railway will permanently be removed from the existing bulkhead out to its end located about 250 ft from the bulkhead (the upland portion of the marine railway will be demolished as part of the upland cleanup action). Marine railway steel rails and timber stringers/pile caps will be removed prior to extraction of timber pile foundations. The various components of the marine railway will be cut or dismantled using both barge-mounted and land-based mechanical equipment and brought to an upland area of the site for size reduction and salvaging/disposal activities. The steel rails will be salvaged or recycled.
- **Travel Lift/Boat Haul-Out Facility**: The entire Travel Lift/Boat Haul-Out facility will permanently be removed, including all wooden or concrete decking that extends over water or upland beyond the limits of the Segment A stepped timber pile bulkhead. Steel superstructure and railing, timber decking, and timber stringers/pile caps/cross bracing will be removed prior to extraction of the timber pile foundations. Electric power conduits to the

haul-out hoist will be removed. The existing stepped timber pile bulkhead will remain in place behind the new sheet pile bulkhead.

- **Float and Float Piles**: A number of existing floats will be removed from the dredge area. Some of the floats will be permanently removed to accommodate planned float realignment (discussed in Section 7.0). Other floats will be temporarily relocated and replaced following completion of sediment dredging and backfilling. If necessary, selected timber piles supporting floats to be moved to provide construction equipment access will be extracted.

No creosoted-timber pilings or other timber stringers/pile caps/cross bracing will be reused in the marine environment. If the Port does allow the salvage of any creosoted wood products, the contractor will be required to certify that the materials will not be reused for marine or other aquatic applications.

3.5 DREDGING METHODS AND CONTROLS

Sediment dredging will be conducted using a combination of both barge-based and land-based clamshell and/or fixed-arm excavation equipment; use of an environmental bucket is not anticipated, and no hydraulic dredging will be conducted. Dredged material will typically be placed on small barges for dewatering within the project work area. Land-based excavation and dredged material offloading/handling will occur in areas adjacent to the shoreline.

Sediment removal will be conducted following installation of the new sheet pile bulkhead and tieback system. Removal of sediment between the two bulkheads in the Segment A bulkhead will require sequencing with the installation of the new bulkhead.

Dredging and marine demolition work will be conducted in a controlled manner that limits turbidity and dispersal of material in the water, maintains surface water quality at the mixing zone boundary, and prevents the spread of contaminated sediments to uncontaminated areas or areas that have already been dredged. Measures that are currently anticipated to be employed to maintain surface water quality include:

- Barges will be fitted with appropriate containment basins and filter materials at all drainage locations, and will be filled in a manner that prevents overflow and spillage of dredged material to surface water.
- Piles will be vibrated to break the skin-friction bond between the pile and adjacent sediment, and slowly extracted with a vibratory hammer and in a manner that limits turbidity and sediment from re-entering the water column during pile removal. Piles will not be broken off intentionally by twisting, bending, or other deformation.
- The clamshell bucket will be operated so that each pass of the bucket is complete, and the bucket will be emptied after each pass. Partial loads of dredged material will not be dumped back into the water, and stockpiling dredged material below the ordinary high water line will be prohibited.
- The rate of ascent of the clamshell bucket will be controlled in a manner to limit sediment loss during ascent through the water column and while swinging the bucket to the barge.

- A floating surface boom will be deployed around the perimeter of the work area in the event that floatable debris appears as a result of the dredging and marine demolition operations. Such debris will be collected and disposed at a Subtitle D solid waste disposal facility.
- Silts curtain will be deployed around the work area during all dredging activities.
- Spill prevention and response equipment will be used on all project barges to prevent the release of petroleum products and other hazardous substances to surface water.
- In-water work will be performed in accordance with permit conditions, which set timing restrictions for in-water work.

Surface water monitoring will be conducted during dredging to confirm compliance with the conditions of Ecology's Water Quality Certification for the sediment cleanup action. Sediment confirmational sampling within and directly outside the dredge areas will be conducted following dredging to confirm compliance with the Site CULs. Dredged areas that are found to exceed CULs during confirmational sampling will be capped with a thin layer of backfill material, rather than being re-dredged.

Close tolerances on sediment dredging and excavation depths will be maintained, and pre- and post-removal bathymetric surveys will be conducted to verify the lateral extent and depth of sediment dredging and excavation activities prior to initiating placement of backfill material along the new bulkhead.

3.6 MANAGEMENT AND DISPOSAL OF DREDGED MATERIALS

Dredge material handling and disposal requirements may depend on the disposal facility ultimately selected for the project, but are currently anticipated to include:

- Constructing a lined and bermed sediment offloading/containment area at a designated location along the Site shoreline; existing pavement may be used in lieu of a bottom liner. A temporary dockside catchment structure will be used to prevent sediment from spilling back into the marine environment or onto unlined upland areas during barge offloading operations.
- Placing dredged sediments on a barge for dewatering within the aquatic portion of the project work area.
- Offloading the material from the barge into the sediment containment area.
- Conducting any additional sediment dewatering/stabilization for free liquids that may be needed for offsite transportation/disposal.
- Loading sediment into lined and covered trucks/containers for truck and/or rail transportation and disposal at a permitted Subtitle D solid waste landfill facility.
- Collecting, treating, and disposing of potentially contaminated decant water and stormwater present within the sediment containment area.

3.7 BACKFILLING

Following completion of sediment dredging/excavation activities, imported backfill material will be placed in the marine area along the front of the new bulkhead and in the areas between the new and existing bulkheads, and in any areas dredged to greater than -14 ft MLLW.

Backfill material will be placed in the marine area along the front of the new bulkhead to raise the mudline to -2 ft MLLW along the bulkhead and to create a slope no steeper than 2.5H:1V down to the designed dredge elevation. This wedge of marine backfill in front of the new bulkhead will provide additional soil support for long-term loading conditions on the new bulkhead. The fill material will be a sand and gravel mixture appropriate for both structural support and aquatic habitat substrate, with a relatively low percentage of fines (less than about 5 percent material passing the U.S. No. 200 sieve) to limit turbidity during placement. It is currently estimated that approximately 2,800 yd^3 of backfill will be placed within the marine area of the Site.

Backfill material will also be placed between the new and existing bulkheads, including within the sediment removal area between the upper and lower portions of the existing Segment A stepped bulkhead. The fill material behind the new bulkhead will be placed up to the final grade of the adjacent ground surface in the upland area. The fill material will be a free flowing granular fill material (such as pea gravel) to facilitate placement within constrained fill areas and/or a sand and gravel mixture with a relatively low percentage of fines (less than about 5 percent material passing the U.S. No. 200 sieve, based on the fraction passing the ¾-in sieve).

Backfill placement may need to be sequenced to prevent unacceptable differential loadings on the new bulkhead during construction. If sequencing is required, the sequencing requirements will be specified in the detailed design documents.

4.0 BULKHEAD SHORING / REPLACEMENT

As discussed in Section 2.2, the existing bulkhead within Segments A and B are not considered structurally capable of supporting dredging or upland excavation directly adjacent to the bulkhead without incurring temporary shoring costs that significantly exceed the cost of bulkhead replacement, and, even if shored, might incur significant damage or distress on the existing bulkhead. Due to the risk of bulkhead failure during the sediment cleanup and cost considerations, Ecology has agreed with the Port's suggestion that existing bulkhead Segments A and B will be replaced with a permanent sheet pile bulkhead[1] as part of the cleanup action rather than installing a temporary sheet pile shoring system. Accordingly, the cleanup action includes the following bulkhead replacement activities:

- Installing a coated steel sheet pile bulkhead in front of existing bulkhead Segments A and B which would tie into the 14th Street sheet pile bulkhead to the west and into the existing Segment C bulkhead to the south.
- Installing tiebacks that connect to a deadman anchor system installed within the upland soil behind the new bulkhead (anticipated to be similar to the 14th Street sheet pile bulkhead anchor system).
- Extending existing storm drain outfalls through penetrations in the new bulkhead.
- Installing pile caps, structural decking for walkways and viewing platforms, and guardrails along the top of the new bulkhead.

The contractor will be required to carefully sequence excavation of the petroleum hydrocarbon-contaminated soil in upland excavation Area A adjacent to the existing Segment A bulkhead, and remove sediment between the Segment A stepped timber pile bulkhead in conjunction with installation and backfilling of the new sheet pile bulkhead.

During the construction of the bulkhead, impacts to the normal operation of the Port will be necessary. This may include the inability for the Port travel lift to access the boatyards and the closure of 14th Street to vehicle and pedestrian traffic. Operational access will be restored to the boat storage yards by removing a number of utility poles. Vehicle and pedestrian traffic will be temporarily re-routed around construction activities.

4.1 STORM DRAIN

As part of the bulkhead replacement, existing storm drain discharge and the City of Everett's combined sewer overflow (CSO) outfall [i.e., Puget Sound Outfall 2 (PSO2)] will be extended through penetrations in the new bulkhead. Erosion/scour control material (e.g., quarry spalls or riprap) will be

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[1] The type and configuration chosen for new bulkhead construction is the least expensive option for the shoring alternatives and similar to the existing 14th street bulkhead. Refer to Appendix G.

installed in the marine environment at the outfall locations. The storm drain outfalls and PSO2 are summarized below.

Eight existing storm drain outfalls that drain the Site and adjacent upland areas penetrate the existing bulkhead segments. Segment A contains a 10-inch, 12-inch, and two 8-inch pipe outfalls; Segment B contains a 6-inch, 8-inch, and 12-inch pipe drains; Segment C contains an 8-inch pipe drain. Drainage for these eight existing outfalls will be consolidated to discharge from three outfalls, including one existing outfall to the west of the Site and two of the existing Site outfall locations. The two new Site outfalls will be sized and located to allow management of existing and potential future stormwater flows, and to allow retrofitting of stormwater pretreatment equipment once long-term use of the Site is determined. The new outfalls will be 24 inches in diameter with an invert elevation of 4 ft MLLW.

The existing PSO2 is an approximately 18-inch-diameter concrete pipe that extends from the northeast corner of existing bulkhead Segment A into the marina. CSO outfalls are covered under the City of Everett's current National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit (Permit No. WA- 002449-0). The new PS02 outfall and pipe alignment will be relocated to discharge about 60 ft south of its current alignment, near the south end of bulkhead Segment A to better align with future roadway right-of-ways. The new PS02 line will be 30 inches in diameter to meet current City of Everett design requirements based on exiting flows. The new CSO outfall will be installed at an invert elevation of 0 ft MLLW.

Proposed alignments for the new Site storm drain outfalls and PSO2 are included in Appendix I.

4.2 BULKHEAD ALIGNMENT

The proposed alignment for the new sheet pile bulkhead takes into consideration future upgrades to the entire bulkhead system that supports the upland areas at the Site. While it is anticipated that only bulkhead Segments A and B will be replaced during the sediment cleanup action, the Segment C bulkhead replacement may be constructed as part of a future redevelopment, and selected floats and marine structures along the bulkhead may be realigned in the future, within the operational period authorized under the federal permit that will be obtained for the combined sediment cleanup and North Marina Phase 1 redevelopment project.

The Port's proposed alignment for the new bulkhead is shown on Figure 7. It is currently estimated that the planned bulkhead alignment, including Segment C, would result in approximately 7,060 ft^2 (1/6 acres) of existing subtidal and intertidal aquatic land below Mean Higher High Water (MHHW; Elevation 11.1 ft MLLW) being converted to upland behind the new bulkhead. Proposed mitigation for this impact is addressed in Section 7.2.

4.3 BULKHEAD DESIGN CRITERIA

Because the cost of temporary shoring for existing bulkhead Segments A and B during dredging and upland excavation would be greater than the cost of constructing a new bulkhead, a new permanent bulkhead will be installed to replace the Segment A and Segment B bulkheads. The new bulkhead design will be similar to the existing 14th Street bulkhead to the extent possible; this will include use of coated AZ18 sheetpiling and steel walers, tieback rods, and a concrete deadman anchor system. The selected bulkhead is designed to be resistant to the 200-year return period earthquake, consistent with the existing 14th Street bulkhead. Alternative bulkhead designs capable of withstanding the 2,475-year return period earthquake identified in the International Building Code (IBC) were evaluated, but the more conservative bulkhead designs were considered impracticable due to the approximate 60 percent increase in cost and the lack of consistency with existing Port infrastructure (e.g., the 14th Street bulkhead). Specific design criteria for the replacement bulkhead are presented in Moffatt & Nichol's Engineering Design Report Support memorandum (Moffat & Nichol 2012) provided in Appendix J.

Careful construction sequencing will be required to successfully install the new bulkhead, minimize the potential for failure of the existing bulkheads, and remove sediment and soil to the design depths required. Potential construction sequencing is also discussed in Moffatt & Nichol's memorandum provided in Appendix J.

5.0 UPLAND AREA A SOIL CLEANUP

This section summarizes soil cleanup in upland Area A that will be designed and implemented as part of the sediment cleanup action.

5.1 EXCAVATION AREA A DESIGN

The lateral limits of soil excavation for Area A, shown on Figure 4, were designed to encompass all the soil sampling locations where diesel-range petroleum hydrocarbons were detected at concentrations above the CUL These locations include SB-95, SB-96, SB-97, SB-100, SB-101, SB-102, SB-141, SB-142, and SB-143. Tables summarizing the analytical results at these locations are provided in Appendix C. No CUL exceedances occurred at the following soil sampling locations adjacent to Area A (SB-93, SB-94, SB-98, SB-103, SB-104, SB-105, SB-139, SB-140, SB-142A, and SB-143A). Tables summarizing the analytical results at these locations are also provided in Appendix C.

As described in Section 2.1.1, the vertical extent of CULs exceedances in upland Area A soil varies. To limit the volume of soil to be removed, Area A was divided into seven subareas (A-1 through A-7), as shown on Figure 5. The known vertical extent of contamination in Areas A-1 through A-6 and the planned depth of excavation within each area are summarized in Table 2. Area A-7 includes the tentatively identified USTs and the extent of contamination/excavation in this area will be determined following removal of the tanks. In areas where the vertical limits of contamination extend more than 1 to 2 ft below the groundwater table, *in situ* soil agitation and product recovery will be used to reduce concentration of diesel-range petroleum hydrocarbons in soil and reduce the depth of soil removal. *In situ* soil agitation is described below in Section 5.2, and was used successfully during previous cleanup activities in the Site vicinity conducted under Ecology's Voluntary Cleanup Program (VCP). In each area, compliance monitoring will be used to determine the final extent of soil removal.

It is currently estimated that approximately 2,000 yd^3 of contaminated soil will be removed from the upland Area A soil excavation. This preliminary volume estimate is subject to change during detailed design based on further evaluation of available environmental data, the excavation depths/slopes, and other factors. Approximately 300 yd^3 of clean overburden soil is present over the zone of impacted soil; clean overburden soil will be temporarily stockpiled and reused as excavation backfill material, as appropriate.

5.2 EXCAVATION METHODS AND CONTROLS

Prior to removal of soil in Area A, the UST(s) that have been tentatively identified by a geophysical survey on the east side of the excavation area and any associated piping materials will be decommissioned and removed. A 30-Day Notice of Intent to Decommission USTs will be prepared and submitted to Ecology, as required by WAC 173-360-385. UST decommissioning will be conducted by the Contractor (or its subcontractor), and include cleaning, inerting, and removing the USTs; removal of any underground piping; and excavation and disposal of any petroleum-contaminated soil in the vicinity of the UST(s).

Excavation of the petroleum hydrocarbon-contaminated soil in upland Area A will require careful sequencing with removal of the timber bulkhead tiebacks and installation of the new bulkhead in order to limit bulkhead loading conditions and control marine water flow into the excavation areas. Due to the shallow depth of groundwater in the area (approximately 6 to 9 ft BGS, depending on season and tidal elevations), excavation below the groundwater table will be required. To facilitate soil removal and excavation backfilling activities, some limited amount of excavation dewatering may be conducted. However, the proximity of the excavation to the shoreline precludes maintaining the excavation in the dry during high tide cycles because of the loadings the marine water would apply to the shoring/bulkhead system. As a result, excavation will be sequenced with low tides such that the majority of contaminated soil can be excavated in the dry without the need for dewatering. Localized dewatering of the excavation during low tides, if required in some areas, will be accomplished using internal sump pumps. Dewatering water will be pumped to onsite holding tanks and discharged to the City of Everett sanitary sewer following water quality testing and treatment (if applicable), as required by the City of Everett .

In situ soil agitation may be used to release petroleum hydrocarbons from the soil matrix for contaminated soil located below the groundwater table. *In situ* soil agitation will be accomplished by aggressively agitating the soil at the bottom of the excavation using the bucket of an extended reach excavator or other appropriate equipment. Agitating the soil at the bottom of the excavation breaks the capillary forces holding the petroleum product in the interstitial spaces between the soil particles and allows it to float to the water surface. Once the soil and water are thoroughly agitated and an observable petroleum hydrocarbon sheen or free product accumulates on the surface of the water, oleophilic (hydrophobic) absorbent pads and/or booms would be used to collect the free product and some limited amount of impacted water may be extracted from the excavation. Soil removal and/or soil agitation will continue until confirmation sampling indicates compliance with the CULs. Based on experience on similar projects, soil CULs are achieved once the soil stops emitting a sheen, the soil achieves the CULs.

The existing timber bulkhead within the excavation footprint will be partially deconstructed during implementation of the Area A cleanup. The pilings, lagging, and tiebacks for the upper bulkhead will be removed in incremental steps as the excavation progresses. Vertical piling will be cut near the excavation base periodically as the excavation is advanced. Bulkhead materials will be size-reduced, as required, and disposed of in conjunction with contaminated soil.

Marine surface water and sediment will be protected during cleanup of Area A by the implementation of environmental controls, including absorbent booms and silt curtains placed at the downgradient end of excavation. Additionally, the contractor will be required to sequence the work to install the replacement bulkhead prior to implementation of cleanup in Area A, and to complete cleanup of Area A prior to implementation of sediment cleanup in this area.

Post-excavation surveys will be conducted to document the lateral extent and depth of the upland Area A soil cleanup action.

5.3 MANAGEMENT AND DISPOSAL OF EXCAVATED MATERIAL

The UST(s) and any associated piping will be size-reduced, as required, and transported for offsite recycling/disposal.

Excavated contaminated soil will be allowed to drain and/or mix with drier materials to remove free liquids, temporarily stockpiled and/or transferred into trucks or roll-off containers, and transported or disposed at a permitted Subtitle D solid waste landfill facility. Controls will be implemented to prevent releases of hazardous materials during handling of contaminated soil; these include installation and maintenance of temporary erosion and sediment control (TESC) structures and best management practices (BMPs) such as the use of silt fencing, washing haul truck tires, properly covering stockpiles, and properly covering and securing loads during hauling operations.

Petroleum hydrocarbon product removed during *in situ* soil agitation will be contained and transported to a properly permitted offsite facility for treatment/disposal. Groundwater extracted from the excavation, as necessary, may also be transported to a properly permitted offsite facility for treatment/disposal, or may be pretreated at an appropriate onsite construction water treatment system prior to discharge to the City of Everett's sanitary sewer system.

5.4 BACKFILL

Following removal of the petroleum-contaminated soil and demonstration of compliance with the CULS, the excavation will be backfilled. It is currently estimated that approximately 2,500 yd^3 of backfill will be placed to restore the Area A excavation.

The base of the excavation that extends beneath groundwater level will be backfilled with coarse aggregate or quarry spalls up to groundwater level, and the excavation will then be backfilled to final grade with clean material suitable for placement as structural fill. The clean fill material will be placed in maximum 10-inch compacted lifts, backfilled to either match the pre-existing grade or a somewhat lower grade consistent with the Port's plans for future redevelopment in the area, and sloped to promote stormwater drainage. Backfill will be compacted to a minimum of 92 percent of Modified Proctor maximum dry density, except that the upper 2 ft will be compacted to 95 percent. The area will be repaved following backfilling consistent with adjacent grades.

Excavation and backfilling activities will be coordinated with installation of the tiebacks and deadman anchor system for the new sheet pile bulkhead. If necessary, excavation and backfilling will be sequenced to avoid unacceptable, temporary differential loads on the new bulkhead during construction. Construction sequencing will be determined during detailed design of the replacement bulkhead.

6.0 PERMITTING

This section summarizes agency coordination and certain permits/approvals that will be required to implement the sediment cleanup action construction activities.

6.1 COORDINATION

The sediment cleanup action will require in-water construction activities that are subject to review under state and federal permitting authorities. Permitting will require coordination with the United States Army Corps of Engineers (USACE) and resource services, and preparation of a Joint Aquatics Resource Permit Application (JARPA) and a Biological Evaluation (BE). Early coordination with the state and federal resource services will be conducted to discuss the various project elements and the likely impacts of the project on marine habitat, as well as to obtain early input regarding the mitigation proposed to address project impacts (see Section 7.2). This input will be used to refine the design and address any concerns of the resource services in the design prior to submitting the JARPA. A pre-application meeting was held on August 19, 2013 with the USACE and the resource services; the input of that meeting was used to refine the bulkhead alignment and other aspects of the design presented in the JARPA.

In addition to coordination with the USACE and resource services, coordination with the City of Everett will be required regarding obtaining a Shoreline Substantial Development Permit Exemption permit/approval for discharge of construction water to the City of Everett sanitary sewer and project work hours (it is currently anticipated that some limited amount of nighttime/weekend dredging and/or excavation may be necessary), and meeting substantive requirements for a grading permit and management of stormwater.

6.2 APPLICABLE, RELEVANT, AND APPROPRIATE REGULATORY REQUIREMENTS

The sediment cleanup action will be conducted under Consent Decree No. No. 12 2 03430 1 between the Port and Ecology. The Consent Decree requires identification of the permits or specific federal, state, or local requirements that the agency has determined are applicable to Site activities. In accordance with MTCA, all cleanup actions conducted under MTCA shall comply with applicable state and federal laws [WAC 173-340-710(1)]. MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate. Collectively, these requirements are referred to as applicable or relevant and appropriate requirements (ARARs). A discussion and comprehensive list of ARARs for cleanup actions at the Site is presented in Section 3.4 and Table 3.4 of the CAP.

This cleanup action is exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 Revised Code of Washington (RCW) and of any laws requiring or authorizing local government permits or approvals, but must still comply with the substantive requirements of such permits or approvals. The primary regulations governing the soil and sediment cleanup actions are the MTCA cleanup regulation (Chapter 173-340 WAC) and the SMS (Chapter 173-204 WAC). ARARs are discussed on the following sections.

6.2.1 PERMITS AND APPROVALS

Permits and approvals that will be required for the sediment cleanup action include:

- Nationwide 38 or Section 10/404 permit from the USACE (appropriate permit to be determined by the USACE)
- Substantive requirements of the Section 401 Water Quality Certification (WQC) (substantive requirements achieved through coordination with Ecology)
- Hydraulic Project Approval (HPA) from Washington State Department of Fish and Wildlife (WDFW)
- Shoreline Substantial Development Permit Exemption from the City of Everett
- Permit to Discharge to the City of Everett sanitary sewer.

6.2.2 OTHER LAWS AND REGULATIONS

It is currently expected that the sediment cleanup action will be designed to have no surface water discharge off of the Site. However, the Port has an active NPDES construction stormwater permit for the North Marina area that will be used during cleanup action construction, including Appendix B to the associated construction Stormwater Pollution Prevention Plan (SWPPP) that provides specific procedures for stormwater management during cleanup of contaminated soil.

Other laws and regulations include, but are not limited to:

- Washington Water Pollution Control Act and the following implementing regulation: Water Quality Standards for Surface Waters (WAC 173-201A). These regulations establish water quality standards for surface waters of the State of Washington consistent with public health and the propagation and protection of fish, shellfish, and wildlife. These standards will be used to develop appropriate BMPs for cleanup action construction activities.
- Washington Solid Waste Management Act [Chapter 70.95 (RCW)] and the following implementing regulation: Criteria for Municipal Solid Waste Landfills (WAC 173-351). These regulations establish a comprehensive statewide program for solid waste management, including proper handling and disposal. The management of contaminated sediment, soil, and debris to be removed from the Site would be conducted in accordance with these regulations to the extent that the materials can be managed as solid waste.

- Shoreline Management Act (SMA; Chapter 90.58 RCW and WAC 173-26-201). Establishes permitting and other requirements for substantial development occurring within waters of the United States or within 200 ft of a shoreline, and requires that the activities in coastal zones be consistent with local regulations. MTCA exempts cleanup projects being conducted under an enforceable order or consent decree from the requirement of obtaining the shoreline permit; however, the project being permitted includes construction elements that are not related to the cleanup action, and as a result, a shoreline permit will need to be obtained, or the City of Everett will need to determine that the planned improvements are consistent with the Port's existing shoreline permit.
- Hazardous Waste Operations (WAC 296-843). Establishes safety requirements for workers providing investigation and cleanup operations at sites containing hazardous materials. These requirements will be applicable to onsite cleanup activities and would be addressed in a site-specific health and safety plan (HASP) prepared for the sediment cleanup action construction activities.
- Washington Hazardous Waste Management Act (Chapter 70.105 RCW) and the following implementing regulation: Dangerous Waste Regulations (WAC 173-303). These regulations establish a comprehensive statewide framework for the planning, regulation, control, and management of dangerous waste. The regulation designates those solid wastes that are dangerous or extremely hazardous to the public health and environment. The management of excavated contaminated materials from the Site would be conducted in accordance with these regulations to the extent that any dangerous wastes are discovered or generated during the cleanup action.

The earthwork activities to be performed as part of the sediment cleanup action are not regulated under the Washington Clean Air Act (Chapter 70.94 RCW and WAC 173-400-100), and the cleanup action activities are not expected to create conditions that would significantly affect the ambient air quality or to cause any exceedances of applicable air quality standards.

7.0 PROJECT IMPACTS AND MITIGATION

This section summarizes likely impacts to marine habitat as a result of implementation of the sediment cleanup action construction activities and proposed mitigation to address these project impacts. It also describes the impacts associated with North Marina Phase 1 redevelopment construction elements that will be permitted in conjunction with the sediment cleanup, and the proposed mitigation for these impacts.

7.1 PROJECT IMPACTS

The project includes the following major in-water construction elements that may cause impacts to aquatic habitat, or provide benefits to aquatic habitat that may help offset impacts:

- Removal of the marine railway creosoted timber
- Removal of the Travel Lift/Boat Haul-Out facility creosoted timber
- Installation of about 350 linear ft of new steel sheet pile bulkhead to replace (encapsulate) existing creosoted-timber bulkhead segments
- Sediment dredging/excavation to remove about 9,000 yd^3 of contaminated sediment
- Backfilling for long-term bulkhead stability and site redevelopment.

As described in Section 1.2, the project for permitting purposes will include construction of in-water features, and associated habitat impacts and/or benefits, related to Phase 1 of the Port's redevelopment of the North Marina area. Non-cleanup redevelopment elements that may be implemented within the general timeframe and location of the Site sediment cleanup, and will potentially cause habitat impacts that will have to be mitigated, include:

- Replacing the bulkhead to the south of the portion that will be replaced as part of the sediment cleanup action (e.g., Segment C)
- Constructing a public access viewing platform in the northeast corner of the North Marina, in the location currently occupied by the Port's haul-out facility
- Realigning the marina floats and associated gates in the portion of the marina adjacent to the Site uplands.

Site cleanup and Phase I of the North Marina area redevelopment improvements are shown on Figure 10. Only a portion of the planned float realignments are shown on Figure 10; the full extent of the planned realignments is shown on Figure 11. The combined project is referred to as the "integrated North Marina Phase 1 project" for permitting purposes.

As discussed in Section 4.1, it is currently estimated that the Port's proposed alignment for the replacement sheet pile bulkhead would result in a total of approximately 7,060 ft^2 (1/6 acres) of existing sub-tidal and intertidal sediment below MHHW (Elevation 11.1 ft MLLW) being converted to upland fill behind the new bulkhead for the integrated North Marina Phase 1 project.

The project provides environmental benefits in addition to removal of contaminated sediment. The project will also remove creosote-treated piles and timbers from the marine environment. Additionally, beneficial changes in shading will occur upon removal of the existing Travel Lift/Boat Haul-Out facility and the marine railway.

Remediation of contaminated sediment, demolition of marine structures, and bulkhead replacement activities at the Site may have minor, short-term negative effects on intertidal habitat. In general, dredging, pile driving, and demolition/removal activities will likely cause listed species to temporarily avoid the area. Associated construction disturbances created during in-water work by barges, tugs, and dredges will likely disturb any fish in the immediate vicinity and drive them away from the project Site. Resident fish may find refuge under adjacent piers, docks, and boats within the marina, but migratory fish, including juvenile salmonids, will most likely move into other areas beyond the range of construction effects.

Short-term changes in shading may occur during dredging, as existing floats are moved to allow access for marine demolition and dredging activities. The floats will be temporarily relocated to adjacent marina areas over subtidal habitat, beyond the range of juvenile salmon foraging habitat. Injury to fish during dredging, from contact with dredging equipment or entrapment during placement of clean backfill material, is unlikely to occur because fish will avoid the project Site due to in-water construction disturbances. Furthermore, few, if any, listed species are expected to be present during project construction because in-water activities will be scheduled outside the period of juvenile salmon and bull trout migration, as defined by National Oceanic and Atmospheric Administration (NOAA) Fisheries, U.S. Fish and Wildlife Service (USFWS), as will be specified in conditions of the Section 10/404 federal permit and the State HPA permit issued by the WDFW. Project construction will typically occur during daylight hours within the period established by the regulatory agencies (anticipated to be within a timeframe between July to February) to limit disturbance to listed species that could potentially be in the project area during construction.

Removal and isolation of contaminated sediment and creosote-treated wood from the marine area of the Site is anticipated to have significant, long-term beneficial effects on fish, bird, marine mammal, and aquatic invertebrate habitat and associated prey species. Improvement to sediment quality from contaminant removal will provide about 39,000 ft^2 of clean marine substrate that will benefit benthic, epibenthic, and pelagic animals, including juvenile salmon and their prey species, and improve water quality.

Existing adverse effects on sediment and water quality from the creosoted timbers comprising the bulkhead, mooring and pier piles, the Travel Lift/Boat Haul-Out facility, and the marine railway will be eliminated. The number of pilings and estimated square footage of creosote-treated timbers removed from the marine environment will be estimated and integrated into the impact assessment for the BE and the JARPA. Marine railway and Travel Lift/Boat Haul-Out facility removal, and creosoted bulkhead isolation are important parts of this remediation project from a habitat quality perspective because these structures comprise a significant part of intertidal habitat available to juvenile salmonids and other aquatic resources within the project Site.

Long-term beneficial changes in shading will occur upon removal of the existing Travel Lift/Boat Haul-Out facility and the marine railway, and possibly as a result of float realignment. The reduction in over-water shading will be estimated and integrated into the BE impact assessment and the JARPA.

Because the shoreline area adjacent to the bulkheads will be backfilled to about elevation -0 ft MLLW, it is not anticipated that significant intertidal or shallow subtidal habitat will be converted to deep subtidal habitat. However, the gain/loss of intertidal, shallow subtidal, and deep subtidal habitat will be estimated in the BE and considered in conjunction with other aquatic habitat impacts.

7.2 PROPOSED MITIGATION

In the late 1990s, the Port of Everett developed a habitat mitigation bank to compensate for unavoidable adverse impacts on habitat from marine terminal improvements and other projects. The project goal was to provide habitat compensation compatible with the natural landscape, and to maximize the ecological functions and values of the habitat and adjacent interacting ecosystems. The Port purchased and restored a portion of a 32-acre agricultural site on Union Slough (see Figure 1) to a tidally influenced brackish marsh. The Port first delineated existing site wetlands and then developed a detailed conceptual restoration plan. The Port negotiated with regulatory agencies to allow a portion of the restored site to be used as offsite mitigation for an initial set of marine terminal improvements and to use the remainder of the restored saltmarsh/mudflat complex as advanced mitigation to offset impacts of future projects. The Port adapted an indicator value assessment model [Tidal Habitat Model (THM)] developed by the City of Everett and Pentec Environmental under the Snohomish Estuary Wetland Integration Plan to be used to calculate remaining benefits, or credits, in the bank. A benefit of this approach is the reduction of effort that resource, regulatory, and review agencies expend to respond to subsequent Port mitigation needs, since the needed mitigation is already fully functioning. The Port has used the Union Slough site as mitigation for unavoidable impacts from development of a nearshore confined disposal site that is now Pacific Terminal, for construction of the 12th Street Yacht Basin, and for habitat loss during reconstruction of the north (14^{th} Street) bulkhead in the North Marina.

In designing the new habitat at Union Slough, the Port used existing information and data from several years of study of anadromous fish and other resources in the lower Snohomish River estuary. Elements of the plan included grading the site and excavating deep channels to about -4 feet MLLW for fish use during outmigration and overwintering. Dikes were designed with shallow slopes so that trees could grow on them to provide riparian function without compromising dike integrity. Before breaching the dike into Union Slough, areas of higher elevations were graded to be suitable for establishment of brackish marsh vegetation. Monitoring of the site for 5 years showed intensive use by juvenile salmonids and a variety of other species. Brackish marsh colonization exceeded expectations and all performance goals (fish, Dungeness crab, shorebirds, marsh) for the site were met by Year 5. Because of this success, and to increase the number of credits available for the 12th Street Yacht basin, in late 2005 the site was expanded by an additional 5 acres to a total of 23.9 acres below Ordinary High Water (OHW). Of this, 0.41 acres remain that have not been committed as mitigation (Hart Crowser 2013).

The Port proposes to use a portion of this remaining area as mitigation to address adverse project impacts from the sediment cleanup action, bulkhead replacement, and float reconfiguration activities in the marine area of the Site. A one-to-one area ratio is proposed for mitigation, given the significant environmental benefits from sediment remediation, removal of creosote-treated piles and timbers from the marine environment, and long-term beneficial changes in shading from removal of the existing Travel Lift/Boat Haul-Out facility and the marine railway.

8.0 COMPLIANCE MONITORING

In accordance with MTCA requirements in WAC 173-340-410, a compliance monitoring plan will be developed for the marine sediment and upland Area A soil cleanup action activities and submitted to Ecology for approval. Compliance monitoring is conducted for the following three purposes, which are discussed further in the following sections:

- **Protection monitoring** to confirm that human health and the environment are adequately protected during construction, operation, and maintenance associated with the cleanup action
- **Performance monitoring** to confirm that the cleanup action has attained cleanup standards and any other performance standards (such as monitoring necessary to demonstrate compliance with project permits)
- **Confirmational monitoring** to confirm the long-term effectiveness of the cleanup action once the cleanup standards and other performance standards have been attained.

8.1 PROTECTION MONITORING

Protection monitoring will address worker health and safety for activities related to cleanup action construction and excavation activities, as well as protection of the general public, and protection of potential environmental receptors. Worker health and safety will be addressed through preparation of project-specific HASPs by Landau Associates and the construction contractor. Landau Associates' HASP will be prepared and provided under separate cover. The requirements for preparation of a project-specific HASP by the selected contractor will be included in the project construction documents, along with the requirement that it be no less protective than Landau Associates' HASP and the existing Site-specific HASP (Landau Associates 2012) used for previous Site investigation activities. Each HASP will address potential physical and chemical hazards associated with Site activities consistent with the requirements of WAC 173-340-810 and field monitoring to confirm that potential exposure to chemical hazards do not exceed health-based limits.

Monitoring for protection of the environment addresses environmental receptors that may be exposed to chemical or physical hazards at levels that may cause adverse effects. For the sediment cleanup action, the primary receptors of concern are aquatic organisms in the marine environment in the Site vicinity. Environmental protection monitoring during in-water work for the integrated North Marina Phase 1 project (dredging, removal of the marine railway and the Travel Lift/Boat Haul-Out facility and floats and float pilings, installation of new float pilings, and backfilling) will consist of monitoring surface water turbidity and particular chemicals of concern, as necessary. During construction activities associated with the upland Area A cleanup, environmental protection monitoring will consist of air and stormwater monitoring, in addition to monitoring marine surface water for turbidity/ and visible sheen.

8.2 PERFORMANCE MONITORING

Performance monitoring will consist of testing samples of affected media (sediment and soil) to determine that the cleanup action has achieved cleanup standards, and construction quality assurance (CQA) monitoring to confirm that the cleanup action is conducted in conformance with the project construction drawings and specifications.

Performance monitoring scope and procedures are summarized in the compliance monitoring plan, and CQA monitoring activities will be provided in a CQA Plan to be prepared during detailed design of the cleanup action.

8.3 CONFIRMATION MONITORING

Confirmation monitoring will be conducted to confirm the effectiveness of the cleanup action, and will consist of post-construction groundwater monitoring.

As discussed in the EDR for the upland soil cleanup action, existing groundwater monitoring wells remaining at the Site were decommissioned prior to implementation of the upland cleanup action. Four new monitoring wells are scheduled to be installed at the Site in order to evaluate groundwater conditions near the bulkhead area and between the former upland operation areas and the marina. Because of the need to replace certain bulkhead segments and use portions of the upland area to facilitate sediment cleanup action construction activities, the four new monitoring wells will not be installed until after the sediment cleanup action and associated Site restoration activities are completed. Additional information regarding the locations, installation details, well development, and sampling procedures for the four new monitoring wells are provided in Appendix B of the EDR for the upland soil cleanup action.

9.0 CONSTRUCTION DOCUMENTS

The following section provides a brief summary of the construction documents that will be prepared for the sediment cleanup action, the quality assurance and control procedures that will be implemented to monitor and document the implementation of the cleanup action, and procedures that will be implemented to prevent releases of hazardous substances during implementation of the cleanup action.

9.1 CONSTRUCTION DRAWINGS AND SPECIFICATIONS

Construction plans and specifications will be prepared and submitted under separate cover to detail the cleanup action construction activities to be performed. The construction plans and specifications will be prepared in conformance with currently accepted engineering practices and WAC 173-340-400 (4)(b), and provide:

- A general description of the cleanup action, including work to be done, a summary of Site environmental conditions, a summary of design criteria, an existing Site layout map, Site bathymetric and topographic survey information, and a copy of available permits and approvals
- Detailed plans and specifications necessary for construction, construction materials storage, construction waste storage and management, utility locations within cleanup areas, surface drainage, materials, backfill, and change in grades
- A description of construction controls (including air emissions, stormwater, traffic, and noise)
- Construction documentation and reporting requirements.

9.2 CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE

Day-to-day construction quality control (CQC) will be performed by the contractor, consistent with the requirements of the construction contract specifications for the cleanup action. The Port will have a CQA representative onsite during construction to confirm that the work is being performed in accordance with the intent of the plans and specifications. CQC will include the necessary elements to ensure that contaminated materials are properly handled. In accordance with WAC 173-340-400(7)(b), construction will be performed under the supervision of a professional engineer registered in the State of Washington or a qualified technician under the direct supervision of the engineer.

A CQA plan will be prepared in conjunction with the construction plans and specifications. The plan will include the following monitoring parameters:

- Adequacy of construction submittals
- General construction methods and equipment
- Field engineering and survey methods
- Fill gradation, quality, and consistency

- Fill placement and compaction
- Suitability, quality, and installation of structural elements
- Stormwater runoff and erosion control measures
- Decontamination procedures
- Traffic control
- Contractor quality control methods and documentation
- As-built documentation of completed work.

9.3 CONTROL OF HAZARDOUS MATERIALS, ACCIDENTAL DISCHARGES, AND STORMWATER

Procedures to control and, as appropriate, respond to spills will be incorporated into the construction plans and specifications. The materials most likely to be spilled during the Site cleanup action include equipment fuel and oil, or contaminated soil. A spill prevention and pollution control (SPPC) plan will be prepared by the contractor to address procedures for handling and storage of hazardous materials used for construction purposes (e.g., fuel, oil, etc.), and for prevention and response to any hazardous material spills or accidental discharges.

Stormwater runoff has the potential to convey water and soil off the Site. The contractor will be required to prepare construction, equipment decontamination, and stormwater management plans that adequately address environmental protection measures in accordance with project-specific requirements to be included in the plans and specifications. These plans will be subject to review by the Port's CQA personnel prior to initiating the work.

The contractor's project construction plan will describe the overall sequence and construction methods that will be used to complete the cleanup action. The plan will include detailed procedures for controlling, collecting, handling, and disposal of residual contaminated sediment, soil, and debris, and any liquids generated during disposal operations. The equipment decontamination plan will provide design details for the contractor's equipment decontamination pad, including the pad dimensions; construction materials; and water collection, conveyance, and treatment systems. The contractor's stormwater management plan will provide construction details and operation procedures for collection, conveyance, and treatment/disposal of stormwater and construction water, and for installation and maintenance of TESC measures during implementation of the cleanup action.

10.0 INSTITUTIONAL CONTROLS

Because the sediment cleanup action will remove all marine sediment exceeding the Site CULs and not rely on capping or other remedial activities, long-term monitoring and environmental covenants related to the marine component of the Site cleanup will not be needed. All soil exceeding the Site CULs in upland Area A will also be removed from the Site.

However, as discussed in the EDR for the upland soil cleanup action, some contaminated soil will remain under the sidewalk along the east side of the Site along West Marine View Drive. Institutional controls in the form of covenant restrictions will be developed for soil remaining at the Site that has contaminant concentrations above the Site CULs, and for groundwater if it remains impacted after the applicable monitoring period. The covenant restrictions are subject to Ecology review and approval, per Section XX of the Consent Decree.

11.0 PROJECT SCHEDULE

The proposed schedule for the Site cleanup actions has been developed to meet the requirements of the Consent Decree. The schedule is provided in Appendix K.

12.0 USE OF THIS REPORT

This EDR has been prepared for the exclusive use of the Port of Everett and Ecology for specific application to the planned remedial action at the Everett Shipyard Site in Everett Washington. Any reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

This document has been prepared under the supervision and direction of the following key staff.

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Data Source: Esri 2012

G:\Projects\147\036\010\016\Sediment EDR\F1_VicMap.mxd 1/28/2014 NAD 1983 StatePlane Washington North FIPS 4601 Feet

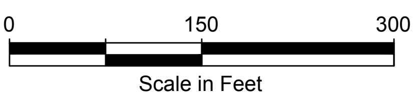
Landau Associates

Engineering Design Report For Sediment Cleanup Everett Shipyard Site Everett, Washington	**Vicinity Map**	Figure 1

Note

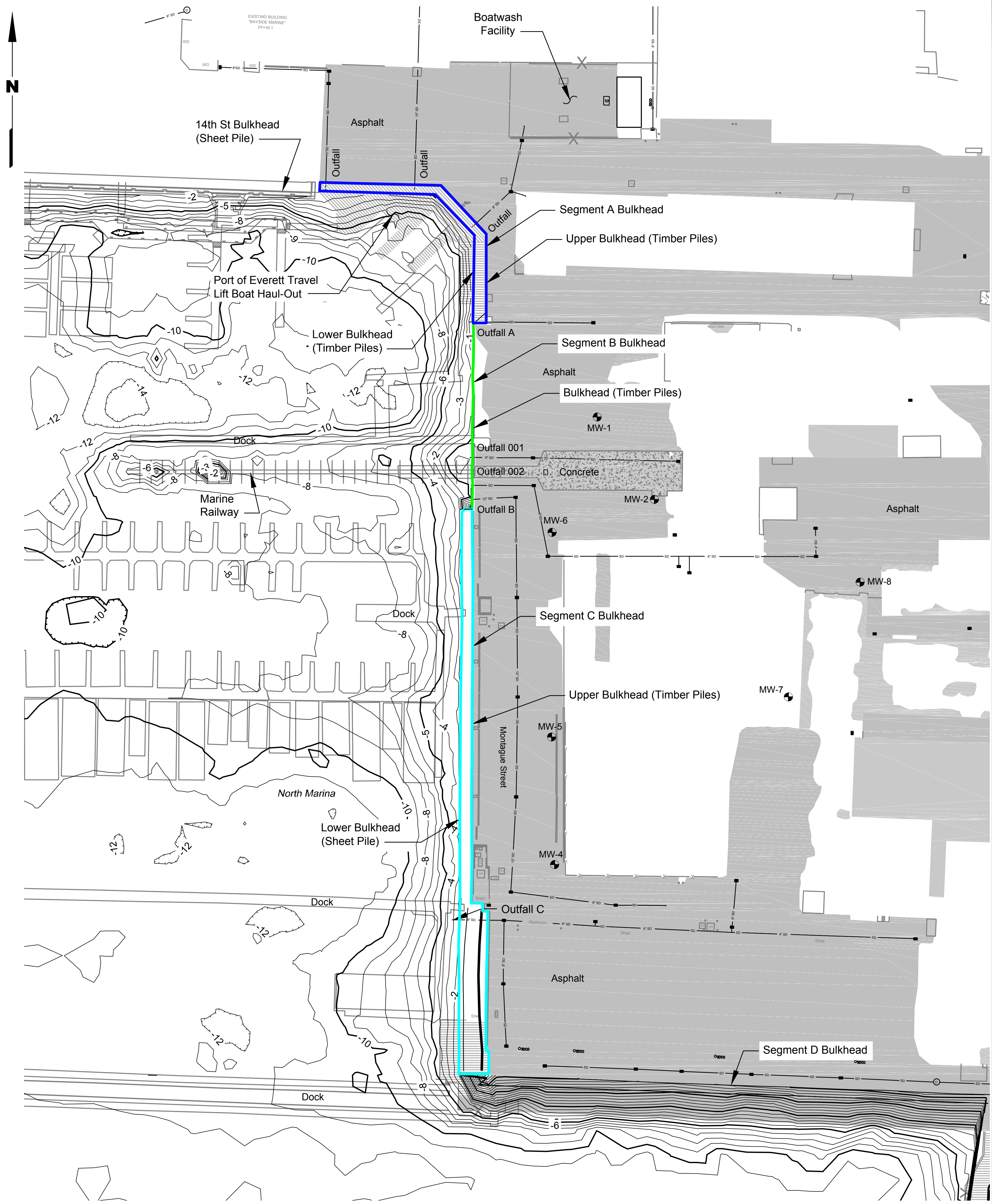
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: Google Earth Pro 2010 (image dated 07/05/12)



Landau Associates

Engineering Design Report For Sediment Cleanup Everett Shipyard Site Everett, Washington	Site Plan	Figure 2



Legend

- Segment A Bulkhead
- Segment B Bulkhead
- Segment C Bulkhead

Notes

1. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12; feet, MLLW
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: AMEC 2012, Google Earth Professional 2012

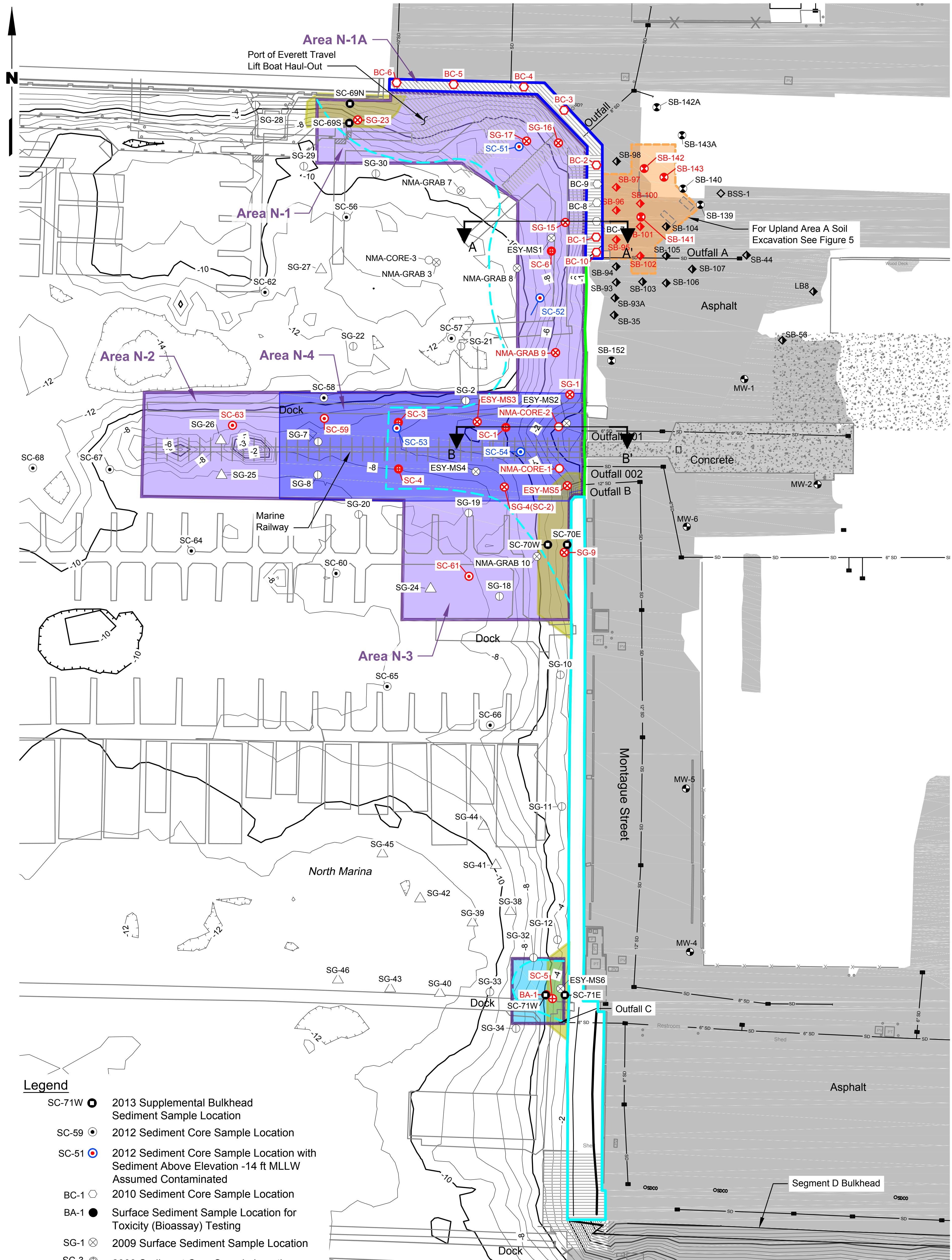
0 80 160
Scale in Feet

Landau Associates

Engineering Design Report For Sediment Cleanup Everett Shipyard Site Everett, Washington

Existing Site Features

Figure 3



Legend

- SC-71W — 2013 Supplemental Bulkhead Sediment Sample Location
- SC-59 — 2012 Sediment Core Sample Location
- SC-51 — 2012 Sediment Core Sample Location with Sediment Above Elevation -14 ft MLLW Assumed Contaminated
- BC-1 — 2010 Sediment Core Sample Location
- BA-1 — Surface Sediment Sample Location for Toxicity (Bioassay) Testing
- SG-1 — 2009 Surface Sediment Sample Location
- SC-3 — 2009 Sediment Core Sample Location
- NMA-CORE-1 — 2004 Sediment Core Sample Location
- MW-4 — Existing Monitoring Well Location
- BSS-1, SB-104 — 2010 Soil Sampling Location
- SB-142 — 2012 Soil Sampling Location
- Segment A Bulkhead
- Segment B Bulkhead
- Segment C Bulkhead
- Extent of SMS Exceedances Presented in RI/FS
- Potential UST Location [Identified and Located by GPR Survey 2012 (URS)]
- Sediment Cleanup Action Area
- Dredge to -14
- Dredge to -12
- Dredge to -8
- Upland Soil Excavation Area A
- Capping Areas

Source: AMEC 2012, URS 2012

Notes

1. Sample locations shown in RED exceed Site cleanup levels.
2. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12; feet, MLLW
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

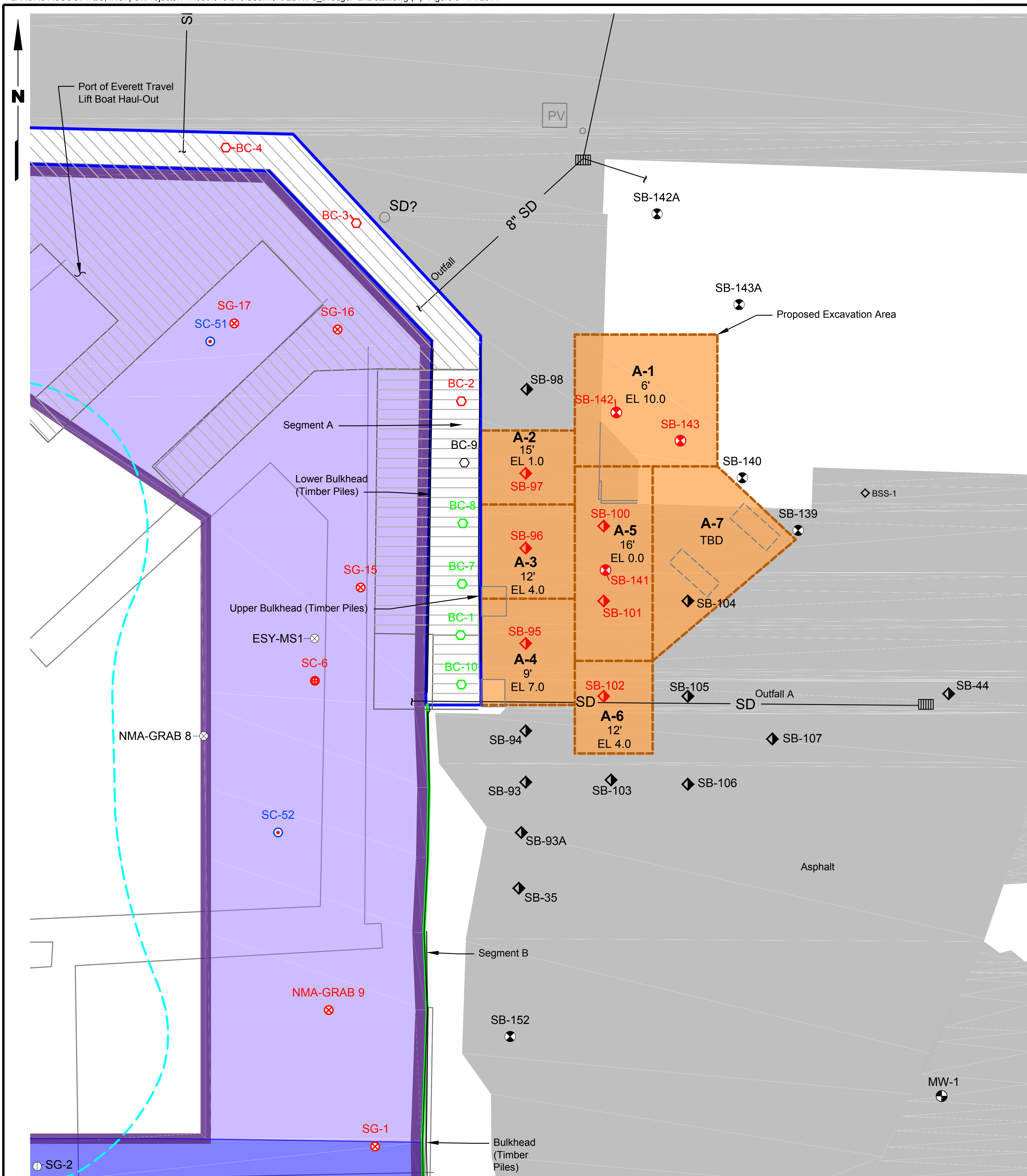
0 60 120
Scale in Feet

Landau Associates

Engineering Design Report For Sediment Cleanup Everett Shipyard Site Everett, Washington

Sediment Dredge Prism and Upland Soil Excavation Area A

Figure 4



Legend

SC-59	2012 Sediment Core Sample Location
SC-51	2012 Sediment Core Sample Location with Sediment Above Elevation -14 ft MLLW Assumed Contaminated
BC-1	2010 Sediment Core Sample Location
BA-1	Surface Sediment Sample Location for Toxicity (Bioassay) Testing
SG-1	2009 Surface Sediment Sample Location
SC-3	2009 Sediment Core Sample Location
NMA-CORE-1	2004 Sediment Core Sample Location
MW-4	Existing Monitoring Well Location
BSS-1 SB-104	2010 Soil Sampling Location
SB-142	2012 Soil Sampling Location

- Segment A Bulkhead
- Segment B Bulkhead
- Segment C Bulkhead
- Extent of SMS Exceedances Presented in RI/FS
- Potential UST Location [Identified and Located by GPR Survey 2012 (URS)]
- Sediment Cleanup Area
- Dredge to -14
- Dredge to -12
- Dredge to -8
- A-2 15' EL 1.0 — Upland Soil Excavation Sub-area Identification Anticipated Depth of Excavation (ft). Base of Excavation Elevation (ft, MLLW)

Notes

1. Sample locations shown in RED exceed Site cleanup levels.
2. Sediment sample locations shown in GREEN exceed upland soil cleanup level for diesel-range petroleum hydrocarbons.
3. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12; feet, MLLW
4. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
5. TBD= Depth of excavation to-be-determined.

Source: AMEC 2012, URS 2012

0 20 40
Scale in Feet

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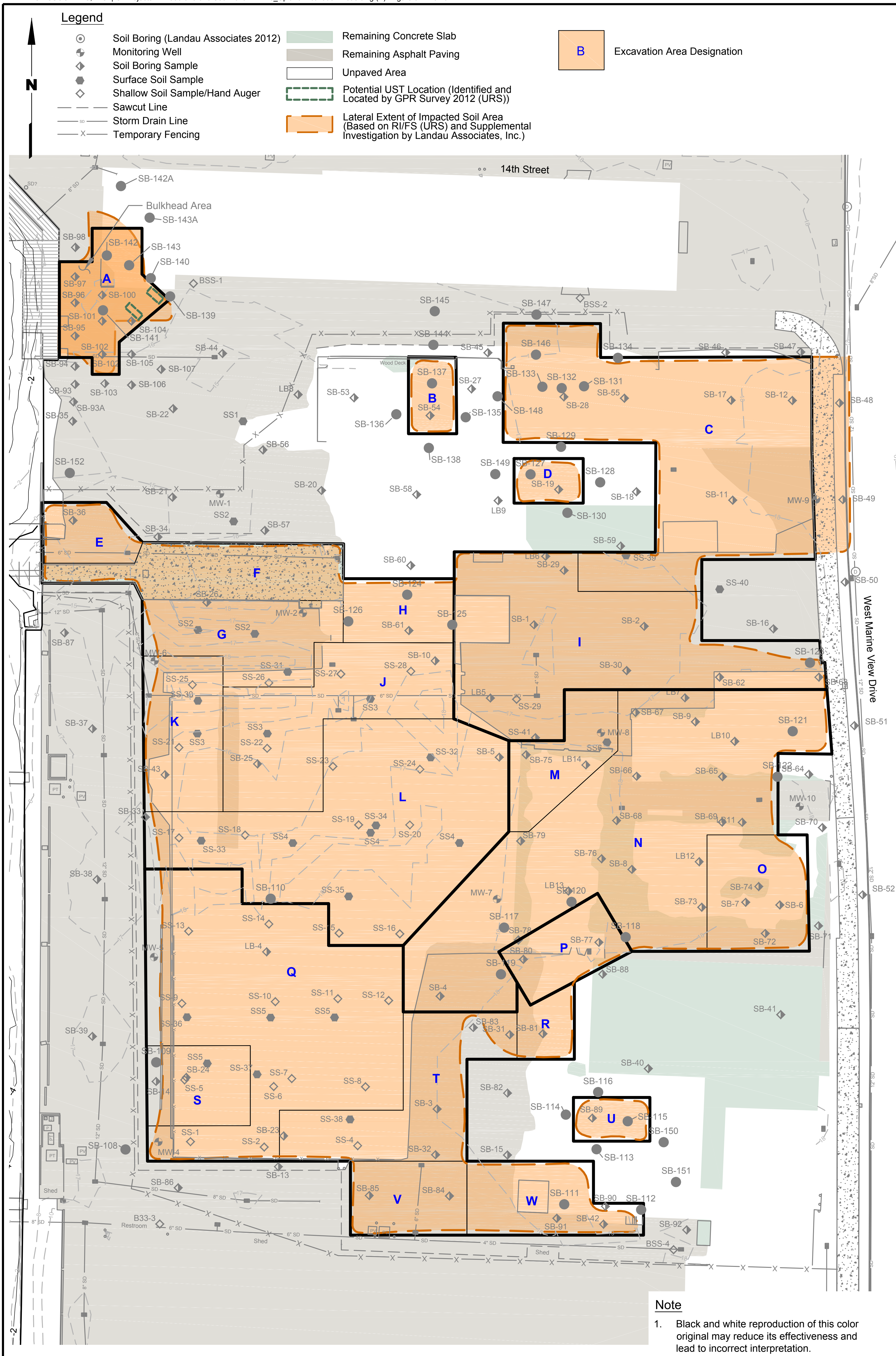
Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Area A
Preliminary Excavation Depths

Figure
5



Base map source: URS Figure 9-3 Dated 5-02-2011, Global Geophysics 2012

0 50 100
Scale in Feet

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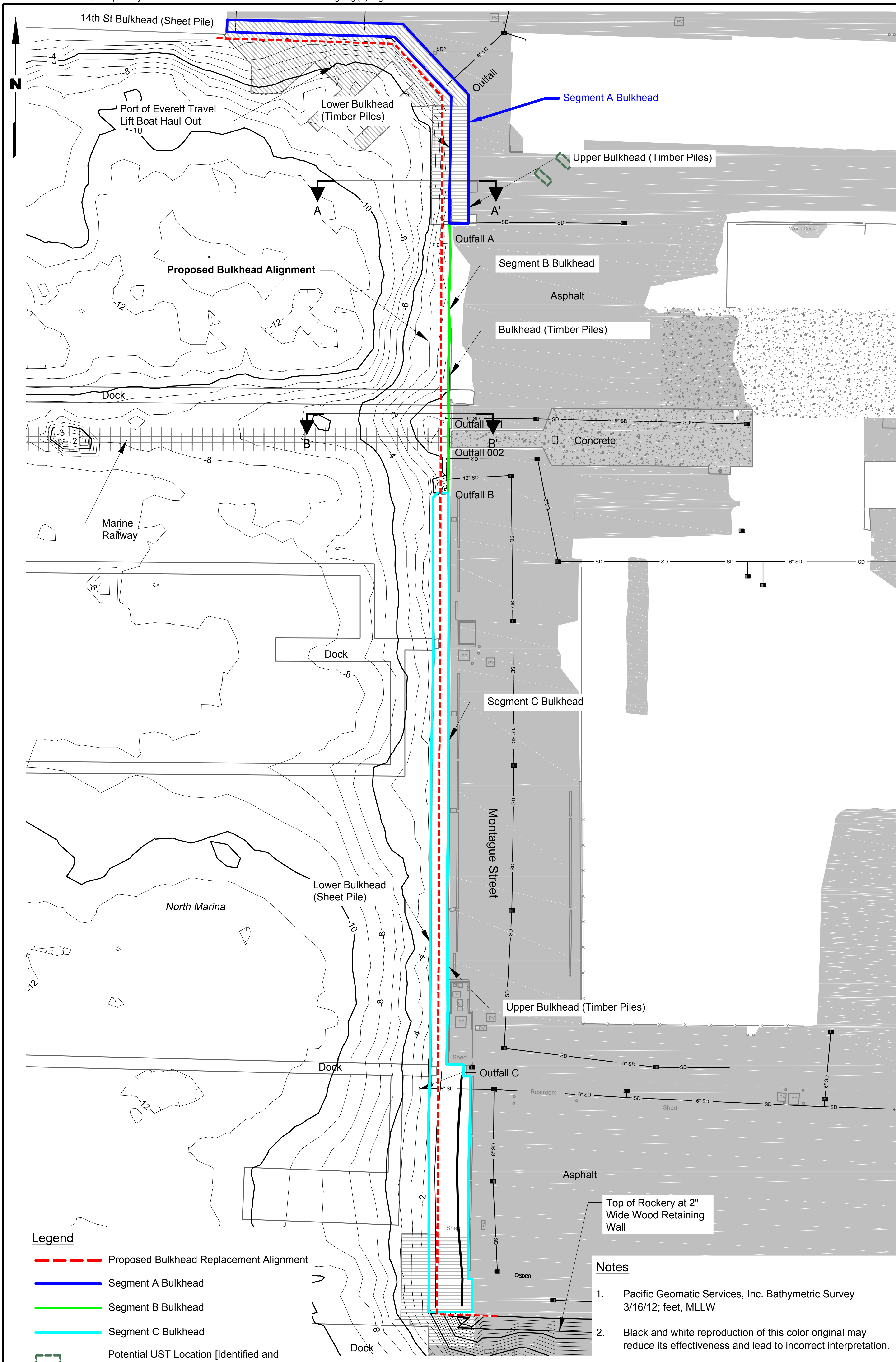
Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

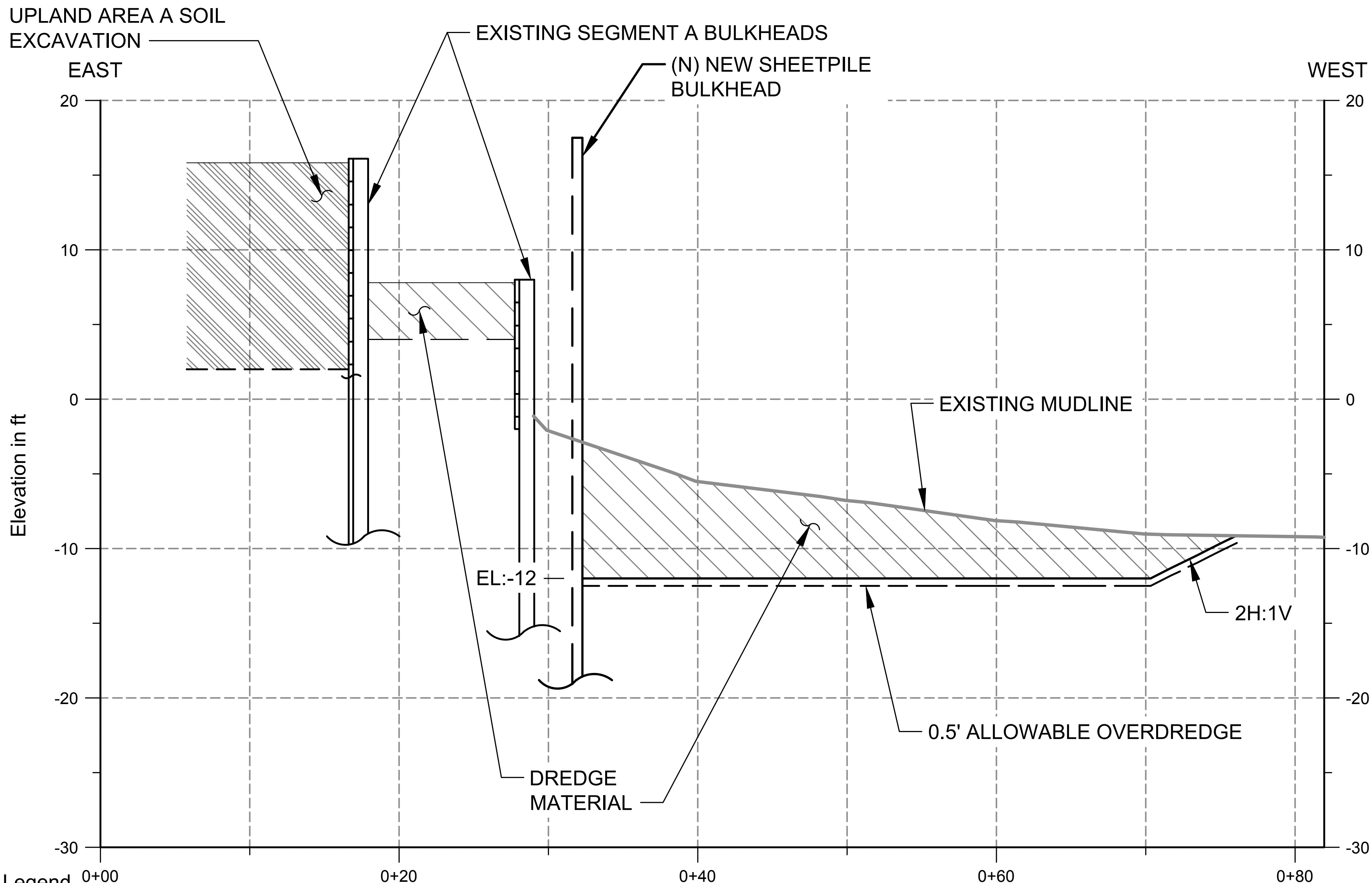
Upland Excavation Areas

Figure
6



LANDAU ASSOCIATES

Engineering Design Report For Sediment Cleanup Everett Shipyard Site Everett, Washington	**Cleanup Action Bulkhead Replacement and Shoring**	Figure 7



Legend

- Dredge Material
- Upland Soil Excavation
- Backfill Material

Geologic Profile A-A'

Horizontal Scale in Feet: 1"=10'
Vertical Scale in Feet: 1"=10'

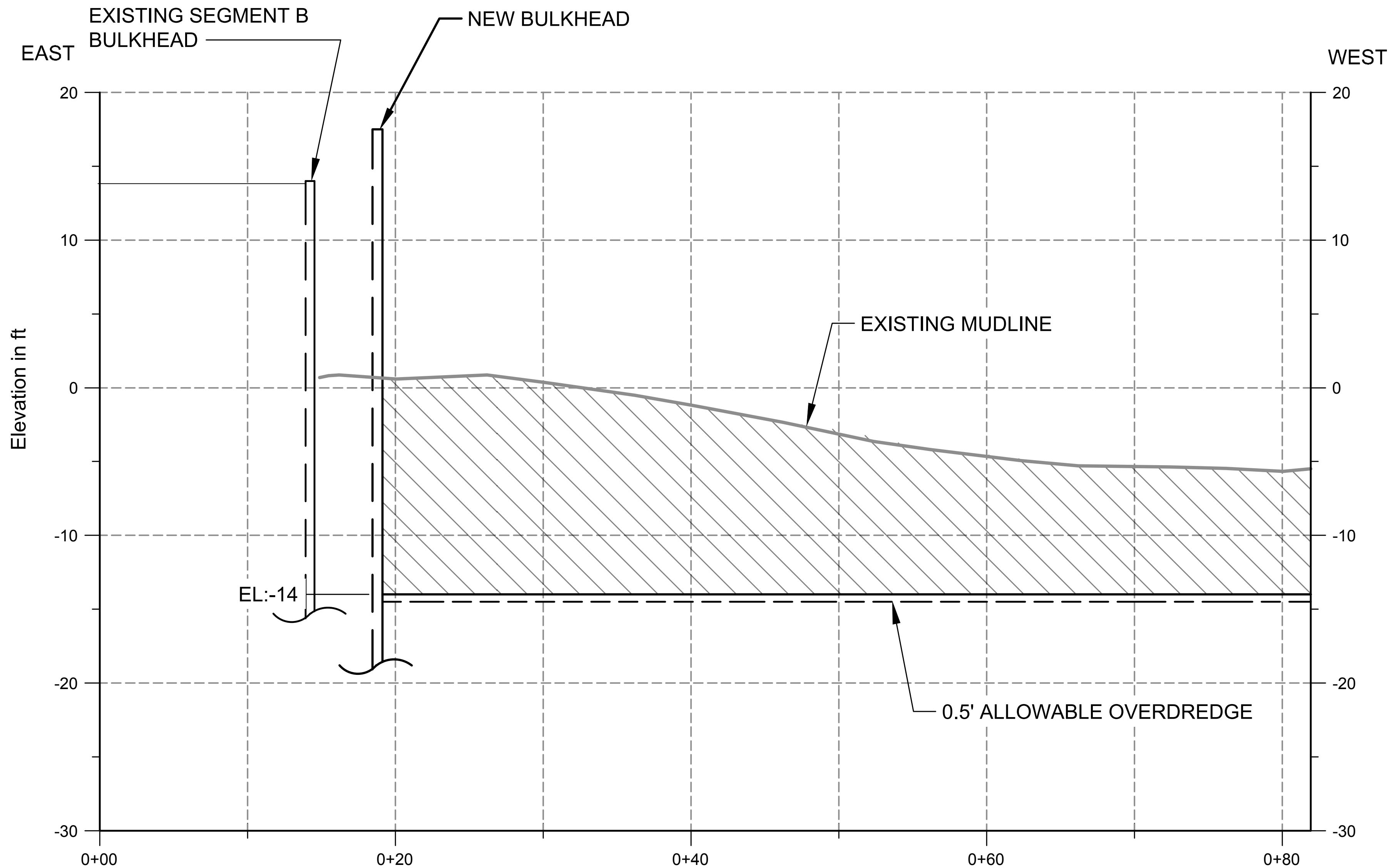
0 10 10
Scale in Feet

Landau Associates

Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Bulkhead Segment A
Typical Dredge Profile

Figure
8



Geologic Profile B-B'

Horizontal Scale in Feet: 1"=10'
Vertical Scale in Feet: 1"=10'

Legend

Dredge Material

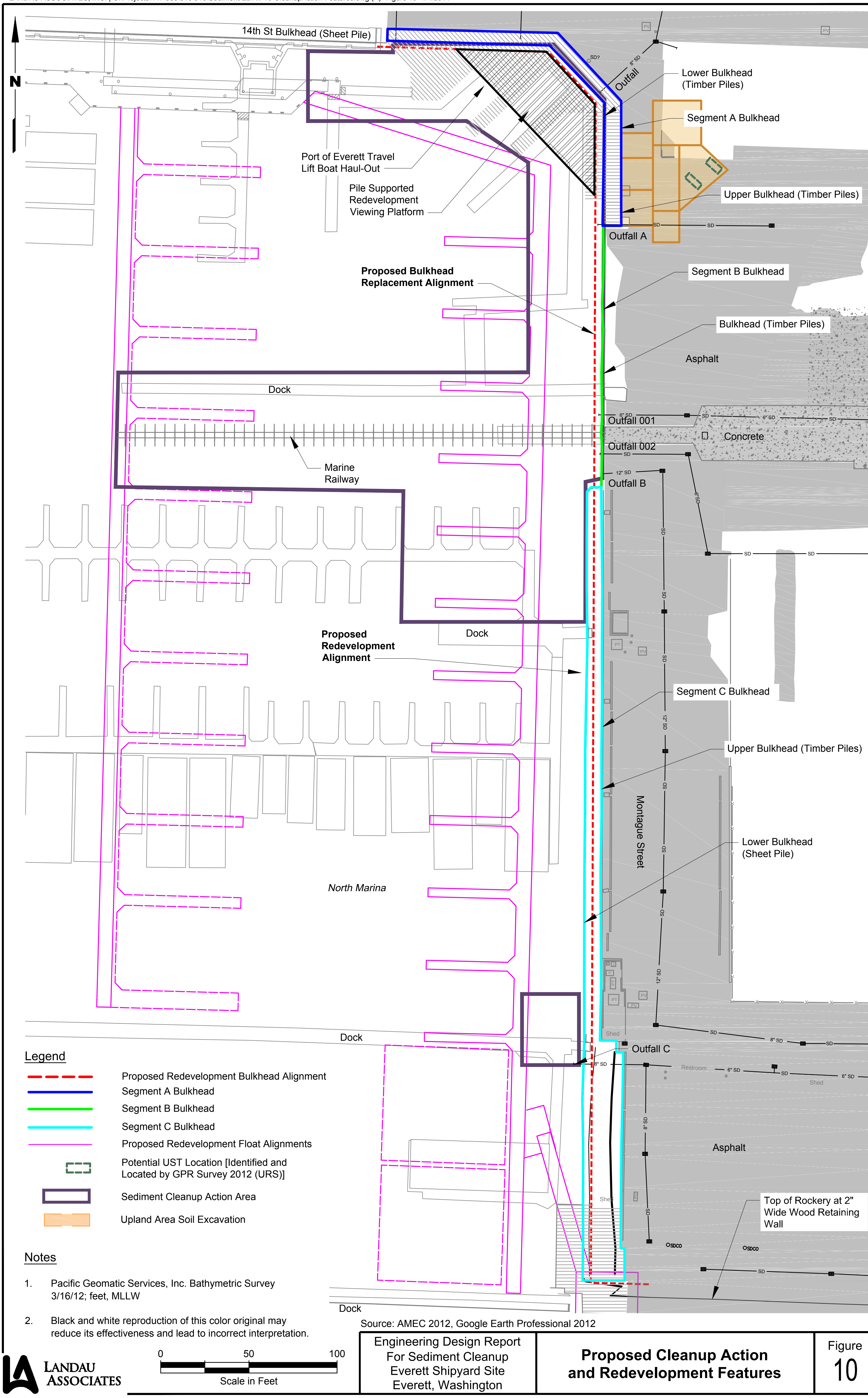
0 10 10
Scale in Feet

LANDAU ASSOCIATES

Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Bulkhead Segment B
Typical Dredge Profile

Figure
9



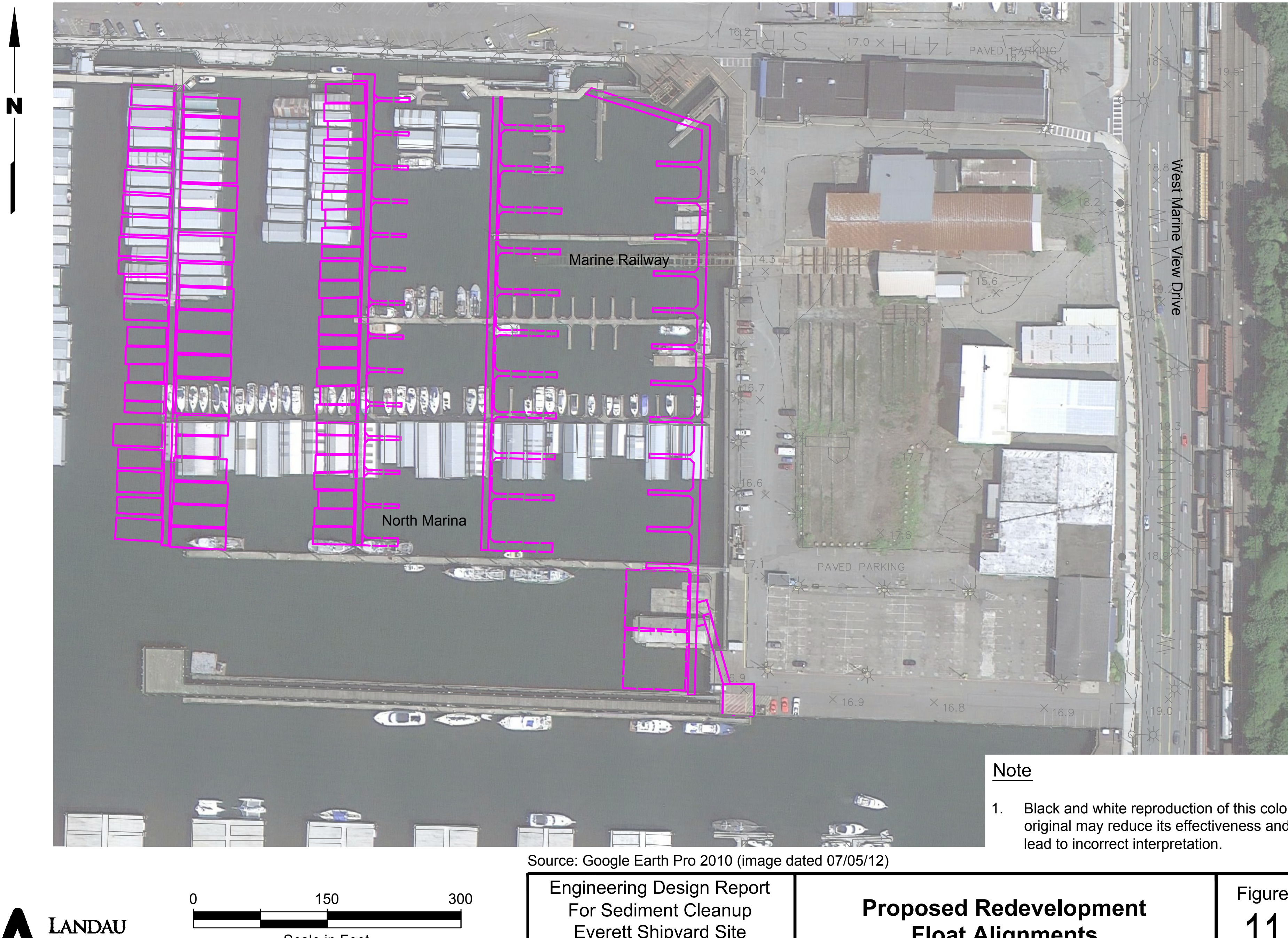
Source: AMEC 2012, Google Earth Professional 2012

Landau Associates

Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Proposed Cleanup Action and Redevelopment Features

Figure 10



Note

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Source: Google Earth Pro 2010 (image dated 07/05/12)

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Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Proposed Redevelopment Float Alignments

Figure 11

TABLE 1
DEPTH OF MARINE SEDIMENT CLEANUP LEVEL EXCEEDANCES
EVERETT SHIPYARD SITE
PORT OF EVERETT

Sample Location with Cleanup Level Exceedance	Mudline Elevation (ft, MLLW)	Depth of Exceedance (ft)	Elevation of Exceedance (ft, MLLW)	Depth of Next Sample (ft)	Elevation of Next Sample Depth (ft, MLLW)	Elevation of Planned Dredge Depth (ft, MLLW)
Area N-1						
SG-15	-5	Surface		NS	NS	-12
SG-16	-3	Surface		NS	NS	-12
SG-17	-6	Surface		NS	NS	-12
SG-23	-5	Surface		NS	NS	-12
NMA-Grab 9	-4	Surface		NS	NS	-12
SC-6	-7	2	-9	3.5-4.75	-10.5 to -11.75	-12
Area N-2						
SC-63	-8	4	-12	NA	-12 to -14	-12
Area N-3						
SG-9	-2	Surface		NS		-12
SC-61	-8	4	-12	NA	-12 to -14	-12
Area N-4						
SG-1	-2	Surface		NS	NS	-14
SG-4	-7	Surface		NS	NS	-14
ESY-MS3	-5	Surface		NS	NS	-14
ESY-MS5	-2	Surface		NS	NS	-14
NMA-Core-1	-3.7	3.9	-7.6	NS	NS	-14
NMA-Core-2	-1.9	6.3	-8.2	NS	NS	-14
SC-1	-5	3	-8	4-6	-9 to -11	-14
SC-3	-7	6	-13	NS	NS	-14
SC-4	-8	5.5	-13.5	NS	NS	-14
SC-59	-8	6	-14	NA	-14 to -16	-14
OutFall C Area						
SC-5	-5	3	-8	3-5	-8 to -10	-8
Additional Investigation--Adjacent to Bulkheads						
Area N-1						
SC-69 -North	-1.1	4.9	-6	NS	NS	-12
SC-69 -South	-6.8	3.2	-10	4.2	-11 to -12	-12
Area N-3						
SC-70-East	-2.8	3.2	-6	NS	NS	-12
SC-70-West	-3.9	6.1	-10	NS	NS	-12
OutFall C Area						
SC-71-East	-2.7	3.3	-6	NS	NS	-8
SC-71-West	-5.1	2.9	-8	NS	NS	-8

ft = feet
MLLW = Mean Lower Low Water
NS = Not Sampled
NA = Not Applicable

TABLE 2
DEPTH OF AREA A SOIL CLEANUP LEVEL EXCEEDANCES (a)
EVERETT SHIPYARD SITE
PORT OF EVERETT

Sample Location with Cleanup Level Exceedance	Ground Surface Elevation (ft, MLLW)	Depth of Exceedance (ft)	Exceedance Concentration (mg/kg)	Next Sample Depth (ft)	Preliminary Excavation Depth (ft)	Elevation of Preliminary Excavation Depth (ft, MLLW)
Area A-1						
SB-142	16	5.5	16,000	9-10	6	10
SB-143	16	4	15,000	5.5-6.5	6	10
Area A-2						
SB-97	16	14	2,800	NS	14	2
Area A-3						
SB-96	16	11	2,100	14	12	4
Area A-4						
SB-95	16	8	3,100	11	9	7
Area A-5						
SB-100	16	14	2,800	NS	16	0
SB-101	16	15	5,500	NS	16	0
SB-141	16	16	3,100	NS	16	0
Area A-6						
SB-100	16	11	4,800	14	12	4
Area A-7						
No Samples Collected	16	NA	NA	NA	TBD (b)	TBD (b)

NS = No Sample
NA = Not Applicable
TBD = To Be Determined
ft = feet
mg/kg = milligrams per kilogram
MLLW = Mean Lower Low Water

Footnotes:
(a) Diesel-range petroleum hydrocarbon cleanup level exceedances are summarized.
The cleanup level for diesel-range petroleum hydrocarbons is 2,000 mg/kg.
(b) TBD following removal of underground storage tank(s).

APPENDIX A

Sediment Sample Analytical Results

TABLE A-1
PRE-REMEDIAL INVESTIGATION SEDIMENT SAMPLES ANALYTICAL RESULTS
NORTH MARINA SEDIMENT QUALITY INVESTIGATION

														Dup of NMA-grab-5		Dup of NMA-core-5			
Sample ID:			NMA-core-1	NMA-core-1	NMA-core-2	NMA-core-2	NMA-grab-3	NMA-core-3	NMA-core-3	NMA-grab-4	NMA-core-4	NMA-core-4	NMA-grab-5	NMA-grab-11	NMA-core-5	NMA-core-5(c)	NMA-core-5	NMA-core-5	NMA-grab-6
Depth:			0.5-2.0ft	2.0-3.9ft	0.5-3.2ft	3.2-6.3ft	0-10cm	0.5-1.8ft	1.8-3.1ft	0-10cm	0.5-3.0ft	3.0-6.0ft	0-10cm	0-10cm	0.5-1.4ft	0.5-1.4ft	1.4-2.3ft	2.8-4.8ft	0-10cm
Lab ID:			GU97A	GU97B	GU97C	GU97D	GU78A	GW93A	GW93B	GU78B/HD32A	GU97E	GU97F	GU78C	GU78I	GU97G	GU97J	GU97H	GU97I	GU78D
Sample Date:	SQS (a)	CSL (b)	7/2/2004	7/2/2004	7/2/2004	7/2/2004	7/1/2004	7/28/2004	7/28/2004	7/1/2004	7/2/2004	7/2/2004	7/1/2004	7/1/2004	7/5/2004	7/5/2004	7/5/2004	7/5/2004	7/1/2004
Metals (mg/kg)																			
Arsenic	57	93	45	40	270	22	10 U	9	13	9 U	7	8 U	8 U	7 U	7	7	6 U	6 U	7 U
Cadmium	5.1	6.7	0.3	0.6	1.4	0.9	0.6	0.6	0.4	0.3 U	0.4	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.2 U	0.3 U
Chromium	260	270	34.7	50.5	100	64.8	59	59.8	37.4	50.4	41.6	28.7	35.4	37.4	37.7	36.1	36.5	35.7	35.9
Copper	390	390	348	446	1560	1060	96.1	106	56.1	62.9	45.0	25.3	45.3	52.9	38.6	39.4	29.8	26.1	35.1
Lead	450	530	70	110	413	230	19	23	43	13	11	8	10	13	12	12	30	4	7
Mercury	0.41	0.59	0.33	1.62	6.21	10.1	0.11	0.22	0.34	0.08	0.08	0.06	0.06	0.12	0.1	0.07 U	0.05	0.05	0.14
Silver	6.1	6.1	0.4 U	0.4 U	1 U	0.4 U	0.6 U	0.5 U	0.6 U	0.5 U	0.4 U	0.5 U	0.5 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Zinc	410	960	410	288	1610	448	117	128	99	88	81.5	41.7	66.5	71.5	72.8	72.8	56.6	46.2	61.7
PAHs (mg/kg OC)																			
Naphthalene	99	170	2.59	2.79	118.77	8.11	0.78 U	0.81 U	1.08	1.15 U	2.27 U	0.71	1.76 U	1.54 U	3.93	5.86	3.20 U	3.55 U	12.77
Acenaphthylene	66	66	2.38	3.98	11.88	6.95	0.78 U	0.81 U	0.45	1.15 U	2.27 U	0.38 U	1.85	2.15	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
Acenaphthene	16	57	17.46	23.77	141.76	73.36	0.78 U	0.81 U	0.70	1.15 U	2.27 U	0.96	2.13	2.69	3.93	2.35	3.20 U	3.55 U	17.02
Fluorene	23	79	11.11	11.48	114.94	50.19	0.78 U	0.81 U	1.10	1.15 U	2.27 U	1.13	2.22	3.15	3.21	2.47	3.20 U	3.55 U	12.77
Phenanthrene	100	480	23.81	34.02	371.65	212.36	1.41	2.09	5.65	1.82	3.58	3.06	14.81 J	33.08 J	19.05 J	6.79 J	5.92	3.55 U	61.70
Anthracene	220	1200	10.05	18.85	95.79	61.78	0.90	1.03	2.05	1.15 U	2.27 U	1.91	5.93	6.38	5.95	3.77	3.20 U	3.55 U	6.17
2-Methylnaphthalene	38	64	2.12 U	1.60 U	5.75	5.41	0.78 U	0.81 U	0.72	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.36	3.20 U	3.55 U	4.15
LPAH (c)(e)	370	780	67.41	94.88	854.79	412.74	2.31	3.12	11.03	1.82	3.58	7.76	26.94	47.46	36.07	21.23	5.92	3.55 U	110.43
Fluoranthene	160	1200	121.69	307.38	613.03	694.98	5.49	4.15	5.82	7.27	6.82	7.46	72.22 J	123.08 J	54.17 J	12.96 J	22.40	3.55 U	63.83
Pyrene	1000	1400	95.24	233.61	459.77	501.93	4.71	5.98	4.28	5.21	13.64	8.41	62.96 J	92.31 J	77.38 J	43.21 J	36.80	3.55 U	64.89
Benzo(a)anthracene	110	270	39.15	73.77	153.26	177.61	2.78	2.01	3.60	2.55	2.84	3.44	19.44 J	26.92 J	16.07	11.73	8.00	3.55 U	17.02
Chrysene	110	460	63.49	106.56	187.74	216.22	4.71	3.97	5.48	4.24	4.43	4.40	35.19 J	43.85 J	28.57 J	17.90 J	12.80	3.55 U	19.15
Total Benzofluoranthenes (f)	230	450	84.13	147.54	260.54	239.38	6.55	5.68	4.79	4.73	10.45	4.97	50.00	52.31	46.43 J	27.16 J	24.80	3.55 U	24.47
Benzo(a)pyrene	99	210	26.46	49.18	99.62	104.25	1.84	1.97	2.05	1.52	2.61	1.45	13.89	14.62	11.90	8.64	7.60	3.55 U	8.30
Indeno(1,2,3-c,d)pyrene	34	88	14.29	14.34	27.97	30.12	0.78 U	0.81 U	1.13	1.15 U	2.27 U	0.38 U	3.15	4.15	2.44	2.53	3.20 U	3.55 U	3.83
Dibenz(a,h)anthracene	12	33	3.17	3.07	6.51	8.49	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
Benzo(g,h,i)perylene	31	78	11.11	10.66	20.31	25.10	0.78 U	0.81 U	0.98	1.15 U	2.27 U	0.38 U	2.31	3.00	2.32 U	1.85	3.20 U	3.55 U	3.19
HPAH (c)(g)	960	5300	458.73	946.11	1828.74	1998.07	26.08	23.76	28.13	25.52	40.80	30.13	259.17	360.23	236.96	125.99	112.40	3.55 U	204.68
SVOCs (mg/kg OC)																			
1,2-Dichlorobenzene	2.3	2.3	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
1,3-Dichlorobenzene			2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
1,4-Dichlorobenzene	3.1	9	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
1,2,4-Trichlorobenzene	0.81	1.8	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
Hexachlorobenzene	0.38	2.3	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
Dimethylphthalate	53	53	2.33	2.79	141.76	1.54 U	0.78 U	0.81 U	1.03	1.15 U	2.27 U	0.38 U	21.30 J	1.54 UJ	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
Diethylphthalate	61	110	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
Di-n-Butylphthalate	220	1700	3.65	2.09	2.80	1.54 U	1.65 U	0.81 U	1.03	1.64 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.77 U
Butylbenzylphthalate	4.9	64	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
bis(2-Ethylhexyl)phthalate	47	78	46.03	31.97	88.12	33.20	3.80 U	2.82	0.80	3.21 U	5.34 U	0.80 U	6.67 U	4.69 U	8.33 U	4.20 U	5.60 U	5.67 U	6.60 U
Di-n-octyl phthalate	58	4500	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	3.52	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
Dibenzofuran	15	58	2.33	2.95	80.46	28.57	0.78 U	0.81 U	1.51 U	1.15 U	2.27 U	0.80	1.76 U	1.69	2.32 U	1.73	3.20 U	3.55 U	8.30
Hexachlorobutadiene	3.9	6.2	2.12 U	1.60 U	1.49 U	1.54 U	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
N-Nitrosodiphenylamine	11	11	2.12 U	1.60 U	1.49 U	18.92 M	0.78 U	0.81 U	0.31 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U	3.20 U	3.55 U	2.13 U
SVOCs (µg/kg)																			
Phenol	420	1200	40 U	39 U	39 U	40 U	20 U	19 U	18 U	53	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U	20 U
2-Methylphenol	63	63	40 U	39 U	39 U	40 U	20 U	19 U	18 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U	20 U
4-Methylphenol	670	670	40 U	39 U	39 U	40 U	20 U	49	140	19 U	40 U	20 U	19 U	20 U	39 U	53	40 U	20 U	20 U
2,4-Dimethylphenol	29	29	40 U	39 U	39 U	40 U	20 U	19 U	18 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U	20 U
Pentachlorophenol	360	690	200 U	200 U	200 U	330	99 U	97 U	88 U	97 U	200 U	98 U	97 U	98 U	200 U	97 U	200 U	100 U	98 U
Benzyl Alcohol	57	73	40 U	39 U	39 U	40 U	20 U	19 U	18 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U	20 U
Benzoic Acid	650	650	400 U	390 U	390 U	400 U	200 U	190 U	180 U	190 U	400 U	200 U	190 U	200 U	390 U	190 U	400 U	200 U	200 U

TABLE A-1
PRE-REMEDIAL INVESTIGATION SEDIMENT SAMPLES ANALYTICAL RESULTS
NORTH MARINA SEDIMENT QUALITY INVESTIGATION

Sample ID:			NMA-core-1	NMA-core-1	NMA-core-2	NMA-core-2	NMA-grab-3	NMA-core-3	NMA-core-3	NMA-grab-4	NMA-core-4	NMA-core-4	NMA-grab-5	Dup of NMA-grab-5 NMA-grab-11	NMA-core-5	Dup of NMA-core-5 NMA-core-5(c)	NMA-core-5	NMA-core-5	NMA-grab-6
Depth:			0.5-2.0ft	2.0-3.9ft	0.5-3.2ft	3.2-6.3ft	0-10cm	0.5-1.8ft	1.8-3.1ft	0-10cm	0.5-3.0ft	3.0-6.0ft	0-10cm	0-10cm	0.5-1.4ft	0.5-1.4ft	1.4-2.3ft	2.8-4.8ft	0-10cm
Lab ID:			GU97A	GU97B	GU97C	GU97D	GU78A	GW93A	GW93B	GU78B/HD32A	GU97E	GU97F	GU78C	GU78I	GU97G	GU97J	GU97H	GU97I	GU78D
Sample Date:	SQS (a)	CSL (b)	7/2/2004	7/2/2004	7/2/2004	7/2/2004	7/1/2004	7/28/2004	7/28/2004	7/1/2004	7/2/2004	7/2/2004	7/1/2004	7/1/2004	7/5/2004	7/5/2004	7/5/2004	7/5/2004	7/1/2004
Organotin (Pore Water) (µg/L)																			
Tributyl Tin Chloride	NA	NA	NA	NA	NA	NA	0.025 U	NA	NA	0.043	NA	NA	0.025 U	0.025 U	NA	NA	NA	NA	0.025 U
Dibutyl Tin Dichloride	NA	NA	NA	NA	NA	NA	0.050 U	NA	NA	0.050 U	NA	NA	0.050 U	0.050 U	NA	NA	NA	NA	0.050 U
Butyl Tin Trichloride	NA	NA	NA	NA	NA	NA	0.050 U	NA	NA	0.050 U	NA	NA	0.050 U	0.050 U	NA	NA	NA	NA	0.050 U
TBT as Tin ion	0.05	0.15	NA	NA	NA	NA	0.022 U	NA	NA	0.039	NA	NA	0.022 U	0.022 U	NA	NA	NA	NA	0.022 U
Organotin (Bulk) (µg/kg)																			
Tributyl Tin Chloride	NA	NA	1700	3200	3500	410	NA	23	5.0 U	5.7 U	5.7	5.7 U	NA	NA	5.8 U	5.6 U	5.6 U	5.9 U	NA
Dibutyl Tin Dichloride	NA	NA	330	290	1100	120	NA	7.8	5.0 U	5.7 U	5.6 U	5.7 U	NA	NA	5.8 U	5.6 U	5.6 U	5.9 U	NA
Butyl Tin Trichloride	NA	NA	19	22	51	5.9 U	NA	5.7 U	5.0 U	5.7 U	5.6 U	5.7 U	NA	NA	5.8 U	5.6 U	5.6 U	5.9 U	NA
TBT as Tin ion	NA	NA	1500	2800	3100	360	NA	21	4.5 U	5.7 U	5.1	5.1 U	NA	NA	5.1 U	5.0 U	5.0 U	5.2 U	NA
Conventionals																			
Total Organic Carbon (percent)	NA	NA	1.89	2.44	2.61	2.59	2.55	2.34	5.84	1.65	1.76	5.23	1.08	1.30	1.68	1.62	1.25	0.564	0.940
Total Solids (percent)	NA	NA	77.80	64.20	74.70	72.50	45.10	57.00	51.60	56.60	67.10	59.20	68.20	65.90	68.60	68.60	73.70	79.10	67.80
Total Volatile Solids (percent)	NA	NA	NA	NA	NA	NA	NA	7.67	13.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE A-1
PRE-REMEDIAL INVESTIGATION SEDIMENT SAMPLES ANALYTICAL RESULTS
NORTH MARINA SEDIMENT QUALITY INVESTIGATION

Sample ID: Depth: Lab ID: Sample Date:	SQS (a)	CSL (b)	NMA-core-6 0.5-2.0ft GU97K 7/2/2004	NMA-core-6 2.0-3.5ft GU97L 7/2/2004	NMA-core-6 4.0-6.0ft GU97M 7/2/2004	NMA-grab-7 0-10cm GU78E/GW81A 7/1/2004	NMA-grab-8 0-10cm GU78F/GW81B 7/1/2004	NMA-grab-9 0-10cm GU78G/HD32B 7/1/2004	NMA-grab-10 0-10cm GU78H 7/1/2004	NMA-grab-11 0-10cm GU78I 7/1/2004
Metals (mg/kg)										
Arsenic	57	93	8	7	6 U	10 U	10 U	10	10 U	7 U
Cadmium	5.1	6.7	0.3 U	0.3 U	0.2 U	0.6	0.6	0.6	0.6	0.3 U
Chromium	260	270	35.1	25.2	37.9	56	57	54	54	37.4
Copper	390	390	33.4	19.3	28.7	109	101	163	92.1	52.9
Lead	450	530	8	5	5	26	21	33	17	13
Mercury	0.41	0.59	0.06	0.07 U	0.06 U	0.13	0.11	0.35	0.12	0.12
Silver	6.1	6.1	0.4 U	0.4 U	0.4 U	0.6 U	0.7 U	0.6 U	0.6 U	0.4 U
Zinc	410	960	59.6	42.4	45.9	123	121	170	117	71.5
PAHs (mg/kg OC)										
Naphthalene	99	170	8.33	0.36 U	3.53 U	3.97 U	0.89 U	1.46	0.88 U	1.54 U
Acenaphthylene	66	66	5.53	0.36 U	3.53 U	3.97 U	0.89 U	2.25	0.88 U	2.15
Acenaphthene	16	57	5.30	0.36 U	3.53 U	3.97 U	1.43	1.52	0.88 U	2.69
Fluorene	23	79	1.52 U	0.36 U	3.53 U	3.97 U	0.98	1.97	0.88 U	3.15
Phenanthrene	100	480	50.76	0.36 U	3.53 U	10.46	3.71	17.42	2.47	33.08
Anthracene	220	1200	12.12	0.36 U	3.53 U	5.02	1.56	6.18	1.58	6.38
2-Methylnaphthalene	38	64	3.64	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
LPAH (c)(e)	370	780	82.05	0.36 U	3.53 U	15.48	7.68	30.79	4.05	47.46
Fluoranthene	160	1200	56.82	0.36 U	3.53 U	58.58	14.29	61.80	12.09	123.08
Pyrene	1000	1400	75.00	0.36 U	3.53 U	46.03	10.27	56.18	12.09	92.31
Benzo(a)anthracene	110	270	23.48	0.36 U	3.53 U	22.18	4.91	21.35	4.65	26.92
Chrysene	110	460	28.03	0.36 U	3.53 U	29.71	7.59	35.96	8.84	43.85
Total Benzofluoranthenes (f)	230	450	49.24	0.36 U	3.53 U	35.98	9.02	45.51	11.44	52.31
Benzo(a)pyrene	99	210	22.73	0.36 U	3.53 U	10.46	2.77	14.04	3.26	14.62
Indeno(1,2,3-c,d)pyrene	34	88	7.58	0.36 U	3.53 U	4.60	1.12	4.44	1.02	4.15
Dibenz(a,h)anthracene	12	33	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12	0.88 U	1.54 U
Benzo(g,h,i)perylene	31	78	6.52	0.36 U	3.53 U	3.97	0.89 U	3.26	0.88 U	3.00
HPAH (c)(g)	960	5300	269.39	0.36 U	3.53 U	211.51	49.96	289.16	53.40	360.23
SVOCs (mg/kg OC)										
1,2-Dichlorobenzene	2.3	2.3	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
1,3-Dichlorobenzene			1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
1,4-Dichlorobenzene	3.1	9	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
1,2,4-Trichlorobenzene	0.81	1.8	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
Hexachlorobenzene	0.38	2.3	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
Dimethylphthalate	53	53	1.52 U	0.36 U	3.53 U	3.97 U	0.98	2.47	0.88 U	1.54 U
Diethylphthalate	61	110	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
Di-n-Butylphthalate	220	1700	1.52 U	0.36 U	3.53 U	23.85 U	4.46 U	3.09 U	6.05 U	1.54 U
Butylbenzylphthalate	4.9	64	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.40	0.88 U	1.54 U
bis(2-Ethylhexyl)phthalate	47	78	1.74 U	0.36 U	3.53 U	30.96	5.36 U	22.47	5.58 U	4.69 U
Di-n-octyl phthalate	58	4500	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
Dibenzofuran	15	58	4.09	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.69
Hexachlorobutadiene	3.9	6.2	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
N-Nitrosodiphenylamine	11	11	1.52 U	0.36 U	3.53 U	3.97 U	0.89 U	1.12 U	0.88 U	1.54 U
SVOCs (µg/kg)										
Phenol	420	1200	20 U	20 U	20 U	95 U	20 U	20 U	19 U	20 U
2-Methylphenol	63	63	20 U	20 U	20 U	95 U	20 U	20 U	19 U	20 U
4-Methylphenol	670	670	58	20 U	20 U	95 U	20 U	20 U	19 U	20 U
2,4-Dimethylphenol	29	29	20 U	20 U	20 U	95 U	20 U	20 U	19 U	20 U
Pentachlorophenol	360	690	98 U	98 U	98 U	470 U	98 U	720	97 U	98 U
Benzyl Alcohol	57	73	20 U	20 U	20 U	95 U	20 U	20 U	19 U	20 U
Benzoic Acid	650	650	200 U	200 U	200 U	950 U	200 U	200 U	190 U	200 U

TABLE A-1
PRE-REMEDIAL INVESTIGATION SEDIMENT SAMPLES ANALYTICAL RESULTS
NORTH MARINA SEDIMENT QUALITY INVESTIGATION

Sample ID: Depth: Lab ID: Sample Date:	SQS (a)	CSL (b)	NMA-core-6 0.5-2.0ft GU97K 7/2/2004	NMA-core-6 2.0-3.5ft GU97L 7/2/2004	NMA-core-6 4.0-6.0ft GU97M 7/2/2004	NMA-grab-7 0-10cm GU78E/GW81A 7/1/2004	NMA-grab-8 0-10cm GU78F/GW81B 7/1/2004	NMA-grab-9 0-10cm GU78G/HD32B 7/1/2004	NMA-grab-10 0-10cm GU78H 7/1/2004	NMA-grab-11 0-10cm GU78I 7/1/2004
Organotin (Pore Water) (µg/L)										
Tributyl Tin Chloride	NA	NA	NA	NA	NA	0.056	0.083	0.12	0.025 U	0.025 U
Dibutyl Tin Dichloride	NA	NA	NA	NA	NA	0.050 U	0.050 U	0.14	0.050 U	0.050 U
Butyl Tin Trichloride	NA	NA	NA	NA	NA	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
TBT as Tin ion	0.05	0.15	NA	NA	NA	0.049	0.074	0.11	0.022 U	0.022 U
Organotin (Bulk) (µg/kg)										
Tributyl Tin Chloride	NA	NA	5.9 U	5.9 U	5.9 U	5.7 U	33	44	NA	NA
Dibutyl Tin Dichloride	NA	NA	5.9 U	5.9 U	5.9 U	5.7 U	9.3	14	NA	NA
Butyl Tin Trichloride	NA	NA	5.9 U	5.9 U	5.9 U	5.7 U	5.5 U	5.5 U	NA	NA
TBT as Tin ion	NA	NA	5.3 U	5.3 U	5.3 U	5.1 U	29	39	NA	NA
Conventionals										
Total Organic Carbon (percent)	NA	NA	1.32	5.61	0.567	2.39	2.24	1.78	2.15	1.30
Total Solids (percent)	NA	NA	69.40	73.40	76.90	48.60	42.70	50.60	46.60	65.90
Total Volatile Solids (percent)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

SQS = Sediment Quality Standards
CSL = Cleanup Screening Level
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram
µg/L = micrograms per liter
PAHs = Polycyclic Aromatic Hydrocarbons
OC = Organic Carbon normalized
LPAH = Low Molecular Weight PAH
HPAH = High Molecular Weight PAH
SVOCs = Semivolatile Organic Compounds
NA = Not available.
U = Indicates compound was analyzed for, but was not detected at the given detection limit.
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M = Indicates an estimated value of analyte detected and confirmed by analyst with low spectral match parameters.
Italicized numbers indicates detection limit exceeds screening criteria.
Boxed results exceed the SQS.

Shaded results exceed the CSL.
(a) SMS sediment quality standard (Chapter 173-204 WAC).
(b) SMS cleanup screening level (Chapter 173-204 WAC).
(c) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:
  (i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.
  (ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.
(d) All organic data (except phenols, benzyl alcohol, and benzoic acid) are normalized to total organic carbon; this involves dividing the dry weight concentration of the constituent by the fraction of total organic carbon present.
(e) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.
(f) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.
(g) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.
(h) Method detection limits exceed the SQS or CSL criteria.
(i) TBT bulk sediment screening level established by Ecology, which is conceptually equivalent to the SQS.

Table 4-4
Summary of Marine Sediment Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

TABLE A-2

	Sediment Management Standards *		**SC-1-3** 02/10/09 2-4 Feet	**SC-1-5** 02/10/09 4-6 Feet	**SC-1-7** 02/10/09 7-9 Feet	**SC-2-2.5** 02/10/09 1.5-3.5 Feet	**SC-2-4** 02/10/09 3.5-5.5 Feet	**SC-3-1** 02/09/09 0-2 Feet	**SC-3-3** 02/09/09 2-4 Feet	**SC-3-5** 02/09/09 4-6 Feet	**SC-4-2** 02/10/09 1.5-3.5 Feet	**SC-4-4** 02/10/09 3.5-5.5 Feet	**SC-5-2** 02/10/09 1-3 Feet	**SC-5-4** 02/10/09 3-5 Feet	**SC-6-2** 02/09/09 0.75-2.5 Feet	**SC-6-3.5** 02/09/09 3.5-4.75 Feet
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)														
VOCs (mg/kg // mg/kgOC)																
1,2,4-Trichlorobenzene*	0.81	1.8	NA	0.020 U / 0.98 U	0.0060 U / 0.35 U	0.020 U / 1.3 U	0.0060 U / 0.31 U	NA	NA	0.0077 U / 0.25 U	NA	0.0070 U / 0.31 U	0.0044 U / 0.87 U	0.019 U / 1.7 U	NA	0.0044 U / 0.52 U
1,2-Dichlorobenzene*	2.3	2.3	NA	0.020 U / 0.98 U	0.0012 U / 0.070 U	0.020 U / 1.3 U	0.0012 U / 0.063 U	NA	NA	0.0015 U / 0.048 U	NA	0.0014 U / 0.061 U	0.00090 U / 0.18 U	0.019 U / 1.7 U	NA	0.0009 U / 0.11 U
1,4-Dichlorobenzene*	3.1	9.0	NA	0.020 U / 0.98 U	0.0012 U / 0.070 U	0.020 U / 1.3 U	0.0012 U / 0.063 U	NA	NA	0.0015 U / 0.048 U	NA	0.0014 U / 0.061 U	0.00090 U / 0.18 U	0.019 U / 1.7 U	NA	0.0009 U / 0.11 U
SVOCs (ug/kg)																
2,4-Dimethylphenol	29	29	NA	20 U	19 U	20 U	20 U	NA	NA	20 U	NA	20 U	20 U	19 U	NA	20 U
2-Methylphenol	63	63	NA	20 U	19 U	20 U	20 U	NA	NA	20 U	NA	20 U	20 U	19 U	NA	20 U
4-Methylphenol	670	670	NA	52	19 U	20 U	20 U	NA	NA	24	NA	20	20 U	19 U	NA	20 U
Benzoic Acid	650	650	NA	200 U	190 U	200 UJ	200 U	NA	NA	200 U	NA	200 U	200 U	190 U	NA	200 U
Benzyl Alcohol	57	73	NA	20 U	19 U	20 U	20 U	NA	NA	20 U	NA	20 U	20 U	19 U	NA	20 U
Pentachlorophenol	360	690	NA	99 U	97 U	99 U	99 U	NA	NA	97 U	NA	99 U	100 U	96 U	NA	98 U
Phenol	420	1,200	NA	20 U	19 U	20 U	20 U	NA	NA	20 U	NA	20 U	20 U	19 U	NA	20 U
SVOCs (mg/kg // mg/kgOC)																
2-Methylnapthalene*	38	64	NA	0.035 / 1.72	0.0065 / 0.38	0.0066 / 0.44	0.0060 / 0.31	NA	NA	0.015 / 0.48	NA	0.0048 / 0.21	0.0094 / 1.9	0.0048 U / 0.43 U	NA	0.015 / 1.8
Acenaphthene*	16	57	NA	0.068 / 3.35	0.0060 / 0.35	0.0090 / 0.60	0.0046 U / 0.24 U	NA	NA	0.026 / 0.84	NA	0.011 / 0.48	0.052 / 10	0.069 / 6.2	NA	0.047 / 5.6
Acenaphthylene*	66	66	NA	0.036 / 1.8	0.0069 / 0.40	0.012 / 0.80	0.0096 / 0.50	NA	NA	0.012 / 0.39	NA	0.0092 / 0.40	0.0094 / 1.9	0.0048 U / 0.43 U	NA	0.0046 U / 0.54 U
Anthracene*	220	1,200	NA	0.071 / 3.5	0.0088 / 0.51	0.022 / 1.5	0.0087 / 0.45	NA	NA	0.036 / 1.2	NA	0.030 / 1.3	0.030 / 5.9	0.0068 / 0.61	NA	0.012 / 1.4
Benz[a]anthracene*	110	270	NA	0.13 / 6.4	0.016 / 0.93	0.11 / 7.3	0.019 / 0.99	NA	NA	0.066 / 2.1	NA	0.098 / 4.3	0.044 / 8.7	0.041 / 3.7	NA	0.028 / 3.3
Benzo[a]pyrene*	99	210	NA	0.076 / 3.7	0.016 / 0.93	0.10 / 6.6	0.021 / 1.1	NA	NA	0.052 / 1.7	NA	0.069 / 3.0	0.024 / 4.8	0.048 / 4.3	NA	0.0082 / 0.97
Benzo(b)fluoranthene	NE	NE	NA	0.11 / 5.4	0.016 / 0.93	0.13 / 8.6	0.015 / 0.78	NA	NA	0.066 / 2.1	NA	0.081 / 3.5	0.025 / 5.0	0.034 / 3.1	NA	0.013 / 1.5
Benzo[g,h,i]perylene*	31	78	NA	0.040 / 2.0	0.012 / 0.70	0.040 / 2.6	0.014 / 0.73	NA	NA	0.028 / 0.90	NA	0.026 / 1.1	0.011 / 2.2	0.023 / 2.1	NA	0.0046 U / 0.54 U
Benzo(k)fluoranthene	NE	NE	NA	0.10 / 4.9	0.013 / 0.76	0.092 / 6.1	0.017 / 0.89	NA	NA	0.059 / 1.9	NA	0.084 / 3.7	0.024 / 4.8	0.053 / 4.8	NA	0.012 / 1.4
Bis[2-ethylhexyl]phthalate*	47	78	NA	0.020 / 0.98	0.019 U / 1.1 U	0.040 / 2.6	0.020 U / 1.04 U	NA	NA	0.020 U / 0.64 U	NA	0.012 J / 0.52 J	0.076 / 15	0.019 U / 1.7 U	NA	0.013 J / 1.5 J
Butyl Benzyl Phthalate*	4.9	64	NA	0.020 U / 0.98 U	0.019 U / 1.1 U	0.020 U / 1.3 U	0.020 U / 1.04 U	NA	NA	0.020 U / 0.64 U	NA	0.020 U / 0.87 U	0.020 U / 4.0 U	0.019 U / 1.7 U	NA	0.020 U / 2.4 U
Chrysene*	110	460	NA	0.23 / 11	0.018 / 1.0	0.13 / 8.6	0.023 / 1.2	NA	NA	0.11 / 3.5	NA	0.16 / 7.0	0.045 / 8.9	0.043 / 3.9	NA	0.030 / 3.5
Dibenz[a,h]anthracene*	12	33	NA	0.011 / 0.54	0.0046 U / 0.27 U	0.016 / 1.1	0.0046 U / 0.24 U	NA	NA	0.0088 / 0.28	NA	0.013 / 0.57	0.0047 U / 0.93 U	0.0048 U / 0.43 U	NA	0.0046 U / 0.54 U
Dibenzofuran*	15	58	NA	0.036 / 1.77	0.0046 / 0.27	0.0080 / 0.53	0.0046 / 0.24	NA	NA	0.015 / 0.48	NA	0.0048 / 0.21	0.015 / 3.0	0.029 / 2.6	NA	0.0096 / 1.1
Diethyl Phthalate*	61	110	NA	0.020 U / 0.98 U	0.019 U / 1.1 U	0.020 U / 1.3 U	0.020 U / 1.04 U	NA	NA	0.020 U / 0.64 U	NA	0.020 U / 0.87 U	0.020 U / 4.0 U	0.019 U / 1.7 U	NA	0.020 U / 2.4 U
Dimethyl Phthalate*	53	53	NA	0.020 U / 0.98 U	0.019 U / 1.1 U	0.020 U / 1.3 U	0.020 U / 1.04 U	NA	NA	0.020 U / 0.64 U	NA	0.020 U / 0.87 U	0.020 U / 4.0 U	0.019 U / 1.7 U	NA	0.020 U / 2.4 U
Di-n-butyl Phthalate*	220	1,700	NA	0.020 U / 0.98 U	0.019 U / 1.1 U	0.020 U / 1.3 U	0.020 U / 1.04 U	NA	NA	0.020 U / 0.64 U	NA	0.020 U / 0.87 U	0.020 U / 4.0 U	0.019 U / 1.7 U	NA	0.020 U / 2.4 U
Di-n-octyl Phthalate*	58	4,500	NA	0.020 U / 0.98 U	0.019 U / 1.1 U	0.020 U / 1.3 U	0.020 U / 1.04 U	NA	NA	0.020 U / 0.64 U	NA	0.020 U / 0.87 U	0.020 U / 4.0 U	0.019 U / 1.7 U	NA	0.020 U / 2.4 U
Fluoranthene*	160	1,200	NA	0.72 / 35	0.055 / 3.2	0.14 / 9.3	0.053 / 2.8	NA	NA	0.28 / 9.0	NA	0.36 / 16	0.19 / 38	0.065 / 5.9	NA	0.26 / 31
Fluorene*	23	79	NA	0.060 / 3.0	0.0079 / 0.46	0.010 / 0.66	0.0069 / 0.36	NA	NA	0.030 / 0.97	NA	0.011 / 0.48	0.034 / 6.7	0.036 / 3.2	NA	0.050 / 5.9
Indeno[1,2,3-cd]pyrene*	34	88	NA	0.036 / 1.8	0.0079 / 0.46	0.037 / 2.4	0.0096 / 0.50	NA	NA	0.028 / 0.90	NA	0.027 / 1.2	0.0089 / 1.8	0.024 / 2.2	NA	0.0046 U / 0.54 U
Napthalene*	99	170	NA	0.11 / 5.4	0.022 / 1.3	0.021 / 1.4	0.029 / 1.5	NA	NA	0.038 / 1.2	NA	0.025 / 1.1	0.12 / 24	0.082 / 7.4	NA	0.036 / 4.3
N-nitrosodiphenylamine*	11	11	NA	0.020 U / 0.98 U	0.019 U / 1.1 U	0.020 U / 1.3 U	0.020 U / 1.0 U	NA	NA	0.020 U / 0.64 U	NA	0.020 U / 0.87 U	0.020 U / 4.0 U	0.019 U / 1.7 U	NA	0.020 U / 2.4 U
Phenanthrene*	100	480	NA	0.22 / 11	0.038 / 2.2	0.048 / 3.2	0.040 / 2.1	NA	NA	0.090 / 2.9	NA	0.057 / 2.5	0.090 / 18	0.034 / 3.1	NA	0.038 / 4.5
Pyrene*	1,000	1,400	NA	0.52 / 26	0.062 / 3.6	0.21 / 14	0.063 / 3.3	NA	NA	0.22 J / 7.1 J	NA	0.28 / 12	0.18 / 36	0.071 / 6.4	NA	0.15 / 18
Total LPAH*	370	780	NA	0.56 / 28	0.090 / 5.2	0.12 / 8.1	0.094 / 4.9	NA	NA	0.23 / 7.5	NA	0.14 / 6.3	0.34 / 66	0.23 / 21	NA	0.18 / 22
Total HPAH*	960	5,300	NA	2.0 / 97	0.22 / 13	1.0 / 67	0.23 / 12	NA	NA	0.92 J / 30 J	NA	1.2 / 52	0.55 / 110	0.402 / 36	NA	0.50 / 59
Total Benzofluoranthenes*	230**	450**	NA	0.21 / 10	0.029 / 1.7	0.22 / 15	0.032 / 1.7	NA	NA	0.12 / 4.0	NA	0.16 / 7.2	0.049 / 9.7	0.087 / 7.8	NA	0.025 / 3.0
Pesticides (mg/kg // mg/kgOC)																
Hexachlorobenzene*	0.38	2.3	NA	0.00098 U / 0.048 U	0.00097 U / 0.056 U	0.00099 U / 0.066U	0.00099 U / 0.052U	NA	NA	0.00098 U / 0.032 U	NA	0.00098 U / 0.043 U	0.00097 U / 0.192 U	0.00097 U / 0.087 U	NA	0.00099 U / 0.117 U
Hexachlorobutadiene*	3.9	6.2	NA	0.00098 U / 0.048 U	0.00097 U / 0.056 U	0.00099 U / 0.066U	0.00099 U / 0.052U	NA	NA	0.00098 U / 0.032 U	NA	0.00098 U / 0.043 U	0.00097 U / 0.192 U	0.00097 U / 0.087 U	NA	0.00099 U / 0.117 U
PCBs (mg/kg // mg/kgOC)																
Aroclor 1016	NE	NE	NA	0.012 U	0.227 U	0.026 U	0.0039 U	NA	NA	0.098 U	NA	0.020 U	0.020 U	0.0038 U	NA	0.0040 U
Aroclor 1221	NE	NE	NA	0.012 U	0.227 U	0.026 U	0.0039 U	NA	NA	0.098 U	NA	0.020 U	0.020 U	0.0038 U	NA	0.0040 U
Aroclor 1232	NE	NE	NA	0.012 U	0.227 U	0.026 U	0.0039 U	NA	NA	0.098 U	NA	0.020 U	0.020 U	0.0077 UJ	NA	0.0040 U
Aroclor 1242	NE	NE	NA	0.012 U	0.227 U	0.026 U	0.0039 U	NA	NA	0.098 U	NA	0.020 U	0.020 U	0.0038 U	NA	0.0040 U
Aroclor 1248	NE	NE	NA	0.012 U	0.227 U	0.026 U	0.0039 U	NA	NA	0.310	NA	0.020 U	0.020 U	0.0038 U	NA	0.0040 U
Aroclor 1254	NE	NE	NA	0.018	0.227 U	0.027	0.0039 U	NA	NA	0.150	NA	0.025	0.062	0.0038 U	NA	0.0040 U
Aroclor 1260	NE	NE	NA	0.013	0.227 U	0.026 U	0.0039 U	NA	NA	0.098 U	NA	0.042	0.073	0.0038 U	NA	0.0040 U
Total PCBs*	12	65	NA	0.031 / 1.5	0.0039 U / 0.23 U	0.027 / 1.8	0.0039 U / 0.20 U	NA	NA	**0.46 / 15**	NA	0.067 / 2.9	**0.14 / 27**	0.0077 UJ / 0.69 UJ	NA	0.0040 U / 0.47 U

TABLE A-2

Table 4-4
Summary of Marine Sediment Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

	Sediment Management Standards [a]: Sediment Quality Standard (SQS)	Sediment Management Standards [a]: Cleanup Screening Level (CSLs)	**SC-1-3** 02/10/09 2-4 Feet	**SC-1-5** 02/10/09 4-6 Feet	**SC-1-7** 02/10/09 7-9 Feet	**SC-2-2.5** 02/10/09 1.5-3.5 Feet	**SC-2-4** 02/10/09 3.5-5.5 Feet	**SC-3-1** 02/09/09 0-2 Feet	**SC-3-3** 02/09/09 2-4 Feet	**SC-3-5** 02/09/09 4-6 Feet	**SC-4-2** 02/10/09 1.5-3.5 Feet	**SC-4-4** 02/10/09 3.5-5.5 Feet	**SC-5-2** 02/10/09 1-3 Feet	**SC-5-4** 02/10/09 3-5 Feet	**SC-6-2** 02/09/09 0.75-2.5 Feet	**SC-6-3.5** 02/09/09 3.5-4.75 Feet
Organotins (ug/kg)																
Tributyltin as TBT Ion	NE	73	NA	3.5 U	3.2 U	3.6 U	3.5 U	NA	NA	3.5 U	NA	**100**	3.5 U	3.2 U	NA	3.3 U
Dibutyl Tin Ion	NE	NE	NA	5.3 U	4.8 U	5.3 U	5.2 U	NA	NA	5.3 U	NA	8.8	5.2 U	4.9 U	NA	4.9 U
Butyl Tin Ion	NE	NE	NA	3.7 U	3.4 U	3.8 U	3.7 U	NA	NA	3.7 U	NA	3.8 U	3.6 U	3.4 U	NA	3.5 U
Organotins-Porewater (ug/L)																
Tributyltin as TBT Ion	0.05	0.15	**0.23**	0.013	0.008 U	0.03	0.008 U	**0.27**	0.018	0.008 U	0.029	0.008 U	**0.25**	0.059 U	**0.18**	0.086 U
Dibutyl Tin Ion	NE	NE	0.049	0.012 U	0.012 U	0.013	0.012 U	0.025	0.012 U	0.012 U	0.012 U	0.012 U	0.027	0.089 U	0.02	0.13 U
Butyl Tin Ion	NE	NE	0.017	0.012 J	0.025	0.011	0.008 U	0.015	0.008 U	0.044	0.008 U	0.008 U	0.031	0.063 U	0.01	0.091 U
Petroleum Hydrocarbons (mg/kg)																
Gasoline Range Organics - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)																
Arsenic	57	93	NA	9	8 U	12	8 U	NA	NA	10 U	NA	12	6 U	8	NA	19
Cadmium	5.1	6.7	NA	0.8	0.4	0.8	0.3 U	NA	NA	1	NA	0.6	0.2 U	0.3	NA	0.2 U
Chromium	260	270	NA	60.3	50.3	61.4	40.7	NA	NA	64	NA	59.6	29.4	30.9	NA	27.7
Copper	390	390	NA	79.1	44.5	94.5	33.7	NA	NA	156	NA	72.6	16.7	16.8	NA	24.9
Lead	450	530	NA	46	11	24	7	NA	NA	112	NA	20	5	3	NA	4
Mercury	0.41	0.59	**0.54 J**	0.25 J	0.14	0.23 J	0.09	0.21 J	0.36 J	**0.42**	0.16 J	0.2	0.05	0.06 J	**0.75 J**	0.05 U
Nickel	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1	NA	0.6	0.5 U	0.6	0.5 U	NA	NA	0.7	NA	0.6 U	0.4 U	0.4 U	NA	0.4 U
Zinc	410	960	NA	127	73	122	59	NA	NA	148	NA	101	42	38	NA	45
Ammonia (mg-N/kg)																
Ammonia	NE	NE	25.6	46.3	30.6	44.4	27.5	45	110	202	25.1	94.3	9.7	7.23	12.8	0.86
Total Sulfides (mg/kg)																
Total Sulfides	NE	NE	638	200	46.9 J	292	1.56 UJ	1,020	160	18,500 J	1,420	161 J	118 J	1.25 U	2,960	20.3 J
Acid Volatile Sulfides	NE	NE	612	1,450	10.1 J	448	7.93 J	751	1,930	2,550 J	889	355 J	39.3 J	2.5	4,570	2.59 J
Total Solids (%)																
Total Solids	NE	NE	56	58.2	60.4	54.8	65.4	51.4	50.6	45.5	54	51.8	76.4	76.8	48.8	77.8
Total Volatile Solids (mg/kg)	NE	NE	7	6.45	5.5	6.71	5.13	6.75	7.02	8.84	6.27	7.04	1.64	1.5	6.93	1.65
TOC (%)																
TOC	NE	NE	2.24	2.03	1.72	1.51	1.92	2.33	2.62	3.1	1.71	2.29	0.505	1.11	3.25	0.846

Notes:
Results exceeding Sediment Management Standard are **BOLD**
Highlighted results indicate reporting limit exceeds Sediment Management Standard
[a] Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).
* The listed SQS value represents a concentration in parts per million (ppm) 'normalized' on a TOC basis.
** The listed SQS value represents the sum of the concentrations of the b, j, and k isomers of benzofluoranthene.
cm - centimeters
LCS/LCSD - Laboratory control sample/laboratory control sample duplicate
MS/MSD - Matrix spike/matrix spike duplicate
NA - Not analyzed
NE - Not established
PCBs - Polychlorinated biphenyls
RPD - Relative percent difference
SRM - Standard reference material
SVOCs - Semivolatile organic compounds
TOC - Total organic carbon
VOCs - Volatile organic compounds
Total LPAH = The sum of detected naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.
Total HPAH = The sum of detected fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene.
Total benzofluoranthenes= The sum of the b, j, and k isomers.
ug/kg - micrograms per kilogram
ug/L - micrograms per liter
ug/kgOC - micrograms per kilogram, 'normalized' for TOC
mg/kg - milligrams per kilogram
J - Estimated value
U - Compound was analyzed for but not detected above the reporting limit shown
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.

TABLE A-2

Table 4-4
Summary of Marine Sediment Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

	Sediment Management Standards [a]		**SG-01** 02/11/09	**SG-02** 02/11/09	**SG-03** 02/13/09	**SG-04** 02/13/09	**SG-05** 02/12/09		**SG-06** 02/12/09	**SG-07** 02/12/09	**SG-08** 02/12/09	**SG-09** 02/12/09	**SG-10** 02/12/09	**SG-11** 02/12/09	**SG-12** 02/12/09	**SG-13** 02/12/09	**SG-14** 02/13/09
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	Field Duplicate 0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
VOCs (mg/kg // mg/kgOC)																	
1,2,4-Trichlorobenzene*	0.81	1.8	0.0064 U / 0.34 U	0.0070 U / 0.37 U	0.0072 U / 0.37 U	0.0078 U / 0.39 U	0.0071 U / 0.39 U	0.0076 U / 0.42 U	0.0071 UJ / 0.39 UJ	0.0072 U / 0.37 U	0.0076 U / 0.40 U	0.0069 U / 0.33 U	0.0071 U / 0.51 U	0.0068 U / 0.40 U	0.0068 U / 0.47 U	0.0066 U / 0.45 U	0.0080 U / 0.36 U
1,2-Dichlorobenzene*	2.3	2.3	0.0013 U / 0.069 U	0.0014 U / 0.073 U	0.0014 U / 0.071 U	0.0016 U / 0.080 U	0.0014 U / 0.077 U	0.0015 U / 0.082 U	0.0014 UJ / 0.076 UJ	0.0014 U / 0.071 U	0.0015 U / 0.079 U	0.0014 U / 0.067 U	0.0014 U / 0.10 U	0.0014 U / 0.081 U	0.0014 U / 0.097 U	0.0013 U / 0.089 U	0.0016 U / 0.073 U
1,4-Dichlorobenzene*	3.1	9.0	0.0013 U / 0.069 U	0.0014 U / 0.073 U	0.0014 U / 0.071 U	0.0016 U / 0.080 U	0.0014 U / 0.077 U	0.0015 U / 0.082 U	0.0014 UJ / 0.076 UJ	0.0014 U / 0.071 U	0.0015 U / 0.079 U	0.0014 U / 0.067 U	0.0014 U / 0.10 U	0.0014 U / 0.081 U	0.0014 U / 0.097 U	0.0013 U / 0.089 U	0.0016 U / 0.073 U
SVOCs (ug/kg)																	
2,4-Dimethylphenol	29	29	20 U	20 U	20 U	98 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
2-Methylphenol	63	63	20 U	20 U	20 U	98 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
4-Methylphenol	670	670	90	20 U	20 U	98 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Benzoic Acid	650	650	200 U	200 U	200 U	980 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Benzyl Alcohol	57	73	**240**	20 U	20 U	98 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Pentachlorophenol	360	690	98 U	99 U	98 U	490 U	98 U	100 U	98 U	98 U	98 U	99 U	98 U	99 U	100 U	98 U	100 U
Phenol	420	1,200	63	22	20 U	98 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
SVOCs (mg/kg // mg/kgOC)																	
2-Methylnapthalene*	38	64	0.035 / 1.9	0.0048 / 0.25	0.020 U / 1.0 U	0.57 / 28	0.0048 / 0.26	0.0062 / 0.34	0.0050 U / 0.27 U	0.0065 / 0.33	0.0058 / 0.31	0.013 / 0.62	0.0097 / 0.69	0.0081 / 0.47	0.026 / 1.8	0.020 U / 1.4 U	0.020 U / 0.91 U
Acenaphthene*	16	57	0.082 / 4.3	0.0048 / 0.25	0.021 / 1.1	**4.0 / 200**	0.0062 / 0.34	0.0072 / 0.39	0.0064 / 0.35	0.0094 / 0.48	0.0067 / 0.35	0.12 / 5.7	0.087 / 6.2	0.019 / 1.1	0.11 / 7.6	0.23 / 16	0.22 / 10
Acenaphthylene*	66	66	0.20 / 11	0.023 / 1.2	0.025 / 1.3	0.86 / 43	0.010 / 0.55	0.011 / 0.60	0.012 / 0.65	0.017 / 0.87	0.012 / 0.64	0.054 / 2.6	0.025 / 1.8	0.052 / 3.0	0.036 / 2.5	0.11 / 7.5	0.028 / 1.3
Anthracene*	220	1,200	0.94 / 50	0.067 / 3.5	0.13 / 6.6	4.1 / 200	0.077 / 4.2	0.062 / 3.4	0.073 / 4.0	0.090 / 4.6	0.065 / 3.4	0.26 / 12	0.080 / 5.7	0.081 / 4.7	0.14 / 9.7	0.39 / 27	0.11 / 5.0
Benz[a]anthracene*	110	270	1.8 / 95	0.24 / 13	0.60 / 31	**8.6 / 430**	0.21 / 12	0.200 / 11	0.39 J / 21 J	0.50 / 26	0.20 / 11	0.93 / 44	0.25 / 18	0.37 / 22	0.36 / 25	1.7 / 120	0.78 / 36
Benzo[a]pyrene*	99	210	1.3 / 69	0.15 / 7.9	0.40 / 20	**2.9 / 140**	0.16 / 8.8	0.160 / 8.7	0.25 / 14	0.26 / 13	0.15 / 7.9	0.66 / 31	0.17 / 12	0.25 / 15	0.23 / 16	0.64 / 44	0.40 / 18
Benzo(b)fluoranthene	NE	NE	2.2 / 120	0.30 / 16	0.56 / 29	10 / 500	0.27 / 15	0.26 / 14	0.34 / 18	0.38 / 19	0.24 / 13	0.86 / 41	0.33 / 24	0.38 / 22	0.32 / 22	1.3 / 89	0.65 / 30
Benzo[g,h,i]perylene*	31	78	0.53 / 28	0.045 / 2.4	0.22 / 11	**1.0 / 50**	0.074 / 4.1	0.079 / 4.3	0.10 / 5.4	0.10 / 5.1	0.068 / 3.6	0.28 / 13	0.082 / 5.9	0.13 / 7.6	0.12 / 8.3	0.35 / 24	0.19 / 8.7
Benzo(k)fluoranthene	NE	NE	1.6 / 85	0.21 / 11	0.56 / 29	8.6 / 430	0.19 / 10	0.18 / 9.8	0.28 J / 15 J	0.31 / 16	0.17 / 9.0	0.86 / 41	0.24 / 17	0.38 / 22	0.32 / 22	1.3 / 89	0.65 / 30
Bis[2-ethylhexyl]phthalate*	47	78	**1.5 / 79**	0.12 / 6.3	0.17 /8.7	0.17 / 8.5	0.031 / 1.7	0.049 / 2.7	0.022 / 1.2	0.055 / 2.8	0.052 / 2.8	0.099 / 4.7	0.064 / 4.6	0.15 / 8.7	0.083 / 5.7	**4.1 / 280**	0.18 / 8.2
Butyl Benzyl Phthalate*	4.9	64	0.067 / 3.5	0.020 U / 1.0 U	0.020 U / 1.0 U	0.098 U / 4.9 U	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.02 U	0.020 U / 1.1 U	0.020 U / 0.95 U	0.020 U / 1.4 U	0.020 U / 1.2 U	0.020 U / 1.4 U	0.020 U / 1.4 U	0.020 U / 0.91 U
Chrysene*	110	460	**3.4 / 180**	0.38 / 20	1.1 / 56	**30 / 1,500**	0.400 / 22	0.40 / 22	0.57 / 31	0.63 / 32.	0.38 / 20.	1.9 / 90	0.54 / 39	0.72 / 412	0.63 / 43	**3.0 / 205**	1.2 / 55
Dibenz[a,h]anthracene*	12	33	0.22 / 12	0.021 / 1.1	0.10 /5.1	**0.47 / 24**	0.035 / 1.9	0.028 / 1.5	0.055 / 3.0	0.055 / 2.8	0.025 / 1.3	0.15 / 7.1	0.041 / 2.9	0.055 / 3.2	0.055 / 3.8	0.14 / 9.6	0.088 / 4.0
Dibenzofuran*	15	58	0.070 / 3.7	0.048 / 0.25	0.020 U / 1.0 U	**4.9 / 240**	0.0090 / 0.50	0.0096 / 0.52	0.0079 / 0.43	0.012 / 0.61	0.0082 / 0.43	0.046 / 2.2	0.019 / 1.4	0.014 / 0.81	0.060 / 4.1	0.092 / 6.3	0.020 U / 0.91 U
Diethyl Phthalate*	61	110	0.020 U / 1.1 U	0.020 U / 1.0 U	0.020 U / 1.0 U	0.098 U / 4.9 U	0.024 / 1.3	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.0 U	0.020 U / 1.1 U	0.020 U / 0.95 U	0.020 U / 1.4 U	0.020 U / 1.2 U	0.020 U / 1.4 U	0.020 U / 1.4 U	0.020 U / 0.91 U
Dimethyl Phthalate*	53	53	0.079 / 4.2	0.020 U / 1.7 U	0.062 / 3.1	0.098 U / 4.9 U	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.0 U	0.020 U / 1.1 U	0.020 U / 0.95 U	0.020 U / 1.4 U	0.020 U / 1.2 U	0.020 U / 1.4 U	0.030 / 2.1	0.037 / 1.7
Di-n-butyl Phthalate*	220	1,700	0.023 / 1.2	0.020 U / 1.0 U	0.020 U / 1.0 U	0.098 U / 4.9 U	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.0 U	0.020 U / 1.1 U	0.020 U / 0.95 U	0.020 U / 1.4 U	0.020 U / 1.2 U	0.020 U / 1.4 U	0.021 / 1.4	0.020 U / 0.91 U
Di-n-octyl Phthalate*	58	4,500	0.040 / 2.1	0.020 U / 1.0 U	0.020 U / 1.0 U	0.098 U / 4.9 U	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.0 U	0.020 U / 1.1 U	0.020 U / 0.95 U	0.020 U / 1.4 U	0.020 U / 1.2 U	0.020 U / 1.4 U	0.020 U / 1.37 U	0.020 U / 0.91 U
Fluoranthene*	160	1,200	**5.0 / 260**	0.61 / 32	1.6 / 82	**120 / 6,000**	0.29 / 16	0.350 / 19	0.50 / 27	0.70 / 36	0.41 / 22	**3.4 / 160**	1.1 / 79	1.4 / 81	1.1 / 76	**14 / 960**	3.4 / 160
Fluorene*	23	79	0.16 / 8.5	0.0091 / 0.48	0.047 / 2.4	**8.9 / 440**	0.021 / 1.2	0.018 / 0.98	0.017 / 0.92	0.022 / 1.1	0.017 / 0.90	0.10 / 4.8	0.036 / 2.6	0.031 / 1.8	0.12 / 8.3	0.25 / 17	0.074 / 3.4
Indeno[1,2,3-cd]pyrene*	34	88	0.55 / 29	0.046 / 2.4	0.17 / 8.7	**1.3 / 65**	0.062 / 3.4	0.067 / 3.7	0.088 / 4.8	0.092 / 4.7	0.055 / 2.9	0.26 / 12	0.073 / 5.2	0.11 / 6.4	0.099 / 6.8	0.31 / 21	0.15 / 6.8
Napthalene*	99	170	0.096 U / 5.1 U	0.0058 / 0.30	0.020 U / 1.0 U	0.49 / 24	0.010 / 0.55	0.011 / 0.60	0.0074 / 0.40	0.011 / 0.56	0.0096 / 0.51	0.024 / 1.1	0.016 / 1.1	0.017 / 0.99	0.058 / 4.0	0.020 U / 1.4 U	0.020 U / 0.91 U
N-nitrosodiphenylamine*	11	11	0.020 U / 1.1 U	0.020 U / 1.05 U	0.020 U / 1.0 U	0.14 / 7.0	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.1 U	0.020 U / 1.0 U	0.020 U / 1.1 U	0.020 U / 0.95 U	0.020 U / 1.4 U	0.020 U / 1.2 U	0.020 U / 1.4 U	0.020 U / 1.4 U	0.020 U / 0.91 U
Phenanthrene*	100	480	1.2 / 63	0.11 / 5.8	0.48 / 24	**110 / 5,500**	0.098 / 5.4	0.10 / 5.5	0.12 / 6.5	0.10 / 5.1	0.090 / 4.8	0.57 / 27	0.27 / 19	0.28 / 169	0.35 / 24	**5.0 / 342**	0.41 / 19
Pyrene*	1,000	1,400	4.3 / 230	0.48 / 25	1.6 / 82	**77 / 3,800**	0.320 / 18	0.42 / 23	0.44 / 24	0.75 / 38	0.42 / 22	3.7 / 180	1.0 / 71	1.2 / 70	1.3 / 90	8.9 / 610	2.8 / 130
Total LPAH*	370	780	2.6 / 140	0.22 / 12	0.70 / 36	**130 / 6,400**	0.22 / 12	0.21 / 11	0.24 / 13	0.25 / 13	0.20 / 11	1.1 / 54	0.51 / 37	0.48 / 28	0.81 / 56	**5.98 / 410**	0.84 / 38
Total HPAH*	960	5,300	**22 / 1,100**	2.5 / 130	6.9 / 350	**260 / 13,000**	2.0 / 110	2.1 / 120	3.0 J / 160 J	3.8 / 190	2.1 / 110	13 / 620	3.8 / 270	5.1 / 290	4.5 / 313	**32 / 2,200**	10 / 470
Total Benzofluoranthenes*	230**	450**	3.8 / 200	0.51 / 27	1.1 / 57	**19 / 930**	0.46 / 25	0.44 / 24	0.62 / 34	0.69 / 35	0.41 / 22	1.7 / 82	0.57 / 41	0.76 / 44	0.64 / 44	2.6 / 180	1.3 / 59
Pesticides (mg/kg // mg/kgOC)																	
Hexachlorobenzene*	0.38	2.3	0.00098 U / 0.052 U	0.00099 U / 0.052 U	0.00097 U / 0.049 U	0.00098 U / 0.049 U	0.00097 U / 0.053 U	0.00097 U / 0.053 U	0.00098 U / 0.053 U	0.00098 U / 0.050 U	0.00099 U / 0.052 U	0.00098 U / 0.047 U	0.00098 U / 0.070 U	0.00098 U / 0.057 U	0.0010 U / 0.069 U	0.00096 U / 0.066 U	0.0010 U / 0.046 U
Hexachlorobutadiene*	3.9	6.2	0.00098 U / 0.052 U	0.00099 U / 0.052 U	0.00097 U / 0.049 U	0.00098 U / 0.049 U	0.00097 U / 0.053 U	0.00097 U / 0.053 U	0.00098 U / 0.053 U	0.00098 U / 0.050 U	0.00099 U / 0.052 U	0.00098 U / 0.047 U	0.00098 U / 0.070 U	0.00098 U / 0.057 U	0.0010 U / 0.069 U	0.00096 U / 0.066 U	0.0010 U / 0.046 U
PCBs (mg/kg // mg/kgOC)																	
Aroclor 1016	NE	NE	0.012 UJ	0.0040 U	0.0039 U	0.0040 U	0.0039 U	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	0.0040 U
Aroclor 1221	NE	NE	0.012 UJ	0.0040 U	0.0039 U	0.0040 U	0.0039 U	0.0060 UJ	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	0.0040 U
Aroclor 1232	NE	NE	0.012 UJ	0.0040 U	0.0039 U	0.0040 U	0.0058 UJ	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	0.0059 UJ	0.0040 U	0.012 UJ	0.0040 U
Aroclor 1242	NE	NE	0.012 UJ	0.0040 U	0.0039 U	0.0040 U	0.0039 U	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	0.0040 U
Aroclor 1248	NE	NE	0.012 UJ	0.0040 U	0.0097 UJ	0.0040 U	0.0039 U	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.037	0.0039 U	0.0039 U	0.0096	0.0039 U	0.0099 UJ
Aroclor 1254	NE	NE	0.028 J	0.0066	0.037	0.0040 U	0.0088	0.0060 J	0.0039 U	0.0039 U	0.0039 U	0.037	0.0072	0.0082	0.010	0.016	0.027
Aroclor 1260	NE	NE	0.012 UJ	0.0040 U	0.0077 UJ	0.0040 U	0.0039 U	0.007	0.0039 U	0.0039 U	0.0039 U	0.0069	0.0039 U	0.0039 U	0.0040 U	0.013 J	0.011
Total PCBs*	12	65	0.028 J / 1.5 J	0.0066 / 0.34	0.037 / 1.9	0.0040 U / 0.20 U	0.0088 / 0.48	0.013 J / 0.71 J	0.0039 U / 0.21 U	0.0039 U / 0.20 U	0.0039 U / 0.21 U	0.081 / 3.9	0.0072 / 0.51	0.0082 / 0.48	0.020 / 1.4	0.029 J / 2.0 J	0.038 / 1.7

Table 4-4
Summary of Marine Sediment Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

	Sediment Management Standards [a]		**SG-01** 02/11/09	**SG-02** 02/11/09	**SG-03** 02/13/09	**SG-04** 02/13/09	**SG-05** 02/12/09		**SG-06** 02/12/09	**SG-07** 02/12/09	**SG-08** 02/12/09	**SG-09** 02/12/09	**SG-10** 02/12/09	**SG-11** 02/12/09	**SG-12** 02/12/09	**SG-13** 02/12/09	**SG-14** 02/13/09
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	Field Duplicate 0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Organotins (ug/kg)																	
Tributyltin as TBT Ion	NE	73	**1,500**	40	**160**	6.2	21	24	10	16	7	**2,800**	30	17	9.5	49	**490**
Dibutyl Tin Ion	NE	NE	530	28	56	5.3 U	31 J	14 J	5.6 U	19	5.2 U	820	12	5.8	5.4 U	14	110
Butyl Tin Ion	NE	NE	65	5.2	13	3.7 U	5.7	3.9 U	4.0 U	4.8	3.7 U	76 U	3.5 U	3.5 U	3.8 U	3.5 U	15
Organotins-Porewater (ug/L)																	
Tributyltin as TBT Ion	0.05	0.15	**0.51**	0.028	0.008 U	0.008 U	0.009	0.008	0.011	0.01	0.042	**0.55**	0.008 U	0.008 U	0.008 U	0.014	0.030 J
Dibutyl Tin Ion	NE	NE	0.1	0.016	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.027	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Butyl Tin Ion	NE	NE	0.025	0.016	0.008 U	0.008 U	0.008 U	0.008	0.009	0.008 U	0.068	0.014	0.016	0.008 U	0.008 U	0.008 U	0.008 U
Petroleum Hydrocarbons (mg/kg)																	
Gasoline Range Organics - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)																	
Arsenic	57	93	**70**	14	10	9 U	11	10	10 U	9 U	9 U	12	9 U	9 U	9 U	11	10 U
Cadmium	5.1	6.7	0.6	0.4	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.4	0.4 U	0.3 U	0.6
Chromium	260	270	78	61	57.1	57.9	54.5	58.1	58	55.5	55.1	41.9	47.7	51.3	35.6	40.4	60
Copper	390	390	**929**	107	178	78.9	127 J	115 J	100 J	107 J	114 J	**972 J**	68.9 J	68.6 J	46.3 J	68.6 J	139
Lead	450	530	**702**	20	22	12	13	13	13	12	12	41	11	12	18	19	25
Mercury	0.41	0.59	**0.7**	0.15	0.24	0.12	0.14	0.13	0.12	0.13	0.13	0.34	0.13	0.11	0.13	0.1	0.23
Nickel	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1	0.6 U	0.6 U	0.5 U	0.6 U	0.5 U	0.6 U	0.6 U	0.5 U	0.6 U	0.6 U	0.6 U	0.5 U	0.5 U	0.5 U	0.6 U
Zinc	410	960	**757**	143	171	121	125	132	115	123	119	190	106	112	89	131	156
Ammonia (mg-N/kg)																	
Ammonia	NE	NE	5.77	8.38	12.5	6.37	15.7 J	15.4 J	9.11 J	7.66 J	7.23 J	5.26 J	5.25 J	5.07 J	4.08 J	6.16 J	5.03
Total Sulfides (mg/kg)																	
Total Sulfides	NE	NE	1,600	150	951	1,360	621 J	1,120 J	592 J	1,020 J	402 J	1,660 J	319 J	1,230 J	768 J	901 J	1,560
Acid Volatile Sulfides	NE	NE	1,100 J	684 J	1,410	704	345 J	1,620 J	2,020	2,250	1,530	2,450	788	1,020	1,290	1,170	2,470
Total Solids (%)																	
Total Solids	NE	NE	50.4	50.5	51.9	48.6	51.4	53.6	49.6	51	48.8	49.2	52.4	52.4	54.1	57.3	45.6
Total Volatile Solids (mg/kg)	NE	NE	6.48	6.66	6.16	6.42	6.54	6.28	6.18	6.32	6.47	5.97	5.24	5.49	5.39	4.87	6.63
TOC (%)																	
TOC	NE	NE	1.89	1.91	1.96	2	1.82	1.83	1.84	1.96	1.89	2.1	1.4	1.72	1.45	1.46	2.19

Notes:
Results exceeding Sediment Management Standard are **BOLD**
Highlighted results indicate reporting limit exceeds Sediment Management Standard
[a] Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).
* The listed SQS value represents a concentration in parts per million (ppm) 'normalized' on a TOC basis.
** The listed SQS value represents the sum of the concentrations of the b, j, and k isomers of benzofluoranthene.
cm - centimeters
LCS/LCSD - Laboratory control sample/laboratory control sample duplicate
MS/MSD - Matrix spike/matrix spike duplicate
NA - Not analyzed
NE - Not established
PCBs - Polychlorinated biphenyls
RPD - Relative percent difference
SRM - Standard reference material
SVOCs - Semivolatile organic compounds
TOC - Total organic carbon
VOCs - Volatile organic compounds
Total LPAH = The sum of detected naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.
Total HPAH = The sum of detected fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene.
Total benzofluoranthenes= The sum of the b, j, and k isomers.
ug/kg - micrograms per kilogram
ug/L - micrograms per liter
ug/kgOC - micrograms per kilogram, 'normalized' for TOC
mg/kg - milligrams per kilogram
J - Estimated value
U - Compound was analyzed for but not detected above the reporting limit shown
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.

TABLE A-2

	Sediment Management Standards [a]		SG-15	SG-16	SG-17	SG-18	SG-19	SG-20		SG-21	SG-22	SG-23	SG-24	SG-25	SG-26	SG-27	SG-28	SG-29		SG-30
			02/11/09	02/11/09	02/13/09	02/12/09	02/12/09	02/11/09		02/11/09	02/11/09	02/11/09	02/11/09	02/11/09	02/11/09	02/11/09	10/08/2009	10/08/2009		10/08/2009
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	Field Duplicate 0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	Field Duplicate 0-10 cm	0-10 cm
VOCs (mg/kg // mg/kgOC)																				
1,2,4-Trichlorobenzene*	0.81	1.8	0.0078 U / 0.39 U	0.0076 U / 0.34 U	0.0074 U / 0.32 U	0.0068 U / 0.36 U	0.0072 U / 0.34 U	0.0072 U / 0.44 U	0.0074 U / 0.46 U	0.0068 U / 0.30 U	0.071 UJ / 0.32 UJ	0.0074 U / 0.37 U	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1.0 U
1,2-Dichlorobenzene*	2.3	2.3	0.0016 U / 0.080 U	0.0015 U / 0.068 U	0.0015 U / 0.066 U	0.0014 U / 0.073 U	0.0014 U / 0.067 U	0.0014 U / 0.086 U	0.0015 U / 0.093 U	0.0014 U / 0.063 U	0.0014 UJ / 0.063 UJ	0.0015 U / 0.075 U	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1.0 U
1,4-Dichlorobenzene*	3.1	9.0	0.0016 U / 0.080 U	0.0015 U / 0.068 U	0.0015 U / 0.066 U	0.0014 U / 0.073 U	0.0014 U / 0.067 U	0.0014 U / 0.086 U	0.0015 U / 0.093 U	0.0014 U / 0.063 U	0.0014 UJ / 0.063 UJ	0.0015 U / 0.075 U	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1 U
SVOCs (ug/kg)																				
2,4-Dimethylphenol	29	29	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	20 U	NA	NA	NA	NA	59 U	20 U	20 U	20 U
2-Methylphenol	63	63	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	20 U	NA	NA	NA	NA	59 U	20 U	20 U	20 U
4-Methylphenol	670	670	20 U	39 J	20 U	20 U	20 U	19 U	20 U	20 U	42	20 U	NA	NA	NA	NA	59 U	20 U	20 U	20 U
Benzoic Acid	650	650	200 U	200 U	200 U	200 U	200 U	190 U	200 U	200 U	200 U	200 U	NA	NA	NA	NA	590 U	200 U	69 J	200 U
Benzyl Alcohol	57	73	20 U	**13,000 J**	20 U	20 U	20 U	19 U	20 U	20 U	20 U	**59 J**	NA	NA	NA	NA	59 U	20 U	20 U	20 U
Pentachlorophenol	360	690	98 U	98 U	98 U	99 U	98 U	97 U	98 U	98 U	98 U	98 U	NA	NA	NA	NA	290 U	98 U	99 U	99 U
Phenol	420	1,200	20 U	29 J	20 U	20 U	20 U	19 U	20 U	20 U	160	20 U	NA	NA	NA	NA	59 U	20 U	65	16 J
SVOCs (mg/kg // mg/kgOC)																				
2-Methylnapthalene*	38	64	0.014 / 0.70	0.0058 / 0.26	0.020 U / 0.87 U	0.0047 U / 0.25 U	0.0048 U/ 0.23 U	0.0048 U/ 0.30 U	0.0048 U/ 0.30 U	0.0048 U/ 0.22 U	0.020 U / 0.90 U	0.0048 U / 0.24 U	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1 U
Acenaphthene*	16	57	0.034 J / 1.7 J	0.034 J / 1.5 J	**0.42 / 18**	0.0047 U / 0.25 U	0.0048 U/ 0.23 U	0.0048 U/ 0.30 U	0.0048 U/ 0.30 U	0.0048 / 0.22	0.020 U / 0.90 U	0.088 J / 4.4 J	NA	NA	NA	NA	0.032 J / 1.7 J	0.01 J / 0.54 J	0.02 U / 1.1 U	0.013 J / 0.65 J
Acenaphthylene*	66	66	0.049 J / 2.5 J	0.11 J / 5.0 J	0.020 U / 0.87 U	0.0047 U / 0.25 U	0.0048 U/ 0.23 U	0.0048 U/ 0.30 U	0.0048 U/ 0.30 U	0.0048 U/ 0.22 U	0.020 U / 0.90 U	0.044 J / 2.2 J	NA	NA	NA	NA	0.037 J / 2 J	0.013 J / 0.71 J	0.014 J / 0.75 J	0.018 J / 0.9 J
Anthracene*	220	1,200	0.22 J/ 11 J	0.40 J / 18 J	0.15 / 6.6	0.012 / 0.63	0.021 / 1.0	0.024 / 1.5	0.028 / 1.74	0.026 / 1.2	0.021 J / 0.95 J	0.16 J / 8.0 J	NA	NA	NA	NA	0.38 / 20	0.052 / 2.8	0.045 / 2.4	0.063 / 3.2
Benz[a]anthracene*	110	270	0.77 J / 39 J	1.4 J/ 63 J	0.87 / 38	0.048 / 2.5	0.068 / 3.2	0.057 / 3.5	0.060 / 3.7	0.067 / 3.0	0.045 J / 2.0 J	0.47 J / 24 J	NA	NA	NA	NA	0.89 J / 48 J	0.14 J / 7.6 J	0.14 / 7.5	0.18 J / 9 J
Benzo[a]pyrene*	99	210	0.48 J / 24 J	1.2 J / 54 J	0.48 / 21	0.034 / 1.8	0.049 / 2.3	0.038 / 2.3	0.040 / 2.5	0.048 / 2.2	0.035 / 1.6	0.32 J / 160 J	NA	NA	NA	NA	0.5 / 27	0.14 J / 7.6 J	0.12 / 6.4	0.24 J / 12.1 J
Benzo(b)fluoranthene	NE	NE	0.94 J / 47	1.9 J / 86	0.65 / 28	0.062 / 3.2	0.086 / 4.1	0.071 / 4.4	0.073 / 4.5	0.082 / 3.7	0.062 / 2.8	0.59 J / 30	NA	NA	NA	NA	0.69 / 37	0.16 / 8.7	0.13 / 7.0	0.23 / 12
Benzo[g,h,i]perylene*	31	78	0.26 / 13	0.51 J / 23 J	0.23 / 10	0.021 / 1.1	0.027 / 1.3	0.016 / 0.99	0.017 / 1.1	0.023 / 1.0	0.018 / 0.81	0.14 J / 7.0 J	NA	NA	NA	NA	0.12 / 6.5	0.041 / 2.2	0.056 / 3	0.082 / 4.1
Benzo(k)fluoranthene	NE	NE	0.65 J / 33	1.4 J / 63	0.65 / 28	0.046 / 2.4	0.068 / 3.2	0.048 / 3.0	0.049 / 3.0	0.064 / 2.9	0.045 / 2.0	0.65 J / 33	NA	NA	NA	NA	0.69 / 37	0.16 / 8.7	0.13 / 7.0	0.23 / 12
Bis[2-ethylhexyl]phthalate*	47	78	0.38 J / 19 J	**2.7 J / 120 J**	0.76 / 33	0.026 / 1.4	0.040 / 1.9	0.064 / 4.0	0.050 / 3.1	0.073 / 3.3	0.042 J / 1.9 J	0.69 J / 35 J	NA	NA	NA	NA	0.56 / 30	0.2 / 10.9	0.12 / 6.4	0.46 / 23.1
Butyl Benzyl Phthalate*	4.9	64	0.059 U / 3.0 U	0.062 J / 2.8 J	0.030 / 1.3	0.020 U / 1.0 U	0.020 U / 0.95 U	0.019 U / 1.2 U	0.020 U / 1.2 U	0.020 U / 0.90 U	0.020 U / 0.90 U	0.040 J / 2.0 J	NA	NA	NA	NA	0.059 U / 3.2 U	0.021 / 1.1	0.02 U / 1.1 U	0.02 U / 1 U
Chrysene*	110	460	1.4 J / 70 J	2.2 J / 100 J	0.98 / 43	0.082 / 4.3	0.12 / 5.7	0.11 / 6.8	0.13 / 8.1	0.11 / 4.9	0.074 / 3.3	0.84 J / 421 J	NA	NA	NA	NA	1.9 J / 100 J	0.26 J / 14.1 J	0.27 / 14.4	0.53 J / 26.6 J
Dibenz[a,h]anthracene*	12	33	0.070 / 3.5	0.11 / 5.0	0.11 / 4.8	0.0079 / 0.41	0.012 / 0.57	0.0068 / 0.42	0.0082 / 0.51	0.0096 / 0.43	0.0082 / 0.37	0.033 / 1.7	NA	NA	NA	NA	0.081 / 4.4	0.017 J / 0.92 J	0.03 / 1.6	0.025 / 1.3
Dibenzofuran*	15	58	0.024 J / 1.2 J	0.039 J / 1.8 J	0.020 U / 0.87 U	0.0047 U / 0.25 U	0.0048 / 0.23	0.0048 U/ 0.30 U	0.0048 U/ 0.30 U	0.0053 / 0.24	0.0048 U / 0.22 U	0.028 J / 1.407 J	NA	NA	NA	NA	0.038 J / 2.1 J	0.011 J / 0.6 J	0.02 U / 1.1 U	0.014 J / 0.7 J
Diethyl Phthalate*	61	110	0.059 U / 3.0 U	0.020 U / 0.90 U	0.024 / 1.0	0.020 U / 1.0 U	0.020 U / 0.95 U	0.019 U / 1.2 U	0.020 U / 1.2 U	0.020 U / 0.90 U	0.020 U / 0.90 U	0.020 U / 1.0 U	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1 U
Dimethyl Phthalate*	53	53	0.038 J / 1.9 J	0.15 J / 6.8 J	0.080 / 3.5	0.020 U / 1.0 U	0.020 U / 0.95 U	0.019 U / 1.2 U	0.020 U / 1.2 U	0.020 U / 0.90 U	0.020 U / 0.90 U	0.14 J / 7.0 J	NA	NA	NA	NA	0.090 / 4.9	0.043 / 2.3	0.04 / 2.1	0.05 / 2.5
Di-n-butyl Phthalate*	220	1,700	0.059 U / 3.0 U	0.068 J / 3.1 J	0.020 U / 0.87 U	0.020 U / 1.0 U	0.020 U / 0.95 U	0.019 U / 1.2 U	0.020 U / 1.2 U	0.020 U / 0.90 U	0.020 U / 0.90 U	0.021 J / 1.1 J	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1 U
Di-n-octyl Phthalate*	58	4,500	0.059 U / 3.0 U	0.047 J / 2.1 J	0.020 U / 0.87 U	0.020 U / 1.0 U	0.020 U / 0.95 U	0.019 U / 1.2 U	0.020 U / 1.2 U	0.020 U / 0.90 U	0.020 U / 0.90 U	0.020 J / 1.0 J	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1 U
Fluoranthene*	160	1,200	1.6 J / 80 J	1.8 J / 81 J	2.7 / 118	0.12 / 6.3	0.23 / 10.95	0.13 / 8.0	0.13 / 8.1	0.16 / 7.2	0.12 / 5.4	1.5 J / 75 J	NA	NA	NA	NA	1.4 / 76	0.52 / 28.3	0.43 / 23	1.4 J / 70.4 J
Fluorene*	23	79	0.068 J / 3.4 J	0.086 J / 3.9 J	0.066 / 2.9	0.0056 / 0.29	0.0067 / 0.32	0.0053 / 0.33	0.0058 / 0.36	0.0062 / 0.28	0.0053 / 0.24	0.056 J / 2.8 J	NA	NA	NA	NA	0.095 / 5.1	0.016 J / 0.87 J	0.016 J / 0.86 J	0.02 / 1
Indeno[1,2,3-cd]pyrene*	34	88	0.25 / 13	0.53 J / 24 J	0.20 / 8.7	0.016 / 0.84	0.022 / 1.0	0.016 / 0.99	0.0016 / 0.99	0.022 / 0.99	0.015 / 0.68	0.14 J / 7.0 J	NA	NA	NA	NA	0.16 / 8.6	0.058 / 3.2	0.056 / 3	0.11 / 5.5
Napthalene*	99	170	0.0090 / 0.45	0.031 J / 1.4 J	0.020 U / 0.87 U	0.0047 U / 0.25 U	0.0048 U/ 0.23 U	0.0048 / 0.30	0.0048 / 0.30	0.0058 / 0.26	0.0058 / 0.26	0.030 J/ 1.5 J	NA	NA	NA	NA	0.036 J / 1.9 J	0.016 J / 0.87 J	0.02 U / 1.1 U	0.015 J / 0.75 J
N-nitrosodiphenylamine*	11	11	0.059 U / 3.0 U	0.020 U / 0.90 U	0.020 U / 0.87 U	0.020 U / 1.0 U	0.020 U / 0.95 U	0.019 U / 1.2 U	0.020 U / 1.2 U	0.020 U / 0.90 U	0.020 U / 0.90 U	0.020 U / 1.0 U	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1 U
Phenanthrene*	100	480	0.46 J / 23 J	0.39 J / 18 J	0.24 / 10	0.031 / 1.6	0.16 / 7.6	0.036 / 2.2	0.038 / 2.4	0.039 / 1.7	0.028 / 1.3	0.24 J / 12 J	NA	NA	NA	NA	0.49 / 26	0.083 / 4.5	0.1 / 5.3	0.11 / 5.5
Pyrene*	1,000	1,400	1.1 J / 55 J	2.9 J / 130 J	2.0 / 87	0.13 / 6.8	0.18 / 8.6	0.14 / 8.6	0.14 / 8.7	0.16 / 7.2	0.11 / 5.0	1.2 J / 60 J	NA	NA	NA	NA	0.99 / 54	0.39 / 21.2	0.33 / 17.6	0.61 J / 30.7 J
Total LPAH*	370	780	0.84 J / 42 J	1.1 J / 48 J	0.88 / 38	0.049 / 2.5	0.19 / 9.2	0.070 / 4.3	0.077 / 4.8	0.082 / 3.7	0.060 J / 2.7 J	0.62 J / 31 J	NA	NA	NA	NA	6.7 / 36	1.73 / 94	0.18 / 9	3.41 / 171
Total HPAH*	960	5,300	7.5 J / 380 J	14 J / 630 J	8.9 / 390	0.57 / 30	0.86 / 41	0.63 / 39	0.66 / 41	0.75 / 33	0.53 J / 24 J	5.9 J / 300 J	NA	NA	NA	NA	0.69 / 37	0.16 / 8.7	1.69 / 90	0.23 / 11.6
Total Benzofluoranthenes*	230**	450**	1.6 / 80	3.3 / 150	1.3 / 57	0.11 / 5.6	0.15 / 7.3	0.12 / 7.3	0.12 7.6	0.15 / 6.5	0.11 / 4.8	1.2 / 62	NA	NA	NA	NA	1.4 / 75	0.32 / 17	0.26 / 14	0.46 / 23
Pesticides (mg/kg // mg/kgOC)																				
Hexachlorobenzene*	0.38	2.3	0.00098 U / 0.049 U	0.0010 UJ / 0.045 UJ	0.00097 U / 0.042 U	0.00098 U / 0.051 U	0.00097 U / 0.046 U	0.00099 U / 0.061 U	0.00098 U / 0.061 U	0.00097 U / 0.043 U	0.00099 U / 0.045 U	0.00098 U / 0.049 U	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1 U
Hexachlorobutadiene*	3.9	6.2	0.00098 U / 0.049 U	0.00098 U / 0.044 U	0.00097 U / 0.042 U	0.00098 U / 0.051 U	0.00097 U / 0.046 U	0.00099 U / 0.061 U	0.00098 U / 0.061 U	0.00097 U / 0.043 U	0.00099 U / 0.045 U	0.00098 U / 0.049 U	NA	NA	NA	NA	0.059 U / 3.2 U	0.02 U / 1.1 U	0.02 U / 1.1 U	0.02 U / 1 U
PCBs (mg/kg // mg/kgOC)																				
Aroclor 1016	NE	NE	0.0039 U	0.0039 U	0.039 U	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	NE	NE	0.0039 U	0.0039 U	0.039 U	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	NE	NE	0.0039 U	0.0039 U	0.039 U	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	NE	NE	0.0039 U	0.0039 U	0.080	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	NE	NE	0.0039 U	0.012 UJ	0.039 U	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	NE	NE	0.0065	0.038	0.100	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0059	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	NE	NE	0.0039 U	0.0081 J	0.039 U	0.0040 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0040 U	0.0039 U	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs*	12	65	0.0065 / 0.33	0.046 J / 2.1 J	0.18 / 7.9	0.0040 U / 0.21 U	0.0039 U / 0.19 U	0.0039 U / 0.24 U	0.0039 U / 0.24 U	0.0039 U / 0.18 U	0.0040 U / 0.18 U	0.0059 / 0.30	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-4
Summary of Marine Sediment Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

TABLE A-2

	Sediment Management Standards [a] Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	**SG-15** 02/11/09	**SG-16** 02/11/09	**SG-17** 02/13/09	**SG-18** 02/12/09	**SG-19** 02/12/09	**SG-20** 02/11/09		**SG-21** 02/11/09	**SG-22** 02/11/09	**SG-23** 02/11/09	**SG-24** 02/11/09	**SG-25** 02/11/09	**SG-26** 02/11/09	**SG-27** 02/11/09	**SG-28** 10/08/2009	**SG-29** 10/08/2009		**SG-30** 10/08/2009
			0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	Field Duplicate 0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	Field Duplicate 0-10 cm	0-10 cm
Organotins (ug/kg)																				
Tributyltin as TBT Ion	NE	73	**190**	**3,000**	**3,300**	3.6	6.2	8.8	13	14	22	**300**	NA	NA	NA	NA	39	22	30 J	11 J
Dibutyl Tin Ion	NE	NE	68	1000	900	5.2 U	5.0 U	5.5 U	5.6	5.6 U	12	80	NA	NA	NA	NA	21	7.9 J	15 J	6.5
Butyl Tin Ion	NE	NE	13	120	85	3.7 U	3.5 U	3.9 U	3.9 U	4.0 U	4.8	12	NA	NA	NA	NA	6.2	3.8 U	4 U	3.8 U
Organotins-Porewater (ug/L)																				
Tributyltin as TBT Ion	0.05	0.15	**0.32**	**2.2**	**0.27 J**	0.008 U	0.011	0.009	0.011	0.013	0.01	**0.2**	0.008 U	0.008 U	0.016	0.012	0.016	0.019	0.008 UJ	0.03
Dibutyl Tin Ion	NE	NE	0.048	0.2	0.016	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.027	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.016	0.012 UJ	0.013
Butyl Tin Ion	NE	NE	0.019	0.038	0.012	0.008 U	0.008 U	0.01	0.008 U	0.008 U	0.016 J	0.016	0.008	0.012	0.01	0.008	0.014	0.011	0.008 UJ	0.01 J
Petroleum Hydrocarbons (mg/kg)																				
Gasoline Range Organics - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)																				
Arsenic	57	93	10	20	9 U	9 U	9 U	11	10 U	12	13	10	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5.1	6.7	0.4 U	0.9	0.7	0.5	0.4	0.4	0.4	0.5	0.4	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	260	270	51	76	47.8	55	57.9	58.4	52	59.4	58.4	57	NA	NA	NA	NA	NA	NA	NA	NA
Copper	390	390	126	**1,040**	**616**	70.5 J	78.9 J	78.6	75.1	91.7	83.9	106	NA	NA	NA	NA	NA	NA	NA	NA
Lead	450	530	19	49	26	11	13	14	13	15	14	21	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.41	0.59	0.19	0.4	0.31	0.12	0.13	0.13	0.12	0.14	0.15	0.15	0.12	0.13	0.18	0.16	NA	NA	NA	NA
Nickel	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1	0.6 U	1	0.5 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	410	960	149	**1,140**	312	105	110	108	100	120	108	141	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg-N/kg)																				
Ammonia	NE	NE	9.48	10.8	7.63	5.50 J	8.67 J	7.28	7.87	9.54	7.18	12.3	5.15	6.35	12	5.94	9.32	18	14.5	12.8
Total Sulfides (mg/kg)																				
Total Sulfides	NE	NE	1,700	3,680	1,540	416 J	867 J	229	255	166	138	2,650	366	1,010	196	696	665 J	436 J	606 J	948 J
Acid Volatile Sulfides	NE	NE	2,000 J	494 J	4,880	1,290	2,850	433 J	178 J	267 J	244 J	1,130 J	384 J	70.6 J	1,440 J	314 J	NA	NA	NA	NA
Total Solids (%)																				
Total Solids	NE	NE	44.8	45	47.9	50.4	50.3	51.3	52.4	51.8	52.3	47	53.7	53.2	53	54.6	51.7	54.8	54.9	47.1
Total Volatile Solids (mg/kg)	NE	NE	6.65	7.36	6.09	6.25	6.4	6.4	6.27	6.9	6.54	6.49	6.22	6.15	5.91	6.29	5.73	6.35	6.32	7.02
TOC (%)																				
TOC	NE	NE	1.99	2.21	2.29	1.91	2.1	1.62	1.61	2.23	2.22	1.99	1.11	1.85	1.89	1.97	1.85	1.84	1.87	1.99

Notes:
Results exceeding Sediment Management Standard are **BOLD**
Highlighted results indicate reporting limit exceeds Sediment Management Standard
[a] Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).
* The listed SQS value represents a concentration in parts per million (ppm) 'normalized' on a TOC basis.
** The listed SQS value represents the sum of the concentrations of the b, j, and k isomers of benzofluoranthene.
cm - centimeters
LCS/LCSD - Laboratory control sample/laboratory control sample duplicate
MS/MSD - Matrix spike/matrix spike duplicate
NA - Not analyzed
NE - Not established
PCBs - Polychlorinated biphenyls
RPD - Relative percent difference
SRM - Standard reference material
SVOCs - Semivolatile organic compounds
TOC - Total organic carbon
VOCs - Volatile organic compounds
Total LPAH = The sum of detected naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.
Total HPAH = The sum of detected fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene.
Total benzofluoranthenes= The sum of the b, j, and k isomers.
ug/kg - micrograms per kilogram
ug/L - micrograms per liter
ug/kgOC - micrograms per kilogram, 'normalized' for TOC
mg/kg - milligrams per kilogram
J - Estimated value
U - Compound was analyzed for but not detected above the reporting limit shown
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.

Table 4-4
Summary of Marine Sediment Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

TABLE A-2

	Sediment Management Standards [a] Sediment Quality Standard (SQS)	Sediment Management Standards [a] Cleanup Screening Level (CSLs)	**SG-31** 10/08/2009 0-10 cm	**SG-32** 10/08/2009 0-10 cm	**SG-33** 10/07/2009 0-10 cm	**SG-34** 10/13/2009 0-10 cm	**SG-35** 10/07/2009 0-10 cm	**SG-36** 05/19/2010 0-10 cm	**SG-37** 05/19/2010 0-10 cm	**SG-38** 05/19/2010 0-10 cm	**SG-39** 05/19/2010 0-10 cm	**SG-40** 05/19/2010 0-10 cm	**SG-41** 05/19/2010 0-10 cm	**SG-42** 05/19/2010 0-10 cm	**SG-43** 05/19/2010 0-10 cm	**SG-44** 05/19/2010 0-10 cm	**SG-45** 05/19/2010 0-10 cm	**SG-46** 05/19/2010 0-10 cm	**SG-47** 05/21/2010 0-10 cm	**BC-1-1** 05/21/2010 0-10 cm	**BC-1-2** 05/21/2010 2-3 ft	**BC-2-1** 5/21/2010 0-10 cm	**BC-2-2** 5/21/2010 2-3 ft
VOCs (mg/kg // mg/kgOC)								NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
1,2,4-Trichlorobenzene*	0.81	1.8	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.005 UJ / 0.12 UJ	0.32 U / 22 U	0.0048 U / 0.25 U	0.0044 U / 1.9 U
1,2-Dichlorobenzene*	2.3	2.3	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.001 UJ / 0.02 UJ	0.14 U / 9.7 U	0.001 U / 0.05 U	0.0009 U / 0.39 U
1,4-Dichlorobenzene*	3.1	9.0	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.001 UJ / 0.02 UJ	0.14 U / 9.7 U	0.001 U / 0.05 U	0.0009 U / 0.39 U
SVOCs (ug/kg)																							
2,4-Dimethylphenol	29	29	NA	20 U	20 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	160 U	320 U	59 U	19 U
2-Methylphenol	63	63	NA	20 U	20 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	160 U	320 U	59 U	19 U
4-Methylphenol	670	670	NA	**1,400**	**790**	390	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	240	320 U	57 J	19 U
Benzoic Acid	650	650	NA	79 J	97 J	53 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	440 J	3200 U	**770**	190 UJ
Benzyl Alcohol	57	73	NA	20 U	20 U	20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	160 U	320 U	59 U	19 U
Pentachlorophenol	360	690	NA	97 U	98 U	98 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	780 U	1600 U	300 U	97 U
Phenol	420	1,200	NA	140	220	86	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	570 U	320 U	730 U	19 U
SVOCs (mg/kg // mg/kgOC)																							
2-Methylnapthalene*	38	64	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.012 J / 0.69 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.17 U / 4.2 U	0.32 U / 22 U	0.045 U / 2.3 U	0.02 / 8.7
Acenaphthene*	16	57	NA	0.011 J / 0.7 J	0.029 / 1.7	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.22 / 5.4	3.1 / **214**	0.13 / 6.7	0.011 / 4.8
Acenaphthylene*	66	66	NA	0.01 J / 0.64 J	0.02 U / 1.2 U	0.012 J / 0.69 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.25 / 6.2	0.32 U / 22 U	0.16 / 8.3	0.011 / 4.8
Anthracene*	220	1,200	NA	0.036 / 2.3	0.04 / 2.4	0.2 / 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.4 / 35	1.7 / 117	0.61 / 32	0.23 / 100
Benz[a]anthracene*	110	270	NA	0.13 / 8.3	0.13 / 7.6	0.2 / 11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.6 / 64	0.62 / 43	1.6 / 83	1.5 / **655**
Benzo[a]pyrene*	99	210	NA	0.1 / 6.4	0.083 / 4.9	0.11 / 6.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.6 / 64	0.2 / 14	1.4 / 73	0.45 / **197**
Benzo(b)fluoranthene	NE	NE	NA	0.13 / 8.3	0.10 / 5.9	0.14 / 8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.2	0.160 J	2.2	0.12
Benzo[g,h,i]perylene*	31	78	NA	0.032 / 2	0.026 / 1.5	0.028 / 1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 / 27	0.1 U / 6.9 U	0.75 / **39**	0.093 / **41**
Benzo(k)fluoranthene	NE	NE	NA	0.13 / 8.3	0.10 / 5.9	0.14 / 8.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.2	0.160 J	2.2	0.12
Bis[2-ethylhexyl]phthalate*	47	78	NA	0.15 / 9.6	0.2 / 11.8	0.19 / 10.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19 / **470**	0.32 U / 22 U	2.6 / **135**	0.062 / 27
Butyl Benzyl Phthalate*	4.9	64	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.55 / **14**	0.32 U / 22 U	0.4 / **21**	0.019 U / 8.3 U
Chrysene*	110	460	NA	0.22 / 14	0.18 / 10.6	0.29 / 16.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.2 / 104	0.58 / 40	2.6 / **135**	1.4 / **611**
Dibenz[a,h]anthracene*	12	33	NA	0.016 J / 1 J	0.011 J / 0.65 J	0.016 J / 0.92 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.43 / 11	0.1 U / 6.9 U	0.38 / 1.0	0.053 / **23**
Dibenzofuran*	15	58	NA	0.013 J / 0.83 J	0.039 / 2.3	0.021 / 1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.16 / 4	0.9 / **62**	0.07 / 3.6	0.022 / 9.6
Diethyl Phthalate*	61	110	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.16 U / 4 U	0.32 U / 22 U	0.059 U / 3.1 U	0.019 U / 8.3 U
Dimethyl Phthalate*	53	53	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.016 J / 0.92 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.6 / **188**	0.32 U / 22 U	0.39 / 20	0.019 U / 8.3 U
Di-n-butyl Phthalate*	220	1,700	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29 / 7.2	0.32 U / 22 U	0.39 / 20	0.019 U / 8.3 U
Di-n-octyl Phthalate*	58	4,500	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.44 / 11	0.32 U / 22 U	0.094 / 4.9	0.019 U / 8.3 U
Fluoranthene*	160	1,200	NA	0.41 / 26.1	0.44 / 25.9	0.65 / 37.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.6 / **188**	5.2 / **359**	4.4 / **228**	0.88 / **384**
Fluorene*	23	79	NA	0.016 J / 1 J	0.042 / 2.5	0.048 / 2.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.3 / 7.4	0.22 UJ / 15 UJ	0.12 / 6.2	0.022 / 9.6
Indeno[1,2,3-cd]pyrene*	34	88	NA	0.032 / 2	0.028 / 1.6	0.031 / 1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.94 / 23	0.1 U / 6.9 U	0.65 / **34**	0.11 / **48**
Napthalene*	99	170	NA	0.0099 J / 0.63 J	0.012 J / 0.71 J	0.012 J / 0.69 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.23 U / 5.7 U	0.1 U / 6.9 U	0.12 U / 6.2 U	0.022 / 9.6
N-nitrosodiphenylamine*	11	11	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.16 U / 4 U	11 / **759**	0.059 U / 3.1 U	0.019 U / 8.3 U
Phenanthrene*	100	480	NA	0.12 / 7.6	0.17 / 10	0.27 / 15.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 / 62	0.33 / 23	1.1 / 57	0.06 / 26
Pyrene*	1,000	1,400	NA	0.37 / 23.6	0.33 / 19.4	0.53 / 30.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0092 UY / 0.23 UY	2.4 / 166	4.2 J / 218 J	0.00096 U / 0.42 U
Total LPAH*	370	780	NA	1.44 / 92	1.33 / 78	2 / 115	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.9 / 121	5.1 / 354	2.2 / 116	0.36 / 155
Total HPAH*	960	5,300	NA	0.13 / 8.3	0.1 / 5.9	0.14 / 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 / 644	9.3 / 643	20 / 1058	4.8 / **2073**
Total Benzofluoranthenes*	230**	450**	NA	0.26 / 17	0.2 / 12	0.28 / 16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.4 / 158	0.32 J / 22 J	4.4 / 228	0.24 / 105
Pesticides (mg/kg // mg/kgOC)																							
Hexachlorobenzene*	0.38	2.3	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0092 UY / 0.23 UY	0.00097 U / 0.07 U	0.00098 U / 0.05 U	0.00096 U / 0.42 U
Hexachlorobutadiene*	3.9	6.2	NA	0.02 U / 1.3 U	0.02 U / 1.2 U	0.02 U / 1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0018 U / 0.04 U	0.00097 U / 0.07 U	0.00098 U / 0.05 U	0.00096 U / 0.42 U
PCBs (mg/kg // mg/kgOC)																							
Aroclor 1016	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.07 U	0.0039 U	0.210 U	0.0039 U
Aroclor 1221	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.07 U	0.0039 U	0.210 U	0.0039 U
Aroclor 1232	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.07 U	0.0039 U	0.210 U	0.0039 U
Aroclor 1242	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.07 U	0.0039 U	0.210 U	0.0039 U
Aroclor 1248	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.35 UY	0.0098 UJ	0.370 UY	0.0039 U
Aroclor 1254	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9	0.0065	3.1	0.0057
Aroclor 1260	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.48	0.0075	0.62	0.0039 U
Total PCBs*	12	65	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.4 / **59**	0.014 / 0.97	3.7 / **193**	0.0057 / 2.5

Table 4-4
Summary of Marine Sediment Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

TABLE A-2

	Sediment Management Standards [a]		**SG-31**	**SG-32**	**SG-33**	**SG-34**	**SG-35**	**SG-36**	**SG-37**	**SG-38**	**SG-39**
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	10/08/2009 0-10 cm	10/08/2009 0-10 cm	10/07/2009 0-10 cm	10/13/2009 0-10 cm	10/07/2009 0-10 cm	05/19/2010 0-10 cm	05/19/2010 0-10 cm	05/19/2010 0-10 cm	05/19/2010 0-10 cm
Organotins (ug/kg)											
Tributyltin as TBT Ion	NE	73	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibutyl Tin Ion	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Tin Ion	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organotins-Porewater (ug/L)											
Tributyltin as TBT Ion	0.05	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibutyl Tin Ion	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Tin Ion	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum Hydrocarbons (mg/kg)											
Gasoline Range Organics - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil - HCID	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)											
Arsenic	57	93	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5.1	6.7	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	260	270	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	390	390	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	450	530	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.41	0.59	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	410	960	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg-N/kg)											
Ammonia	NE	NE	7.65	17.4	17.3	7.25	3.49	11.4	10.2	17.8	10.5
Total Sulfides (mg/kg)											
Total Sulfides	NE	NE	707 J	1,460 J	643 J	990	245 J	692	1020	1140	316
Acid Volatile Sulfides	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Solids (%)											
Total Solids	NE	NE	54.2	45.7	49.1	48.9	38.1	47	48.1	43.1	49.1
Total Volatile Solids (mg/kg)	NE	NE	5.3	6.55	6.74	6.28	6.14	6.62	6.92	7.15	6.64
TOC (%)											
TOC	NE	NE	1.39	1.57	1.7	1.74	2.09	2.1	2.02	3.05	1.81

	SG-40	**SG-41**	**SG-42**	**SG-43**	**SG-44**	**SG-45**	**SG-46**	**SG-47**	**BC-1-1**	**BC-1-2**	**BC-2-1**	**BC-2-2**
	05/19/2010 0-10 cm	05/19/2010 0-10 cm	05/19/2010 0-10 cm	05/19/2010 0-10 cm	05/19/2010 0-10 cm	05/19/2010 0-10 cm	05/19/2010 0-10 cm	05/21/2010 0-10 cm	05/21/2010 0-10 cm	05/21/2010 2-3 ft	5/21/2010 0-10 cm	5/21/2010 2-3 ft
Organotins (ug/kg)												
Tributyltin as TBT Ion	NA	NA	NA	NA	NA	NA	NA	**NA**	**36000**	19	**17000**	**150**
Dibutyl Tin Ion	NA	NA	NA	NA	NA	NA	NA	NA	9400	14 UJ	2900	82
Butyl Tin Ion	NA	NA	NA	NA	NA	NA	NA	NA	730	10 U	2700	29
Organotins-Porewater (ug/L)												
Tributyltin as TBT Ion	NA	NA	NA	NA	NA	NA	NA	NA	**2.6**	NA	**6.4**	NA
Dibutyl Tin Ion	NA	NA	NA	NA	NA	NA	NA	NA	0.56	NA	4	NA
Butyl Tin Ion	NA	NA	NA	NA	NA	NA	NA	NA	0.24	NA	1.2	NA
Petroleum Hydrocarbons (mg/kg)												
Gasoline Range Organics - HCID	NA	NA	NA	NA	NA	NA	NA	NA	20 >	20 >	NA	20 U
Diesel Range Organics - HCID	NA	NA	NA	NA	NA	NA	NA	NA	50 >	50 >	NA	50 >
Lube Oil - HCID	NA	NA	NA	NA	NA	NA	NA	NA	100 >	100 >	NA	100 U
Diesel Range Organics	NA	NA	NA	NA	NA	NA	NA	NA	690	7400	NA	49
Lube Oil	NA	NA	NA	NA	NA	NA	NA	NA	2300	680	NA	25
Metals (mg/kg)												
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	**240**	8	24	6 U
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	2	0.2 U	0.4	0.2 U
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	176	24.4	78.2	20.4
Copper	NA	NA	NA	NA	NA	NA	NA	NA	**3280**	17.9	**2410**	33.8
Lead	NA	NA	NA	NA	NA	NA	NA	NA	**1210**	7	94	6
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	**1.97**	0.08	**1.21**	0.07
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	1 U	0.4 U	1.2	0.3 U
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	**1980**	33	**627**	39
Ammonia (mg-N/kg)												
Ammonia	10.5	12.4	11.4	17.7	7.51	9.28	10.2	5.34	0.39	1.37	0.49	3.55
Total Sulfides (mg/kg)												
Total Sulfides	280	1050	384	265	415	303	334	311	40.4	10.2	1.04 UJ	1.11 UJ
Acid Volatile Sulfides	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Solids (%)												
Total Solids	50.9	47.7	48.1	51	51.5	50.5	50.1	34.7	72.7	75.8	82.4	88.2
Total Volatile Solids (mg/kg)	6.82	6.44	7.01	6.95	6.47	6.62	7.36	7.64	5.55	1.69	2.32	0.96
TOC (%)												
TOC	2.26	2.1	2.24	2.72	1.94	2.22	2.59	3.47	4.04	1.45	1.93	0.229

Notes:

Results exceeding Sediment Management Standard are **BOLD**

Highlighted results indicate reporting limit exceeds Sediment Management Standard

[a] Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).

* The listed SQS value represents a concentration in parts per million (ppm) 'normalized' on a TOC basis.

** The listed SQS value represents the sum of the concentrations of the b, j, and k isomers of benzofluoranthene.

cm - centimeters

LCS/LCSD - Laboratory control sample/laboratory control sample duplicate

MS/MSD - Matrix spike/matrix spike duplicate

NA - Not analyzed

NE - Not established

PCBs - Polychlorinated biphenyls

RPD - Relative percent difference

SRM - Standard reference material

SVOCs - Semivolatile organic compounds

TOC - Total organic carbon

VOCs - Volatile organic compounds

Total LPAH = The sum of detected naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.

Total HPAH = The sum of detected fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene.

Total benzofluoranthenes= The sum of the b, j, and k isomers.

ug/kg - micrograms per kilogram

ug/L - micrograms per liter

ug/kgOC - micrograms per kilogram, 'normalized' for TOC

mg/kg - milligrams per kilogram

J - Estimated value

U - Compound was analyzed for but not detected above the reporting limit shown

UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.

Table 4-4
Summary of Marine Sediment Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

TABLE A-2

	Sediment Management Standards [a]		**BC-3-1**		**BC-3-2**	**BC-4-1**	**BC-4-2**	**BC-5-1**	**BC-5-2**	**BC-6-1**	**BC-6-2**
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	05/21/2010		05/24/2010	05/21/2010	05/24/2010	05/21/2010	05/24/2010	05/21/2010	05/24/2010
			0-10 cm	Field Duplicate 0-10 cm	2-3 ft	0-10 cm	2-3 ft	0-10 cm	2-3 ft	0-10 cm	2-3 ft
VOCs (mg/kg // mg/kgOC)											
1,2,4-Trichlorobenzene*	0.81	1.8	0.0047 U / 0.25 U	0.0047 U / 0.23 U	0.0043 U / 4.2 U	0.005 UJ / 0.14 UJ	0.0044 U / 1.2 U	0.0055 U / 0.07 U	0.0047 U / 0.93 U	0.0045 U / 0.93 U	0.0044 U / 0.86 U
1,2-Dichlorobenzene*	2.3	2.3	0.0009 U / 0.048 U	0.0009 U / 0.04 U	0.0009 U / 0.87 U	0.001 UJ / 0.03 UJ	0.0009 U / 0.24 U	0.0011 U / 0.014 U	0.001 U / 0.2 U	0.0009 U / 0.19 U	0.0009 U / 0.18 U
1,4-Dichlorobenzene*	3.1	9.0	0.0009 U / 0.048 U	0.0009 U / 0.04 U	0.0009 U / 0.87 U	0.001 UJ / 0.03 UJ	0.0009 U / 0.24 U	0.0011 U / 0.014 U	0.001 U / 0.2 U	0.0009 U / 0.19 U	0.0009 U / 0.18 U
SVOCs (ug/kg)											
2,4-Dimethylphenol	29	29	120 U	20 U	20 U	520 U	20 U	65 U	20 U	20 U	19 U
2-Methylphenol	63	63	120 U	20 U	20 U	520 U	20 U	**95**	20 U	20 U	19 U
4-Methylphenol	670	670	180	110	20 U	520 U	20 U	68	20 U	20 U	19 U
Benzoic Acid	650	650	1200 U	310	200 U	5200 U	200 U	390 J	200 U	200 U	190 U
Benzyl Alcohol	57	73	120 U	42	20 U	520 U	20 U	**1400**	20 U	20 U	19 U
Pentachlorophenol	360	690	590 U	58 J	99 U	2600 UJ	97 U	260 J	100 U	99 U	97 U
Phenol	420	1,200	520 U	580 U	20 U	590 U	20 U	900 U	20 U	350 U	19 U
SVOCs (mg/kg // mg/kgOC)											
2-Methylnapthalene*	38	64	0.093 U / 5 U	0.021 U / 1 U	0.0047 U / 4.6 U	0.044 U / 1.2 U	0.028 / 7.4	0.22 U / 2.8 U	0.039 / 7.7	0.014 J / 2.9 J	0.12 / 24
Acenaphthene*	16	57	0.28 / 15	0.063 / 3.1	0.0061 / 5.9	0.023 / 0.64	0.023 / 6.1	0.12 / 1.5	**0.3 / 59**	**0.24 / 49**	**0.25 / 49**
Acenaphthylene*	66	66	0.13 / 7	0.12 / 5.9	0.0047 U / 4.6 U	0.069 / 1.9	0.009 / 2.4	0.29 / 3.7	0.0098 / 1.9	0.13 / 27	0.012 / 2.4
Anthracene*	220	1,200	0.66 / 36	0.77 / 38	0.0047 U / 4.6 U	0.52 U / 14.4 U	0.11 / 29.2	0.88 / 11	0.094 / 19	0.24 / 49	0.11 / 22
Benz[a]anthracene*	110	270	2.3 / **124**	1.2 / 59	0.0085 / 8.3	1 / 27.7	0.19 / 50.4	2.8 / 36	0.079 / 16	0.86 / **177**	0.046 / 9
Benzo[a]pyrene*	99	210	1.9 / **102**	1 / 49	0.0075 / 7.3	0.96 / 26.6	0.061 / 16.2	2.6 / 33	0.049 / 9.7	0.55 / **113**	0.03 / 5.9
Benzo(b)fluoranthene	NE	NE	2.4	1.3	0.020 U	1	0.071	3.4	0.041	0.46	0.02
Benzo[g,h,i]perylene*	31	78	0.8 / **43**	0.38 / 19	0.0047 U / 4.6 U	0.51 / 14	0.026 / 6.9	1.2 / 15	0.027 / 5.3	0.28 / **58**	0.018 / 3.5
Benzo(k)fluoranthene	NE	NE	2.4	1.3	0.020 U	1	0.071	3.4	0.041	0.46	0.02
Bis[2-ethylhexyl]phthalate*	47	78	8.5 / **457**	1.9 / **93**	0.027 / 26	4.7 / **130**	0.02 / 5.3	120 / **1527**	0.046 / 9.1	0.16 / 33	0.013 J / 2.6 J
Butyl Benzyl Phthalate*	4.9	64	1.4 / **75**	0.27 / **13**	0.02 U / 19 U	0.34 J / **9.4 J**	0.02 U / 5.3 U	0.87 / **11**	0.02 U / 3.9 U	0.02 U / 4.1 U	0.019 U / 3.7 U
Chrysene*	110	460	3.3 / **177**	2.5 / 1.0	0.011 / 11	1.6 / 44	0.2 / 53	4.5 / 57	0.089 / 18	1 / **206**	0.053 / 10
Dibenz[a,h]anthracene*	12	33	0.38 / **20**	0.22 / 11	0.0047 U / 4.6 U	0.23 / 6.4	0.01 J / 2.7 J	0.6 / 7.6	0.0098 / 1.9	0.16 / **32**	0.0045 / 0.88
Dibenzofuran*	15	58	0.11 / 5.9	0.039 / 1.9	0.0047 / 4.6	0.021 / 0.58	0.036 / 9.5	0.13 / 1.7	0.12 / **24**	0.092 / **19**	0.17 / **33**
Diethyl Phthalate*	61	110	0.12 U / 6.5 U	0.02 U / 0.98 U	0.02 U / 19 U	0.52 U / 14 U	0.02 U / 5.3 U	0.065 U / 0.83 U	0.02 U / 3.9 U	0.02 U / 4.1 U	0.019 U / 3.7 U
Dimethyl Phthalate*	53	53	0.37 / 20	0.22 / 11	0.02 U / 19 U	3.2 / **89**	0.02 U / 5.3 U	8.2 / **104**	0.02 U / 3.9 U	0.025 / 5.1	0.019 U / 3.7 U
Di-n-butyl Phthalate*	220	1,700	0.46 / 25	0.3 / 15	0.02 U / 19 U	0.52 U / 14 U	0.02 U / 5.3 U	0.51 / 6.5	0.02 U / 3.9 U	0.013 J / 2.7 J	0.019 U / 3.7 U
Di-n-octyl Phthalate*	58	4,500	0.25 / 13	0.12 / 5.9	0.02 U / 19 U	0.52 U / 14 U	0.02 U / 5.3 U	0.89 / 11	0.02 U / 3.9 U	0.013 J / 2.7 J	0.019 U / 3.7 U
Fluoranthene*	160	1,200	8.1 / **436**	2.8 / 137	0.044 / 43	2.7 / 75	0.46 / 122	4.2 / 53	0.4 / 79	1.2 / 247	0.35 / 69
Fluorene*	23	79	0.18 / 9.7	0.1 / 4.9	0.0047 U / 4.6 U	0.037 / 1	0.04 / 11	0.25 / 3.2	0.2 / **39**	0.14 / **29**	0.39 / **77**
Indeno[1,2,3-cd]pyrene*	34	88	0.73 / **39**	0.39 / 19	0.0047 U / 4.6 U	0.46 J / 13 J	0.023 / 6.1	1.1 / 14	0.023 / 4.5	0.26 / **54**	0.014 / 2.8
Napthalene*	99	170	0.086 J / 4.6 J	0.033 U / 1.6 U	0.0047 U / 4.6 U	0.045 U / 1.2 U	0.061 / 16	0.24 U / 3.1 U	0.11 / 22	0.026 / 5.3	0.24 / 47
N-nitrosodiphenylamine*	11	11	0.12 U / 6.5 U	0.02 U / 0.98 U	0.02 U / 19 U	0.52 U / 14 U	0.02 U / 5.3 U	0.065 U / 0.83 U	0.02 U / 3.9 U	0.02 U / 4.1 U	0.019 U / 3.7 U
Phenanthrene*	100	480	2.5 J / **134 J**	0.6 / 29	0.0099 / 9.6	1.6 / 44	0.097 / 26	0.99 / 13	0.27 / 53	0.44 / 91	0.78 / **153**
Pyrene*	1,000	1,400	0.0024 U / 0.13 U	0.00098 U / 0.05 U	0.00099 U / 0.96 U	0.0015 U / 0.04 U	0.00097 U / 0.26 U	0.0015 U / 0.02 U	0.00099 U / 0.2 U	0.00098 U / 0.2 U	0.00097 U / 0.19 U
Total LPAH*	370	780	3.8 / 206	1.7 / 82	0.016 / 16	1.8 / 49	0.34 / 90	2.77 / 35	0.98 / 194	1.22 / 250	1.78 / 350
Total HPAH*	960	5,300	22.4 / **1204**	9.8 / 478	0.072 / 69	9.5 / 263	1.14 / 303	24 / 306	0.798 / 157	5.24 / **1079**	0.655 / 129
Total Benzofluoranthenes*	230**	450**	4.8 / **258**	1.3 / 63	0.02 U / 19 U	2 / 55	0.142 / 38	6.8 / 87	0.082 / 16	0.92 / 189	0.02 / 3.9
Pesticides (mg/kg // mg/kgOC)											
Hexachlorobenzene*	0.38	2.3	0.0024 U / 0.13 U	0.00098 U / 0.05 U	0.00099 U / 0.96 U	0.0015 U / 0.04 U	0.00097 U / 0.26 U	0.0015 U / 0.02 U	0.00099 U / 0.2 U	0.00098 U / 0.2 U	0.00097 U / 0.19 U
Hexachlorobutadiene*	3.9	6.2	0.0024 U / 0.13 U	0.00098 U / 0.05 U	0.00099 U / 0.96 U	0.0015 U / 0.04 U	0.00097 U / 0.26 U	0.0015 U / 0.02 U	0.00099 U / 0.2 U	0.00098 U / 0.2 U	0.00097 U / 0.19 U
PCBs (mg/kg // mg/kgOC)											
Aroclor 1016	NE	NE	1.0 U	0.2 U	0.0039 U	0.059 U	0.0038 U	0.073 U	0.004 U	0.0078 U	0.0039 U
Aroclor 1221	NE	NE	1.0 U	0.2 U	0.0039 U	0.059 U	0.0038 U	0.073 U	0.004 U	0.0078 U	0.0039 U
Aroclor 1232	NE	NE	1.0 U	0.2 U	0.0039 U	0.059 U	0.0038 U	0.073 U	0.004 U	0.0078 U	0.0039 U
Aroclor 1242	NE	NE	1.0 U	0.2 U	0.0039 U	0.059 U	0.0038 U	0.073 U	0.004 U	0.0078 U	0.0039 U
Aroclor 1248	NE	NE	5.3 UY	1.0 UY	0.0039 U	0.150 UY	0.0038 U	0.37 UY	0.004 U	0.0078 U	0.0039 U
Aroclor 1254	NE	NE	18	7.6	0.0062	0.59	0.0038 U	3.3	0.006	0.0081	0.0039 U
Aroclor 1260	NE	NE	2.1 UY	1.0 UY	0.0039 U	0.14	0.0038 U	0.54	0.004 U	0.0078 U	0.0039 U
Total PCBs*	12	65	18 / **968**	7.6 / **371**	0.0062 / 6.0	0.73 / **20**	0.0038 U / 1.0 U	3.8 / **49**	0.006 / 1.2	0.0081 / 1.7	0.0039 U / 0.77 U

	BC-7-2	**BC-8-2**	**BC-9-2**	**BC-10-2**	**ESY-MS1**	**FD of ESY-MS1**	**ESY-MS2**	**ESY-MS3**	**ESY-MS4**	**ESY-MS5**	**ESY-MS6**
	06/03/2010	06/03/2010	06/03/2010	06/03/2010	03/05/03	03/05/03	03/05/03	03/05/03	03/05/03	03/05/03	03/05/03
	1.5-4 ft	3-4 ft	1.5-2.5 ft	0.5-1.5 ft	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
VOCs (mg/kg // mg/kgOC)											
1,2,4-Trichlorobenzene*	NA	NA	NA	NA	0.74 U	0.73 U	0.09 U	0.28 U	0.91 U	0.87 U	1.2 U
1,2-Dichlorobenzene*	NA	NA	NA	NA	0.74 U	0.73 U	0.09 U	0.83 U	0.91 U	0.87 U	1.2 U
1,4-Dichlorobenzene*	NA	NA	NA	NA	0.74 U	0.73 U	0.09 U	0.83 U	0.91 U	0.87 U	1.2 U
SVOCs (ug/kg)											
2,4-Dimethylphenol	NA	NA	NA	NA	20 U	19 U	19 U	20 U	20 U	20 U	19 U
2-Methylphenol	NA	NA	NA	NA	20 U	19 U	19 U	20 U	20 U	20 U	19 U
4-Methylphenol	NA	NA	NA	NA	20 U	19 U	19 U	140 J	20 U	40 J	20 J
Benzoic Acid	NA	NA	NA	NA	200 U	190 U	190 U	210	200 U	200 U	190 U
Benzyl Alcohol	NA	NA	NA	NA	20 UJ	97 UJ	19 U	20 U	20 U	20 U	19 U
Pentachlorophenol	NA	NA	NA	NA	98 U	97 UJ	97 U	160 J	98 U	98 U	96 U
Phenol	NA	NA	NA	NA	20 U	19 U	19 U	20 U	20 U	20 U	19 U
SVOCs (mg/kg // mg/kgOC)											
2-Methylnapthalene*	NA	NA	NA	NA	0.74 U	0.73 U	0.9 U	2.1	0.91 U	0.87 U	1.2 U
Acenaphthene*	NA	NA	NA	NA	3.0 J	4.6 J	0.95	5	.91 U	8.7	3.1
Acenaphthylene*	NA	NA	NA	NA	1.4 J	3.1 J	2	9.6	1.4	7.8	2.9
Anthracene*	NA	NA	NA	NA	4.4 J	8.1 J	5.2	26	3.5	27	6.3
Benz[a]anthracene*	NA	NA	NA	NA	13 J	25 J	15	96	10	96	16
Benzo[a]pyrene*	NA	NA	NA	NA	8.9 J	18 J	13	54	7.3	33	11
Benzo(b)fluoranthene	NA	NA	NA	NA	13 J	32 J	19	92	10	57	20
Benzo[g,h,i]perylene*	NA	NA	NA	NA	4.4 J	8.1 J	6.7	18	1.6	7	3.1
Benzo(k)fluoranthene	NA	NA	NA	NA	10 J	17 J	17	38	10	34	18
Bis[2-ethylhexyl]phthalate*	NA	NA	NA	NA	13 UJ	27 J	5.2 U	**88**	3.8 U	30	16 U
Butyl Benzyl Phthalate*	NA	NA	NA	NA	1.4	1.7	0.9 U	**46**	0.91 U	**19**	1.9
Chrysene*	NA	NA	NA	NA	17 J	35 J	27	**150**	17	**135**	29
Dibenz[a,h]anthracene*	NA	NA	NA	NA	1.9 J	4.2 J	2.9	11	0.91	4.3	1.3
Dibenzofuran*	NA	NA	NA	NA	0.89	1.2	0.95	3	0.91 U	2.3	2.3
Diethyl Phthalate*	NA	NA	NA	NA	0.74 U	0.73 U	0.9 U	0.83 U	0.91 U	2.2	1.2 U
Dimethyl Phthalate*	NA	NA	NA	NA	4.4	4.6	2.5	5.8	0.91 U	3.5	6.3
Di-n-butyl Phthalate*	NA	NA	NA	NA	0.74 U	0.73 U	0.9 U	2.1	0.91 U	2.5	1.2 U
Di-n-octyl Phthalate*	NA	NA	NA	NA	0.74 U	0.73 U	0.9 U	1.2 U	0.91 U	0.87 U	1.3
Fluoranthene*	NA	NA	NA	NA	35 J	100 J	18	**367**	8.6	**391**	41
Fluorene*	NA	NA	NA	NA	1.4 J	2 J	1.7	5.8	0.91	7.8	2.5
Indeno[1,2,3-cd]pyrene*	NA	NA	NA	NA	5.2 J	10 J	8.1	25	2.4	10	4.1
Napthalene*	NA	NA	NA	NA	0.93	1.1	0.95	2.5	0.91 U	1.4	1.3
N-nitrosodiphenylamine*	NA	NA	NA	NA	0.74 U	0.73 U	0.9 U	1.6 U	0.91 U	1 U	1.2 U
Phenanthrene*	NA	NA	NA	NA	10	13	10	42	4.5	65	24
Pyrene*	NA	NA	NA	NA	35 J	85 J	44 J	267	18	235	49
Total LPAH*	NA	NA	NA	NA	22	32	21	91	10	117	40
Total HPAH*	NA	NA	NA	NA	144	333	171	**1,116**	87	1,001	192
Total Benzofluoranthenes*	NA	NA	NA	NA	23 J	49 J	36	129	21	90	38
Pesticides (mg/kg // mg/kgOC)											
Hexachlorobenzene*	NA	NA	NA	NA	0.74 U	0.73 U	0.90 U	0.042 U	0.91 U	0.043 U	1.2 U
Hexachlorobutadiene*	NA	NA	NA	NA	0.74 U	0.73 U	0.90 U	1.2 U	0.91 U	0.87 U	1.2 U
PCBs (mg/kg // mg/kgOC)											
Aroclor 1016	NA	NA	NA	NA	NA	NA	NA	19 U	NA	20 U	NA
Aroclor 1221	NA	NA	NA	NA	NA	NA	NA	38 U	NA	39 U	NA
Aroclor 1232	NA	NA	NA	NA	NA	NA	NA	19 U	NA	20 U	NA
Aroclor 1242	NA	NA	NA	NA	NA	NA	NA	19 U	NA	20 U	NA
Aroclor 1248	NA	NA	NA	NA	NA	NA	NA	19 U	NA	20 U	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA	NA	220	NA	47	NA
Aroclor 1260	NA	NA	NA	NA	NA	NA	NA	68 Y	NA	38 Y	NA
Total PCBs*	NA	NA	NA	NA	NA	NA	NA	9.2	NA	2.0	NA

Table 4-4
Summary of Marine Sediment Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

TABLE A-2

	Sediment Management Standards [a]		**BC-3-1** 05/21/2010		**BC-3-2** 05/24/2010	**BC-4-1** 05/21/2010	**BC-4-2** 05/24/2010	**BC-5-1** 05/21/2010	**BC-5-2** 05/24/2010	**BC-6-1** 05/21/2010	**BC-6-2** 05/24/2010	**BC-7-2** 06/03/2010	**BC-8-2** 06/03/2010	**BC-9-2** 06/03/2010	**BC-10-2** 06/03/2010	**ESY-MS1** 03/05/03	**FD of ESY-MS1** 03/05/03	**ESY-MS2** 03/05/03	**ESY-MS3** 03/05/03	**ESY-MS4** 03/05/03	**ESY-MS5** 03/05/03	**ESY-MS6** 03/05/03
	Sediment Quality Standard (SQS)	Cleanup Screening Level (CSLs)	0-10 cm	Field Duplicate 0-10 cm	2-3 ft	0-10 cm	2-3 ft	0-10 cm	2-3 ft	0-10 cm	2-3 ft	1.5-4 ft	3-4 ft	1.5-2.5 ft	0.5-1.5 ft	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Organotins (ug/kg)																						
Tributyltin as TBT Ion	NE	73	**45000**	**20000**	29	**7300**	4	**25000**	17	32	3.2 U	NA	NA	NA	NA	**3,000**	NA	49	**900**	NA	NA	NA
Dibutyl Tin Ion	NE	NE	9700	5800	5.2 UJ	2400	5.2 UJ	7900	5.4 UJ	25	4.7 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Tin Ion	NE	NE	2400	2300	3.7 U	440	3.7 U	460	3.8 U	8	3.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organotins-Porewater (ug/L)												NA	NA	NA	NA							
Tributyltin as TBT Ion	0.05	0.15	**15**	**4.2**	NA	**2.7**	NA	**1**	NA	0.015	NA	**NA**	**NA**	**NA**	**NA**	**0.66**	**0.65**	0.033	**0.34**	0.019 U	**0.21**	0.024
Dibutyl Tin Ion	NE	NE	3	2.5	NA	0.72	NA	0.22	NA	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Tin Ion	NE	NE	0.38	0.69	NA	0.33	NA	0.1	NA	0.016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum Hydrocarbons (mg/kg)																						
Gasoline Range Organics - HCID	NE	NE	NA	NA	NA	20 U	NA	NA	NA	NA	NA	120 >	120 >	20 U	120 >	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics - HCID	NE	NE	NA	NA	NA	50 >	NA	NA	NA	NA	NA	310 >	310 >	50 U	290 >	NA	NA	NA	NA	NA	NA	NA
Lube Oil - HCID	NE	NE	NA	NA	NA	100 >	NA	NA	NA	NA	NA	620 >	620 U	100 U	580 >	NA	NA	NA	NA	NA	NA	NA
Diesel Range Organics	NE	NE	NA	NA	NA	230	NA	NA	NA	NA	NA	4700	2700	NA	7800	NA	NA	NA	NA	NA	NA	NA
Lube Oil	NE	NE	NA	NA	NA	1500	NA	NA	NA	NA	NA	260	1100	NA	380	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)																						
Arsenic	57	93	**90**	30	6 U	**110**	8	**99**	8	6 U	14	NA	NA	NA	NA	20	20	14	32	10	30	17
Cadmium	5.1	6.7	1.8	0.7	0.2 U	3.2	0.4	4	0.3	0.2 U	0.3	NA	NA	NA	NA	0.7	0.9	0.5	0.4	0.5	0.6	0.4
Chromium	260	270	190	96	30.9	86	29.3	85.6	30.8	36.9	32.9	NA	NA	NA	NA	64	60	51.5	84.1	48	83	52.9
Copper	390	390	**6190**	**2730**	21.3	**1390**	26	**1920**	24.9	36.4	23.2	NA	NA	NA	NA	161	174	117	**1,800**	80.1	**531**	76.9
Lead	450	530	225	133	3	217	21	**459**	21	18	17	NA	NA	NA	NA	52	46	20	94	13	56	17
Mercury	0.41	0.59	**6.7**	**1.88**	0.05	**0.88**	0.07	**1.99**	0.06	0.04	0.04	NA	NA	NA	NA	0.29	0.27	0.2	**0.53**	0.1	0.3	0.1
Nickel	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	52	52	43	51	41	53	47
Silver	6.1	6.1	**10.5**	0.8 UJ	0.3 U	0.9 U	0.4 U	0.8	0.4 U	0.3 U	0.4 U	NA	NA	NA	NA	0.6 U	0.6 U	0.6 U	0.5 U	0.6 U	0.6 U	0.6 U
Zinc	410	960	**2780**	**649**	53	**734**	56	**1070**	52	74	51	NA	NA	NA	NA	178 J	325 J	148	**797**	107	**433**	148
Ammonia (mg-N/kg)																						
Ammonia	NE	NE	1.25	0.48	0.25	0.34	2.17	1.63	1.86	0.61	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Sulfides (mg/kg)																						
Total Sulfides	NE	NE	1.33 UJ	1.9	1.1 UJ	18.9	273	752	137	292	155	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acid Volatile Sulfides	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Solids (%)																						
Total Solids	NE	NE	78.5	76.7	87.9	78.7	79	60.8	80.4	82	82.6	NA	NA	NA	NA	47.7	48	50.3	57.2	46	45.3	50.8
Total Volatile Solids (mg/kg)	NE	NE	2.65	3.59	0.66	3.83	1.82	9.87	1.56	1.5	1.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOC (%)																						
TOC	NE	NE	1.86	2.05	0.103	3.61	0.377	7.86	0.507	0.486	0.509	NA	NA	NA	NA	2.7	2.6	2.1	2.4	2.2	2.3	1.6

Notes:
Results exceeding Sediment Management Standard are **BOLD**
Highlighted results indicate reporting limit exceeds Sediment Management Standard
[a] Sediment Sampling and Analysis Plan Appendix; Washington State Department of Ecology, Publication 03-09-043, Revised February 2008 (WAC 173-204).
* The listed SQS value represents a concentration in parts per million (ppm) 'normalized' on a TOC basis.
** The listed SQS value represents the sum of the concentrations of the b, j, and k isomers of benzofluoranthene.
cm - centimeters
LCS/LCSD - Laboratory control sample/laboratory control sample duplicate
MS/MSD - Matrix spike/matrix spike duplicate
NA - Not analyzed
NE - Not established
PCBs - Polychlorinated biphenyls
RPD - Relative percent difference
SRM - Standard reference material
SVOCs - Semivolatile organic compounds
TOC - Total organic carbon
VOCs - Volatile organic compounds
Total LPAH = The sum of detected naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.
Total HPAH = The sum of detected fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene.
Total benzofluoranthenes= The sum of the b, j, and k isomers.
ug/kg - micrograms per kilogram
ug/L - micrograms per liter
ug/kgOC - micrograms per kilogram, 'normalized' for TOC
mg/kg - milligrams per kilogram
J - Estimated value
U - Compound was analyzed for but not detected above the reporting limit shown
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria			Dup of SC-56													Dup of SC-59		
Sample ID			SC-56	DUP-1	SC-56	SC-56	SC-57	SC-57	SC-57	SC-58	SC-58	SC-58	SC-59	SC-59	SC-59	SC-59	DUP-2	SC-59	SC-60
Laboratory Sample ID	Sediment	Cleanup	VG57E	VG57F	VG57M/VL06A	VG57N/VO97C	VG57G	VG57O	VG57P	VG57H	VG57Q/VL06B	VG57R	VG58D	VG58A	VG58E	VG58F/VL06C	VG58H/VL06D	VG58G	VG58I
Sample Date	Quality	Screening	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-12 to -14	-12 to -14	-14 to -16	-16 to -17	-13 to -14	-14 to -16	-16 to -17	-13 to -14	-14 to -16	-16 to -17	-9 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-14 to -16	-16 to -17	-10 to -11
TOTAL METALS (mg/kg)																			
Method SW6010B/7471A/200.8																			
Arsenic	57	93	14.5	13.6	11.4	NA	13.9	NA	NA	16.4	12.6	NA	NA	19.8	NA	10.0	9.0	NA	NA
Copper	390	390	76.7	73.0	33.6 J	NA	91.9	NA	NA	98.6	102	NA	NA	129 J	NA	113	110	NA	NA
Lead	450	530	19.0	22.2	9.0 J	NA	18.3	NA	NA	27.6	32.1	NA	NA	38.7 J	NA	59.7	55.7	NA	NA
Mercury	0.41	0.59	0.13	0.13	0.13	0.13	0.18	0.13	0.14	0.14	0.18	0.16	0.15	0.21 J	0.47	0.40	0.38	0.19	0.12
Silver			0.3 U	0.3 U	0.3 U	NA	0.4 U	NA	NA	0.4 U	0.6	NA	NA	0.4 U	NA	0.6	0.5	NA	NA
Zinc	410	960	108	102	54	NA	120	NA	NA	126	133	NA	NA	128 J	NA	148	138	NA	NA
TBT (mg/kg)																			
Method KRONE 1988 SIM																			
Tributyltin Ion	0.073 (h)	0.073 (h)	0.052	0.043	0.0022 J	NA	0.033	NA	NA	0.014	0.026	NA	NA	0.140	NA	0.037 U	0.037 U	NA	NA
Dibutyltin Ion	---	---	0.019 J	0.0079 J	0.0056 U	NA	0.017	NA	NA	0.0099	0.018	NA	NA	0.050	NA	0.055 U	0.056 U	NA	NA
Butyltin	---	---	0.0033 J	0.0024 J	0.0039 U	NA	0.0028 J	NA	NA	0.0023 J	0.0032 J	NA	NA	0.0087	NA	0.039 U	0.039 U	NA	NA
SEMIVOLATILES																			
Method SW8270																			
PAHs (mg/kg OC)																			
Naphthalene	99	170	9.390	8.015	9.859	20.130	3.464	NA	NA	7.109	7.749	NA	NA	10.063	NA	15.195	10.790	NA	NA
Acenaphthylene	66	66	2.254 J	1.641	2.077	3.571	2.071 U	NA	NA	2.701 U	1.328	NA	NA	1.195 U	NA	3.285	2.890	NA	NA
Acenaphthene	16	57	3.192	2.252	1.725	1.461	1.036 J	NA	NA	1.896 J	2.214	NA	NA	2.830	NA	6.776 J	3.468 J	NA	NA
Fluorene	23	79	4.695	3.473	1.796	1.623	1.571 J	NA	NA	2.986	2.620	NA	NA	3.145	NA	8.830 J	4.624 J	NA	NA
Phenanthrene	100	480	13.146	9.924	7.042	8.442	5.714	NA	NA	9.479	7.749	NA	NA	13.208	NA	15.811	15.414	NA	NA
Anthracene	220	1,200	5.164	3.702	1.620	1.623	3.143	NA	NA	6.161	3.690	NA	NA	5.409	NA	6.366 J	3.083 J	NA	NA
2-Methylnaphthalene	38	64	3.052	2.214	1.937	2.955	1.250 J	NA	NA	2.701	2.177	NA	NA	1.761	NA	4.723	3.468	NA	NA
LPAH (c,d)	370	780	37.840	29.008	24.120	36.851	14.929	--	--	27.630	25.351	--	--	34.654	--	56.263	40.270	--	--
Fluoranthene	160	1,200	17.840	16.031	4.577	5.844	12.500	NA	NA	22.749	22.509	NA	NA	46.541	NA	51.335	40.462	NA	NA
Pyrene	1,000	1,400	41.784	32.443	4.930	5.844	22.500	NA	NA	61.611	36.900	NA	NA	37.107	NA	47.228	40.462	NA	NA
Benzo(a)anthracene	110	270	8.451	5.344	1.620	0.974	7.143	NA	NA	9.953	7.380	NA	NA	12.579	NA	13.142	12.331	NA	NA
Chrysene	110	460	13.146	9.924	2.254	1.299	10.714	NA	NA	19.905	13.284	NA	NA	25.157	NA	26.694	26.975	NA	NA
Total Benzofluoranthenes (e)	230	450	23.944	16.031	3.099	1.753	17.143	NA	NA	32.701	17.712	NA	NA	20.755	NA	24.641	26.975	NA	NA
Benzo(a)pyrene	99	210	7.512	4.962	1.444	1.039	5.357	NA	NA	9.953	5.904	NA	NA	8.805	NA	6.982	8.092	NA	NA
Indeno(1,2,3-cd)pyrene	34	88	3.192	1.985	1.021	0.519 J	2.393	NA	NA	4.076	2.768	NA	NA	4.214	NA	4.517	5.010	NA	NA
Dibenz(a,h)anthracene	12	33	2.817 U	0.725 J	0.704	0.617 U	1.036 J	NA	NA	1.611 J	1.365	NA	NA	1.572	NA	2.033	2.312	NA	NA
Benzo(g,h,i)perylene	31	78	3.897	2.176	1.373	0.812 J	2.607	NA	NA	3.934	2.989	NA	NA	4.591	NA	5.133	5.588	NA	NA
HPAH (c,e,f)	960	5,300	119.765	89.618	21.021	18.084	81.393	--	--	166.493	110.812	--	--	161.321	--	181.704	168.208	--	--
SVOCs (mg/kg OC)																			
1,2-Dichlorobenzene	2.3	2.3	2.817 U	0.763 U	0.458 J	0.617 U	2.071 U	NA	NA	2.701 U	0.701 U	NA	NA	1.195 U	NA	0.842 U	0.674 U	NA	NA
1,3-Dichlorobenzene	None	None	2.817 U	0.763 U	0.423 J	0.617 U	2.071 U	NA	NA	2.701 U	0.701 U	NA	NA	1.195 U	NA	0.842 U	0.674 U	NA	NA
1,4-Dichlorobenzene	3.1	9	2.817 U	0.763 U	0.493 J	0.617 U	2.071 U	NA	NA	2.701 U	0.701 U	NA	NA	1.195 U	NA	0.554 J	2.312 J	NA	NA
1,2,4-Trichlorobenzene	1	1.8	2.817 U	0.763 U	0.493 J	0.617 U	2.071 U	NA	NA	2.701 U	0.701 U	NA	NA	1.195 U	NA	0.842 U	0.674 U	NA	NA
Hexachlorobenzene	0	2.3	2.817 U	0.763 U	0.669 UJ	0.617 U	2.071 U	NA	NA	2.701 U	0.701 UJ	NA	NA	1.195 U	NA	0.842 UJ	0.674 UJ	NA	NA
Dimethylphthalate	53	53	2.254 J	0.763 U	0.669 U	0.617 U	2.071 U	NA	NA	2.701 U	0.701	NA	NA	1.195 U	NA	0.842 U	0.674 U	NA	NA
Diethylphthalate	61	110	7.042 U	2.405	1.690 U	1.558 U	5.357 U	NA	NA	6.635 U	1.771 U	NA	NA	2.956 U	NA	2.053 U	1.696 U	NA	NA
Di-n-Butylphthalate	220	1,700	7.042 J	0.763 UJ	0.669	0.617 U	2.071 U	NA	NA	2.701 U	0.701 U	NA	NA	1.195 U	NA	0.842 U	0.674 U	NA	NA
Butylbenzylphthalate	5	64	2.817 U	0.763 U	0.775	0.617 U	2.071 U	NA	NA	1.896 J	0.480 J	NA	NA	1.195 U	NA	0.842 U	0.674 U	NA	NA
bis(2-Ethylhexyl)phthalate	47	78	11.737 U	9.160 U	1.831 U	0.455 U	10.000	NA	NA	12.796 U	6.273 U	NA	NA	6.289 U	NA	1.068 U	0.848 U	NA	NA
Di-n-Octyl phthalate	58	4,500	2.817 U	0.763 U	0.563 J	0.617 U	2.071 U	NA	NA	2.701 U	0.590 J	NA	NA	1.195 U	NA	0.842 U	0.674 U	NA	NA
Dibenzofuran	15	58	4.178	3.015	1.972	1.883	1.679 J	NA	NA	3.365	2.657	NA	NA	2.138	NA	3.901	2.505	NA	NA
Hexachlorobutadiene	4	6.2	2.817 U	0.763 U	0.458 J	0.617 U	2.071 U	NA	NA	2.701 U	0.701 U	NA	NA	1.195 U	NA	0.842 U	0.674 U	NA	NA
N-Nitrosodiphenylamine	11	11	2.817 U	0.763 U	0.342 J	0.617 U	2.071 U	NA	NA	2.701 U	0.701 U	NA	NA	1.195 U	NA	0.842 U	0.674 U	NA	NA

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria																		
				Dup of SC-56													Dup of SC-59		
Sample ID			SC-56	DUP-1	SC-56	SC-56	SC-57	SC-57	SC-57	SC-58	SC-58	SC-58	SC-59	SC-59	SC-59	SC-59	DUP-2	SC-59	SC-60
Laboratory Sample ID	Sediment	Cleanup	VG57E	VG57F	VG57M/VL06A	VG57N/VO97C	VG57G	VG57O	VG57P	VG57H	VG57Q/VL06B	VG57R	VG58D	VG58A	VG58E	VG58F/VL06C	VG58H/VL06D	VG58G	VG58I
Sample Date	Quality	Screening	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-12 to -14	-12 to -14	-14 to -16	-16 to -17	-13 to -14	-14 to -16	-16 to -17	-13 to -14	-14 to -16	-16 to -17	-9 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-14 to -16	-16 to -17	-10 to -11
SVOCs (mg/kg)																			
Phenol	0.42	1.2	**0.042** J	**0.038**	**0.068**	**0.072**	**0.035** J	NA	NA	**0.077**	**0.100**	NA	NA	**0.098**	NA	**0.200**	**0.160**	NA	NA
2-Methylphenol	0.063	0.063	0.060 U	0.020 U	**0.017** J	**0.012** J	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
4-Methylphenol	0.67	0.67	**0.110** J	**0.099**	**0.160**	**0.140**	**0.053** J	NA	NA	**0.063** J	**0.110**	NA	NA	**0.340**	NA	**0.880** J	**0.470** J	NA	NA
2,4-Dimethylphenol	0.029	0.029	0.120 U	0.039 U	**0.043**	0.039 U	0.120 U	NA	NA	0.110 U	0.038 U	NA	NA	0.038 U	NA	0.083 U	0.071 U	NA	NA
Pentachlorophenol	0.36	0.69	0.600 UJ	0.200 UJ	0.190 U	0.190 U	0.580 UJ	NA	NA	0.570 UJ	0.190 U	NA	NA	0.190 U	NA	0.410 U	0.350 U	NA	NA
Benzyl Alcohol	0.057	0.073	**0.068**	**0.052**	0.019 U	**0.024**	**0.035** J	NA	NA	**0.086**	**0.062** J	NA	NA	**0.030**	NA	**0.044** J	**0.041** J	NA	NA
Benzoic Acid	0.65	0.65	1.20 UJ	**0.120** J	**0.220** J	**0.130** J	1.20 UJ	NA	NA	1.10 UJ	**0.210** J	NA	NA	**0.180** J	NA	0.830 U	**0.200** J	NA	NA
Hexachloroethane	---	---	0.060 U	0.020 U	0.019 U	0.019 U	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
1-Methylnaphthalene	---	---	**0.036** J	**0.030**	**0.039**	**0.064**	0.058 U	NA	NA	0.057 U	**0.032**	NA	NA	**0.016** J	NA	**0.130**	**0.088**	NA	NA
2,2'-Oxybis(1-Chloropropane)	---	---	0.060 U	0.020 U	0.019 U	0.019 U	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
2,4,5-Trichlorophenol	---	---	0.300 U	0.098 U	0.097 U	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
2,4,6-Trichlorophenol	---	---	0.300 U	0.098 U	0.097 U	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
2,4-Dichlorophenol	---	---	0.600 U	0.200 U	**0.031** J	0.190 U	0.580 U	NA	NA	0.570 U	0.190 U	NA	NA	0.190 U	NA	0.410 U	0.350 U	NA	NA
2,4-Dinitrophenol	---	---	2.50 U	0.840 U	0.820 U	0.820 U	2.50 U	NA	NA	2.40 U	0.810 U	NA	NA	0.800 UJ	NA	1.800 U	1.500 U	NA	NA
2,4-Dinitrotoluene	---	---	0.300 U	0.098 U	0.097 U	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
2,6-Dinitrotoluene	---	---	0.300 U	0.098 U	0.097 U	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
2-Chloronaphthalene	---	---	0.060 U	0.020 U	0.019 U	0.019 U	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
2-Chlorophenol	---	---	0.060 U	0.020 U	0.019 U	0.019 U	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
2-Nitroaniline	---	---	0.300 U	0.098 U	0.097 U	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
2-Nitrophenol	---	---	0.300 U	0.098 U	0.097 U	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
3,3'-Dichlorobenzidine	---	---	0.450 U	0.150 U	0.140 UJ	0.140 U	0.440 U	NA	NA	0.430 U	0.140 UJ	NA	NA	0.140 UJ	NA	0.310 UJ	0.260 UJ	NA	NA
3-Nitroaniline	---	---	0.300 U	0.098 U	0.097 U	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
4,6-Dinitro-2-Methylphenol	---	---	0.600 U	0.200 U	0.190 U	0.190 U	0.580 U	NA	NA	0.570 U	0.190 U	NA	NA	0.190 U	NA	0.410 U	0.350 U	NA	NA
4-Bromophenyl-phenylether	---	---	0.060 U	0.020 U	0.019 U	0.019 U	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
4-Chloro-3-methylphenol	---	---	0.300 U	0.098 U	**0.041** J	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
4-Chloroaniline	---	---	0.800 U	0.270 U	0.260 UJ	0.260 U	0.790 U	NA	NA	0.770 U	0.260 U	NA	NA	0.250 U	NA	0.560 U	0.480 U	NA	NA
4-Chlorophenyl-phenylether	---	---	0.060 U	0.020 U	0.019 U	0.019 U	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
4-Nitroaniline	---	---	0.300 U	0.098 U	0.097 U	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
4-Nitrophenol	---	---	0.300 U	0.098 U	0.097 U	0.097 U	0.290 U	NA	NA	0.280 U	0.096 U	NA	NA	0.094 U	NA	0.210 U	0.180 U	NA	NA
bis(2-Chloroethoxy) Methane	---	---	0.060 U	0.020 U	0.019 UJ	0.019 U	0.058 U	NA	NA	0.057 U	0.019 UJ	NA	NA	0.019 U	NA	0.041 UJ	0.035 UJ	NA	NA
Bis-(2-Chloroethyl) Ether	---	---	0.060 U	0.020 U	0.019 UJ	0.019 U	0.058 U	NA	NA	0.057 U	0.019 UJ	NA	NA	0.019 U	NA	0.041 UJ	0.035 UJ	NA	NA
Carbazole	---	---	**0.036** J	**0.026**	**0.019**	**0.0097** J	0.058 U	NA	NA	**0.043** J	**0.036**	NA	NA	**0.031**	NA	0.041 U	0.035 U	NA	NA
Hexachlorocyclopentadiene	---	---	1.20 U	0.390 U	0.390 U	0.390 U	1.20 U	NA	NA	1.10 U	0.380 U	NA	NA	0.380 U	NA	0.830 U	0.710 U	NA	NA
Isophorone	---	---	0.060 U	0.020 U	0.019 U	0.019 U	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
Nitrobenzene	---	---	0.060 U	0.020 U	0.019 U	0.019 U	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
N-Nitroso-Di-N-Propylamine	---	---	0.060 U	0.020 U	0.019 U	0.019 U	0.058 U	NA	NA	0.057 U	0.019 U	NA	NA	0.019 U	NA	0.041 U	0.035 U	NA	NA
PCBs (mg/kg OC)																			
Method SW8082																			
Aroclor 1016	---	---	0.178 U	0.145 U	0.137 U	NA	0.139 U	NA	NA	0.190 U	0.148 U	NA	NA	0.245 U	NA	0.080 U	0.075 U	NA	NA
Aroclor 1242	---	---	0.178 U	0.145 U	0.137 U	NA	0.139 U	NA	NA	0.190 U	0.148 U	NA	NA	0.245 U	NA	0.080 U	0.075 U	NA	NA
Aroclor 1248	---	---	**1.221**	**0.725**	0.137 U	NA	**0.500**	NA	NA	**0.806**	**0.517**	NA	NA	**2.830**	NA	**3.080**	**2.505**	NA	NA
Aroclor 1254	---	---	**1.784**	**1.221**	0.137 U	NA	**0.750**	NA	NA	**1.232**	**0.812**	NA	NA	**4.025**	NA	**1.314** J	**2.119** J	NA	NA
Aroclor 1260	---	---	**0.657**	**0.496**	0.137 U	NA	**0.429**	NA	NA	**0.569**	**0.443**	NA	NA	**2.642**	NA	**1.253**	**0.886**	NA	NA
Aroclor 1221	---	---	0.178 U	0.145 U	0.137 U	NA	0.139 U	NA	NA	0.190 U	0.148 U	NA	NA	0.245 U	NA	0.080 U	0.075 U	NA	NA
Aroclor 1232	---	---	0.178 U	0.145 U	0.137 U	NA	0.139 U	NA	NA	0.190 U	0.148 U	NA	NA	0.245 U	NA	0.080 U	0.075 U	NA	NA
Aroclor 1262	---	---	0.178 U	0.145 U	0.137 U	NA	0.139 U	NA	NA	0.190 U	0.148 U	NA	NA	0.245 U	NA	0.080 U	0.075 U	NA	NA
Aroclor 1268	---	---	0.178 U	0.145 U	0.137 U	NA	0.139 U	NA	NA	0.190 U	0.148 U	NA	NA	0.245 U	NA	0.080 U	0.075 U	NA	NA
Total PCBs (c)	12	65	**3.662**	**2.443**	NA	NA	**1.679**	NA	NA	**2.607**	**1.771**	--	--	**9.497**	--	**5.647** J	**5.511** J	--	--
CONVENTIONALS																			
Total Solids (SM2540B; %)	---	---	**59.00**	**59.70**	**63.70**	**57.50**	**51.90**	NA	NA	**53.70**	**56.40**	NA	NA	**50.30**	NA	**47.80**	**46.10**	NA	NA
Total Organic Carbon (Plumb 1981; %)	10 (g)	10 (g)	**2.13**	**2.62**	**2.84**	**3.08**	**2.80**	NA	NA	**2.11**	**2.71**	NA	NA	**1.59**	NA	**4.87**	**5.19**	NA	NA

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria										
Sample ID			SC-60	SC-60	SC-60	SC-60	SC-61	SC-61	SC-61	SC-61	SC-61
Laboratory Sample ID	Sediment	Cleanup	VG58B	VG58J/VL06E	VG58K	VG58L	VG58M	VG58C	VG58N/VL06F	VG58O	VG58P
Sample Date	Quality	Screening	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-11 to -12	-12 to -14	-14 to -16	-16 to -17	-9 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-16 to -17
TOTAL METALS (mg/kg)											
Method SW6010B/7471A/200.8											
Arsenic	57	93	**14.5**	**9.9**	NA	NA	NA	**13.4**	**11.5**	NA	NA
Copper	390	390	**76**	**64.1**	NA	NA	NA	**85.4**	**85**	NA	NA
Lead	450	530	**19.9**	**27.5**	NA	NA	NA	**35.4**	**44.1**	NA	NA
Mercury	0.41	0.59	**0.16**	**0.23**	**0.31**	**0.28**	**0.14**	**0.43**	**0.30**	**0.22**	**0.15**
Silver			0.4 U	0.3 U	NA	NA	NA	**0.4**	**0.4**	NA	NA
Zinc	410	960	**109**	**106**	NA	NA	NA	**128**	**127**	NA	NA
TBT (mg/kg)											
Method KRONE 1988 SIM											
Tributyltin Ion	0.073 (h)	0.073 (h)	0.0038 U	**0.021**	NA	NA	NA	**0.0096**	0.0037 U	NA	NA
Dibutyltin Ion	---	---	0.0056 U	**0.0044** J	NA	NA	NA	**0.0065**	0.0055 U	NA	NA
Butyltin	---	---	0.0040 U	0.0037 U	NA	NA	NA	0.0038 U	0.0039 U	NA	NA
SEMIVOLATILES											
Method SW8270											
PAHs (mg/kg OC)											
Naphthalene	99	170	**18.239**	**20.673**	NA	NA	NA	**3.385**	**16.794**	NA	NA
Acenaphthylene	66	66	**2.075**	**2.692**	NA	NA	NA	**0.708**	**2.519**	NA	NA
Acenaphthene	16	57	**2.138**	**2.596**	NA	NA	NA	**1.015**	**3.053**	NA	NA
Fluorene	23	79	**1.950**	**2.596**	NA	NA	NA	**1.231**	**3.130**	NA	NA
Phenanthrene	100	480	**7.547**	**10.577**	NA	NA	NA	**4.615**	**14.885**	NA	NA
Anthracene	220	1,200	**1.447**	**3.029**	NA	NA	NA	**1.754**	**2.290**	NA	NA
2-Methylnaphthalene	38	64	**2.673**	**3.173**	NA	NA	NA	**0.862**	**3.359**	NA	NA
LPAH (c,d)	370	780	**33.396**	**42.163**	--	--	--	**12.708**	**42.672**	--	--
Fluoranthene	160	1,200	**4.717**	**19.231**	NA	NA	NA	**15.077**	**16.794**	NA	NA
Pyrene	1,000	1,400	**4.717**	**16.346**	NA	NA	NA	**12.615**	**12.595**	NA	NA
Benzo(a)anthracene	110	270	**0.723**	**4.808**	NA	NA	NA	**4.308**	**2.595**	NA	NA
Chrysene	110	460	**1.164**	**7.692**	NA	NA	NA	**7.692**	**3.817**	NA	NA
Total Benzofluoranthenes (e)	230	450	**1.384**	**8.654**	NA	NA	NA	**7.692**	**4.580**	NA	NA
Benzo(a)pyrene	99	210	**0.755**	**3.173**	NA	NA	NA	**2.862**	**1.870**	NA	NA
Indeno(1,2,3-cd)pyrene	34	88	**0.409** J	**1.683**	NA	NA	NA	**1.569**	**1.183**	NA	NA
Dibenz(a,h)anthracene	12	33	0.629 U	**0.769** J	NA	NA	NA	**0.492** J	**0.496** J	NA	NA
Benzo(g,h,i)perylene	31	78	**0.692**	**1.923**	NA	NA	NA	**1.785**	**1.565**	NA	NA
HPAH (c,e,f)	960	5,300	**14.560**	**64.279**	--	--	--	**54.092**	**45.496**	--	--
SVOCs (mg/kg OC)											
1,2-Dichlorobenzene	2.3	2.3	0.629 U	0.913 U	NA	NA	NA	0.585 U	0.725 U	NA	NA
1,3-Dichlorobenzene	None	None	0.629 U	0.913 U	NA	NA	NA	0.585 U	0.725 U	NA	NA
1,4-Dichlorobenzene	3.1	9	0.629 U	**528.846**	NA	NA	NA	0.585 U	**1.718**	NA	NA
1,2,4-Trichlorobenzene	1	1.8	0.629 U	0.913 U	NA	NA	NA	0.585 U	0.725 U	NA	NA
Hexachlorobenzene	0	2.3	0.629 U	0.913 UJ	NA	NA	NA	0.585 U	0.725 UJ	NA	NA
Dimethylphthalate	53	53	0.629 U	0.913 U	NA	NA	NA	0.585 U	0.725 U	NA	NA
Diethylphthalate	61	110	1.541 U	2.308 U	NA	NA	NA	**1.477**	1.832 U	NA	NA
Di-n-Butylphthalate	220	1,700	0.629 U	0.913 U	NA	NA	NA	0.585 U	0.725 U	NA	NA
Butylbenzylphthalate	5	64	0.629 U	0.913 U	NA	NA	NA	0.585 U	0.725 U	NA	NA
bis(2-Ethylhexyl)phthalate	47	78	1.824 U	2.404 U	NA	NA	NA	5.538 U	1.603 U	NA	NA
Di-n-Octyl phthalate	58	4,500	0.629 U	0.913 U	NA	NA	NA	0.585 U	0.725 U	NA	NA
Dibenzofuran	15	58	**1.509**	**2.356**	NA	NA	NA	**0.800**	**2.519**	NA	NA
Hexachlorobutadiene	4	6.2	0.629 U	0.913 U	NA	NA	NA	0.585 U	0.725 U	NA	NA
N-Nitrosodiphenylamine	11	11	0.629 U	0.913 U	NA	NA	NA	0.585 U	0.725 U	NA	NA

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria										
Sample ID			SC-60	SC-60	SC-60	SC-60	SC-61	SC-61	SC-61	SC-61	SC-61
Laboratory Sample ID	Sediment	Cleanup	VG58B	VG58J/VL06E	VG58K	VG58L	VG58M	VG58C	VG58N/VL06F	VG58O	VG58P
Sample Date	Quality	Screening	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012	08/20/2012
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-11 to -12	-12 to -14	-14 to -16	-16 to -17	-9 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-16 to -17
SVOCs (mg/kg)											
Phenol	0.42	1.2	**0.120**	**0.040**	NA	NA	NA	**0.064**	**0.099**	NA	NA
2-Methylphenol	0.063	0.063	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
4-Methylphenol	0.67	0.67	**0.780**	**0.510**	NA	NA	NA	**0.150**	**0.110**	NA	NA
2,4-Dimethylphenol	0.029	0.029	0.039 U	0.038 U	NA	NA	NA	0.038 U	0.038 U	NA	NA
Pentachlorophenol	0.36	0.69	0.200 U	0.190 U	NA	NA	NA	0.190 U	0.190 U	NA	NA
Benzyl Alcohol	0.057	0.073	**0.027**	**0.030** J	NA	NA	NA	**0.028**	**0.052** J	NA	NA
Benzoic Acid	0.65	0.65	**0.140** J	**0.240** J	NA	NA	NA	0.380 U	**0.200** J	NA	NA
Hexachloroethane	---	---	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
1-Methylnaphthalene	---	---	**0.048**	**0.041**	NA	NA	NA	**0.014** J	**0.042**	NA	NA
2,2'-Oxybis(1-Chloropropane)	---	---	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
2,4,5-Trichlorophenol	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
2,4,6-Trichlorophenol	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
2,4-Dichlorophenol	---	---	0.200 U	0.190 U	NA	NA	NA	0.190 U	0.190 U	NA	NA
2,4-Dinitrophenol	---	---	0.830 UJ	0.820 U	NA	NA	NA	0.800 UJ	0.810 U	NA	NA
2,4-Dinitrotoluene	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
2,6-Dinitrotoluene	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
2-Chloronaphthalene	---	---	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
2-Chlorophenol	---	---	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
2-Nitroaniline	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
2-Nitrophenol	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
3,3'-Dichlorobenzidine	---	---	0.150 UJ	0.140 UJ	NA	NA	NA	0.140 UJ	0.140 UJ	NA	NA
3-Nitroaniline	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
4,6-Dinitro-2-Methylphenol	---	---	0.200 U	0.190 U	NA	NA	NA	0.190 U	0.190 U	NA	NA
4-Bromophenyl-phenylether	---	---	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
4-Chloro-3-methylphenol	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
4-Chloroaniline	---	---	0.260 U	0.260 U	NA	NA	NA	0.260 U	0.260 U	NA	NA
4-Chlorophenyl-phenylether	---	---	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
4-Nitroaniline	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
4-Nitrophenol	---	---	0.098 U	0.096 U	NA	NA	NA	0.095 U	0.095 U	NA	NA
bis(2-Chloroethoxy) Methane	---	---	0.020 U	0.019 UJ	NA	NA	NA	0.019 U	0.019 UJ	NA	NA
Bis-(2-Chloroethyl) Ether	---	---	0.020 U	0.019 UJ	NA	NA	NA	0.019 U	0.019 UJ	NA	NA
Carbazole	---	---	**0.012** J	**0.014** J	NA	NA	NA	**0.016** J	**0.018** J	NA	NA
Hexachlorocyclopentadiene	---	---	0.390 U	0.380 U	NA	NA	NA	0.380 U	0.380 U	NA	NA
Isophorone	---	---	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
Nitrobenzene	---	---	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
N-Nitroso-Di-N-Propylamine	---	---	0.020 U	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA
PCBs (mg/kg OC)											
Method SW8082											
Aroclor 1016	---	---	0.123 U	0.962 U	NA	NA	NA	1.200 U	0.153 U	NA	NA
Aroclor 1242	---	---	0.123 U	0.962 U	NA	NA	NA	1.200 U	0.153 U	NA	NA
Aroclor 1248	---	---	**0.597**	**1.442**	NA	NA	NA	**2.738**	**2.176**	NA	NA
Aroclor 1254	---	---	**0.786**	**1.346**	NA	NA	NA	**3.385**	**2.366**	NA	NA
Aroclor 1260	---	---	**0.535**	0.962 U	NA	NA	NA	**1.908**	**1.756**	NA	NA
Aroclor 1221	---	---	0.123 U	0.962 U	NA	NA	NA	1.200 U	0.153 U	NA	NA
Aroclor 1232	---	---	0.123 U	0.962 U	NA	NA	NA	1.200 U	0.153 U	NA	NA
Aroclor 1262	---	---	0.123 U	0.962 U	NA	NA	NA	1.200 U	0.153 U	NA	NA
Aroclor 1268	---	---	0.123 U	0.962 U	NA	NA	NA	1.200 U	0.153 U	NA	NA
Total PCBs (c)	12	65	**1.918**	**2.788**	--	--	--	**8.031**	**6.298**	--	--
CONVENTIONALS											
Total Solids (SM2540B; %)	---	---	**50.60**	**58.60**	NA	NA	NA	**52.90**	**52.50**	NA	NA
Total Organic Carbon (Plumb 1981; %)	10 (g)	10 (g)	**3.18**	**2.08**	NA	NA	NA	**3.25**	**2.62**	NA	NA

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

Sample ID	SMS Criteria: Sediment Quality Standard (a)	SMS Criteria: Cleanup Screening Level (b)	SC-62	SC-62	SC-62	SC-62	SC-63	SC-63	SC-63	SC-63	DUP of SC-63 DUP-3	SC-63	SC-64	SC-64	SC-64	SC-64	SC-65	SC-65	SC-65
Laboratory Sample ID			VG79A/VO97A	VG79B/VO97B	VG79C/VQ99A	VG79D/VQ99B	VG79E	VG79F	VG79G/VL06G	VG79H	VG79J	VG79I	VG79K/VL06H	VG79L/VL06I	VG79M	VG79N	VG79O/VL06J	VG79P/VL06L	VG79Q
Sample Date			08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012
Sample Depth (ft below mudline)			-11.4 to -12	-12 to -14	-14 to -16	-16 to -17	-9 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-14 to -16	-16 to -17	-11 to -12	-12 to -14	-14 to -16	-16 to -17	-11 to -12	-12 to -14	-14 to -16
TOTAL METALS (mg/kg)																			
Method SW6010B/7471A/200.8																			
Arsenic	57	93	**12.2**	**13.0**	NA	NA	NA	NA	**10.7**	NA	NA	NA	**12.4**	**10.6**	NA	NA	**13.1**	**13.4**	NA
Copper	390	390	**74.8**	**75.4**	NA	NA	NA	NA	**86**	NA	NA	NA	**74.8**	**77**	NA	NA	**80.2**	**77**	NA
Lead	450	530	**14.3**	**18.4**	NA	NA	NA	NA	**267**	NA	NA	NA	**17.2**	**32.8**	NA	NA	**26.2**	**18.6**	NA
Mercury	0.41	0.59	**0.12**	**0.14**	**0.20**	**0.19**	**0.23**	**1.17**	**0.35**	**0.29** J	**0.44** J	**0.06**	**0.15**	**0.20**	**0.30**	**0.43**	**0.15**	**0.17**	**0.17**
Silver			0.4 U	0.3 U	NA	NA	NA	NA	**0.4**	NA	NA	NA	0.4 U	0.4 U	NA	NA	0.4 U	0.4 U	NA
Zinc	410	960	**103**	**103**	NA	NA	NA	NA	**115**	NA	NA	NA	**107**	**108**	NA	NA	**111**	**115**	NA
TBT (mg/kg)																			
Method KRONE 1988 SIM																			
Tributyltin Ion	0.073 (h)	0.073 (h)	**0.054**	**0.037**	NA	NA	NA	NA	**0.024**	NA	NA	NA	**0.018**	**0.026**	NA	NA	**0.017**	**0.0090**	NA
Dibutyltin Ion	---	---	**0.016**	**0.014**	NA	NA	NA	NA	**0.011**	NA	NA	NA	**0.0084**	**0.0099**	NA	NA	**0.011**	**0.0038** J	NA
Butyltin	---	---	**0.0041**	**0.0035** J	NA	NA	NA	NA	**0.0024** J	NA	NA	NA	0.0037 U	**0.0025** J	NA	NA	**0.0034** J	**0.0021** J	NA
SEMIVOLATILES																			
Method SW8270																			
PAHs (mg/kg OC)																			
Naphthalene	99	170	**8.738**	**12.664**	**27.239**	**25.143**	NA	NA	**14.737**	NA	NA	NA	**10.949**	**3.000**	NA	NA	**1.803**	**4.348**	NA
Acenaphthylene	66	66	0.922 U	0.786 U	**4.104**	**4.000**	NA	NA	**1.649**	NA	NA	NA	**1.314**	**0.481** J	NA	NA	**0.374** J	**0.507** J	NA
Acenaphthene	16	57	**1.990**	**4.803**	**4.851**	**3.486**	NA	NA	**10.877**	NA	NA	NA	**1.387**	**0.778**	NA	NA	0.646 U	**0.471** J	NA
Fluorene	23	79	**3.107**	**5.240**	**6.716**	**5.486**	NA	NA	**7.719**	NA	NA	NA	**1.460**	**1.074**	NA	NA	**0.408** J	**0.471** J	NA
Phenanthrene	100	480	**10.194**	**17.904**	**21.269**	**21.143**	NA	NA	**23.509**	NA	NA	NA	**4.745**	**5.926**	NA	NA	**1.361**	**1.884**	NA
Anthracene	220	1,200	**3.252**	**4.105**	**7.090**	**4.971**	NA	NA	**6.316**	NA	NA	NA	**1.387**	**1.222**	NA	NA	**0.510** J	**0.351** J	NA
2-Methylnaphthalene	38	64	**2.913**	**5.240**	**7.090**	**6.286**	NA	NA	**3.860**	NA	NA	NA	**1.934**	**0.704**	NA	NA	**0.408** J	**0.652** J	NA
LPAH (c,d)	370	780	**27.282**	**44.716**	**71.269**	**64.229**	--	--	**64.807**	--	--	--	**21.241**	**12.481**	--	--	**4.456**	**8.043**	--
Fluoranthene	160	1,200	**16.505**	**20.087**	**52.239**	**25.143**	NA	NA	**42.105**	NA	NA	NA	**4.380**	**12.593**	NA	NA	**2.245**	**1.667**	NA
Pyrene	1,000	1,400	**21.845**	**33.624**	**37.313**	**20.000**	NA	NA	**29.825**	NA	NA	NA	**7.299**	**11.111**	NA	NA	**4.762**	**2.029**	NA
Benzo(a)anthracene	110	270	**4.854**	**4.803**	**8.955**	**4.229**	NA	NA	**6.316**	NA	NA	NA	**1.277**	**4.074**	NA	NA	**1.122**	**0.471** J	NA
Chrysene	110	460	**8.738**	**8.734**	**12.687**	**6.286**	NA	NA	**9.474**	NA	NA	NA	**2.226**	**8.519**	NA	NA	**2.415**	**0.688**	NA
Total Benzofluoranthenes (e)	230	450	**12.621**	**14.847**	**15.672**	**7.429**	NA	NA	**8.070**	NA	NA	NA	**3.504**	**8.889**	NA	NA	**3.163**	**1.051** J	NA
Benzo(a)pyrene	99	210	**4.175**	**4.803**	**5.597**	**3.314**	NA	NA	**3.263**	NA	NA	NA	**1.350**	**3.296**	NA	NA	**1.190**	**0.471** J	NA
Indeno(1,2,3-cd)pyrene	34	88	**2.330**	**2.096**	**2.799**	**1.714**	NA	NA	**1.684**	NA	NA	NA	**0.693**	**1.889**	NA	NA	**0.578** J	0.688 U	NA
Dibenz(a,h)anthracene	12	33	**0.922**	**0.830**	**0.933**	**1.086**	NA	NA	**0.737**	NA	NA	NA	0.693 U	**0.593** J	NA	NA	0.646 U	0.688 U	NA
Benzo(g,h,i)perylene	31	78	**3.107** J	**2.140** J	**3.619**	**2.686**	NA	NA	**2.035**	NA	NA	NA	**0.839**	**1.926**	NA	NA	**0.578** J	**0.351** J	NA
HPAH (c,e,f)	960	5,300	**75.097**	**91.965**	**139.813**	**70.800**	--	--	**103.509**	--	--	--	**21.569**	**52.889**	--	--	**16.054**	**6.728**	--
SVOCs (mg/kg OC)																			
1,2-Dichlorobenzene	2.3	2.3	0.922 U	0.786 U	0.709 U	1.086 U	NA	NA	0.667 U	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA
1,3-Dichlorobenzene	None	None	0.922 U	0.786 U	0.709 U	1.086 U	NA	NA	0.667 U	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA
1,4-Dichlorobenzene	3.1	9	0.922 U	0.786 U	0.709 U	1.086 U	NA	NA	**0.340** J	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA
1,2,4-Trichlorobenzene	1	1.8	0.922 U	0.786 U	0.709 U	1.086 U	NA	NA	0.667 U	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA
Hexachlorobenzene	0	2.3	0.922 U	0.786 U	0.709 U	1.086 U	NA	NA	0.667 UJ	NA	NA	NA	0.693 UJ	0.704 UJ	NA	NA	0.646 UJ	0.688 UJ	NA
Dimethylphthalate	53	53	0.922 U	**1.048**	0.709 U	1.086 U	NA	NA	0.667 U	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA
Diethylphthalate	61	110	2.330 U	2.009 U	1.754 U	2.686 U	NA	NA	1.684 U	NA	NA	NA	1.752 U	1.741 U	NA	NA	1.633 U	1.739 U	NA
Di-n-Butylphthalate	220	1,700	0.922 U	0.786 U	0.709 U	**1.257**	NA	NA	**5.614**	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA
Butylbenzylphthalate	5	64	0.922 U	0.786 U	0.709 U	1.086 U	NA	NA	0.667 U	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA
bis(2-Ethylhexyl)phthalate	47	78	**4.854** U	**5.677** U	2.015 U	1.600 U	NA	NA	2.351 U	NA	NA	NA	1.898 U	2.407 U	NA	NA	2.959 U	1.341 U	NA
Di-n-Octyl phthalate	58	4,500	**0.583** J	0.786 U	0.709 U	1.086 U	NA	NA	0.667 U	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA
Dibenzofuran	15	58	**3.058**	**4.803**	**6.343**	**4.571**	NA	NA	**5.965**	NA	NA	NA	**1.350**	**0.704**	NA	NA	**0.408** J	**0.471** J	NA
Hexachlorobutadiene	4	6.2	0.922 U	0.786 U	0.709 U	1.086 U	NA	NA	0.667 U	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA
N-Nitrosodiphenylamine	11	11	0.922 U	0.786 U	0.709 U	1.086 U	NA	NA	0.667 U	NA	NA	NA	0.693 U	0.704 U	NA	NA	0.646 U	0.688 U	NA

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria										DUP of SC-63								
Sample ID			SC-62	SC-62	SC-62	SC-62	SC-63	SC-63	SC-63	SC-63	DUP-3	SC-63	SC-64	SC-64	SC-64	SC-64	SC-65	SC-65	SC-65
Laboratory Sample ID	Sediment	Cleanup	VG79A/VO97A	VG79B/VO97B	VG79C/VQ99A	VG79D/VQ99B	VG79E	VG79F	VG79G/VL06G	VG79H	VG79J	VG79I	VG79K/VL06H	VG79L/VL06I	VG79M	VG79N	VG79O/VL06J	VG79P/VL06L	VG79Q
Sample Date	Quality	Screening	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-11.4 to -12	-12 to -14	-14 to -16	-16 to -17	-9 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-14 to -16	-16 to -17	-11 to -12	-12 to -14	-14 to -16	-16 to -17	-11 to -12	-12 to -14	-14 to -16
SVOCs (mg/kg)																			
Phenol	0.42	1.2	**0.070**	**0.091**	**0.13**	**0.063**	NA	NA	**0.130**	NA	NA	NA	**0.160**	**0.081**	NA	NA	**0.120**	**0.052**	NA
2-Methylphenol	0.063	0.063	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
4-Methylphenol	0.67	0.67	**0.090**	**0.350**	**0.200**	**0.180**	NA	NA	**0.270**	NA	NA	NA	**0.520**	**0.130**	NA	NA	**0.045**	**0.330**	NA
2,4-Dimethylphenol	0.029	0.029	0.038 U	0.037 U	0.038 U	0.038 U	NA	NA	0.039 U	NA	NA	NA	0.038 U	0.038 U	NA	NA	0.038 U	0.039 U	NA
Pentachlorophenol	0.36	0.69	0.190 U	0.180 U	0.19 U	0.19 U	NA	NA	0.190 U	NA	NA	NA	0.190 U	0.190 U	NA	NA	0.190 U	0.190 U	NA
Benzyl Alcohol	0.057	0.073	**0.140**	**0.093**	**0.065**	0.019 U	NA	NA	**0.048** J	NA	NA	NA	**0.042** J	**0.030** J	NA	NA	**0.035** J	**0.018** J	NA
Benzoic Acid	0.65	0.65	**0.260** J	**0.210** J	0.38 U	0.38 U	NA	NA	**0.210** J	NA	NA	NA	**0.200** J	**0.110** J	NA	NA	**0.130** J	0.390 U	NA
Hexachloroethane	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
1-Methylnaphthalene	---	---	**0.031**	**0.080**	**0.110**	**0.064**	NA	NA	**0.059**	NA	NA	NA	**0.029**	**0.010** J	NA	NA	0.019 U	**0.011** J	NA
2,2'-Oxybis(1-Chloropropane)	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
2,4,5-Trichlorophenol	---	---	0.095 U	0.092 U	0.094 U	0.094 U	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
2,4,6-Trichlorophenol	---	---	0.095 U	0.092 U	0.094 U	0.094 U	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
2,4-Dichlorophenol	---	---	0.190 U	0.180 U	0.19 U	0.19 U	NA	NA	0.190 U	NA	NA	NA	0.190 U	0.190 U	NA	NA	0.190 U	0.190 U	NA
2,4-Dinitrophenol	---	---	0.810 U	0.780 U	0.8 U	0.8 U	NA	NA	0.820 U	NA	NA	NA	0.820 U	0.810 U	NA	NA	0.820 U	0.820 U	NA
2,4-Dinitrotoluene	---	---	0.095 U	0.092 U	0.094 U	0.094 U	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
2,6-Dinitrotoluene	---	---	0.095 U	0.092 U	0.094 U	0.094 U	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
2-Chloronaphthalene	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
2-Chlorophenol	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
2-Nitroaniline	---	---	0.095 U	0.092 U	0.094 UJ	0.094 UJ	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
2-Nitrophenol	---	---	0.095 U	0.092 U	0.094 U	0.094 U	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
3,3'-Dichlorobenzidine	---	---	0.140 U	0.140 U	0.14 U	0.14 U	NA	NA	0.150 UJ	NA	NA	NA	0.140 UJ	0.140 UJ	NA	NA	0.140 UJ	0.150 UJ	NA
3-Nitroaniline	---	---	0.095 U	0.092 U	0.094 UJ	0.094 UJ	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
4,6-Dinitro-2-Methylphenol	---	---	0.190 U	0.180 U	0.19 U	0.19 U	NA	NA	0.190 U	NA	NA	NA	0.190 U	0.190 U	NA	NA	0.190 U	0.190 U	NA
4-Bromophenyl-phenylether	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
4-Chloro-3-methylphenol	---	---	0.095 U	0.092 U	0.094 U	0.094 U	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
4-Chloroaniline	---	---	0.260 U	0.250 U	0.25 U	0.26 U	NA	NA	0.260 U	NA	NA	NA	0.260 U	0.260 U	NA	NA	0.260 U	0.260 U	NA
4-Chlorophenyl-phenylether	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
4-Nitroaniline	---	---	0.095 U	0.092 U	0.094 UJ	0.094 UJ	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
4-Nitrophenol	---	---	0.095 U	0.092 U	0.094 U	0.094 U	NA	NA	0.097 U	NA	NA	NA	0.096 U	0.095 U	NA	NA	0.096 U	0.097 U	NA
bis(2-Chloroethoxy) Methane	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 UJ	NA	NA	NA	0.019 UJ	0.019 UJ	NA	NA	0.019 UJ	0.019 UJ	NA
Bis-(2-Chloroethyl) Ether	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 UJ	NA	NA	NA	0.019 UJ	0.019 UJ	NA	NA	0.019 UJ	0.019 UJ	NA
Carbazole	---	---	**0.025**	**0.034**	**0.038**	**0.020**	NA	NA	**0.040**	NA	NA	NA	**0.014** J	0.019 U	NA	NA	0.019 U	0.019 U	NA
Hexachlorocyclopentadiene	---	---	0.380 U	0.370 U	0.38 U	0.38 U	NA	NA	0.390 U	NA	NA	NA	0.380 U	0.380 U	NA	NA	0.380 U	0.390 U	NA
Isophorone	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
Nitrobenzene	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
N-Nitroso-Di-N-Propylamine	---	---	0.019 U	0.018 U	0.019 U	0.019 U	NA	NA	0.019 U	NA	NA	NA	0.019 U	0.019 U	NA	NA	0.019 U	0.019 U	NA
PCBs (mg/kg OC)																			
Method SW8082																			
Aroclor 1016	---	---	0.184 U	0.166 U	NA	NA	NA	NA	0.667 U	NA	NA	NA	0.142 U	0.148 U	NA	NA	0.129 U	0.141 U	NA
Aroclor 1242	---	---	0.184 U	0.166 U	NA	NA	NA	NA	0.667 U	NA	NA	NA	0.142 U	0.148 U	NA	NA	0.129 U	0.141 U	NA
Aroclor 1248	---	---	0.631 U	1.659 U	NA	NA	NA	NA	**6.667**	NA	NA	NA	**0.438**	**1.148**	NA	NA	**0.442**	**0.471**	NA
Aroclor 1254	---	---	**0.971**	**2.140**	NA	NA	NA	NA	**4.211**	NA	NA	NA	**0.547**	**1.481**	NA	NA	**0.544**	**0.543**	NA
Aroclor 1260	---	---	**0.583**	**0.961**	NA	NA	NA	NA	**2.667**	NA	NA	NA	**0.511**	**1.407**	NA	NA	**0.374**	**0.362**	NA
Aroclor 1221	---	---	0.184 U	0.166 U	NA	NA	NA	NA	0.667 U	NA	NA	NA	0.142 U	0.148 U	NA	NA	0.129 U	0.141 U	NA
Aroclor 1232	---	---	0.184 U	0.166 U	NA	NA	NA	NA	0.667 U	NA	NA	NA	0.142 U	0.148 U	NA	NA	0.129 U	0.141 U	NA
Aroclor 1262	---	---	0.364 U	0.611 U	NA	NA	NA	NA	0.667 U	NA	NA	NA	0.142 U	0.148 U	NA	NA	0.129 U	0.141 U	NA
Aroclor 1268	---	---	0.184 U	0.166 U	NA	NA	NA	NA	0.667 U	NA	NA	NA	0.142 U	0.148 U	NA	NA	0.129 U	0.141 U	NA
Total PCBs (c)	12	65	**1.553**	**3.100**	NA	NA	NA	NA	**13.544**	NA	NA	NA	**1.496**	**4.037**	NA	NA	**1.361**	**1.377**	NA
CONVENTIONALS																			
Total Solids (SM2540B; %)	---	---	**55.80**	**57.20**	**59.80**	**72.70**	NA	NA	**51.20**	NA	NA	NA	**54.50**	**52.50**	NA	NA	**54.60**	**51.90**	NA
Total Organic Carbon (Plumb 1981; %)	10 (g)	10 (g)	**2.06**	**2.29**	**2.68**	**1.75**	NA	NA	**2.85**	NA	NA	NA	**2.74**	**2.70**	NA	NA	**2.94**	**2.76**	NA

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria															
Sample ID			SC-65	SC-66	SC-66	SC-66	SC-66	SC-66	SC-67	SC-67	SC-67	SC-67	SC-67	SC-68	SC-68	SC-68
Laboratory Sample ID	Sediment	Cleanup	VG79R	VG80A/VL06M	VG80B/VL06N	VG80C/VL06O	VG80D	VG80E	VG93A/VL06P	VG93B/VL06Q	VG93C/VL06R	VG93D	VG93E	VG93F/VL06S	VG93G/VO97D	VG93H/VO97E
Sample Date	Quality	Screening	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-16 to -17	-9 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-16 to -17	-10 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-16 to -17	-13.4 to -14	-14 to -16	-16 to -17
TOTAL METALS (mg/kg)																
Method SW6010B/7471A/200.8																
Arsenic	57	93	NA	**13.3**	**12.0**	**14.2**	NA	NA	**11.7**	**12.5**	**8.9**	NA	NA	**11.1**	NA	NA
Copper	390	390	NA	**89.8**	**89**	**90.5**	NA	NA	**76.4**	**82.7**	**69.3**	NA	NA	**65.2**	NA	NA
Lead	450	530	NA	**21.4**	**34.4**	**153**	NA	NA	**14.2**	**21.8**	**29.1**	NA	NA	**12.6**	NA	NA
Mercury	0.41	0.59	**0.36**	**0.16**	**0.32**	**0.19**	**0.16**	**0.09**	**0.09**	**0.17**	**0.23**	**0.14**	**0.07**	**0.10**	**0.13**	**0.09**
Silver			NA	0.4 U	0.4 U	**0.4**	NA	NA	0.3 U	0.4 U	**0.4**	NA	NA	0.4 U	NA	NA
Zinc	410	960	NA	**125**	**120**	**129**	NA	NA	**115**	**110**	**103**	NA	NA	**99**	NA	NA
TBT (mg/kg)																
Method KRONE 1988 SIM																
Tributyltin Ion	0.073 (h)	0.073 (h)	NA	**0.025**	**0.021**	0.0036 U	NA	NA	**0.0097**	**0.022**	0.0038 U	NA	NA	**0.010**	NA	NA
Dibutyltin Ion	---	---	NA	**0.011**	**0.0065**	0.0053 U	NA	NA	**0.0049** J	**0.015**	0.0057 U	NA	NA	**0.0028** J	NA	NA
Butyltin	---	---	NA	**0.0044**	**0.0032** J	0.0038 U	NA	NA	**0.0021** J	**0.0034** J	0.0040 U	NA	NA	**0.0020** J	NA	NA
SEMIVOLATILES																
Method SW8270																
PAHs (mg/kg OC)																
Naphthalene	99	170	NA	**2.615**	**8.451**	**13.281**	NA	NA	**2.719**	**2.706**	**10.236**	NA	NA	**1.743**	**25.294**	**14.835**
Acenaphthylene	66	66	NA	**0.636** J	**1.479**	**3.320**	NA	NA	**0.645** J	**0.471** J	**1.339**	NA	NA	0.625 U	**2.176**	**1.648**
Acenaphthene	16	57	NA	**0.530** J	**1.162**	**1.797**	NA	NA	**0.599** J	**0.667** J	**3.307**	NA	NA	0.625 U	**3.235**	**1.429**
Fluorene	23	79	NA	**0.742**	**1.197**	**2.109**	NA	NA	**0.968**	**0.784**	**3.937**	NA	NA	**0.461** J	**4.294**	**2.033**
Phenanthrene	100	480	NA	**3.145**	**4.577**	**8.984**	NA	NA	**3.548**	**2.667**	**10.236**	NA	NA	**1.842**	**10.000**	**7.143**
Anthracene	220	1,200	NA	**1.413**	**1.338**	**1.953**	NA	NA	**2.488**	**1.373**	**2.441**	NA	NA	**0.757**	**3.059**	**2.308**
2-Methylnaphthalene	38	64	NA	**0.777**	**1.655**	**2.344**	NA	NA	**0.829** J	**0.627** J	**2.008**	NA	NA	**0.395** J	**5.176**	**3.187**
LPAH (c,d)	370	780	--	**9.081**	**18.204**	**31.445**	--	--	**10.968**	**8.667**	**31.496**	--	--	**4.803**	**48.059**	**29.396**
Fluoranthene	160	1,200	NA	**4.947**	**6.690**	**8.984**	NA	NA	**7.834**	**5.490**	**11.024**	NA	NA	**3.191**	**10.588**	**7.692**
Pyrene	1,000	1,400	NA	**13.074**	**8.099**	**8.984**	NA	NA	**14.286**	**8.627**	**9.055**	NA	NA	**3.947**	**14.118**	**10.989**
Benzo(a)anthracene	110	270	NA	**2.332**	**1.796**	**2.148**	NA	NA	**5.991**	**2.157**	**2.126**	NA	NA	**1.480**	**3.000**	**2.527**
Chrysene	110	460	NA	**4.947**	**3.521**	**3.125**	NA	NA	**13.825**	**3.765**	**2.874**	NA	NA	**2.500**	**5.059**	**4.176**
Total Benzofluoranthenes (e)	230	450	NA	**8.834**	**3.873**	**3.555**	NA	NA	**13.825**	**4.706**	**2.795**	NA	NA	**2.566**	**7.059**	**6.044**
Benzo(a)pyrene	99	210	NA	**3.428**	**1.585**	**2.070**	NA	NA	**4.055**	**1.765**	**1.457**	NA	NA	**0.954**	**2.588**	**2.363**
Indeno(1,2,3-cd)pyrene	34	88	NA	**1.555**	**0.915**	0.742 U	NA	NA	**1.705**	**0.980**	**0.787**	NA	NA	**0.461** J	**1.294**	**1.044**
Dibenz(a,h)anthracene	12	33	NA	**0.813**	0.704 U	0.742 U	NA	NA	**0.783** J	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U
Benzo(g,h,i)perylene	31	78	NA	**1.590**	**1.268**	**1.445**	NA	NA	**1.567**	**1.020**	**0.984**	NA	NA	**0.493** J	**1.529** J	**1.264** J
HPAH (c,e,f)	960	5,300	--	**41.519**	**27.746**	**30.313**	--	--	**63.871**	**28.510**	**31.102**	--	--	**15.592**	**45.235**	**36.099**
SVOCs (mg/kg OC)																
1,2-Dichlorobenzene	2.3	2.3	NA	0.671 U	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U
1,3-Dichlorobenzene	None	None	NA	0.671 U	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U
1,4-Dichlorobenzene	3.1	9	NA	0.671 U	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U
1,2,4-Trichlorobenzene	1	1.8	NA	0.671 U	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U
Hexachlorobenzene	0	2.3	NA	0.671 UJ	0.704 UJ	0.742 UJ	NA	NA	0.922 UJ	0.745 UJ	0.787 UJ	NA	NA	0.625 UJ	1.176 U	1.044 U
Dimethylphthalate	53	53	NA	**0.530** J	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U
Diethylphthalate	61	110	NA	1.696 U	1.725 U	1.836 U	NA	NA	2.258 U	1.882 U	1.929 U	NA	NA	1.546 U	2.882 U	2.637 U
Di-n-Butylphthalate	220	1,700	NA	0.671 U	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U
Butylbenzylphthalate	5	64	NA	**0.353** J	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	**0.576** J	1.044 U
bis(2-Ethylhexyl)phthalate	47	78	NA	3.251 U	1.514 U	1.211 U	NA	NA	2.350 U	1.608 U	1.496 U	NA	NA	1.447 U	**2.765** U	**1.813** U
Di-n-Octyl phthalate	58	4,500	NA	0.671 U	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U
Dibenzofuran	15	58	NA	**0.813**	**0.951**	**1.797**	NA	NA	**1.106**	**0.784**	**2.677**	NA	NA	**0.461** J	**5.118**	**2.143**
Hexachlorobutadiene	4	6.2	NA	0.671 U	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U
N-Nitrosodiphenylamine	11	11	NA	0.671 U	0.704 U	0.742 U	NA	NA	0.922 U	0.745 U	0.787 U	NA	NA	0.625 U	1.176 U	1.044 U

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria															
Sample ID			SC-65	SC-66	SC-66	SC-66	SC-66	SC-66	SC-67	SC-67	SC-67	SC-67	SC-67	SC-68	SC-68	SC-68
Laboratory Sample ID	Sediment	Cleanup	VG79R	VG80A/VL06M	VG80B/VL06N	VG80C/VL06O	VG80D	VG80E	VG93A/VL06P	VG93B/VL06Q	VG93C/VL06R	VG93D	VG93E	VG93F/VL06S	VG93G/VO97D	VG93H/VO97E
Sample Date	Quality	Screening	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/22/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012	08/23/2012
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-16 to -17	-9 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-16 to -17	-10 to -10.5	-10.5 to -12	-12 to -14	-14 to -16	-16 to -17	-13.4 to -14	-14 to -16	-16 to -17
SVOCs (mg/kg)																
Phenol	0.42	1.2	NA	**0.180**	**0.095**	**0.110**	NA	NA	**0.210**	**0.084**	**0.068**	NA	NA	0.160	**0.050**	**0.042**
2-Methylphenol	0.063	0.063	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
4-Methylphenol	0.67	0.67	NA	**0.052**	**0.089**	**0.093**	NA	NA	**0.054**	**0.056**	**0.094**	NA	NA	**0.045**	**0.110**	**0.170**
2,4-Dimethylphenol	0.029	0.029	NA	0.038 U	0.039 U	0.038 U	NA	NA	0.039 U	0.038 U	0.039 U	NA	NA	0.038 U	0.039 U	**0.012** J
Pentachlorophenol	0.36	0.69	NA	0.190 U	0.200 U	0.190 U	NA	NA	0.200 U	0.190 U	0.200 U	NA	NA	0.190 U	0.200 U	0.190 U
Benzyl Alcohol	0.057	0.073	NA	**0.051** J	**0.031** J	**0.049** J	NA	NA	**0.074** J	**0.022** J	**0.020** J	NA	NA	**0.072** J	**0.059**	**0.030**
Benzoic Acid	0.65	0.65	NA	**0.150** J	**0.100** J	**0.650**	NA	NA	0.240 J	0.380 U	0.390 U	NA	NA	**0.180** J	**0.100** J	0.390 U
Hexachloroethane	---	---	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
1-Methylnaphthalene	---	---	NA	**0.012** J	**0.020**	**0.032**	NA	NA	0.020 U	0.019 U	**0.029**	NA	NA	0.019 U	**0.060**	**0.032**
2,2'-Oxybis(1-Chloropropane)	---	---	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
2,4,5-Trichlorophenol	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
2,4,6-Trichlorophenol	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
2,4-Dichlorophenol	---	---	NA	0.190 U	0.200 U	0.190 U	NA	NA	0.200 U	0.190 U	0.200 U	NA	NA	0.190 U	0.200 U	0.190 U
2,4-Dinitrophenol	---	---	NA	0.810 U	0.830 U	0.800 U	NA	NA	0.840 U	0.810 U	0.830 U	NA	NA	0.800 U	0.840 U	0.820 U
2,4-Dinitrotoluene	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
2,6-Dinitrotoluene	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
2-Chloronaphthalene	---	---	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
2-Chlorophenol	---	---	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
2-Nitroaniline	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
2-Nitrophenol	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
3,3'-Dichlorobenzidine	---	---	NA	0.140 UJ	0.150 UJ	0.140 UJ	NA	NA	0.150 UJ	0.140 UJ	0.150 UJ	NA	NA	0.140 UJ	0.150 U	0.140 U
3-Nitroaniline	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
4,6-Dinitro-2-Methylphenol	---	---	NA	0.190 U	0.200 U	0.190 U	NA	NA	0.200 U	0.190 U	0.200 U	NA	NA	0.190 U	0.200 U	0.190 U
4-Bromophenyl-phenylether	---	---	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
4-Chloro-3-methylphenol	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
4-Chloroaniline	---	---	NA	0.260 U	0.260 U	0.260 U	NA	NA	0.270 U	0.260 U	0.260 U	NA	NA	0.260 U	0.270 U	0.260 U
4-Chlorophenyl-phenylether	---	---	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
4-Nitroaniline	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
4-Nitrophenol	---	---	NA	0.095 U	0.098 U	0.095 U	NA	NA	0.098 U	0.096 U	0.098 U	NA	NA	0.094 U	0.098 U	0.096 U
bis(2-Chloroethoxy) Methane	---	---	NA	0.019 UJ	0.020 UJ	0.019 UJ	NA	NA	0.020 UJ	0.019 UJ	0.020 UJ	NA	NA	0.019 UJ	0.020 U	0.019 U
Bis-(2-Chloroethyl) Ether	---	---	NA	0.019 UJ	0.020 UJ	0.019 UJ	NA	NA	0.020 UJ	0.019 UJ	0.020 UJ	NA	NA	0.019 UJ	0.020 U	0.019 U
Carbazole	---	---	NA	**0.020**	**0.015** J	0.019 U	NA	NA	**0.016** J	**0.0096** J	**0.016** J	NA	NA	0.019 U	**0.027**	**0.011** J
Hexachlorocyclopentadiene	---	---	NA	0.380 U	0.390 U	0.380 U	NA	NA	0.390 U	0.380 U	0.390 U	NA	NA	0.380 U	0.390 U	0.390 U
Isophorone	---	---	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
Nitrobenzene	---	---	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
N-Nitroso-Di-N-Propylamine	---	---	NA	0.019 U	0.020 U	0.019 U	NA	NA	0.020 U	0.019 U	0.020 U	NA	NA	0.019 U	0.020 U	0.019 U
PCBs (mg/kg OC)																
Method SW8082																
Aroclor 1016	---	---	NA	0.141 U	0.137 U	0.152 U	NA	NA	0.180 U	0.157 U	0.150 U	NA	NA	0.128 U	NA	NA
Aroclor 1242	---	---	NA	0.141 U	0.137 U	0.152 U	NA	NA	0.180 U	0.157 U	0.150 U	NA	NA	0.128 U	NA	NA
Aroclor 1248	---	---	NA	**0.495**	**1.514**	**0.242**	NA	NA	**0.258**	**1.765**	**1.575**	NA	NA	**0.204**	NA	NA
Aroclor 1254	---	---	NA	**0.707**	**1.761**	**0.289**	NA	NA	**0.369**	**1.569**	**1.614**	NA	NA	**0.250**	NA	NA
Aroclor 1260	---	---	NA	**0.459**	**0.951**	**0.391**	NA	NA	**0.235**	**1.451**	**0.787**	NA	NA	**0.158**	NA	NA
Aroclor 1221	---	---	NA	0.141 U	0.137 U	0.152 U	NA	NA	0.180 U	0.157 U	0.150 U	NA	NA	0.128 U	NA	NA
Aroclor 1232	---	---	NA	0.141 U	0.137 U	0.152 U	NA	NA	0.180 U	0.157 U	0.150 U	NA	NA	0.128 U	NA	NA
Aroclor 1262	---	---	NA	0.141 U	0.137 U	0.152 U	NA	NA	0.180 U	0.157 U	0.150 U	NA	NA	0.128 U	NA	NA
Aroclor 1268	---	---	NA	0.141 U	0.137 U	0.152 U	NA	NA	0.180 U	0.157 U	0.150 U	NA	NA	0.128 U	NA	NA
Total PCBs (c)	12	65	NA	**1.661**	**4.225**	**0.922**	NA	NA	**0.862**	**4.784**	**3.976**	NA	NA	**0.612**	NA	NA
CONVENTIONALS																
Total Solids (SM2540B; %)	---	---	NA	**53.30**	**51.80**	**57.50**	NA	NA	**56.20**	**54.30**	**55.50**	NA	NA	**41.10**	**62.40**	**63.30**
Total Organic Carbon (Plumb 1981; %)	10 (g)	10 (g)	NA	**2.83**	**2.84**	**2.56**	NA	NA	**2.17**	**2.55**	**2.54**	NA	NA	**3.04**	**1.70**	**1.82**

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria		14 Street Bulkhead (Cross-Section A)							Northrn Portion of the Segment C Bulkhead (Cross-Section E)					
			Adjacent				15 ft South			Adjacent		15 ft West			
Sample ID			SC-69N	SC-69N	SC-69N	SC-69N	SC-69S	SC-69S	SC-69S	SC-70E	SC-70E	SC-70W	SC-70W	SC-70W	SC-70W
Laboratory Sample ID	Sediment	Cleanup	WQ54A	WQ54B	WQ54C	WU12A	WQ54E/WT20A	WQ54F	WQ54H	WQ54I	WU12B	WQ54K	WQ54M	WQ54O	WQ54Q
Sample Date	Quality	Screening	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-2 to -3	-3 to -4	-4 to -5	-5 to -6	-8 to -9	-9 to -10	-11 to -12	-4 to -5	-5 to -6	-5 to -6	-7 to -8	-9 to -10	-11 to -12
TOTAL METALS (mg/kg)															
Method SW7471A															
Mercury	0.41	0.59	**0.06**	**0.04**	**0.05**	NA	**0.36**	**0.07**	**0.06**	**2.35**	**3.17**	**0.29**	**2.41**	**2.49**	**0.06**
TBT (mg/kg)															
Method KRONE 1988 SIM															
Tributyltin Ion	0.073 (h)	0.073 (h)	**0.082**	**0.0095**	**0.002** J	NA	**0.048**	0.0035 U	**0.003** J	**6.6**	**8.9**	**0.58**	**0.24**	**0.027**	**0.002** J
Dibutyltin Ion	---	---	**0.034**	**0.0037** J	0.0053 U	NA	**0.024**	0.0053 U	0.0052 U	**2**	**2.1**	**0.25**	**0.19**	**0.024**	**0.0037** J
Butyltin	---	---	**0.0094**	**0.0017** J	0.0037 U	NA	**0.0049**	**0.0019** J	0.0037 U	**0.17**	**0.1**	**0.064**	**0.02**	**0.0035** J	**0.0025** J
SEMIVOLATILES															
Method SW8270															
PAHs (mg/kg OC)															
Naphthalene	99	170	**24.78**	**4.03** J	**65.17**	**73.27**	**34.12**	**51.61**	**5.25**	**11.48**	**27.07**	**11.67**	**9.12**	**48.69**	**22.25**
Acenaphthylene	66	66	3.36 UJ	4.79 UJ	4.27 UJ	2.58 U	**3.36** J	**3.06** J	1.69 UJ	**3.19** J	**6.39**	**1.92** J	**1.92** J	**4.87** J	**1.96** J
Acenaphthene	16	57	**28.32**	**3.02** J	**117.52**	**90.91**	**56.87**	**64.52**	**15.25**	**111.11**	**255.64**	**37.50**	**45.60**	**232.21**	**24.87**
Fluorene	23	79	**37.17**	4.79 U	**50.21**	**33.92**	**28.91**	**44.35**	**3.90**	**29.63**	**161.65**	**33.33**	**30.94**	**303.37**	**32.72**
Phenanthrene	100	480	**74.34**	**6.05**	**16.03**	**51.56**	**80.57**	**58.06**	**1.95**	**140.74**	**270.68**	**283.33**	**55.37**	**786.52**	**60.21**
Anthracene	220	1,200	**13.81**	4.79 U	4.27 U	**2.31** J	**43.13**	**22.58**	1.69 U	**40.74**	**75.19**	**104.17**	**22.15**	**93.63**	**8.25**
2-Methylnaphthalene	38	64	**10.80**	4.79 U	**235.04**	**217.10**	**9.48**	**11.29**	**1.02** J	**3.41**	**9.02**	**9.17**	**2.93**	**30.71**	**10.86**
LPAH (c,d)	370	780	**178.41**	**13.10**	**248.93**	**251.97**	**246.97**	**244.19**	**26.36**	**336.89**	**790.23**	**471.92**	**165.11**	**1469.29**	**150.26**
Fluoranthene	160	1,200	**77.88**	**50.38**	**12.82**	2.58 U	**710.90**	**185.48**	**6.10**	**666.67**	**676.69**	**387.50**	**270.36**	**749.06**	**54.97**
Pyrene	1,000	1,400	**102.65**	**50.38**	**10.68**	2.58 U	**421.80**	**112.90**	**4.24**	**407.41**	**451.13**	**416.67**	**169.38**	**449.44**	**37.96**
Benzo(a)anthracene	110	270	**21.24**	**7.05**	4.27 U	2.58 U	**189.57**	**36.29**	**1.61** J	**140.74**	**45.11**	**175.00**	**52.12**	**104.87**	**9.03**
Chrysene	110	460	**26.55**	**23.68**	4.27 U	2.58 U	**246.45**	**40.32**	**2.29**	**188.89**	**180.45**	**200.00**	**91.21**	**127.34**	**10.60**
Total Benzofluoranthenes (e)	230	450	**47.79**	**27.71**	8.44 U	5.29 U	**232.23**	**32.26**	**1.86** J	**144.44**	**157.89**	**325.00**	**74.92**	**71.16**	**10.08**
Benzo(a)pyrene	99	210	**14.16**	**5.54**	4.27 U	2.58 U	**61.61**	**12.10**	1.69 U	**59.26**	**67.67**	**170.83**	**26.71**	**26.59**	**4.06**
Indeno(1,2,3-cd)pyrene	34	88	**6.19**	**3.78** J	4.27 U	2.58 U	**20.85**	**4.19**	1.69 U	**24.07**	**26.69**	**62.50**	**9.45**	**7.12**	2.49 U
Dibenz(a,h)anthracene	12	33	**2.65** J	4.79 U	4.27 U	2.58 U	**9.00**	**1.94** J	1.69 U	**9.63**	**13.91**	**24.58**	**4.89**	**2.81**	2.49 U
Benzo(g,h,i)perylene	31	78	**6.55**	**4.03** J	4.27 U	2.58 U	**18.01**	**5.00**	1.69 U	**22.22**	**24.06**	**58.33**	**7.82**	**6.74**	**1.70** J
HPAH (c,e,f)	960	5,300	**305.66**	**172.54**	**23.50**	ND	**1910.43**	**430.48**	**16.10**	**1663.33**	**1643.61**	**1820.42**	**706.84**	**1545.13**	**128.40**
SVOCs (mg/kg OC)															
1,2-Dichlorobenzene	2.3	2.3	3.36 U	4.79 U	4.27 U	2.58 U	0.95 U	3.06 U	1.69 U	0.74 U	**2.14**	0.79 U	0.65 U	0.71 U	2.49 U
1,3-Dichlorobenzene	None	None	3.36 U	4.79 U	4.27 U	2.58 U	0.95 U	3.06 U	1.69 U	0.74 U	0.71 U	0.79 U	0.65 U	0.71 U	2.49 U
1,4-Dichlorobenzene	3.1	9	3.36 U	4.79 U	4.27 U	2.58 U	0.95 U	3.06 U	1.69 U	0.74 U	**1.69**	0.79 U	0.65 U	0.71 U	2.49 U
1,2,4-Trichlorobenzene	1	1.8	3.36 U	4.79 U	4.27 U	2.58 U	0.95 U	3.06 U	1.69 U	0.74 U	0.71 U	0.79 U	0.65 U	0.71 U	2.49 U
Hexachlorobenzene	0.38	2.3	3.36 U	4.79 U	4.27 U	2.58 U	0.95 U	3.06 U	1.69 U	0.74 U	0.71 U	0.79 U	0.65 U	0.71 U	2.49 U
Dimethylphthalate	53	53	**7.43**	4.79 U	4.27 U	2.58 U	**1.23**	3.06 U	1.69 U	**1.59**	0.71 U	**1.54**	0.65 U	0.71 U	2.49 U
Diethylphthalate	61	110	8.32 U	12.34 U	10.58 U	6.51 U	2.32 U	7.58 U	4.24 U	**3.19**	1.80 U	**2.00**	1.60 U	1.80 U	6.28 U
Di-n-Butylphthalate	220	1,700	3.36 U	4.79 U	4.27 U	2.58 U	0.95 U	3.06 U	1.69 U	**1.81**	0.71 U	**2.42**	0.65 U	0.71 U	2.49 U
Butylbenzylphthalate	5	64	3.36 U	4.79 U	4.27 U	2.58 U	0.95 U	**3.15**	1.69 U	0.74 U	0.71 U	0.79 U	0.65 U	0.71 U	2.49 U
bis(2-Ethylhexyl)phthalate	47	78	**26.55**	**6.55**	**44.87**	3.26 U	**12.32**	3.79 U	2.12 U	**32.22**	**11.28**	**12.08**	**7.49**	**1.72**	3.14 U
Di-n-Octyl phthalate	58	4,500	3.36 U	4.79 U	**85.47**	2.58 U	**1.04**	3.06 U	1.69 U	**10.00**	0.71 U	0.79 U	0.65 U	0.71 U	2.49 U
Dibenzofuran	15	58	**24.78**	4.79 U	**11.75**	**9.77**	**23.70**	**26.61**	1.69 U	**12.59**	**31.20**	**17.92**	**10.75**	**67.42**	**14.40**
Hexachlorobutadiene	4	6.2	3.36 U	4.79 U	4.27 U	2.58 U	0.95 U	3.06 U	1.69 U	0.74 U	0.71 U	0.79 U	0.65 U	0.71 U	2.49 U
N-Nitrosodiphenylamine	11	11	3.36 U	4.79 U	4.27 U	2.58 U	**2.51**	**2.10** J	1.69 U	**3.70**	0.71 U	**0.92**	0.65 U	**8.24**	**1.57** J

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria		14 Street Bulkhead (Cross-Section A)							Northrn Portion of the Segment C Bulkhead (Cross-Section E)					
			Adjacent				15 ft South			Adjacent		15 ft West			
Sample ID			SC-69N	SC-69N	SC-69N	SC-69N	SC-69S	SC-69S	SC-69S	SC-70E	SC-70E	SC-70W	SC-70W	SC-70W	SC-70W
Laboratory Sample ID	Sediment	Cleanup	WQ54A	WQ54B	WQ54C	WU12A	WQ54E/WT20A	WQ54F	WQ54H	WQ54I	WU12B	WQ54K	WQ54M	WQ54O	WQ54Q
Sample Date	Quality	Screening	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013	05/17/2013
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-2 to -3	-3 to -4	-4 to -5	-5 to -6	-8 to -9	-9 to -10	-11 to -12	-4 to -5	-5 to -6	-5 to -6	-7 to -8	-9 to -10	-11 to -12
SVOCs (mg/kg)															
Phenol	0.42	1.2	0.019 U	0.019 U	0.04 U	0.04 U	**0.041**	0.038 U	0.02 U	**0.044**	**0.22**	**0.031**	**0.063**	**0.14**	0.019 U
2-Methylphenol	0.063	0.063	0.019 U	0.019 U	0.04 U	0.04 U	**0.0098** J	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	**0.0098** J	**0.04**	0.019 U
4-Methylphenol	0.67	0.67	**0.015** J	0.019 U	0.04 U	0.04 U	**0.17**	**0.09**	0.02 U	**0.17**	**4.7**	**0.19**	**0.15**	**0.35**	**0.032**
2,4-Dimethylphenol	0.029	0.029	**0.015** J	**0.033** J	**0.038** J	**0.038** J	**0.026** J	0.075 U	0.04 U	0.04 U	**0.2**	0.038 U	0.039 U	**0.11**	0.038 U
Pentachlorophenol	0.36	0.69	0.19 U	0.19 U	0.4 U	0.4 U	0.2 U	0.38 U	0.2 U	0.2 U	0.19 U	0.19 U	0.2 U	0.19 U	0.19 U
Benzyl Alcohol	0.057	0.073	0.019 U	0.019 U	0.04 U	0.04 U	**0.015** J	0.038 U	0.02 U	**0.033**	0.019 U	0.019 U	**0.066**	**0.058**	0.019 U
Benzoic Acid	0.65	0.65	0.38 U	0.39 U	0.79 U	0.79 U	**0.1** J	0.75 U	0.4 U	0.4 U	0.38 U	**0.14** J	**0.27** J	**0.18** J	0.38 U
Hexachloroethane	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
1-Methylnaphthalene	---	---	**0.042**	0.019 U	**1.2**	**1.2**	**0.14**	**0.1**	0.02 U	**0.092**	**0.19**	**0.16**	**0.064**	**0.69**	**0.061**
2,2'-Oxybis(1-Chloropropane)	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
2,4,5-Trichlorophenol	---	---	0.094 U	0.097 U	0.2 U	0.2 U	0.098 U	0.19 U	0.099 U	0.099 U	0.096 U	0.096 U	0.098 U	0.097 U	0.096 U
2,4,6-Trichlorophenol	---	---	0.094 U	0.097 U	0.2 U	0.2 U	0.098 U	0.19 U	0.099 U	0.099 U	0.096 U	0.096 U	0.098 U	0.097 U	0.096 U
2,4-Dichlorophenol	---	---	0.19 U	0.19 U	0.4 U	0.4 U	0.2 U	0.38 U	0.2 U	0.2 U	0.19 U	0.19 U	0.2 U	0.19 U	0.19 U
2,4-Dinitrophenol	---	---	0.8 UJ	0.83 UJ	1.7 UJ	1.7 U	0.84 UJ	1.6 UJ	0.84 UJ	0.84 UJ	0.81 U	0.82 UJ	0.84 UJ	0.82 UJ	0.81 UJ
2,4-Dinitrotoluene	---	---	0.094 U	0.097 U	0.2 U	0.2 U	0.098 U	0.19 U	0.099 U	0.099 U	0.096 U	0.096 U	0.098 U	0.097 U	0.096 U
2,6-Dinitrotoluene	---	---	0.094 U	0.097 U	0.2 U	0.2 U	0.098 U	0.19 U	0.099 U	0.099 U	**0.045** J	0.096 U	0.098 U	0.097 U	0.096 U
2-Chloronaphthalene	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
2-Chlorophenol	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
2-Nitroaniline	---	---	0.094 U	0.097 U	0.2 U	0.2 U	0.098 U	0.19 U	0.099 U	0.099 U	0.096 U	0.096 U	0.098 U	0.097 U	0.096 U
2-Nitrophenol	---	---	0.094 U	0.097 U	0.2 U	0.2 U	0.098 U	0.19 U	0.099 U	0.099 U	0.096 U	0.096 U	0.098 U	0.097 U	0.096 U
3,3'-Dichlorobenzidine	---	---	0.14 U	0.15 U	0.3 U	0.3 U	0.15 U	0.28 U	0.15 U	0.15 U	0.14 U	0.14 U	0.15 U	0.15 U	0.14 U
3-Nitroaniline	---	---	0.094 UJ	0.097 UJ	0.2 UJ	0.2 U	0.098 UJ	0.19 UJ	0.099 UJ	0.099 UJ	0.096 U	0.096 UJ	0.098 UJ	0.097 UJ	0.096 UJ
4,6-Dinitro-2-Methylphenol	---	---	0.19 U	0.19 U	0.4 U	0.4 U	0.2 U	0.38 U	0.2 U	0.2 U	0.19 U	0.19 U	0.2 U	0.19 U	0.19 U
4-Bromophenyl-phenylether	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
4-Chloro-3-methylphenol	---	---	0.094 U	0.097 U	0.2 U	0.2 U	0.098 U	0.19 U	0.099 U	0.099 U	0.096 U	0.096 U	0.098 U	0.097 U	0.096 U
4-Chloroaniline	---	---	0.26 UJ	0.26 UJ	0.53 UJ	0.53 U	0.27 UJ	0.51 UJ	0.27 UJ	0.27 UJ	0.26 U	0.26 UJ	0.26 UJ	0.26 UJ	0.26 UJ
4-Chlorophenyl-phenylether	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
4-Nitroaniline	---	---	0.094 UJ	0.097 UJ	0.2 UJ	0.2 U	0.098 UJ	0.19 UJ	0.099 UJ	0.099 UJ	0.096 U	0.096 UJ	0.098 UJ	0.097 UJ	0.096 UJ
4-Nitrophenol	---	---	0.094 U	0.097 U	0.2 U	0.2 U	0.098 U	0.19 U	0.099 U	0.099 U	0.096 U	0.096 U	0.098 U	0.097 U	0.096 U
bis(2-Chloroethoxy) Methane	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
Bis-(2-Chloroethyl) Ether	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
Carbazole	---	---	**0.042**	0.019 U	**0.94**	**0.94**	**0.28**	**0.15**	**0.035**	**0.38**	**0.46**	**0.83**	**0.11**	**0.45**	**0.029**
Hexachlorocyclopentadiene	---	---	0.38 U	0.39 U	0.79 U	0.79 U	0.39 U	0.75 U	0.4 U	0.4 U	0.38 U	0.38 U	0.39 U	0.39 U	0.38 U
Isophorone	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
Nitrobenzene	---	---	0.019 U	0.019 U	0.04 U	0.04 U	**0.043**	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
N-Nitroso-Di-N-Propylamine	---	---	0.019 U	0.019 U	0.04 U	0.04 U	0.02 U	0.038 U	0.02 U	0.02 U	0.019 U	0.019 U	0.02 U	0.019 U	0.019 U
CONVENTIONALS															
Total Solids (SM2540B; %)	---	---	**76.03**	**78.61**	**65.95**	**65.95**	**56.80**	**70.17**	**70.57**	**49.22**	**46.50**	**55.25**	**46.58**	**49.74**	**73.81**
Total Organic Carbon (Plumb 1981; %)	10 (g)	10 (g)	**0.565**	**0.397**	**0.936**	**0.936**	**2.11**	**1.24**	**1.18**	**2.70**	**2.66**	**2.40**	**3.07**	**2.67**	**0.764**

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria		Southern Portion of the Segment C Bulkhead Near Outfall C			
			Adjacent		15 ft West	
Sample ID			SC-71E	SC-71E	SC-71W	SC-71W
Laboratory Sample ID	Sediment	Cleanup	WQ54R	WQ54S	WQ54T	WQ54U
Sample Date	Quality	Screening	05/17/2013	05/17/2013	05/17/2013	05/17/2013
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-4 to -5	-5 to -6	-6 to -7	-7 to -8
TOTAL METALS (mg/kg)						
Method SW7471A						
Mercury	0.41	0.59	**3.65**	**0.07**	**0.44**	**0.12**
TBT (mg/kg)						
Method KRONE 1988 SIM						
Tributyltin Ion	0.073 (h)	0.073 (h)	**0.016**	0.0033 U	**0.017**	0.0036 U
Dibutyltin Ion	---	---	**0.01**	0.0049 U	**0.014**	0.0054 U
Butyltin	---	---	**0.0026** J	0.0035 U	**0.0023** J	0.0038 U
SEMIVOLATILES						
Method SW8270						
PAHs (mg/kg OC)						
Naphthalene	99	170	**77.87**	**867.26**	**59.52**	**52.52**
Acenaphthylene	66	66	**3.81** J	**5.66** J	**6.35** J	**7.56** J
Acenaphthene	16	57	**61.48**	**407.08**	**55.56**	**28.36**
Fluorene	23	79	**40.57**	**345.13**	**63.49**	**37.82**
Phenanthrene	100	480	**65.57**	**265.49**	**289.68**	**105.04**
Anthracene	220	1,200	**25.00**	**10.62**	**47.62**	**28.36**
2-Methylnaphthalene	38	64	**20.08**	**230.09**	**32.94**	**21.01**
LPAH (c,d)	370	780	**274.30**	**1901.24**	**522.22**	**259.66**
Fluoranthene	160	1,200	**348.36**	**25.66**	**277.78**	**126.05**
Pyrene	1,000	1,400	**229.51**	**24.78**	**285.71**	**105.04**
Benzo(a)anthracene	110	270	**49.18**	**4.34**	**63.49**	**27.31**
Chrysene	110	460	**65.57**	**6.37**	**95.24**	**30.46**
Total Benzofluoranthenes (e)	230	450	**65.57**	**6.99**	**79.37**	**27.31**
Benzo(a)pyrene	99	210	**22.13**	**3.54**	**51.59**	**14.71**
Indeno(1,2,3-cd)pyrene	34	88	**6.97**	**1.50** J	**14.68**	**4.20**
Dibenz(a,h)anthracene	12	33	**2.79**	1.68 U	**5.95**	**1.58** J
Benzo(g,h,i)perylene	31	78	**6.15**	**2.12**	**16.67**	**5.57**
HPAH (c,e,f)	960	5,300	**796.23**	**75.31**	**890.48**	**342.23**
SVOCs (mg/kg OC)						
1,2-Dichlorobenzene	2.3	2.3	0.78 U	1.68 U	0.75 U	2.10 U
1,3-Dichlorobenzene	None	None	0.78 U	1.68 U	0.75 U	2.10 U
1,4-Dichlorobenzene	3.1	9	**1.15**	1.68 U	**51.59**	**6.30**
1,2,4-Trichlorobenzene	1	1.8	0.78 U	1.68 U	0.75 U	2.10 U
Hexachlorobenzene	0.38	2.3	0.78 U	1.68 U	0.75 U	2.10 U
Dimethylphthalate	53	53	0.78 U	1.68 U	**0.48** J	2.10 U
Diethylphthalate	61	110	1.93 U	4.25 U	**2.46**	5.25 U
Di-n-Butylphthalate	220	1,700	0.78 U	1.68 U	**2.06**	2.10 U
Butylbenzylphthalate	5	64	0.78 U	1.68 U	0.75 U	2.10 U
bis(2-Ethylhexyl)phthalate	47	78	**4.92**	2.12 U	**22.22**	**2.52** J
Di-n-Octyl phthalate	58	4,500	0.78 U	1.68 U	**0.95**	2.10 U
Dibenzofuran	15	58	**36.89**	**115.04**	**28.57**	**23.11**
Hexachlorobutadiene	4	6.2	0.78 U	1.68 U	0.75 U	2.10 U
N-Nitrosodiphenylamine	11	11	**2.09**	**3.63**	**6.35**	**4.10**

TABLE A-3
DESIGN-PHASE SEDIMENT SAMPLE ANALYTICAL RESULTS
PORT OF EVERETT
EVERETT, WASHINGTON

	SMS Criteria		Southern Portion of the Segment C Bulkhead Near Outfall C			
			Adjacent		15 ft West	
Sample ID			SC-71E	SC-71E	SC-71W	SC-71W
Laboratory Sample ID	Sediment	Cleanup	WQ54R	WQ54S	WQ54T	WQ54U
Sample Date	Quality	Screening	05/17/2013	05/17/2013	05/17/2013	05/17/2013
Sample Depth (ft below mudline)	Standard (a)	Level (b)	-4 to -5	-5 to -6	-6 to -7	-7 to -8
SVOCs (mg/kg)						
Phenol	0.42	1.2	**0.063**	0.019 U	**0.074**	**0.033**
2-Methylphenol	0.063	0.063	**0.026**	0.019 U	0.019 U	**0.018** J
4-Methylphenol	0.67	0.67	**0.2**	**0.027**	**0.62**	**0.22**
2,4-Dimethylphenol	0.029	0.029	**0.12**	**0.084**	**0.05**	**0.046**
Pentachlorophenol	0.36	0.69	**0.048** J	0.19 U	0.19 U	0.2 U
Benzyl Alcohol	0.057	0.073	**0.018** J	0.019 U	**0.053**	0.02 U
Benzoic Acid	0.65	0.65	**0.12** J	0.38 U	**0.1** J	0.4 U
Hexachloroethane	---	---	0.019 U	0.019 U	0.019 U	0.02 U
1-Methylnaphthalene	---	---	**0.5**	**2.4**	**0.74**	**0.25**
2,2'-Oxybis(1-Chloropropane)	---	---	0.019 U	0.019 U	0.019 U	0.02 U
2,4,5-Trichlorophenol	---	---	0.094 U	0.095 U	0.095 U	0.099 U
2,4,6-Trichlorophenol	---	---	0.094 U	0.095 U	0.095 U	0.099 U
2,4-Dichlorophenol	---	---	0.19 U	0.19 U	0.19 U	0.2 U
2,4-Dinitrophenol	---	---	0.8 UJ	0.81 UJ	0.8 UJ	0.84 UJ
2,4-Dinitrotoluene	---	---	0.094 U	0.095 U	0.095 U	0.099 U
2,6-Dinitrotoluene	---	---	0.094 U	0.095 U	0.095 U	0.099 U
2-Chloronaphthalene	---	---	0.019 U	0.019 U	0.019 U	0.02 U
2-Chlorophenol	---	---	0.019 U	0.019 U	0.019 U	0.02 U
2-Nitroaniline	---	---	0.094 U	0.095 U	0.095 U	0.099 U
2-Nitrophenol	---	---	0.094 U	0.095 U	0.095 U	0.099 U
3,3'-Dichlorobenzidine	---	---	0.14 U	0.14 U	0.14 U	0.15 U
3-Nitroaniline	---	---	0.094 UJ	0.095 UJ	0.095 UJ	0.099 UJ
4,6-Dinitro-2-Methylphenol	---	---	0.19 U	0.19 U	0.19 U	0.2 U
4-Bromophenyl-phenylether	---	---	0.019 U	0.019 U	0.019 U	0.02 U
4-Chloro-3-methylphenol	---	---	0.094 U	0.095 U	0.095 U	0.099 U
4-Chloroaniline	---	---	0.25 UJ	0.26 UJ	0.26 UJ	0.27 UJ
4-Chlorophenyl-phenylether	---	---	0.019 U	0.019 U	0.019 U	0.02 U
4-Nitroaniline	---	---	0.094 UJ	0.095 UJ	0.095 UJ	0.099 UJ
4-Nitrophenol	---	---	0.094 U	0.095 U	0.095 U	0.099 U
bis(2-Chloroethoxy) Methane	---	---	0.019 U	0.019 U	0.019 U	0.02 U
Bis-(2-Chloroethyl) Ether	---	---	0.019 U	0.019 U	0.019 U	0.02 U
Carbazole	---	---	**0.46**	**2.4**	**0.47**	**0.068**
Hexachlorocyclopentadiene	---	---	0.38 U	0.38 U	0.38 U	0.4 U
Isophorone	---	---	0.019 U	0.019 U	0.019 U	0.02 U
Nitrobenzene	---	---	0.019 U	0.019 U	0.019 U	0.02 U
N-Nitroso-Di-N-Propylamine	---	---	0.019 U	0.019 U	0.019 U	0.02 U
CONVENTIONALS						
Total Solids (SM2540B; %)	---	---	**64.88**	**74.12**	**56.52**	**70.03**
Total Organic Carbon (Plumb 1981; %)	10 (g)	10 (g)	**2.44**	**1.13**	**2.52**	**0.952**

SMS = Sediment Management Standards
TBT = tributl tin
SIM = Select Ion Monitoring
PAHs - Polycyclic Aromatic Hydrocarbons
SVOCs = Semivolatile Organic Compounds
LPAH = Lower Molecular Weight PAH
HPAH = High Molecular Weight PAH
WAC = Washington Administrative Code
DMMP = Dredged Material Management Program
PSDDA = Puget Sound Dredged Disposal Analysis Program
OC = Organic Carbon Normalized
mg/kg = milligrams per kilogram
NA = Not Analyzed.
U = Indicates the compound was undetected at the reported concentration.
UJ = The analyte was not detected in the sample; the reported sample reporting limit is an estimate.
J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
Bold = Detected compound.
Boxed = Exceeds Sediment Quality Standard.
Shaded = Exceeds Cleanup Screening Level.

(a) SMS Sediment Quality Standard (Chapter 173-204 WAC).
(b) SMS Cleanup Screening Level (Chapter 173-204 WAC).
(c) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:
  (i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers.
  (ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.
(d) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds listed.
(e) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.
(f) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.
(g) DMMP clarification paper and SMS technical information memorandum: Management of Wood Waste Under Dredged Material Management Program and the SMS Cleanup Program.
(h) Ecology, 1996, SMS technical information memorandum: testing reporting, and evaluation of tributyltin data in PSDAA and SMS programs.

APPENDIX B

Upland Area A Soil Boring Logs

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL(1)	TYPICAL DESCRIPTIONS (2)(3)
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		**GW**	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		**GM**	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		**SW**	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		**SM**	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			**ML**	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			**MH**	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			**PT**	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		**AC** or **PC**	Asphalt concrete pavement or Portland cement pavement
ROCK		**RK**	Rock (See Rock Classification)
WOOD		**WD**	Wood, lumber, wood chips
DEBRIS		**DB**	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent:		> 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and	≤ 50% - "very gravelly," "very sandy," "very silty," etc.
	> 15% and	≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and	≤ 15% - "with gravel," "with sand," "with silt," etc.
		≤ 5% - "with trace gravel," "with trace sand," "with trace silt," etc., or not noted.

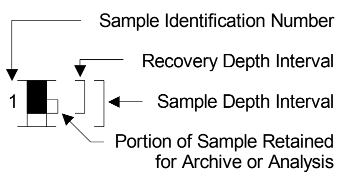
4. Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	2.50-inch O.D., 2.00-inch I.D. WSDOT
h	3.00-inch O.D., 2.375-inch I.D. Mod. California
i	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Vibrocore (Rotosonic/Geoprobe)
5	Other - See text if applicable

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽ Approximate water level at time of drilling (ATD)
▼ Approximate water level at time other than ATD

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ESY Upland Area A
Everett, Washington

Soil Classification System and Key

Figure B-1

SB-139

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot		Graphic Symbol	USCS Symbol	Drilling Method: Geoprobe™ Ground Elevation (ft): Drilled By: Cascade Drilling Inc.	Water Level
0						AC	Asphalt and base course	
		d3		3.1		SP	Grey, fine SAND with trace silt and white shell fragments; slight diesel-like odor, no sheen (medium dense, moist) **(FILL)**	
5							Collected soil sample SB-139 (6-7)	
		d3		2.6		WD	WOOD DEBRIS, including sawdust and wood pieces greater than 2" sampler diameter (slight diesel-like odor, slight sheen) (medium dense, wet) **(FILL)**	ATD
10							Collected soil sample SB-139 (10-11)	
		d3		2.0				
15								
		d3		1.3				
20								
25								

Boring Completed 10/25/12
Total Depth of Boring = 20.0 ft.

Notes: 1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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ESY Upland Area A
Everett, Washington

Log of Boring SB-139

Figure B-2

SB-140

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Graphic Symbol	USCS Symbol	Drilling Method: Geoprobe™ Ground Elevation (ft): Drilled By: Cascade Drilling Inc.	Water Level
0–6	2–3	d3	55.0		SP	Brown, fine to medium SAND with trace silt and shell fragments (medium petroleum-like odor, no sheen) (medium dense, moist) **(FILL)** Collected soil sample SB-140 (2-3)	
6–16		d3	95.6		WD	WOOD DEBRIS, wood chips with some chips larger than 2" sampler diameter (medium petroleum-like odor, medium sheen) (medium dense, wet) **(FILL)**	ATD (at 6 ft)
		d3	5.0				
			5.9				
16–20	16–16.5	d3			SP	Grey, fine SAND with trace silt (no odor, no sheen) (medium dense, moist) Collected soil sample SB-140 (16-16.5)	

Boring Completed 10/25/12
Total Depth of Boring = 20.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

SB-141

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Graphic Symbol	USCS Symbol	Drilling Method: Geoprobe™ Ground Elevation (ft): Drilled By: Cascade Drilling Inc.	Water Level
0					AC	Asphalt and base course	
		d3	27.1		SP	Grey, medium to coarse SAND with trace fine sand (no odor, no sheen) (medium dense, damp) **(FILL)**	ATD
					SP	Grey, fine SAND with trace silt and shell fragments (diesel-like odor, medium sheen) (medium dense, wet) **(FILL)**	
5		d3	33.5				
					SP	Grey, medium SAND with white, medium sand-sized particles (diesel-like odor, medium sheen) (medium dense, wet) **(FILL)**	
10			66.0			Collected soil sample SB-141 (10-11)	
		d3			WD	WOOD DEBRIS, including sawdust (diesel-like odor, slight sheen) (medium dense, wet) **(FILL)**	
15			26.7			Collected soil sample SB-141 (15-16)	
		d3					
20							

Boring Completed 10/25/12
Total Depth of Boring = 20.0 ft.

25

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

SB-142

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Type	Blows/Foot		Graphic Symbol / USCS Symbol		Drilling Method: Geoprobe™ Ground Elevation (ft): Drilled By: Cascade Drilling Inc.	Water Level
0	d3				SP	Light brown, fine to medium SAND with trace silt and shell fragments (no odor, no sheen) (medium dense, moist) **(FILL)**	
4.5	d3		102		SP	Grey, fine SAND with trace silt and shell fragments (strong diesel-like odor, medium sheen) (medium dense, wet) **(FILL)** Collected soil sample SB-142 (4.5-5.5) Collected soil sample SB-142 (9-10) - odor and sheen continue to 17' bgs, could be smeared by sampler from above	ATD (4.5 ft)
	d3		9.9				
17	d3		6.5		WD	WOOD SAWDUST with fine sand (medium dense, wet) **(FILL)**	
18			4.0		SP	Grey, fine SAND with trace silt and shell fragments (no odor, no sheen) (medium dense, wet) Collected soil sample SB-142 (19-20)	

Depth scale: 0, 5, 10, 15, 20, 25

Boring Completed 10/25/12
Total Depth of Boring = 20.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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ESY Upland Area A
Everett, Washington

Log of Boring SB-142

Figure
B-5

SB-142A

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Graphic Symbol	USCS Symbol	Drilling Method: Geoprobe™ Ground Elevation (ft): Drilled By: Cascade Drilling Inc.	Water Level
0–5		d3	0.9		SP	Light brown, fine to medium SAND with trace silt and shell fragments (no odor, no sheen) (medium dense, moist) **(FILL)**	
5–10		d3	1.7		SP	Grey, fine SAND with trace silt and shell fragments (no odor, no sheen) (medium dense, wet) **(FILL)** Collected soil sample SB-142A (6-7)	ATD
10–15		d3	3.2			Collected soil sample SB-142A (10-11)	
15–20		d3	1.4			Collected soil sample SB-142A (15-16)	
20					WD	Dark brown SAWDUST (no odor, no sheen) (medium dense, wet) **(FILL)**	

Boring Completed 10/26/12
Total Depth of Boring = 20.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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ESY Upland Area A
Everett, Washington

Log of Boring SB-142A

Figure B-6

SB-143

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot		Graphic Symbol	USCS Symbol	Drilling Method: Geoprobe™ Ground Elevation (ft): Drilled By: Cascade Drilling Inc.	
0						SP-SM	Light brown, fine to medium SAND with silt and trace shell fragments (no odor, no sheen) (medium dense, moist) **(FILL)**	Groundwater not encountered.
		d3		60.1		SP	Grey, fine SAND with trace silt and shell fragments (diesel-like odor, medium sheen) (medium dense, moist) **(FILL)** Collected soil sample SB-143 (3-4)	
5		d3		40.3		DB	DEBRIS, including red brick, wood, and concrete (no odor, no sheen) (very dense, moist) **(FILL)**	

Boring Completed 10/25/12
Total Depth of Boring = 8.0 ft.

- refusal between 7.5 and 8 feet bgs in 2 attempts, abandon boring location in anticipation of step-out boring

10

15

20

25

Notes: 1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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ESY Upland Area A
Everett, Washington

Log of Boring SB-143

Figure B-7

Project: Everett Shipyard Project Location: Everett, Washington Project Number: 33761354	Log of Boring SB-94 Sheet 1 of 1

Date(s) Drilled	6/24/10	Logged By	AP	Checked By	DRR
Drilling Method	GeoProbe	Drilling Contractor	Cascade Drilling	Total Depth of Borehole	16 feet bgs
Drill Rig Type		Drill Bit Size/Type	3 1/4" Macrocore	Ground Surface Elevation	
Groundwater Level (feet bgs)	6.5	Sampling Method	Grab	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows/ 6in.	SAMPLES Recovery (%)	SAMPLES OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
						0.0		SP/GP	GRAVEL and SAND (base course)	
	2							SP	Gray medium SAND (dry) (fill) (no evidence of hydrocarbons)	
	4									
		Grab	SB-94-5							
	6									
						0.0			6.5 ft ▼ Grading (wet) (slight hydrocarbon odor)	
										Temporary well set groundwater sampled SB-94-GW
	8								Grading (strong hydrocarbon odor, slight sheen)	
						0.0				
		Grab	SB-94-10							
	10					0.0		SP/SC	Gray medium SAND with little clay, some shell fragments (wet)	
	12									
									Grading increasing shell fragments (strong hydrocarbon odor, heavy sheen)	
	14					0.0				
		Grab	SB-94-15							
	16								Boring was completed to 16' bgs. Groundwater was encountered at 6.5' bgs. Boring was backfilled with bentonite.	

URS

Project: Everett Shipyard Project Location: Everett, Washington Project Number: 33761354	Log of Boring SB-95 Sheet 1 of 1

Date(s) Drilled	6/24/10	Logged By	AP	Checked By	DRR
Drilling Method	GeoProbe	Drilling Contractor	Cascade Drilling	Total Depth of Borehole	16 feet bgs
Drill Rig Type		Drill Bit Size/Type	3 1/4" Macrocore	Ground Surface Elevation	
Groundwater Level (feet bgs)	8	Sampling Method	Grab	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	SAMPLES Type / Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0							Asphalt	
							SP/GP	GRAVEL and SAND (base course)	
							SP/SC	Light gray fine to coarse SAND with some clay (dry) (fill) (no evidence of hydrocarbons)	
	2				0.0				
	4								
	6				0.0		SP	Gray fine SAND (moist) (slight hydrocarbon odor)	
	8	SB-95 8						Grading (wet) (no sheen) 8 ft ▼	
	10				0.0			Grading (moderate hydrocarbon odor, slight sheen)	Temporary well set groundwater sampled SB-95-GW
		SB-95 11					SC	Dark gray clayey fine SAND (soft) (moist) (no evidence of hydrocarbons)	
	12				0.0		SP/SC	Dark gray fine SAND with some clay, some shell fragments (wet) (slight odor, slight sheen)	
	14	SB-95 14							
								Wood (creosote odor)	
	16							Boring was completed to 16' bgs. Groundwater was encountered at 8' bgs. Boring was backfilled with bentonite.	

URS

Log of Boring SB-96

Sheet 1 of 1

Project: Everett Shipyard
Project Location: Everett, Washington
Project Number: 33761354

Date(s) Drilled	**6/24/10**	Logged By	**AP**	Checked By	**DRR**
Drilling Method	**GeoProbe**	Drilling Contractor	**Cascade Drilling**	Total Depth of Borehole	**16 feet bgs**
Drill Rig Type		Drill Bit Size/Type	**3 1/4" Macrocore**	Ground Surface Elevation	
Groundwater Level (feet bgs)	**9.5**	Sampling Method	**Grab**	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	Samples: Type	Samples: Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
	1							SP	Gray fine to coarse SAND (dry) (no evidence of hydrocarbons)	
	2					0.0				
	6								Grading (moist)	
	7					0.0			Grading black fine SAND (moist) (slight hydrocarbon odor, no sheen)	
	8	Grab	SB-96-8							
	9.5								9.5 ft ▼ Grading (wet) (slight hydrocarbon odor, slight sheen)	
	10					0.0				
	11	Grab	SB-96-11							
	13					0.0			Grading (slight hydrocarbon odor, no sheen)	
	14	Grab	SB-96-14							
	15								Wood (creosote odor)	
	16								Boring was completed to 16' bgs. Groundwater was encountered at 9.5' bgs. Boring was backfilled with bentonite.	

URS

Project: Everett Shipyard Project Location: Everett, Washington Project Number: 33761354	**Log of Boring SB-97** Sheet 1 of 1

Date(s) Drilled	6/24/10	Logged By	AP	Checked By	DRR
Drilling Method	GeoProbe	Drilling Contractor	Cascade Drilling	Total Depth of Borehole	16 feet bgs
Drill Rig Type		Drill Bit Size/Type	3 1/4" Macrocore	Ground Surface Elevation	
Groundwater Level (feet bgs)	7	Sampling Method	Grab	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
						0.0		SP	Gray/brown fine to coarse SAND (dry) (fill) (no evidence of hydrocarbons)	
	2									
	4									
									Grading (moist)	
	6		SB-97-7							
						0.0			7 ft ▼ Grading black fine SAND (wet) (slight hydrocarbon odor, no sheen)	
	8									
	10		SB-97-11							
	12					0.0			Grading (moderate hydrocarbon odor, no sheen)	
			SB-97-14						Grading some shell fragments	
	14									
									Wood (creosote odor)	
	16								Boring was completed to 16' bgs. Groundwater was encountered at 7' bgs. Boring was backfilled with bentonite.	

Project: Everett Shipyard	Log of Boring SB-98
Project Location: Everett, Washington	Sheet 1 of 1
Project Number: 33761354	

Date(s) Drilled	6/24/10	Logged By	AP	Checked By	DRR
Drilling Method	GeoProbe	Drilling Contractor	Cascade Drilling	Total Depth of Borehole	16 feet bgs
Drill Rig Type		Drill Bit Size/Type	3 1/4" Macrocore	Ground Surface Elevation	
Groundwater Level (feet bgs)	7.5	Sampling Method	Grab	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
								SP/GP	GRAVEL and SAND (base course)	
	2					0.0		SP	Gray/brown fine to coarse SAND (dry) (fill) (no evidence of hydrocarbons)	
	6	Grab	SB-98-6						Grading (moist)	
	8					0.0			Grading black fine to coarse SAND (wet) (slight hydrocarbon odor) 7.5 ft ▼	
								SP/SC	Black fine to coarse SAND with clay (wet) (slight hydrocarbon odor, slight sheen)	
	10	Grab	SB-98-10							
	15	Grab	SB-98-15							
	16								Boring was completed to 16' bgs. Groundwater was encountered at 7.5' bgs. Boring was backfilled with bentonite.	

ENV2 W/O WELL T:\ONEWORLD\33761354 EVERETT SHIPYARD\33761354.GPJ URSSEA3B.GLB URSSEA3.GDT 8/3/10

URS

Project: Everett Shipyard	Log of Boring SB-100
Project Location: Everett, Washington	Sheet 1 of 1
Project Number: 33761354	

Date(s) Drilled	**6/25/10**	Logged By	**AP**	Checked By	**DRR**
Drilling Method	**GeoProbe**	Drilling Contractor	**Cascade Drilling**	Total Depth of Borehole	**16 feet bgs**
Drill Rig Type		Drill Bit Size/Type	**3 1/4" Macrocore**	Ground Surface Elevation	
Groundwater Level (feet bgs)	**6**	Sampling Method	**Grab**	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	Samples: Type	Samples: Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
	1							SP/GP	GRAVEL and SAND (base course)	
	2							SP/SM	Gray fine SAND with some silt (moist) (fill) (slight hydrocarbon odor)	
	2.5					0.0				
	4.75	Grab	SB-100-5						Grading (moderate hydrocarbon odor)	
	6								Grading (wet)	6 ft ▼
	7								Grading some shell fragments (moderate hydrocarbon odor, slight sheen)	
	8					0.0				
	9.75	Grab	SB-100-10							
	10							ML	Dark gray sandy SILT with fine sand (wet)	
	11							SP	Gray fine to coarse SAND with trace fine gravel (wet) (slight hydrocarbon odor)	
	12							SM	Gray silty fine SAND with some shell fragments (wet) (moderate hydrocarbon odor)	
	13					0.0				
	13.75	Grab	SB-100-14							
	15								Wood (creosote odor)	
	16								Boring was completed to 16' bgs. Groundwater was encountered at 6' bgs. Boring was backfilled with bentonite.	

Project: Everett Shipyard	Log of Boring SB-101
Project Location: Everett, Washington	Sheet 1 of 1
Project Number: 33761354	

Date(s) Drilled	**6/25/10**	Logged By	**AP**	Checked By	**DRR**
Drilling Method	**GeoProbe**	Drilling Contractor	**Cascade Drilling**	Total Depth of Borehole	**16 feet bgs**
Drill Rig Type		Drill Bit Size/Type	**3 1/4" Macrocore**	Ground Surface Elevation	
Groundwater Level (feet bgs)	**6**	Sampling Method	**Grab**	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
								SP/GP	GRAVEL and SAND (base course)	
	2					0.0		SP/SM	Light gray fine to coarse SAND with some silt (moist) (fill) (slight hydrocarbon odor)	
	4		SB-101-5							
									Grading dark gray fine SAND with some silt (moist)	
	6								Grading (wet)	6 ft ▼
						0.0			Grading some shell fragments	
	8								No recovery	
	10									
						0.0			Asphaltic layer (moderate hydrocarbon odor)	
	12								No recovery	
	14		SB-101-15							
								SP/SM	Dark brown fine to coarse SAND with some silt and fine gravel (wet) (slight hydrocarbon odor)	
	16								Boring was completed to 16' bgs. Groundwater was encountered at 6' bgs. Boring was backfilled with bentonite.	

URS

Project: Everett Shipyard	Log of Boring SB-102
Project Location: Everett, Washington	Sheet 1 of 1
Project Number: 33761354	

Date(s) Drilled	6/25/10	Logged By	AP	Checked By	DRR
Drilling Method	GeoProbe	Drilling Contractor	Cascade Drilling	Total Depth of Borehole	16 feet bgs
Drill Rig Type		Drill Bit Size/Type	3 1/4" Macrocore	Ground Surface Elevation	
Groundwater Level (feet bgs)	6	Sampling Method	Grab	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
								SP/GP	GRAVEL and SAND (base course)	
	2					0.0		SM	Gray fine to coarse SAND with silt (moist) (no evidence of hydrocarbons)	
	4		SB-102-5							
						0.0		SP/SM	Grading dark gray fine SAND with silt (moist) (slight hydrocarbon odor)	
	6								6 ft ▼ Grading (wet) (moderate hydrocarbon odor, moderate sheen)	
								ML	Dark gray SILT, some mica (wet)	
	8									
	10					0.0		ML/CL	Dark gray clayey SILT, some mica (wet)	
			SB-102-11					ML/SM	Dark gray sandy SILT with fine sand, some mica (wet)	
									Wood	
	12					0.0		SM	Dark gray sandy SILT with fine sand, some mica (wet)	
	14		SB-102-14							
									Wood (creosote odor)	
	16								Boring was completed to 16' bgs. Groundwater was encountered at 6' bgs. Boring was backfilled with bentonite.	

URS

Project: Everett Shipyard	Log of Boring SB-103
Project Location: Everett, Washington	Sheet 1 of 1
Project Number: 33761354	

Date(s) Drilled	**6/25/10**	Logged By	**AP**	Checked By	**DRR**
Drilling Method	**GeoProbe**	Drilling Contractor	**Cascade Drilling**	Total Depth of Borehole	**16 feet bgs**
Drill Rig Type		Drill Bit Size/Type	**3 1/4" Macrocore**	Ground Surface Elevation	
Groundwater Level (feet bgs)	**6**	Sampling Method	**Grab**	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
								SP/GP	Gray coarse SAND and fine GRAVEL (dry) (base course)	
	2					0.0		SP	Dark gray fine SAND (moist) (fill) (no evidence of hydrocarbons)	
	4								Grading some shell fragments	
	6		SB-103-6						6 ft ▼	
									Grading (wet)	
	8									
								SC	Dark gray fine SAND and CLAY (soft) (wet)	
	10		SB-103-10			0.0			Grading CLAY and fine SAND (soft) (moist)	
									Grading (slight hydrocarbon odor, slight sheen)	
	12		SB-103-13			0.0			Grading fine SAND and CLAY (wet) (moderate hydrocarbon odor, moderate sheen)	
	14								Wood (creosote odor)	
	16								Boring was completed to 16' bgs. Groundwater was encountered at 6' bgs. Boring was backfilled with bentonite.	

URS

Project: Everett Shipyard	Log of Boring SB-104
Project Location: Everett, Washington	Sheet 1 of 1
Project Number: 33761354	

Date(s) Drilled	6/25/10	Logged By	AP	Checked By	DRR
Drilling Method	GeoProbe	Drilling Contractor	Cascade Drilling	Total Depth of Borehole	16 feet bgs
Drill Rig Type		Drill Bit Size/Type	3 1/4" Macrocore	Ground Surface Elevation	
Groundwater Level (feet bgs)	8	Sampling Method	Grab	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
								SP/GP	GRAVEL and SAND (base course)	
	2					0.0		SM	Dark gray silty fine SAND, some shell fragments (moist) (fill) (no evidence of hydrocarbons)	
	4								Grading (slight hydrocarbon odor)	
			SB-104-5							
	6					0.0				
	8								8 ft ▼ Grading (wet)	
									Wood (creosote odor)	
	10									
	12								No recovery	
	14									
									Wood	
	16								Boring was completed to 16' bgs. Groundwater was encountered at 8' bgs. Boring was backfilled with bentonite.	

URS

Log of Boring SB-105

Project: Everett Shipyard
Project Location: Everett, Washington
Project Number: 33761354

Date(s) Drilled	**6/25/10**	Logged By	**AP**	Checked By	**DRR**
Drilling Method	**GeoProbe**	Drilling Contractor	**Cascade Drilling**	Total Depth of Borehole	**16 feet bgs**
Drill Rig Type		Drill Bit Size/Type	**3 1/4" Macrocore**	Ground Surface Elevation	
Groundwater Level (feet bgs)	**16**	Sampling Method	**Grab**	Hammer Data	
Borehole Backfill		Location			

Elevation, feet	Downhole Depth, feet	SAMPLES Type	SAMPLES Number	Blows/ 6in.	Recovery (%)	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Asphalt	
								SP/GP	GRAVEL and SAND (base course)	
	2					0.0		SP	Gray fine SAND, some shell fragments (moist) (fill) (no evidence of hydrocarbons)	
	6	Grab	SB-105-6						Grading (wet)	
								ML	Dark gray SILT and fine SAND, some mica and shells (wet)	
	10	Grab	SB-105-11			0.0		CL/ML	Dark gray silty CLAY (moist) (slight hydrocarbon odor)	
	12								Wood fragments (slight hydrocarbon odor, slight sheen on wood chunks)	
	16								16 ft ▼	
									Boring was completed to 16' bgs. Groundwater was encountered at 16' bgs. Boring was backfilled with bentonite.	

APPENDIX C

Upland Area A Analytical Results

Table 4-1
Summary of Soil Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

TABLE C-1

Sample ID: / Sample ID Depth Interval (feet bgs): / Date Collected: / Field QC:	**Preliminary Cleanup Levels**	SB-95 8 6/24/2010	SB-95 11 6/24/2010	SB-95 14 6/24/2010	SB-96 8 6/24/2010	SB-96 11 6/24/2010	SB-96 14 6/24/2010	SB-97 7 6/24/2010	SB-97 11 6/24/2010	SB-97 14 6/24/2010	SB-98 6 6/24/2010	SB-98 10 6/24/2010	SB-98 15 6/24/2010	SB-100 5 6/25/2010	SB-100 10 6/25/2010	SB-100 14 6/25/2010	SB-101 5 6/25/2010	SB-101 15 6/25/2010
TPH (mg/kg)																		
Diesel-range**	2,000[a]	**3,100 J**	24 J	290 J	**3,300 J**	**2,100 J**	1,200 J	5.6 UJ	96 J	**2,800 J**	5.1 UJ	560 J	23 J	**2,000 J**	**4,600 J**	**2,800 J**	**2,000 J**	**3,100 J**
Oil-range**	2,000[a]	110 J	13 UJ	22 J	260 J	140 J	50 J	11 UJ	13 UJ	110 J	10 UJ	120 J	13 UJ	100 J	210 J	180 J	77 J	190 J
PAHs (ug/kg)																		
Benzo(a)anthracene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene**	140[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TTEC**	140[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (ug/kg)																		
Aroclor 1016	5,600[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254**	1,600[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs**	1,000[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organotins (ug/kg)																		
Tributyltin as TBT Ion	7,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibutyl Tin Ion	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Tin Ion	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)																		
Antimony**	32[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic**	20[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	120,200 (Cr^{3+})[b]/240 (Cr^{6+})[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper**	3,200[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead**	250[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	1,600[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOCs (ug/kg)																		
Methylene chloride	130,000[b]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	3,200[d]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	5,600[d]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	30[a]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1,900[b]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	7,000[a]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	6,000[a]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	9,000[a,f]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	16,000,000[b]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	800,000[b]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	NE[b]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	8,000,000[b]	R	NA	58 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NE	R	NA	100 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	NE	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	NE	R	NA	78 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Isopropyltoluene	NE	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	NE	R	NA	87 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	5,000[a]	R	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs (ug/kg)																		
Pentachlorophenol	2,500[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl)phthalate	71,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
NA - Not analyzed or not available
NE - Not established
cPAHs - Carcinogenic Polycyclic Aromatic Hydrocarbons
PCBs - Polychlorinated biphenyls
SVOCs - Semivolatile Organic Compounds
TPH - Total petroleum hydrocarbons
VOCs - Volatile Organic Compounds
bgs - below ground surface
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
SS - sub-slab soil sample
J - Estimated value

U - Compound was analyzed for but not detected above the reporting limit shown
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.
R - Rejected. The presence or absence of this analyte cannot be verified
[a]MTCA Method A Soil Cleanup Level
[b]MTCA Method B Soil Cleanup Level - Direct contact
[c] Carcinogenic PAH (cPAH) cleanup levels under MTCA are based on the calculated total toxicity of the mixture using the Toxicity Equivalency Methodology in WAC 173-340-708 (8). The mixture of cPAHs shall be considered a single hazardous substance and compared to the applicable MTCA Method B cleanup level for benzo(a)pyrene
[d] Protection of Marine Surface Water
[e]Sample was re-analyzed . For reporting purposes higher value if detected was used, while the lower undetect was used if undetected
[f]Cleanup level is for total xylenes
BOLD Exceeds preliminary cleanup level
* Chromatographic profile does not match the laboratory standard chromatogram
** Indicator Hazardous Substance

Table 4-1
Summary of Soil Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

TABLE C-1

Sample ID:		SB-102	SB-102	SB-102	SB-103	SB-103	SB-103	SB-104	SB-105	SB-105	SB-106	SB-106	SB-107	SB-107	SB-107	SS1	SS2	SS3	SS4	SS5
Sample ID Depth Interval (feet bgs):	**Preliminary Cleanup Levels**	5	11	14	6	10	13	5	6	11	5	10	5	10	13	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Collected:		6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	6/25/2010	3/4/2003	3/5/2003	3/4/2003	3/4/2003	3/4/2003
Field QC:																				
TPH (mg/kg)																				
Diesel-range**	2,000[a]	**8,400 J**	**4,800 J**	1,300 J	6.2 UJ	6.4 UJ	1,300 J	6.7 J	5.5 UJ	8.0 UJ	6.8 UJ	7.2 UJ	5.8 UJ	7.1 UJ	6.6 UJ	25U	50U	25U	570	25U
Oil-range**	2,000[a]	350 J	200 J	54 J	12 UJ	13 UJ	45 J	10 UJ	11 UJ	16 UJ	14 UJ	22 J	12 UJ	14 UJ	17 J	280	680	260	870	450
PAHs (ug/kg)																				
Benzo(a)anthracene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene**	140[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	See Note c	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TTEC**	140[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (ug/kg)																				
Aroclor 1016	5,600[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254**	1,600[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs**	1,000[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organotins (ug/kg)																				
Tributyltin as TBT Ion	7,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibutyl Tin Ion	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Tin Ion	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)																				
Antimony**	32[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic**	20[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.4U	12U	14U	**84**	**210**
Cadmium	80[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.56U	2.0U	2.3U	2.9	3.2
Chromium	120,200 (Cr^{3+})[b]/240 (Cr^{6+})[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31	51	150	51	96
Copper**	3,200[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	750	2,000	2,600	1,400	2,000
Lead**	250[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	24	28	230	240	**550**
Nickel	1,600[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	990	3,100	1,600	2,800
VOCs (ug/kg)																				
Methylene chloride	130,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	3,200[d]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	5,600[d]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	30[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1,900[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	7,000[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	6,000[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	9,000[a,f]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	16,000,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	800,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	NE[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	8,000,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Isopropyltoluene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	5,000[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs (ug/kg)																				
Pentachlorophenol	2,500[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-Ethylhexyl)phthalate	71,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
NA - Not analyzed or not available
NE - Not established
cPAHs - Carcinogenic Polycyclic Aromatic Hydrocarbons
PCBs - Polychlorinated biphenyls
SVOCs - Semivolatile Organic Compounds
TPH - Total petroleum hydrocarbons
VOCs - Volatile Organic Compounds
bgs - below ground surface
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
SS - sub-slab soil sample
J - Estimated value

U - Compound was analyzed for but not detected above the reporting limit shown
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.
R - Rejected. The presence or absence of this analyte cannot be verified
[a]MTCA Method A Soil Cleanup Level
[b]MTCA Method B Soil Cleanup Level - Direct contact
[c] Carcinogenic PAH (cPAH) cleanup levels under MTCA are based on the calculated total toxicity of the mixture using the Toxicity Equivalency Methodology in WAC 173-340-708 (8). The mixture of cPAHs shall be considered a single hazardous substance and compared to the applicable MTCA Method B cleanup level for benzo(a)pyrene
[d] Protection of Marine Surface Water
[e]Sample was re-analyzed . For reporting purposes higher value if detected was used, while the lower undetect was used if undetected
[f]Cleanup level is for total xylenes
BOLD Exceeds preliminary cleanup level
* Chromatographic profile does not match the laboratory standard chromatogram
** Indicator Hazardous Substance

Table 4-1
Summary of Soil Analytical Results
Everett Shipyard
Everett, Washington
RI/FS

TABLE C-1

Sample ID: / Sample ID Depth Interval (feet bgs): / Date Collected: / Field QC:	**Preliminary Cleanup Levels**	SS-33 1/6/2009	SS-34 1/21/2009	SS-34 1/21/2009 Field Duplicate	SS-35 1/6/2009	SS-36 1/6/2009	SS-37 1/21/2009	SS-38 1/6/2009	SS-39 0.5 - 1 12/4/2008	SS-39 1 - 2 12/4/2008	SS-40 12/3/2008	SS-41-2 12/3/2008
TPH (mg/kg)												
Diesel-range**	2,000[a]	150	100	100	78	200	100	1,900	59	NA	5.1 U	180
Oil-range**	2,000[a]	190	120	160	270	720	350	1,400	370	NA	10 U	490
PAHs (ug/kg)												
Benzo(a)anthracene	See Note c	140 J	220 J	490	260	1,100	600	880	130	4.6 U	12	2,000
Chrysene	See Note c	160 J	360 J	920	320	1,300	1,000	1,300	150	4.6 U	20	2,200
Benzo(b)fluoranthene	See Note c	140 J	450 J	700	280	1,100	870	1,200	110	4.6 U	14	2,400
Benzo(k)fluoranthene	See Note c	140 J	450 J	700	280	1,100	1,200	1,200	110	4.6 U	12	2,100
Benzo(a)pyrene**	140[b]	**170 J**	**370 J**	**530**	**220**	**940**	**710**	**1,400**	130	4.6 U	16	**2,000**
Indeno(1,2,3-cd)pyrene	See Note c	90 J	240	260	110	630	240 J	830	77	4.6 U	9.1	1,200
Dibenzo(a,h)anthracene	See Note c	38 J	110	120	46	260	4.7 U	350	35	4.6 U	4.6 U	590
TTEC**	140[b]	**226 J**	**521 J**	**766**	**321**	**1,372**	**1,011 J**	**1,859**	**178**	NA	21	**2,851**
PCBs (ug/kg)												
Aroclor 1016	5,600[b]	31 U	NA	NA	NA	NA	65 U	NA	NA	NA	NA	330 U
Aroclor 1242	NE	31 U	NA	NA	NA	NA	65 U	NA	NA	NA	NA	330 U
Aroclor 1248	NE	31 U	NA	NA	NA	NA	65 U	NA	NA	NA	NA	820 UJ
Aroclor 1254**	1,600[b]	79	NA	NA	NA	NA	140	NA	NA	NA	NA	**2,200**
Aroclor 1260	NE	31 U	NA	NA	NA	NA	65 U	NA	NA	NA	NA	460
Aroclor 1221	NE	31 U	NA	NA	NA	NA	65 U	NA	NA	NA	NA	330 U
Aroclor 1232	NE	31 U	NA	NA	NA	NA	65 U	NA	NA	NA	NA	330 U
Total PCBs**	1,000[a]	79	NA	NA	NA	NA	140	NA	NA	NA	NA	**2,660**
Organotins (ug/kg)												
Tributyltin as TBT Ion	7,400	59	NA	NA	NA	NA	530	NA	NA	NA	NA	NA
Dibutyl Tin Ion	NE	130	NA	NA	NA	NA	380	NA	NA	NA	NA	NA
Butyl Tin Ion	NE	63	NA	NA	NA	NA	260	NA	NA	NA	NA	NA
Metals (mg/kg)												
Antimony**	32[b]	30 U	30 U	30 U	30 U	**140**	**80**	**150**	27 J	NA	5 U	**100**
Arsenic**	20[a]	**30**	**140**	**130**	**130**	**530**	**480**	**660**	**134 J**	5 U	5	**1,110**
Cadmium	80[b]	1.0 U	1	1	2	2.3	3	2.7	0.9	NA	0.3	11
Chromium	120,200 (Cr^{3+})[b]/240 (Cr^{6+})[b]	53	58	62	101	75	128	146	40.5	NA	21.1	83
Copper**	3,200[b]	2,250	3,140	3,130	**3,330**	1,870	1,900	2,210	305	9.1	49.9	2,700
Lead**	250[a]	40	90	90	180	**799**	**810**	**881**	182 J	NA	39	**1,270**
Nickel	1,600[b]	28	38	37	46	35	67	25	27	NA	21	32
Zinc	24,000[b]	890	800	667	2,300	2,310	3,690	1,730	655	87	128	7,720
VOCs (ug/kg)												
Methylene chloride	130,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	3,200[d]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	5,600[d]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	30[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1,900[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	7,000[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	6,000[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	9,000[a,f]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	16,000,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	800,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	NE[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	8,000,000[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Isopropyltoluene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	5,000[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs (ug/kg)												
Pentachlorophenol	2,500[b]	300 U	NA	NA	NA	NA	310 U	NA	NA	NA	NA	290
Bis(2-Ethylhexyl)phthalate	71,000[b]	61 U	NA	NA	NA	NA	220	NA	NA	NA	NA	1,500

Notes:
NA - Not analyzed or not available
NE - Not established
cPAHs - Carcinogenic Polycyclic Aromatic Hydrocarbons
PCBs - Polychlorinated biphenyls
SVOCs - Semivolatile Organic Compounds
TPH - Total petroleum hydrocarbons
VOCs - Volatile Organic Compounds
bgs - below ground surface
mg/kg - milligrams per kilogram
ug/kg - micrograms per kilogram
SS - sub-slab soil sample
J - Estimated value

U - Compound was analyzed for but not detected above the reporting limit shown
UJ - Compound was analyzed for but not detected above the reporting limit shown. The reporting limit is an estimated value.
R - Rejected. The presence or absence of this analyte cannot be verified
[a]MTCA Method A Soil Cleanup Level
[b]MTCA Method B Soil Cleanup Level - Direct contact
[c] Carcinogenic PAH (cPAH) cleanup levels under MTCA are based on the calculated total toxicity of the mixture using the Toxicity Equivalency Methodology in WAC 173-340-708 (8). The mixture of cPAHs shall be considered a single hazardous substance and compared to the applicable MTCA Method B cleanup level for benzo(a)pyrene
[d] Protection of Marine Surface Water
[e]Sample was re-analyzed . For reporting purposes higher value if detected was used, while the lower undetect was used if undetected
[f]Cleanup level is for total xylenes
BOLD Exceeds preliminary cleanup level
* Chromatographic profile does not match the laboratory standard chromatogram
** Indicator Hazardous Substance

TABLE C-2
SOIL ANALYTICAL RESULTS
EVERETT SHIPYARD

	Cleanup Level	SB-139 (6-7) EV12100167-66 10/25/2012	SB-140 (2-3) EV12100167-64 10/25/2012	SB-141 (10-11) EV12100167-68 10/25/2012	SB-141 (15-16) EV12100167-69 10/25/2012	SB-142 (4.5-5.5) EV12100167-60 10/25/2012	SB-142 (9-10) EV12100167-61 10/25/2012	SB-142A (6-7) EV12100172-66 10/26/2012	SB-143 (3-4) EV12100167-63 10/25/2012	SB-143 (5.5-6.5) EV12110096-01 11/16/2012
TOTAL PETROLEUM HYDROCARBONS (mg/kg)										
HCID										
Gasoline Range Organics						20 U				
Diesel Fuel						**>50**				
Motor Oil						100 U				
NWTPH-DX										
Diesel	2000	**170**	**330**	**6500**	**5500**	**16000**	25 U	25 U	**15000**	25 U
Oil	2000	50 U	50 U	**810** J	**1300** J	500 U	50 U	50 U	1000 U	50 U

J = Indicates the analyte was positively identified; the associated value is approximate.
U = Indicates the compound was not detected at the reported concentration.
Bold = Detected compound.
Box = Exceedance of cleanup level.

Source: \\edmdata01\projects\147\036\WIP\T\Evt Shpyd Data Tables.xlsx

APPENDIX D

2009 Groundwater Level Measurements

TABLE D-1

Table 2-3
Groundwater Monitoring Well Construction Details and Water Level Measurements
Everett Shipyard
Everett, Washington
RI/FS

Monitor Well	Total Depth (ft bgs)	Screen Interval (ft bgs)	Top of Casing Elevation (ft NAVD88)	January 6, 2009 Depth to Groundwater (ft btoc)		January 6, 2009 Groundwater Elevation (ft msl)		April 1, 2009 Depth to Groundwater (ft btoc)		April 1, 2009 Groundwater Elevation (ft msl)		July 9, 2009 Depth to Groundwater (ft btoc)		July 9, 2009 Groundwater Elevation (ft msl)		October 13, 2009 Depth to Groundwater (ft btoc)		October 13, 2009 Groundwater Elevation (ft msl)	
					low tide		low tide		low tide		low tide		low tide		low tide	low tide		low tide	
				1:30 PM	**7:25 PM**	**1:30 PM**	**7:25 PM**	**11:15 AM**	**4:25 PM**	**11:15 AM**	**4:25 PM**	**10:30 AM**	**2:00 PM**	**10:30 AM**	**2:00 PM**	**6:45 AM**	**9:15 AM**	**6:45 AM**	**9:15 AM**
MW-1	15	4.5-14.5	12.84	2.96	2.98	9.88	9.86	3.61	3.59	9.23	9.25	4.49	4.22	8.35	8.62	4.53	4.50	8.31	8.34
MW-2	15.2	4.75-14.75	13.84	2.76	3.01	11.08	10.83	3.70	4.56	10.14	9.28	5.02	5.15	8.82	8.69	5.21	5.25	8.63	8.59
MW-4	13	3-13	15.09	4.09	6.11	11.00	8.98	6.69	6.69	8.40	8.40	7.25	7.25	7.84	7.84	7.58	7.60	7.51	7.49
MW-5	12.5	2.5-12.5	14.81	3.14	5.93	11.67	8.88	6.55	6.61	8.26	8.20	7.12	7.18	7.69	7.63	7.48	7.49	7.33	7.32
MW-6	12.5	2.5-12.5	13.31	3.79	3.61	9.52	9.70	4.94	5.19	8.37	8.12	NM	NM	NM	NM	5.93	6.02	7.38	7.29
MW-7	12.5	2.5-12.5	15.15	3.83	3.84	11.32	11.31	5.24	5.20	9.91	9.95	6.32	6.35	8.83	8.80	6.68	5.65	8.47	9.50
MW-8	12.5	2.5-12.5	14.88	3.22	5.11	11.66	9.77	4.94	4.85	9.94	10.03	5.60	5.63	9.28	9.25	5.89	5.24	8.99	9.64
MW-9	13	2.9-12.9	15.54	5.24	5.32	10.30	10.22	5.76	5.72	9.78	9.82	6.04	6.03	9.50	9.51	NM	6.26	NM	9.28
MW-10	12.5	2.5-12.5	15.33	5.68	NM	9.65	NM	5.36	5.28	9.97	10.05	5.73	5.72	9.60	9.61	5.81	5.81	9.52	9.52

Notes:
ft = feet
bgs = below ground surface
btoc = below top of casing
msl = mean sea level
NAVD88 = North American Vertical Datum of 1988, in feet
NM = not measured, well was not accessible during water level sweep following low tide
An interface probe was used to check for the presence of non-aqueous phase liquid (NAPL) in each well prior to each sampling event. NAPL was not detected in any of the wells.
MW-1 & MW-2 were originally surveyed in a different vertical datum than MW-4 through MW-10.
For purposes of comparison, MW-1 & MW-2 reference elevations were converted to NAVD88 using VERTCON by US Army Corps of Engineers.
Groundwater level measurements were collected within a 45 minute period beginning at the time listed above.
January 6, 2009: High tide of 11.4' at 11:07 AM, low tide of -0.3' at 6:46 PM.
April 1, 2009: High tide of 10.2' at 8:32 AM, low tide of -1.0' at 4:08 PM.
July 9, 2009: High tide of 9.3' at 5:44 AM, low tide of -1.1' at 12:51 PM.
October 13, 2009: High tide of 8.4' at 12:00 AM, low tide of 0.8' at 6:54 AM.
Tidal elevations are in feet relative to mean lower low water (MLLW).

APPENDIX E

Geophysical Survey

Global Geophysics
16651 White Mountain Road SE
Monroe, WA 98272
Tel: 425-890-4321
Fax: 360-805-0259

July 28, 2010 Our ref: 100-0728.000

URS Corporation
1501 4th Avenue, Suite 1400
Seattle, WA 98101

ATTENTION: Mr. David Raubvogel

RE: REPORT FOR UST LOCATE AT 1402 WEST MARINE VIEW DRIVE, EVERETT, WASHINGTON

This letter report presents the results of the geophysical survey performed by Global Geophysics on July 28th, 2010 at 1402 West Marine View Drive, Everett, WA. The objective of the geophysical test was to attempt to locate underground storage tanks.

METHODOLOGY, INSTRUMENTATION AND FIELD PROCEDURES

Magnetometer and ground penetrating radar were used for this project. The standard procedures of these surveys are attached in the appendix.

Magnetics

This magnetometer is used to measure variations in the magnetic field of the Earth, including local distortions or anomalies of the field caused by ferrous objects or minerals. In general, the magnitude of the magnetometer response is proportional to the mass of the ferrous object. A single drum can be detected to a depth of approximately 15 to 20 feet, and a 4-inch diameter steel pipeline can be detected to a depth of approximately 10 feet. Non-ferrous metals, such as copper and aluminum cannot be located with a magnetometer.

A Geometrics Cesium magnetometer was used to collect magnetic data along the traverses 5 ft apart.

Ground Penetrating Radar

The GPR method uses electromagnetic pulses, emitted at regular intervals by an antenna to map subsurface features. The electromagnetic pulses are reflected where changes in electrical properties of materials occur such as changes in lithology or where underground utilities are present. The reflected electromagnetic energy is received by an antenna, converted into an electrical signal, and recorded on the GPR unit. The data is recorded and viewed in real time on a graphical display that depicts a continuous profile or cross-section image of the subsurface directly beneath the path of the antenna.

The depth of penetration of the GPR signal varies according to antenna frequency and the conductivity of the subsurface material. The depth of subsurface penetration with GPR decreases with an increase in the frequency of the antenna and an increase in soil conductivity. Low frequency antennas (50 to 500 MHz) provide the best compromise between obtaining good subsurface penetration and resolution.

The data at this site were collected using Geophysical Survey Systems, Inc. (GSSI) SIR 2000 GPR system with antennas having center frequency of 200 MHz and 400 MHz. The data were digitally recorded for post processing.

RESULTS

The magnetic data is contoured and presented in Figure 1. Two strongest magnetic anomalies are identified as potential underground storage tanks (USTs). A bigger area inside the dashed cyan line with higher than background magnetic intensity is interpreted as possible concrete support with metallic mesh (no rebar was detected with GPR).

GPR survey was conducted on the magnetic anomalies. The depth to the top of a reflector is within 2 ft. Three GPR profiles are shown in Figure 2.

LIMITATIONS

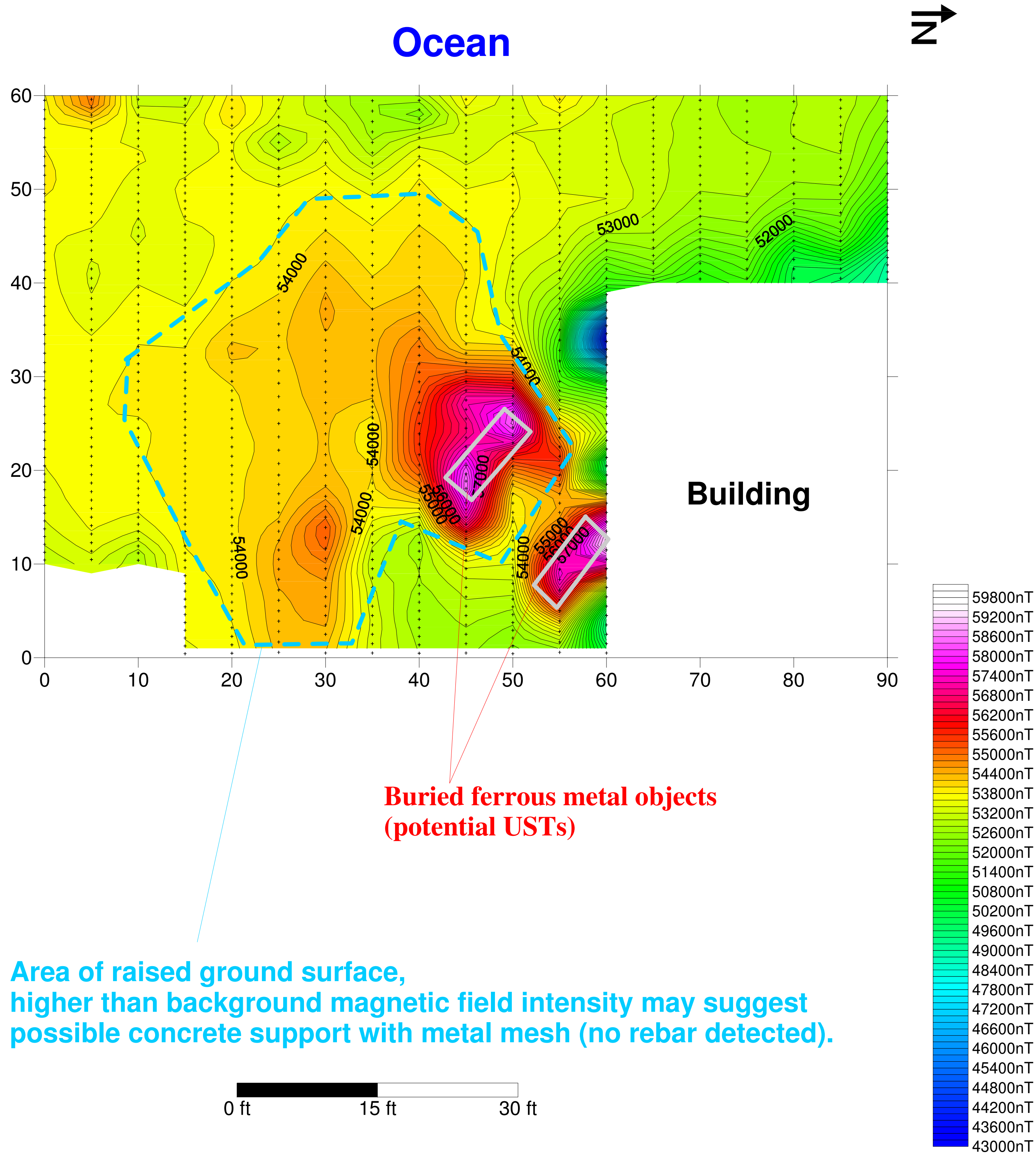
Global Geophysics's services are conducted in a manner consistent with the level of care and skill ordinarily exercised by other members of the geophysical community currently practicing under similar conditions subject to the time limits and financial and physical constraints applicable to the services. Magnetics and ground penetrating radar (GPR) are remote sensing geophysical methods that may not detect all subsurface objects. Furthermore, it is possible that geophysical anomalies that are interpreted to be USTs may upon intrusive sampling prove to be misinterpreted.

If you have any questions or require additional information, please contact us at 425-890-4321.

Sincerely,

Global Geophysics

John Liu, Ph.D.
Principal Geophysicist

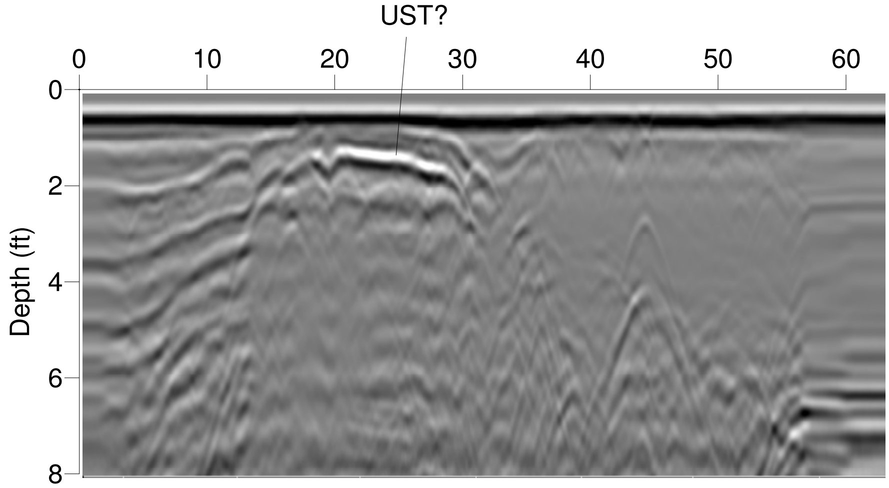


Note: Magnetic field intensity SI unit is nano Tesla

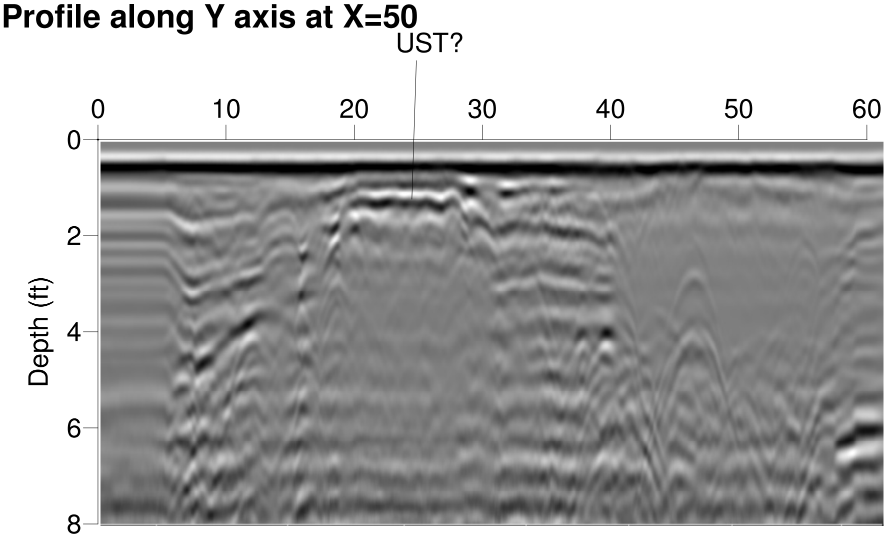
PROJECT	URS CORPORATION GEOPHYSICAL SURVEYS AT 1402 W MARINE VIEW DR. EVERETT, WA
TITLE	MAGNETIC CONTOUR PLAN

Global Geophysics 16651 White Mountain Road SE Monroe, WA, 98272 Tel: 425-890-4321	PROJECT No.	100-0728.000		FILE No.
	DESIGN	--		SCALE AS SHOWN REV.
	CADD	JL		FIGURE 1
	CHECK	--		
	REVIEW	--		

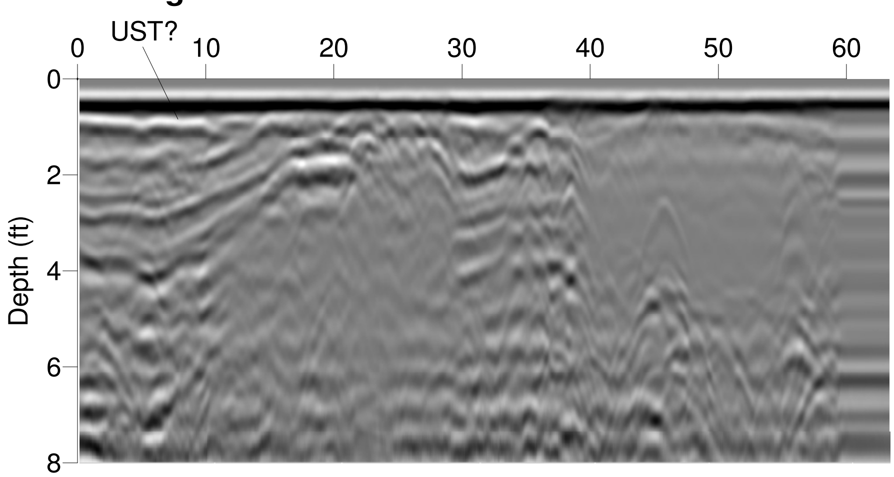
GPR Profile along Y axis at X=45



GPR Profile along Y axis at X=50



GPR Profile along Y axis at X=55



PROJECT
URS CORPORATION
GEOPHYSICAL SURVEYS AT 1402 W MARINE VIEW DR.
EVERETT, WA

TITLE

EXAMPLE GPR PROFILES

Global Geophysics
16651 White Mountain Road SE
Monroe, WA, 98272
Tel: 425-890-4321

PROJECT No.	100-0728.000	FILE No.
DESIGN	--	SCALE AS SHOWN REV.
CADD	JL	
CHECK	--	**FIGURE 2**
REVIEW	--	

APPENDIX F

Evaluation of Bulkhead Shoring vs Replacement Costs

LANDAU ASSOCIATES
ENVIRONMENTAL | GEOTECHNICAL | NATURAL RESOURCES

TECHNICAL MEMORANDUM

TO: Erik Gerking, Port of Everett

FROM: Larry Beard, P.E.

DATE: February 7, 2013

RE: EVERETT SHIPYARD SITE
EVALUATION OF BULKHEAD SHORING VS REPLACEMENT COSTS

The Port of Everett (Port) retained Moffatt & Nichol (M&N) to evaluate the structural condition of the existing bulkhead that establishes the shoreline for the Everett Shipyard Site (Site), and to develop a method and estimated cost for temporarily shoring the bulkhead during Site cleanup activities. M&N also evaluated potential replacement alternatives for the bulkhead that fronts the Site uplands, as well as the bulkhead to the south of the Site. The results of these evaluations were discussed below and are presented in detail in Attachments 1 and 2 to this letter for the temporary shoring evaluation and the bulkhead replacement evaluation, respectively.

BULKHEAD SHORING

There are three different bulkhead types present along the Site shoreline, which consist of the following segments:

- A stepped timber pile bulkhead with timber lagging and tie-backs (Segment A) present underneath the travel lift pier and decking area in the northeast corner of the North Marina
- A vertical timber pile bulkhead with tie-backs (Segment B) that extends south from the stepped timber pile bulkhead to about 25 ft south of the marine railway
- A stepped cantilever steel sheet pile and timber pile bulkhead with tie-backs (Segment C) that extends south from Segment B to end of the eastern bulkhead along this alignment.

Segments A and B of the bulkhead will require shoring during sediment dredging and, in the case of Segment A, during upland excavation of the petroleum hydrocarbon-contaminated area. Segment C is not anticipated to require shoring because dredging is not required between the stepped bulkheads, and the lower sheet pile bulkhead is anticipated to remain stable during dredging without additional lateral support. Figure 1 from Attachment 1 illustrates the alignments for the bulkhead sections. Note that there is also a bulkhead Section D illustrated on the figure, but it is not discussed in this letter because it is not located within the Site. Also note that Segment A at the northern end of the alignment actually extends about 70 ft farther west than the 0-20 starting point identified in the attached M&N memorandums, to the east end of the existing 14th Street bulkhead, resulting in a total length for Segment A of 350 ft.

As described in Attachment 1, shoring of the existing bulkhead is complicated by the configuration and condition of the existing bulkhead system. Shoring for Segment A is particularly difficult due to its stepped, tieback configuration, and the need to excavate upland petroleum hydrocarbon-contaminated soil to a depth of up to 16 ft immediately adjacent to the upper bulkhead. Excavation and dredging in the petroleum hydrocarbon area will require complex construction sequencing in addition to an elaborate shoring system, as described in Attachment 1.

The conceptual shoring design would not prevent water from the north Marina from entering the excavation in the petroleum hydrocarbon excavation area, so the actual cost for a shoring system that would also prevent the discharge of contaminated upland groundwater and free-phase petroleum hydrocarbon contamination to marine environment would be greater than estimated in Attachment 1.

M&N estimated that the shoring system for Segment A would cost about $11,000 per linear foot (LF) and the shoring system for Segment B would cost about $6,000/LF. The conceptual shoring design and costs developed by M&N are considered preliminary and a more detailed analysis may result in a more efficient and lower cost approach, but the shoring costs will remain high due to:

- The bulkhead configuration
- The need to both dredge and excavate immediately adjacent to the bulkhead
- The need to create a rigid shoring system (i.e., no lateral deflection) to avoid damaging the existing bulkhead
- The need to prevent marine water from entering the upland excavation
- The lack of information on the configuration and condition of subgrade portions of the existing bulkhead systems
- The condition of the bulkheads.

In addition to the high costs, M&N also indicated that the disturbance associated with the installation and removal of the temporary shoring could cause the bulkhead to fail when the temporary shoring is removed. They also pointed out that contaminated sediment retained between the shoring and bulkhead would be released to the marine environment when the shoring is removed.

BULKHEAD REPLACEMENT

As described in Attachment 2, M&N evaluated a number of different bulkhead replacement alternatives and conducted a more detailed evaluation of two anchored wall bulkhead systems that would be stable under major earthquake loading conditions. Their evaluation estimated that the two systems would cost from about $9,800/LF to about $12,000/LF. They also compared this to the engineer's estimate for construction of the 14th Street bulkhead ($6,000/LF), which is not designed to resist earthquake loadings.

COMPARISON OF BULKHEAD SHORING AND REPLACEMENT

A comparison of estimated bulkhead shoring and replacement costs are provided in Table 1 below.

TABLE 1
COST COMPARISON FOR
BULKHEAD SHORING AND REPLACEMENT ALTERNATIVES

Alternative	Unit Cost ($/LF)	Total Cost ($)
Temporary Shoring	$10,700/5,980 (Segments A/B)	$3,040,000
Anchored Wall (tie-down)	$9,770,000	$3,420,000
Anchored Wall (A-frame)	$12,200	$4,270,000
14th Street Bulkhead Wall	$6,000	$2,100,000

Based on the above costs, shoring the existing bulkhead would be about 10 percent less expensive than the least expensive anchored wall (earthquake-resistant) replacement bulkhead, but about 30 percent more expensive than replacement with a bulkhead similar in design to the existing 14th Street bulkhead. Additionally, disturbance caused by the shoring could cause the existing bulkhead to fail upon removal of the shoring. The temporary shoring would also result in small quantities of contaminated sediment trapped behind the shoring being release to the post-dredging surface when the shoring is removed. In addition to these issues, shoring the existing bulkhead would retain a large quantity of creosoted wood in the marine environment rather than replacing the creosoted wood with a more environmentally protective material.

Based on these considerations, it is our opinion that existing bulkhead Segments A and B should be replaced as part of the cleanup action rather than shoring the existing bulkhead because replacement would be more cost effective, reliable, and environmentally protective than temporary shoring.

* * * * * * * * * *

This technical memorandum was prepared for the exclusive use of the Port of Everett and Ecology for specific application to the Everett Shipyard Site located in Everett, Washington. The use of this document by others or for another project is at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

LDB/tam
Attachments

ATTACHMENT 1

East Marina Bulkhead Remediation Support

MEMORANDUM

To: **Erik Gerking, Port of Everett**

From: **Pooja Jain, M&N**

Cc: **Mike Hemphill, M&N**

Date: **December 14, 2012**

Subject: **Port of Everett East Marina Bulkhead Remediation Support**

M&N Job No.: **7872**

The Port of Everett (POE) retained Moffatt & Nichol (M&N) to investigate schematic level options for temporary support of the deteriorating timber bulkheads at the North Marina to allow removal of contaminated material as documented by Landau and Associates (Appendix A). This task includes one shoring scheme for each of two bulkhead construction types found in the area under consideration. In addition the POE has requested order of magnitude costs for the installation of a containment wall to be installed to reduce migration of contaminants during the remediation work.

This memorandum documents the following for the temporary shoring:

1. Extent of the remediation assumed (provided by Landau and Associates).
2. Assumptions made about the staging and phasing of the excavation, dredge and fill.
3. Presentation of one possible support scheme for each of the two bulkhead segment configurations investigated.
4. Discussion of challenges and risks associated with working near the existing bulkheads.
5. Order of magnitude costs analysis of the shoring schemes proposed.

The costs presented in this memo for the containment wall are from prior M&N experience for a different site and will be provided without any analysis for site specific conditions.

EXISTING BULKHEAD

The existing 1,135 feet bulkhead has four distinct areas consisting of different types of construction (see Figure 1). The remediation contemplated will affect the subject bulkheads from the termination of the new 14th street wall to approximately station 6+50. The preliminary extent of dredging and landside remediation is shown in Appendix A Figures 2 and 5 from Landau and Associates. This memo is limited to discussion of the bulkhead from station 0-20 to approximately station 2+50.

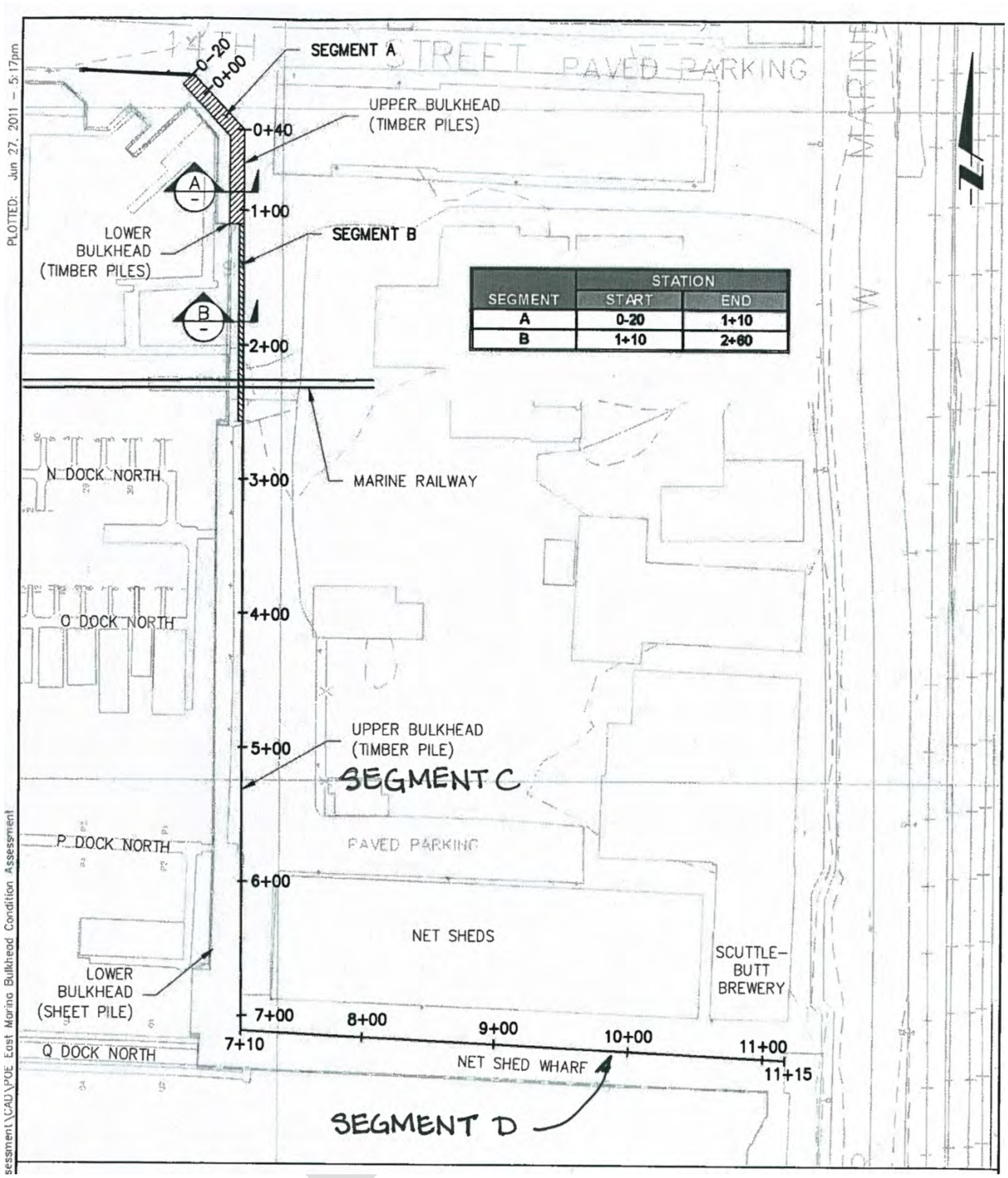


Figure 1:Plan of the Subject Area With Bulkhead Types

The bulkhead types are:

- Stepped timber pile bulkhead with timber lagging and tie-backs (labeled Segment A).
- Vertical timber pile bulkhead with tie-backs (labeled Segment B).

- Stepped cantilever sheet pile and timber pile bulkhead with tie-backs (labeled Segment C).
- Stepped timber bulkhead and timber pile bulkhead with timber lagging and tie-backs (labeled Segment D).

The condition of these areas were determined in the 2007 and 2011 condition assessment studies by Moffatt and Nichol and reported using the rating system in the ASCE Underwater Investigations Standard Practice Manual. The lower bulkhead of Segment A was found to be "WORN[1]" and the upper bulkhead was "FAIR[2]" in 2011

On September 6, 2012 Moffatt & Nichol engineers visited the site and observed that the Segment B bulkhead had deteriorated from a "FAIR" condition north of station 2+30 reported in 2011 to a "REPLACE[3]" condition as observed currently. The condition south of station 2+30 remains "WORN." Use and service warnings were expressed to the Port of Everett in a memo dated September 7, 2012 on the subject. This quick change in condition illustrates the unknown and potentially dangerous condition of the subject structures.

This study is limited to bulkhead Segments A and B. Segments C and D are not a part of this exercise however if dredging for remediation is performed in these areas it is likely shoring will be required.

[1] WORN is described in the manual as "Component found to exhibit cracking, corrosion, or other indicators of deterioration. The component is still serviceable but requires maintenance attention to achieve or extend its service life. Advanced deterioration or overstressing is observed on widespread portions of the component but does not significantly reduce the load-bearing capacity of the structure."

[2] FAIR is described in the manual as "Component found to be serviceable but not in good condition. Lightly worn usually due to normal wear or weather conditions. Localized areas of moderate to advanced deterioration may be present, but do not significantly reduce the load bearing capacity of component."

[3] REPLACE is described in the manual as "Component found to be worn to the state of needing immediate replacement or major repair.

TEMPORARY SHORING

Substantial remediation efforts requiring dredging and excavation are planned for areas near the subject walls (as delineated by Landau, see Appendix A). The timber bulkheads are not expected to remain intact without temporary support during this process. This memo describes one possible shoring scheme for each of two bulkhead segments to stabilize and save the existing bulkhead during removal of contaminated sediments such that the existing bulkhead will remain in place and serviceable after the cleanup is completed. The shoring wall designs are largely controlled by the need to limit the movement of the existing wood bulkheads during the work so that they do not fail due to being overstressed. The size of the sheets has been chosen and the tie backs have been located with deflection as the controlling design parameter, not the strength of the shoring components. The sheets are therefore substantially larger than they would be if preservation of the wall were not driving the design. To analyze these schemes the following assumptions have been made based on discussions with Landau, the Port of Everett, and review of previous M&N condition memos.

- The timber constructed bulkheads will remain in place during excavation and fill. Shoring and bracing will be installed to temporarily support them.
- The existing bulkhead construction will be preserved or repaired to its current condition but not improved or brought up to a higher performance standard than its original construction. Existing deadman anchors or anchor piles will be reused but anchor rods will be replaced with new.
- Excavation will occur in phases as defined and must be followed for the given structural solution to be implemented.
- All work except dredging will be done with land based equipment.
- A maximum differential hydrostatic head of two feet is assumed. This will require drain holes in the temporary sheet pile walls.
- The geotechnical recommendations provided by Shannon and Wilson for the permanent wall design were used for this design. Only the static case is considered. (See Appendix B)
- There will be no live load on the soil behind the shoring wall during this work for a distance of at least 25 feet or the top of the cut excavation slope, whichever is greater.
- There is significant risk of bulkhead failure so the shoring sheets will not be extracted. They will be left in place and cut off at the mudline.

TEMPORARY SHORING SCHEMES

Segment A

Shoring of Segment A can be accomplished using tied back sheet piles in front of the lower bulkhead and careful staged excavation and fill behind both of the bulkheads. The existing tiebacks will have to be removed in order to excavate and they will be replaced during the fill placement. See Figure 2 (not to scale).

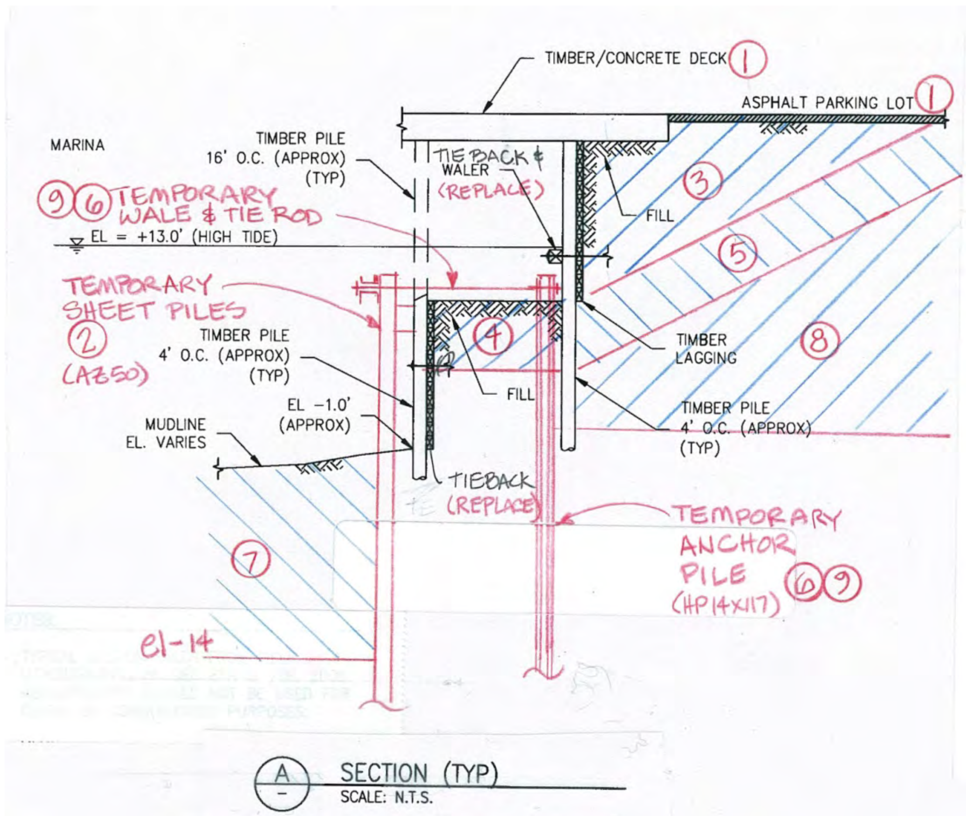


Figure 2: Potential construction sequence for remediation – Segment A

The proposed sequence is as follows:

1. Remove deck structure above the work area as required.
2. Install sheet piles in front of lower bulkhead.
3. Remove a wedge of material behind landward bulkhead from elevation matching the lower bulkhead fill to ground level at 2H:1V or other suitable slope per geotechnical recommendation. Assume a crawler crane to excavate the soil. Preserve tie back at this stage.
4. Remove 5 feet of soil behind lower bulkhead. Remove tie backs if required.
5. Remove a wedge of material behind the landward bulkhead down to an elevation matching the depth of excavation in front at the lower bulkhead maintaining the same 2H:1V slope. Excavate so that soil level stays roughly even between the bulkheads. Remove tiebacks as required when this stage of excavation is complete.
6. Install anchor piles, steel walers, and tiebacks at temporary sheet pile wall.

7. Remove contaminated soil in front of temporary shoring wall. Monitor wall deflection and tighten tiebacks to limit deflection of timber bulkhead. Back fill in front of lower bulkhead with clean material.
8. Remove remainder of contaminated material behind landward bulkhead.
9. Remove temporary tiebacks, waler and pile between bulkheads.
10. Replace tieback at lower bulkhead. Backfill behind lower bulkhead and upper bulkhead together maintaining height within 2' on either side.
11. Backfill behind landward bulkhead up to tieback location and replace.
12. Backfill behind landward bulkhead up to grade.
13. Secure top of steel sheets to timber bulkhead or cut off at mud line.

Segment B

Shoring of Segment B can be accomplished using a tied back sheet pile wall essentially supporting the entire existing bulkhead up to the existing waler location. The existing tie backs outside the marine railway area appear to be below the required excavation and so can remain during the construction; however it is our understanding that some of these tiebacks have been compromised based on recent pit dug behind Segment B. See figure 3. It should be noted that figure 3 is not to scale.

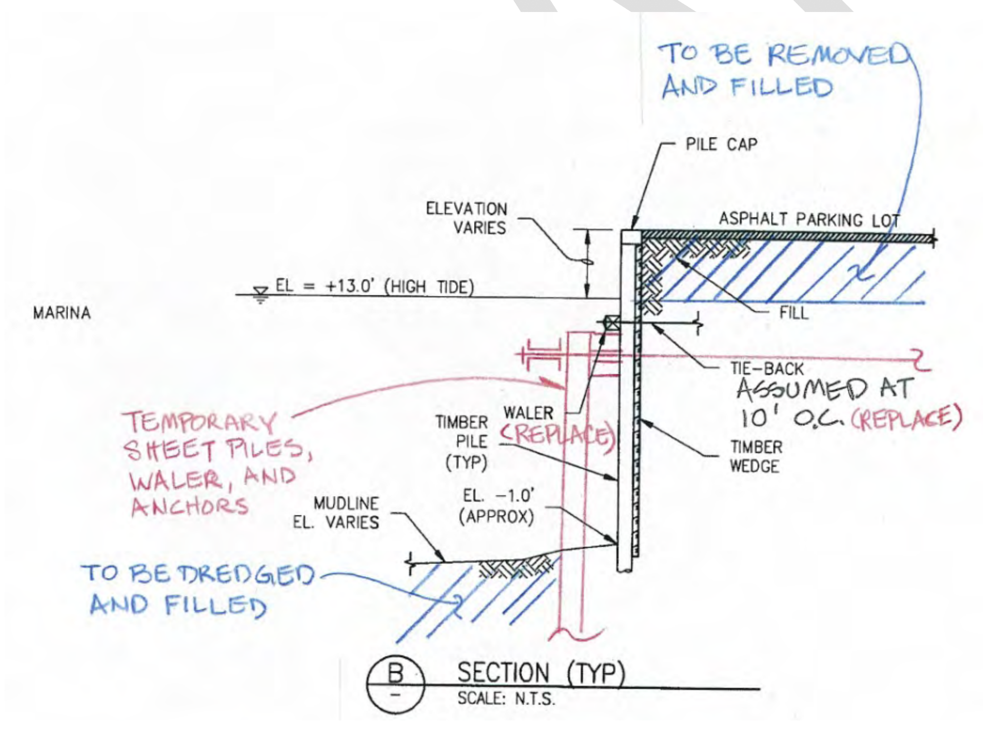


Figure 3: Potential construction sequence for remediation – Segment B

The proposed sequence is as follows:

1. Remove portion of marine railway at bulkhead.
2. Install sheet piles in front of bulkhead.
3. Remove soil behind bulkhead to three feet below surface per geotechnical direction. At the marine railway area the tiebacks will have to be removed during excavation. Outside of this area the remediation is not anticipated to be deep enough to require removal of the existing tie backs.
4. Install steel waler in front of sheet pile wall just below existing timber waler. Install tiebacks to temporary anchor piles installed behind the bulkhead. Trenching will be necessary to install the temporary tiebacks.
5. Remove contaminated material in front of temporary shoring wall.
6. Backfill in front of wall.
7. Backfill behind bulkhead up to existing tieback location and replace.
8. Remove temporary tiebacks and pull temporary anchor piles.
9. Backfill behind bulkhead up to grade.
10. Remove temporary waler.
11. Secure top of sheets to wood bulkhead or cut off at mud line.

CHALLENGES AND RISKS

Condition of the existing bulkheads: The existing bulkheads were found to be FAIR, AND WORN during the condition assessment done in 2011. Areas of settlement are evident behind Segment B and some of it has recently been downgraded to "REPLACE." The condition of the tiebacks and deadman or pile anchors is unknown.

Knowledge of existing construction: Very limited structural information from the original construction is available for Segment A and no information is available for Segment B. No information is available on the tiebacks at any of the locations. These support schemes are based on what is visible in the system and our best guess as to what is not visible, including the depth of penetration for the Segment B piles, and the tieback locations for Segment A. If conditions deviate significantly the support structure may have to be reinforced or the replacement of the tiebacks may have to be redesigned leading to construction risk and change orders.

Damage during construction: Installation of the sheet piles will require either impact hammer or more likely a vibratory hammer. It is quite likely that the vibration could cause settlement of the bulkhead or surrounding soil. The contractor will have to take protective measures in order to avoid damaging the bulkhead with excavation equipment or pile driving equipment. Given the current state of the existing bulkhead at Segment B, it is likely that bulkhead may be locally or globally compromised during sheet pile installation. It is a significant construction risk which may lead to release of contaminated soils into the marina.

Inability to remove some of the contaminated material: Installation requirements for the sheets dictate that they be placed in front of the existing bulkheads at least three or four feet. It will not be possible to remove the material between the sheets and the existing bulkhead. When the sheets are removed that contaminated soil prism will remain.

Creosote treated timber remains in intertidal zone: The schemes evaluated leave the existing bulkheads intact. When work is concluded the treated face will remain exposed as it is now.

Detailed design and geotechnical review may find these schemes inadequate: Detailed staged design has not been done for this exercise. It may be found after more detailed design and consultation with a geotechnical engineer that additional shoring and bracing is required.

TEMPORARY SHORING OPINION OF COSTS

Order of Magnitude Construction costs are developed for the two schemes discussed above. The costs are developed for a representative section at Segment A and B.

The costs include the following:

1. Mobilization/Demobilization (10%)
2. Bulkhead
    a. Steel Sheet Piles installed as shown in Figures 2 and 3 based on an estimated size (assume installation by landside based equipment).
    b. Temporary tie-back anchors with anchor piles and walers at Segments A and B.
    c. Replacement of permanent tie back anchors at Segments A and B.
3. Contractor Markup – 30%
4. Design Contingency – 30%

Demolition costs, excavation, dredging, backfill, upland restoration, design and permitting fee are not included in the comparative cost development.

A summary of **costs per foot** of construction for the two bulkhead segments is provided below:

Item	**Segment A**	**Segment B**
Mobilization/Demobilization	$595	$335
Shore bulkhead for remediation	$5,710	$3,200
Subtotal	***$6.305***	***$3,535***
Contractor Markup (30%)	$1,890	$1,060
Subtotal	***$8,195***	***$4,595***
Design Contingency (30%)	$2,460	$1,380
Total	**$10,655**	**$5,975**

RECOMMENDATION

It is recommended to construct a replacement bulkhead in front of the existing timber bulkheads. The cost of shoring the existing bulkheads is a non-recoverable expense. It is recommended that the limited public resources available for this project be invested in a bulkhead wall that exposes the Port of Everett to less construction risk and enhances the safety of the public rather than on a temporary solution to one problem.

REFERENCES

East Marina Bulkhead Replacement Condition Assessment and Replacement Alternatives Technical Memorandum dated January 2007 by Moffatt & Nichol.

East Marina Bulkhead Replacement Segment A & B Condition Re-Assessment and Replacement Alternatives Technical Memorandum dated July 2011 by Moffatt & Nichol.

Geotechnical Recommendations for soil pressures from Shannon & Wilson (received via e-mail)

Bulkhead Site Visit Memo dated September 7, 2012

Port of Everett East Marina Bulkhead Replacement Feasibility Study [DRAFT] Memorandum dated October 12, 2012.

Appendix A

Appendix B

ATTACHMENT 2

East Marina Bulkhead Replacement Feasibility Study (Final)

600 University Street, Suite 610
Seattle, WA 98101

moffatt & nichol

MEMORANDUM

To: Erik Gerking, Port of Everett

From: Pooja Jain, M&N

Cc: Mike Hemphill, M&N

Date: December 18, 2012

Subject: Port of Everett East Marina Bulkhead Replacement Feasibility Study [FINAL]

M&N Job No.: 7872

Port of Everett retained Moffatt & Nichol (M&N) to conduct a Feasibility Study for the replacement of the East Marina bulkhead wall, along the northeast perimeter of the south basin of the Everett Marina. This memorandum documents the following:

1. Assessment of existing condition of the wall based on review of "East Marina Bulkhead Replacement Condition Assessment and Replacement Alternatives" prepared by Moffatt & Nichol dated January 2007 and "East Marina Bulkhead Replacement Segment A & B Condition Re-Assessment and Replacement Alternatives" prepared by Moffatt & Nichol dated July 2011;
2. Bulkhead alternatives evaluation based on 50 year design life including assessment of constructability and environmental constraint;
3. Comparative costs analysis of the bulkhead alternatives considered favorable for the site;
4. Comparative cost analysis of the 14th street bulkhead with the bulkhead alternatives considered favorable for the site; and
5. Recommendation for preferred alternatives.

EXISTING BULKHEAD WALL

The existing 1,175 feet of bulkhead has four distinct areas consisting of different types of construction (see Figure 1). These different types are:

- Stepped timber pile bulkhead with timber lagging and tie-backs (labeled Segment A);
- Vertical timber pile bulkhead with tie-backs (labeled Segment B);
- Stepped cantilever sheet pile and timber pile bulkhead with tie-backs (labeled Segment C); and,

- Stepped timber wall and timber pile bulkhead with timber lagging and tie-backs (labeled Segment D).

The condition of these areas was determined in the 2007 and 2011 assessment studies conducted by Moffatt and Nichol. The following sections give a brief summary of the findings in these reports.

SEGMENT A BULKHEAD

The length of Segment A is 130 feet and consists of a stepped bulkhead near/under the boat hoist area (See Photograph 1). The upper wall consists of 14-inch diameter timber piling, timber lagging, timber walers, and steel tie-backs. The pilings are located approximately 4 feet on center with timber lagging directly behind. The horizontal tie-backs penetrated both the waler and pile.

The lower wall consists of 14-inch diameter timber piling. The timber pilings are spaced approximately 4 feet on center with timber lagging located behind. Every 10 to 15 feet on-center, the piling extends to the pile cap to support the deck above. The horizontal tie-backs penetrate the pile.

The utilities include water/fire lines located on the underside of the decking. Three drainage piles penetrate the bulkhead above and below water.

Based on the condition assessment in 2011, there are no visible signs of deterioration on the piling, lagging or the tiebacks above or below the high water mark, other than normal wear caused by weather conditions on the upper bulkhead. There were some signs of deterioration on the lower bulkhead and the lagging and severely corroded tie-backs appear to be in poor condition; however the wall appears plumb.

Photograph 1: Segment A Bulkhead Wall

SEGMENT B BULKHEAD

The length of Segment B is 150 feet and consists of a single vertical bulkhead directly west of the parking lot (See Photograph 2). The wall consists of 14-inch diameter timber piling, triangular shaped timber wedges, timber waler, and steel tie-backs. The horizontal tiebacks penetrate both the pile and waler.

A 1-inch utility conduit rests on the waler and a 10-inch corrugated plastic drainage pipe penetrates the wall above waterline at station 2+40.

Based on the condition assessment in 2011 the piling, waler, and tie-backs appear to be in fair condition, but the tie-backs have started to puncture the waler due to timber softening. At several locations the timber wedge between piles is missing and sediment/backfill is observed to be flowing out from behind the timber piles. The timber wedge deterioration appears to significantly affect the backfill as evidenced from the excessive settlement of the uplands areas.

Further, during a site visit conducted in September 2012, the segment of the wall north of the marine railway tracks undergone significant deterioration and is in imminent danger of collapse.

Photograph 2: Segment B Bulkhead Wall

SEGMENT C BULKHEAD

The length Segment C is 450 feet and consists of a stepped bulkhead directly under the parking lot sidewalk (See Photograph 3). The upper bulkhead consists of 14-inch diameter timber piling, triangular shaped timber wedges, timber waler, and steel tie-backs. The piling are located adjacent to one another and timber wedges are in place behind the timber piles to fill gaps. The horizontal tie-backs penetrated both the waler and pile.

The lower bulkhead consists of steel sheet piling with corrosion inhibiting anodes. Timber piling are located behind the wall and support the sidewalk above.

Based on the condition assessment in 2007, there are no visible signs of deterioration on the piling of the upper bulkhead, other than normal wear caused by weather conditions. The tie-backs were beginning to puncture the waler due to timber softening. There were no signs of visible deterioration on the lower bulkhead sheet piling or anodes.

Photograph 3: Segment C Bulkhead Wall

SEGMENT D BULKHEAD

The length of Segment D is 440 feet and consists of a stepped timber bulkhead along the landside of a timber wharf structure (See Photograph 4). The upper bulkhead consists of 14-inch timber piling, timber lagging, and a riprap base. The piling are located approximately 8 feet on-center with timber lagging directly behind. An underwater investigation revealed what appears to be an abandoned lower timber bulkhead exposed only in a few areas protruding above the riprap. Riprap (2- to 3-ton stones) is located in front of the upper bulkhead, which appear to buttress the lower bulkhead.

Based on the condition assessment in 2007, there are no visible signs of deterioration on the piling, lagging or tie-backs, other than normal wear caused by weather conditions.

Photograph 4: Segment D Bulkhead Wall

PROJECT CONSTRAINTS

The project constraints are categorized as operational, constructability and design/environmental constraints for the Segment A and Segment B bulkhead.

Constructability	Site Specific Design/ Environmental
Construction sequence and mechanism should preserve structural integrity of existing wall until replacement is fully activated to support uplands. The existing wall along Segment B is in a state of replacement. Construction in the vicinity of this wall will likely require temporary shoring. Access using barge based equipment is limited. Shallow water depth during low tides require contractor's barge to move in and out with tides or conduct construction using land based equipment. Desirable for replacement system similar to the 14th street bulkhead replacement system installed in 2007. The 14th Street bulkhead was not designed for seismic loads (non-code compliant); it is desirable to develop a code compliant wall for the limits under consideration for this project.	Need to design a code complaint wall to resist seismic events per the prevailing codes. Large depths of liquefiable soils. All contaminated soils behind the Segment A should be contained during construction. The existing wall system shall remain functional until construction of new bulkhead to contain the contaminated soils. Permitting a vertical replacement bulkhead is difficult compared with soft shoring options. Permitting a reduction in habitat below MHHW/ OHW is difficult and may require mitigation (unless a benefit or gain in habitat can be obtained).

DESIGN ASSUMPTIONS

1. The wall needs to be designed in compliance with the prevailing codes (IBC) to resist static, seismic and post seismic condition loads;
2. Design criteria dated October 26, 2012 is used as the basis for the alternatives development;
3. The site is characterized by large depth of liquefiable soils;
4. Existing mud line slopes at 2.5H:1V;

5. The combined length of Segment A and B is 280 feet for the purpose of cost estimate. The costs per lineal foot of wall are also presented. The cost for Segment C and D shall be extrapolated based on the per lineal foot cost of Segment A and B;
6. Future building development upland offset a minimum of 20 feet from the wall and will be supported in independent pile foundations; and
7. The wall shall be constructed seaward of the existing bulkhead (lower tier bulkhead). We understand that the POE has mitigation credit that can be utilized to offset the loss of habitat.

GEOTECHNICAL CONSIDERATIONS

The subsurface soil conditions along the new bulkhead consist of about 40 to 45 feet of loose to dense sand soils with various amounts of silt and gravel. Below about elevation -25 feet MLLW, very dense glacial deposits consisting of silty sand to sandy gravel were encountered. The high groundwater level behind the wall was assumed to be equivalent to +11 feet, which corresponds to the average high tide.

The proposed bulkhead will be designed according to the International Building Code (IBC) due to the proposed development adjacent to the bulkhead. The IBC requires seismic design criteria for a 475-year return period earthquake. The estimated peak ground acceleration (PGA) for the site would be about 0.28g. As a result of this ground motion, there is a high potential for liquefaction of the soils below the groundwater table down to about elevation -12 feet (about 30 feet of soil). This would result in flattening of the existing slopes in front of the bulkhead and settlement and increased lateral pressures on back of the bulkhead. The proposed wall design will be designed to accommodate these increased pressures and loss of lateral support. The proposed wall design would also prevent lateral spreading. These geotechnical criterions have been taken into account during the alternatives development.

It should be noted that the existing 14th Street bulkhead assumed 200-year return period earthquake because the wall was not subject to IBC criteria. As a result, the earth pressures under the seismic loading condition were significantly lower (approximately 1/3rd of the proposed bulkhead). This difference in the lateral earth pressures requires the bulkhead under consideration to be more substantially more robust than the existing 14th Street bulkhead.

ALTERNATIVES EVALUATION

Several wall alternatives are evaluated with specific discussion about suitability for the Segment A and Segment B bulkhead due to varying constraints.

1. Gravity Wall System

   A Gravity Wall is any coherent structure that relies solely on its mass and geometry to resist the forces acting upon it. An example of such a system is a counterfort wall. Such wall systems need extensive excavation to install the gravity components. Installation of a gravity wall seaward of the existing timber bulkhead would lead to in-water fill and could result in loss of habitat (i.e. project could have a large aquatic footprint). A gravity wall would also be very difficult to make seismically code compliant due to the deep liquefiable layer. Therefore, this design concept is eliminated from further consideration.

2. Cantilever Wall Systems

Any cantilever system will need to extend below the critical failure surface to prevent failure under seismic load conditions. The new wall will be installed seaward of the existing bulkhead to preserve the structural integrity of the existing bulkhead during construction. Since the site is characterized by large depth of liquefiable soils, it is likely that a cantilever system will require very large stiffness and/or an additional lateral load resisting system to prevent large deflection and/or failure during a seismic event.

Several cantilever system options were considered for the site:

a. Steel Sheet Pile/Combination Wall offshore of existing timber bulkhead;

b. Steel sheet Pile/Combination Wall between upper and lower tier timber bulkhead;

c. Concrete Sheet Pile Wall System; and,

d. Steel Soldier Piles with Concrete Panels.

We investigated the use of wall section with large stiffness; however, it is not possible to develop a code compliant design (even under static conditions) due to extreme deflections, therefore, Option 2 is eliminated as an alternative. The need for a supplementary lateral force resisting system is recognized per earlier discussion. Section 3 will discuss available supplementary systems.

3. Anchored Wall System

Anchored wall systems comprise of a cantilever wall system supported laterally by means of tieback anchors, a deadman system, or compression or vertical batter piles. Any of these systems can be added to any of the cantilever wall system discussed above. The following tieback/batter pile systems were evaluated:

a. Deadman Anchor System

Deadman anchor systems comprise of a tie rod installation perpendicular to the wall anchors. The rod is anchored in a deadman upland of the wall to provide lateral resistance in the form of passive resistance against the soil. This option was discarded due to the following issues:

- Installation of deadman anchors will require extensive upland excavation.
- The project site is characterized by large depth (approx. 30 feet) of liquefiable soils. Under liquefaction, the passive resistance of the soil drops significantly due to loss of shear strength rendering the dead man anchor system ineffective under a design seismic event. Such loss of passive resistance may lead to failure of the wall during a seismic event and therefore this option is eliminated from further consideration.

b. Tie-down Ground Anchors

Tie-down ground anchors at a 1H:1V slope are grouted yielding anchor systems comprising of pre-stressing strands or steel rods that rely on the adhesive bond between the grout and soil for lateral capacity (Figure 2 and 3).

c. A-Frame Anchor System

A-Frame anchor systems comprise of a tie rod installation perpendicular to the wall anchors. The rod is anchored in two batter piles forming an A-Frame upland of the wall. The piles provide the lateral resistance via tension and compression on the piles. The piles will be driven past the liquefiable layer into competent glacial soils (Figure 4 and 5). This option will require significant upland excavation and fill for the installation of tiebacks, A-frame piles and concrete cap.

This system may prevent future installation of utilities parallel to the length of the wall due the placement of tiebacks at even spacing. Further, it is recommended that future building development be placed beyond the footprint of the A-frame system to allow for inspections following a seismic event, if needed.

Option 3b and 3c are further evaluated for environmental constraints and opportunities in subsequent sections.

4. Riprap/Soft Shoring Slope with Vegetation

The proposed riprap/soft slope comprises of well graded rock, placed at least 2H:1V slope to prevent scour depending on soil. The outer layer is an armor layer of cobble-size stone. The inner layer is a backing layer of gravel, which is underlain by a geotextile layer (filter fabric). The armor layer is thickened at the toe of the slope to buttress the riprap. Above high water, the riprap can either be covered by soil and vegetation planted as a visual curtain, or can replace the stone entirely.

Due to the 2H:1V slope of the riprap, approximately 38 feet of uplands would be lost and unusable for future development. The Port would like to retain the uplands for future development.

The flatter slope may provide greater potential for improving aquatic habitat. It should be noted that this option does no mitigate for the global slope failure that may occur during a seismic event. In a seismic event, liquefaction will likely cause the rock slope to displace leading to significant damage to adjacent uplands infrastructure.

Based on the above stated reasons, this option is eliminated from further consideration.

5. Pin Piles with Armor Slope

   Option 4 may be further modified with pin piles to support a steeper than 2H:1V slope by installing pin piles to support the slope by means of 5- to 12- inch diameter steel pipe piles. The piles can be used to essentially pin the slope to maintain the steeper stable slope (hence the term "pin piles"). Due to cut back into the uplands, significant area will be lost and unusable for future development.

   The pin piles derive their strength in tension or compression through bond between the pipes and soil. The primary issue with this option is the loss of the bond strength under liquefaction of existing soils during a seismic event leading to significant damage to adjacent uplands infrastructure and therefore this option is eliminated from further consideration.

ENVIRONMENTAL CONSTRAINTS AND OPPORTUNITIES

Two wall alternatives have been selected for further evaluation of environmental constraints and opportunities based on their technical feasibility and suitability for the site:

1. Alternative 1: Anchored Wall System with Tie-down Ground Anchors (Option 3b above)
2. Alternative 2: Anchored Wall System with A-Frame Anchor System (Option 3c above)

The following discussion compares some of the environmental constraints and opportunities of the three most feasible alternatives.

REGULATORY FRAMEWORK

Shoreline and in-water projects must comply with a number of federal, state, and local regulatory laws. Each regulatory agency has statutory responsibility for certain aspects of environmental protection and for regulating activities to avoid, minimize or mitigate for possible negative environmental impacts that could result during construction or eventual operation of the completed facility/infrastructure. The following permits and approvals could be required for any of the three selected alternatives as they all propose elements of shoreline and in-water construction:

- State Environmental Policy Act (SEPA)/National Environmental Policy Act (NEPA) review or exemption (for maintenance and repair);

- City of Everett Shoreline Substantial Development Permit (SSDP) or exemption (for maintenance and repair);
- Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA);
- US Army Corps of Engineers (USACE) Section 10 and 404 permit(s);
- Coastal Zone Management Act (CZMA) Certification;
- Washington State Department of Ecology (Ecology) Section 401 Water Quality Certification;
- Coordination with the Department of Natural Resources (DNR) on any proposed changes to tideland leases or lease conditions; and,
- Local permits as necessary.

All of the above permits and approvals take time to complete and can impact the final design, schedule, and overall cost of the project.

One environmental issue for the project, beyond the scope of this study, is the consideration of cleanup and contamination issues at the site. Additional coordination and time for project review and permitting may be required. Design of the replacement bulkhead will need to consider existing sediment, soil, or groundwater contamination along with completed or ongoing cleanup or monitoring actions.

CONSTRUCTION COSTS

Order of Magnitude Construction costs are developed for the two alternatives discussed above. The costs are developed for fully code compliant structural systems for both the alternatives (i.e. compliant with the International Building Code as adopted by the City of Everett). We understand that 14th bulkhead is not designed for seismic loads and therefore not a code compliant system. However, it is our understanding the bulkhead replacement under consideration for this project needs to be code compliant in order to support the future upland development. The costs are developed for a representative section at Segment A/B. The costs are then extrapolated for the entire project including Segments A, B, C and D.

The costs include the following:

1. Mobilization/Demobilization (10%)
2. Bulkhead
    a. Steel Sheet Piles installed for 19 feet retained height
    b. Concrete Cap
    c. Tie-down anchors with double corrosion protection system (Alternative 1) or tie-rods with A-frame piles and cap (Alternative 2)
    d. Test Anchor Program (Alternative 1 only)
    e. Excavation and Fill
    f. Corrosion Protection (coating)
    g. Miscellaneous costs (utility relocation, asphalt etc.)

3. Contractor Markup – 30%
4. Design Contingency – 30%

Demolition costs, design and permitting fee are not included in the comparative cost development since these costs will be identical for the two alternatives. Note that the costs have been updated following submission of the draft report to incorporate construction cost validation meeting with local contractors.

A summary of costs for the two alternatives is provided below:

Item	**Alternative 1: Anchored Wall System with Tie-down Ground Anchors**	**Alternative 2: Anchored Wall System with A-Frame Anchor System**
Mobilization/Demobilization	$0.62mn	$0.78mn
Bulkhead	$6.17mn	$7.71 mn
Subtotal	***$6.79mn***	***$8.49mn***
Contractor Markup (30%)	$2.04mn	$2.55mn
Subtotal	***$8.83mn***	***$11.03mn***
Design Contingency (30%)	$2.65mn	$3.31mn
Total	**$11.48mn**	**$14.34mn**

Upon the Port's request, a cost comparison was completed for the 14th street bulkhead and the seismically compliant system proposed for this project. The 14th street bulkhead costs were extracted from the engineers estimate for the project (Reid Middleton 2006).

In order to arrive at 2012 construction costs, an escalation of 2.5 percent per year is applied to all bid items other than the sheet piles. Based on recent unit costs obtained from Skyline Steel, the cost of coated sheet piles per pound of sheets are 30% higher than unit prices included in Reid Middleton estimate. The same is used for steel sheet escalation.

The per unit foot cost of the 14th street bulkhead with escalation is $5,000 per lineal foot of bulkhead. This would translate to $5.88 mn for 1,175 feet long wall. It should be noted that the 14th street bulkhead system was not designed to withstand the seismic loads per the IBC. The seismic loads for this site are extremely onerous primarily due to the liquefiable nature of the soils. Further, the existing anchor system was re-used with some reinforcement that certainly lent itself to significant cost savings not realized in either of the alternative concept design estimates. An additional $1,000 per lineal foot of bulkhead should be added to the engineers estimate to account for a new deadman system. This would translate to $7.05 mn for 1,175 feet of wall.

COMPARISON MATRIX

The following comparison matrix provides a comparison of two feasible alternatives based on above alternatives evaluation. It should be again noted that consideration of cleanup and contamination issues of the site have not been vetted as part of this report.

Parameter	**14th St Bulkhead**	**Alternative 1 Anchored Wall System with Tie-down Ground Anchors**	**Alternative 2 Anchored Wall System with A-Frame Anchor System**
Cost	Low $7.05 mn	High $11.08mn	High $13.85mn
Reduction in over-water coverage	-	None	None
Upland Excavation/Fill for lateral force resisting system	High (for tieback, sheet piles and cap installation)	None	High (for tieback, A-frame pile and cap installation)
Volume of Riprap Fill Below MHHW	None	None	None
Reduction in Shoreline Habitat	High Impact (Wall seaward of existing)	High Impact (Wall seaward of existing)	High Impact (Wall seaward of existing)
Seismic Vulnerability	High (Not designed per code)	Low (Design to satisfy current code requirements)	Low (Design to satisfy current code requirements)
Permitting	High Difficulty (Wall seaward of existing)	High Difficulty (Wall seaward of existing)	High Difficulty (Wall seaward of existing)

PREFERRED ALTERNATIVE

Alternative 1 and 2 are both comparable and could be considered as preferred alternatives based on seismic compliance, constructability, and impacts to operations and uplands. The alternatives will be further discussed with Port of Everett to arrive at the preferred course of design.

These alternatives will be designed to withstand the IBC code requirements including seismic conditions. We are able to generate a cost benefit analysis for design for varying levels of earthquakes lower than the IBC requirements. Reduced seismic criteria will result in significant savings to the Port (at an increased risk for seismic condition).

It is noted that the vertical nature of the wall within the intertidal zone will likely be a permitting challenge and onsite and/or offsite mitigation could be required to mitigate for negative impacts to the existing intertidal zone. However, the long term stability of the site following a seismic event was found to be of greater significance. It should be noted that risks affiliated with contaminated soils, sediments, and groundwater have not yet been vetted.

REFERENCES

East Marina Bulkhead Replacement Condition Assessment and Replacement Alternatives Technical Memorandum dated January 2007 by Moffatt & Nichol.

East Marina Bulkhead Replacement Segment A & B Condition Re-Assessment and Replacement Alternatives Technical Memorandum dated July 2011 by Moffatt & Nichol.

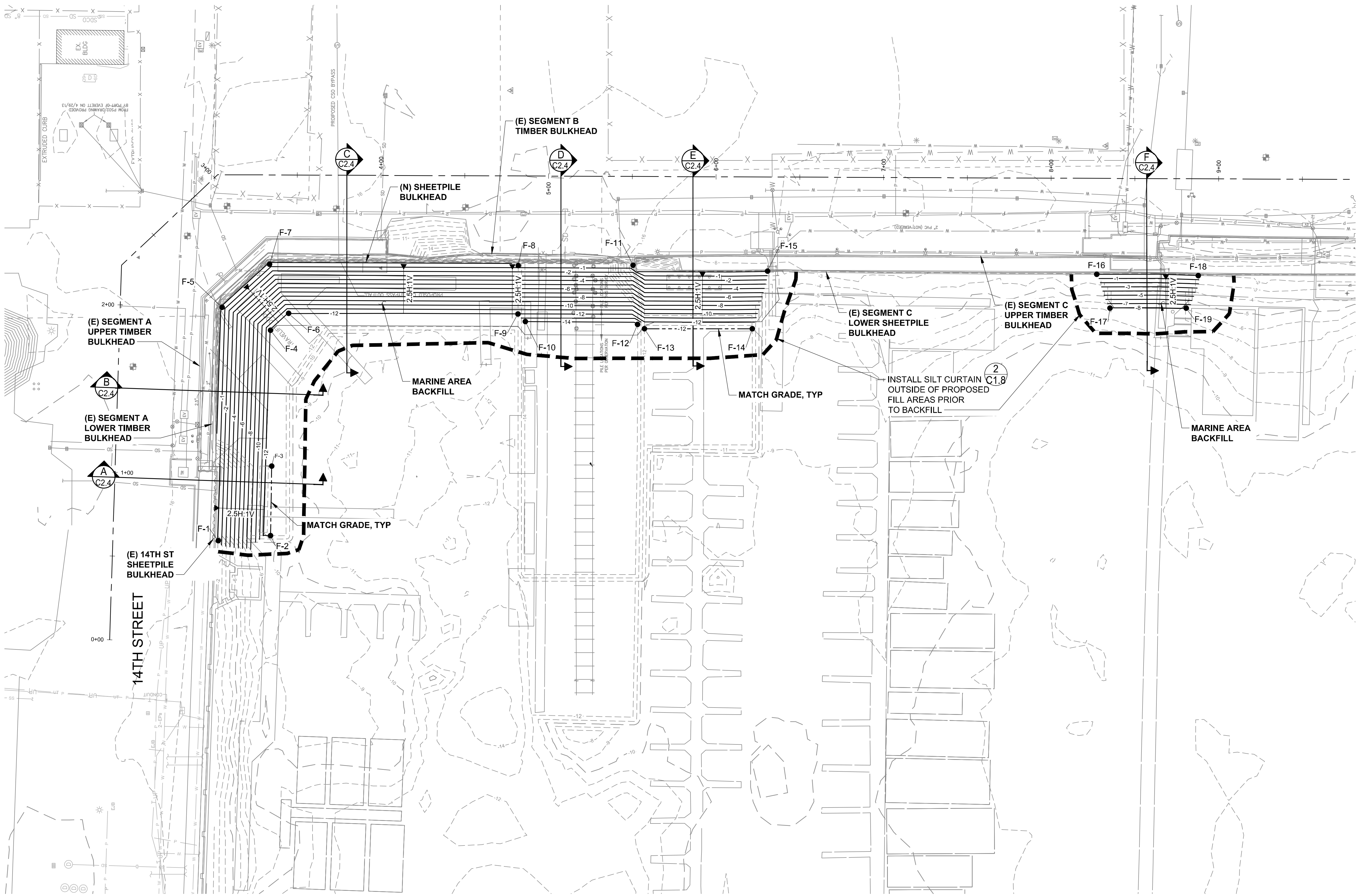
Geotechnical Recommendations for soil pressures from Shannon & Wilson (received via e-mail)

DRAFT Port of Everett Bulkhead Replacement Project – Bulkhead Design Criteria dated October 2012 by Moffatt & Nichol

Engineers estimate, 14th Street Marina, provided by the Port of Everett, Reid Middleton, 2006.

APPENDIX G

Bulkhead Dredge Profiles



BACKFILL AREA SURFACE			
Point Name	Northing	Easting	Elevation
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F-2	367463.1773	1301810.8736	-12.0
F-3	367462.4906	1301852.2838	-12.0
F-4	367463.1987	1301933.4176	-12.0
F-5	367492.1377	1301947.1085	0.0
F-6	367452.3891	1301943.4772	-12.0
F-7	367463.7718	1301972.7871	0.0
F-8	367315.3518	1301972.0116	0.0
F-9	367315.5447	1301943.0873	-12.0
F-10	367311.1074	1301938.6523	-14.0
F-11	367246.8108	1301972.2086	0.0
F-12	367244.1099	1301936.9210	-14.0
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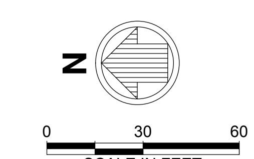

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NO.	DATE	BY	REVISION

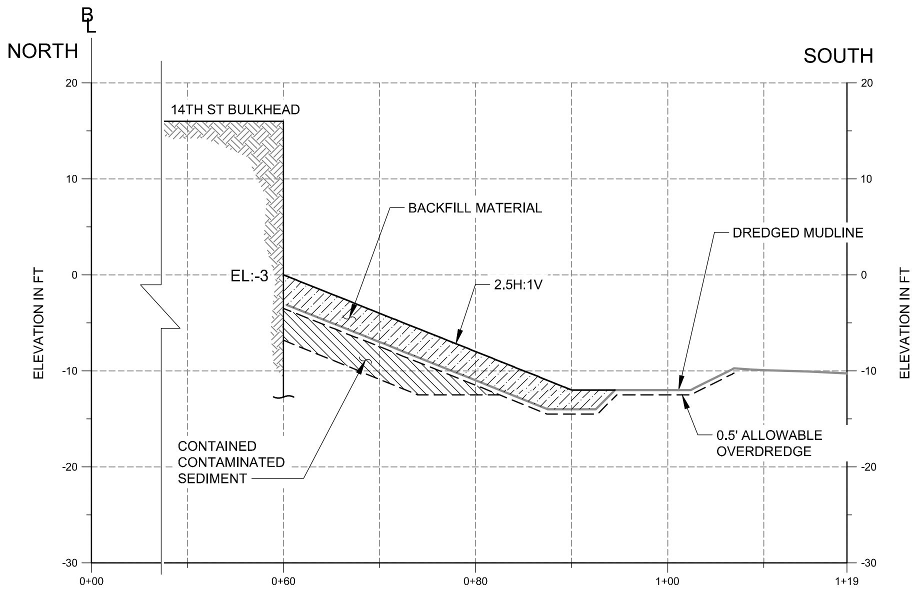
90% SUBMITTAL
NOT TO BE USED FOR CONSTRUCTION

PROJECT ENGINEER: D. PISCHER
SCALE: 1"=30'
DESIGNED BY: K. WIKEN
DATE: JANUARY, 2014
DRAWN BY: E. ZICK
CHECKED BY: L. BEARD
APPROVED BY:

PORT OF EVERETT
EVERETT SHIPYARD SITE SEDIMENT CLEANUP AND CENTRAL MARINA IMPROVEMENTS - PHASE I

MARINE AREA BACKFILL PLAN

DWG NO. **C2.3**
CIP NO. 3-0-012-02
PROJECT NO. PD-CM-2014-02.2
SHEET NO. X OF X



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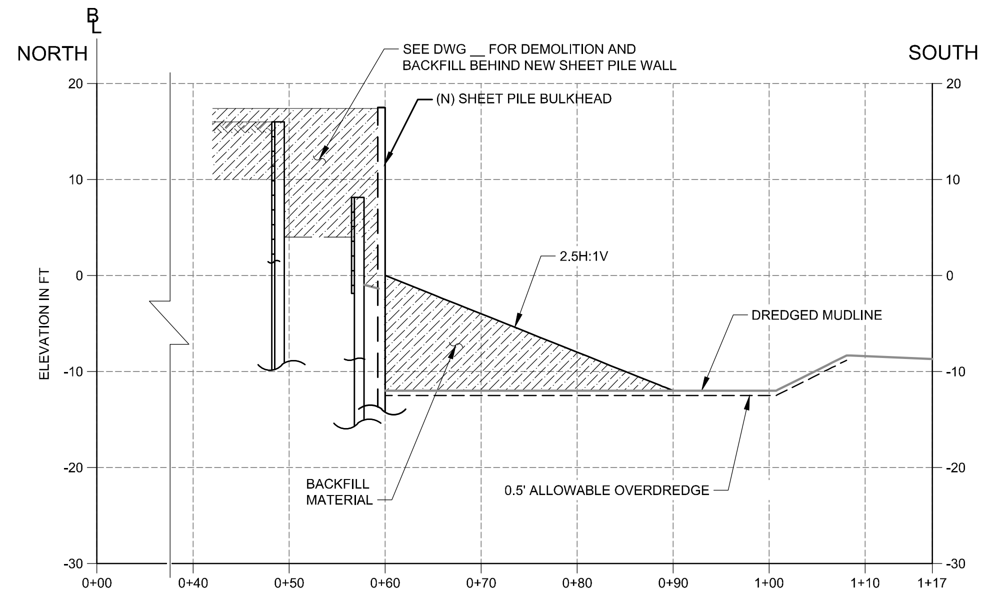

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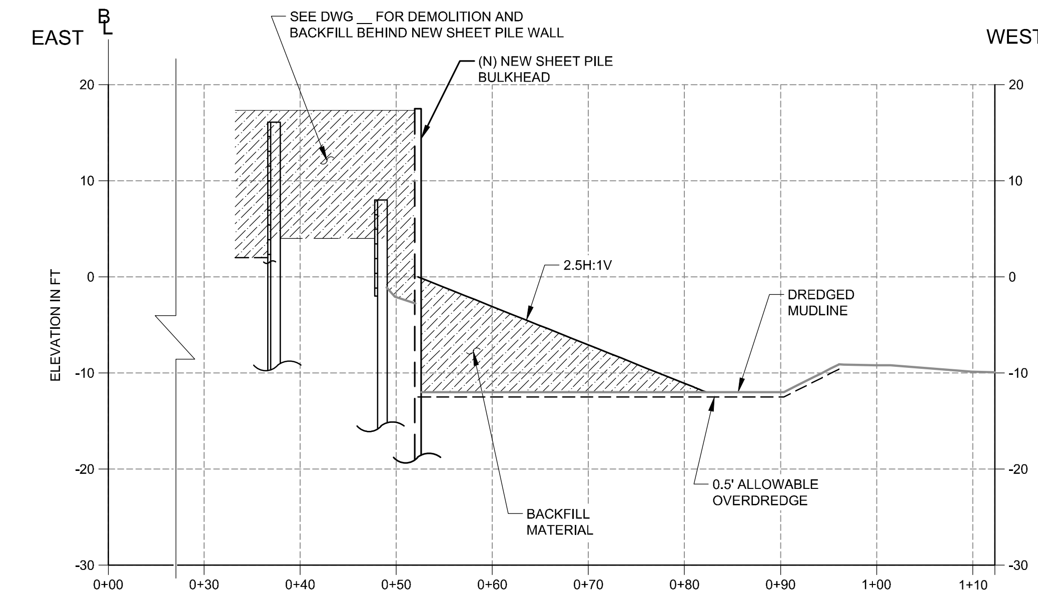

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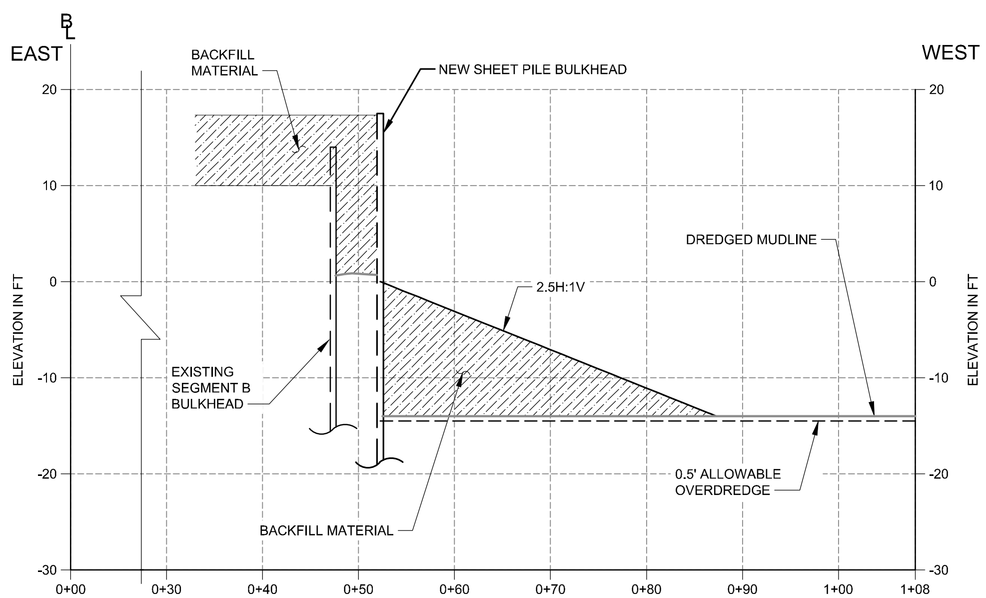

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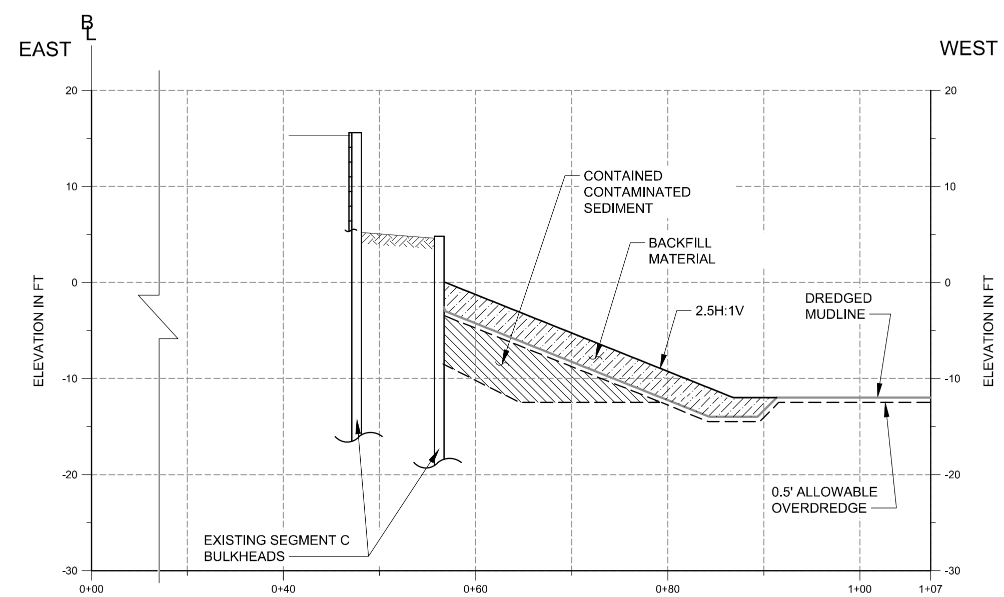

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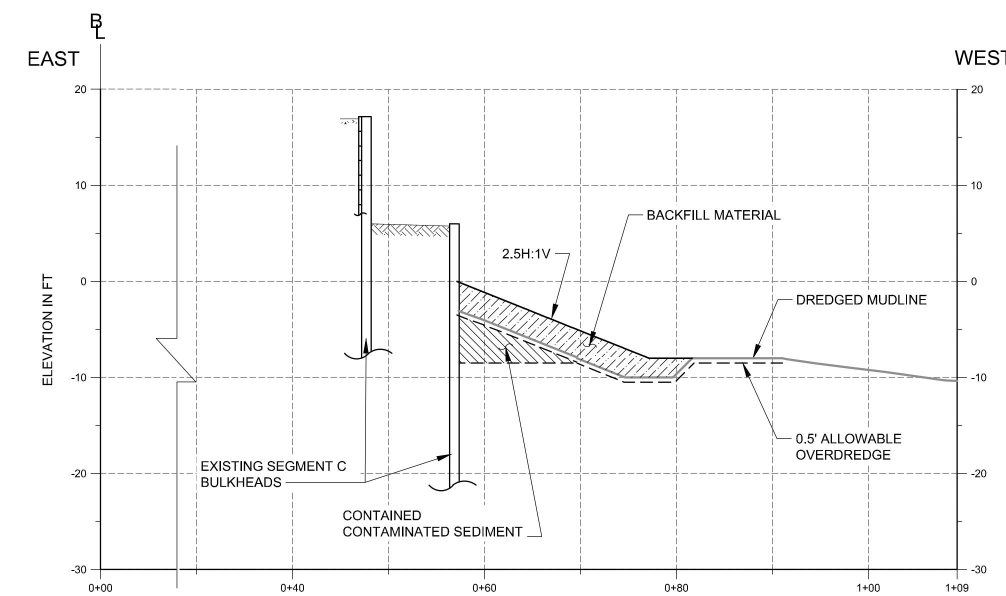

F SECTION C2.3

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Scale in Feet
VERTICAL SCALE: 1"=10'

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NO.	DATE	BY	REVISION

90% SUBMITTAL
NOT TO BE USED FOR CONSTRUCTION

PROJECT ENGINEER: D. PISCHER	SCALE:
DESIGNED BY: K. WIKEN	DATE: JANUARY, 2014
DRAWN BY: E. ZICK	CHECKED BY: L. BEARD
APPROVED BY:	

PORT OF EVERETT

EVERETT SHIPYARD SITE SEDIMENT CLEANUP AND CENTRAL MARINA IMPROVEMENTS - PHASE I

MARINE AREA BACKFILL SECTIONS

DWG NO. C2.4
CIP NO. 3-0-012-02
PROJECT NO. PD-CM-2014-02.2
SHEET NO. X OF X

APPENDIX H

Sediment CAP Stability Evaluation

TECHNICAL MEMORANDUM

TO: Hun Seak Park, Washington State Department of Ecology
Erik Gerking, Port of Everett

FROM: Dave Pischer, P.E., and Larry Beard, P.E., L.G.

DATE: December 17, 2013

**RE: EVERETT SHIPYARD SITE – SEDIMENT CLEANUP ACTION
SEDIMENT CAP SLOPE STABILITY EVALUATION
EVERETT, WASHINGTON**

This technical memorandum has been prepared to summarize Landau Associates' evaluation of the overall stability of capping material to be placed over contaminated marine sediment that will remain directly in front of existing bulkhead segments as part of the planned sediment cleanup action at the Everett Shipyard Site (ESY; Site) in Everett, Washington.

The Washington State Department of Ecology (Ecology) and the Port of Everett (Port) have agreed that it would be impracticable to install temporary shoring in front of portions of the existing 14th St. bulkhead and the Segment C bulkhead in order to remove all of the contaminated sediment present directly in front of these existing sheetpile bulkhead segments. Instead, Ecology and the Port have agreed that near-surface sediment adjacent to the bulkhead in three designated sediment dredging areas would be removed at a 2.5H:1V (horizontal:vertical) slope down to the planned dredge depth and the remaining sediment slope would be capped with at least two feet of granular backfill material. The following three sediment dredging areas will incorporate capping material to contain remaining contaminated sediment adjacent to the existing bulkhead (see Figure 1 for Section locations and Figure 2 for Section profiles):

- Adjacent to the 14th Street bulkhead just west of the Segment A bulkhead (Section A)
- Adjacent to the Segment C bulkhead just south of the marine railway (Section E)
- Adjacent to the Segment C bulkhead near Outfall C (Section F).

In each area, capping material will be placed over the dredged sediment slope with a final grade at El. 0 ft mean lower low water (MLLW) adjacent to the bulkhead down to the planned dredge depth (El. -12 ft MLLW at Sections A and E, and El. -8 ft MLLW at Section F, as indicated on Figures 1 and 2).

SLOPE STABILITY EVALUATION

The purpose of our slope stability evaluation was to assess the overall stability of the capping material to be placed over contaminated marine sediment to remain on the 2.5H:1V cut slope in front of the subject bulkhead areas under both static and seismic loading conditions.

Stability Analysis Approach

The slope stability analyses focused on a slope profile representative of the Section A and E capped slopes shown on Figure 2, because they are similar and higher (top to toe) than the Section F capped slope. For the purpose of this evaluation, it was assumed that approximately three feet of capping material will be placed from El. 0 to -3 ft MLLW adjacent to the bulkhead and extend down the 2.5H:1V slope to the planned dredge depth at El. -12 ft MLLW.

The overall approach used in the slope stability analyses is summarized below:

- Perform a series of stability analyses for the capped slope under static loading conditions to identify the critical failure surface and the factor of safety on that surface.
- Examine the stability of the capped slope under seismic loading to determine the factor of safety on a critical failure surface by application of a "pseudo-static" seismic coefficient (k_h) to represent the horizontal forces developed during the design earthquake shaking.

The slope stability analyses were performed using limit equilibrium methods in the Rocscience, Inc. computer software program SLIDE, Version 5, under both static and seismic (pseudo-static) conditions. The Morgenstern-Price method which satisfies both force and moment equilibrium was used in our slope stability analyses. SLIDE analyzes slope stability by assuming numerous failure surfaces and calculating the forces that would promote slope movement and the forces resisting slope movement for each selected failure surface. For limit equilibrium analyses, the stability of a slope is typically expressed as the factor of safety (FS) against sliding, which is the ratio of forces resisting slope movement divided by the forces promoting movement. SLIDE uses a searching routine to determine the critical failure surfaces (i.e., those surfaces with the lowest factors of safety) for a given slope. A FS of 1.0 indicates a slope at equilibrium, while values greater than 1.0 indicate increased slope stability.

Modeled Water Level

The water level in the marina used for the slope stability analyses was assumed to be at El. 0 ft MLLW, because a lower water level tends to increase slope stability and a higher water level has no effect on the slope stability evaluation.

Modeled Soil Conditions

Soil properties used for the slope stability analyses are summarized in the table below. Reasonably conservative shear strength parameters for the capping material and the underlying marine sediment were assumed for the purpose of this slope stability evaluation. The shear strength properties of the granular capping material were estimated using empirical correlations and our professional engineering judgment. The shear strength properties of the soft, silty marine sediment to be capped were estimated using available direct shear test results for samples collected from historic Dames & Moore Borings 4 and 5 which were drilled from the deck of a dock in the northeast corner of the marina (Dames

& Moore 1964), empirical correlations, and our professional engineering judgment. For the purpose of this slope stability evaluation, the presence of any stronger/more competent material within the capped sediment slope profile was ignored.

Soil Properties Used in Slope Stability Analyses

Soil Unit	Total Unit Weight (pcf)	Effective Friction Angle (φ, degrees)	Cohesion (c, psf)
Capping Material (Granular Backfill)	125	36	1 (a)
Marine Sediment	110	28	15

(a) Cohesionless materials were assumed to have a nominal cohesion value of 1 psf, which is common for input into slope stability models to prevent the computer model from producing anomalous shallow failures.

Seismic Loading Conditions

For seismic (pseudo-static) slope stability analyses, a value of about one-half of the peak ground acceleration (PGA) for the seismic event is commonly used to approximate the lateral forces experienced during the design earthquake. We used the same seismic event (i.e., 200-year seismic event) used by the Port in 2002 for the design of the existing 14th Street bulkhead and currently being used for design of the new East Marina bulkhead. Based on seismic design information presented in the draft geotechnical report (Shannon and Wilson 2013) for the new bulkhead to be constructed along Segments A and B as part of the sediment cleanup action, a pseudo-static horizontal acceleration coefficient (K_h) of 0.12g was used for the seismic slope stability analyses.

Results of Slope Stability Analyses

Based upon the conditions and assumptions noted above, our slope stability analyses indicate that the capped sediment slopes have a calculated FS against sliding greater than 1.5 under static loading conditions. Under seismic (pseudo-static) loading conditions, the capped sediment slopes have a calculated FS against sliding greater than 1.0. The potential slope failure surfaces with the lowest FS typically sheared through the capping material, down into the marine sediment along the slope, and extended out near the cap/sediment contact along the base of the capped slope. Thus, to increase the FS against sliding under seismic loading conditions, we evaluated the effect of including a shallow key at the toe of the capped slope. As generally indicated on Figure 3, our analyses indicate that including a 1- to 2-ft deep key at the toe of the capped slope increases seismic slope stability by making the potential slope failure surfaces extend out and shear through additional granular material along the base of the capped slope.

Accordingly, the sediment dredge prism and backfilling plans and sections are being modified to include excavation and backfilling of an approximately 2-ft deep key trench in the three sediment dredging areas that will incorporate capping material to contain remaining contaminated sediment adjacent to the existing bulkhead.

USE OF THIS DOCUMENT

This technical memorandum was prepared for the exclusive use of the Port of Everett and Ecology for specific application to the Everett Shipyard Site located in Everett, Washington. The use of this document by others or for another project is at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

REFERENCES

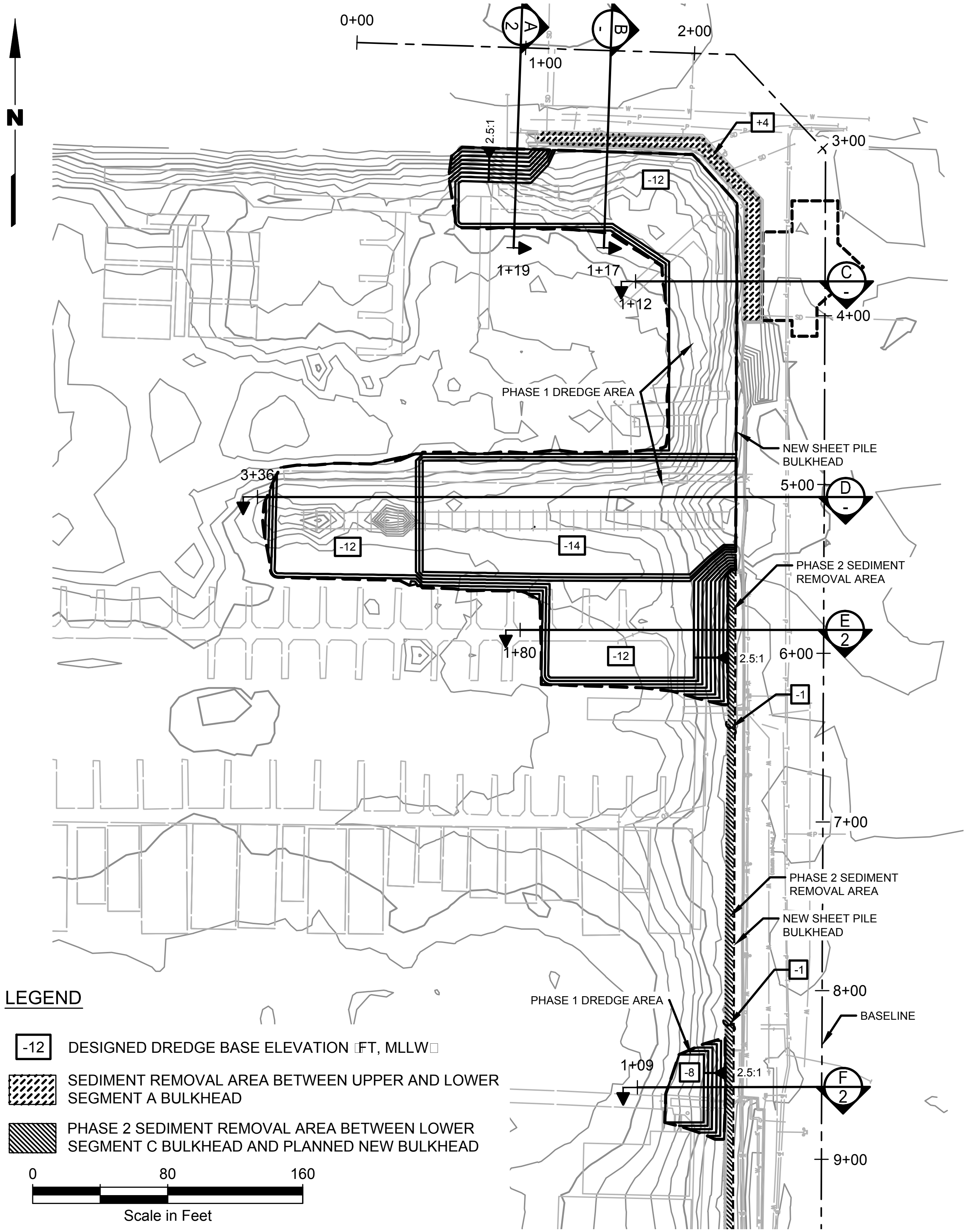
Dames & Moore. 1964. Report of Soils Investigation, Proposed Bulkhead, Small Boat Harbor, Everett, Washington. Prepared for the Port of Everett. April 2.

Shannon and Wilson. 2013. Draft Geotechnical Report, 14th Street and 16th Street Marina District, East Marina Bulkhead Replacement. Prepared for the Port of Everett. July 3.

DAP/LDB/rgm

ATTACHMENTS

Figure 1 – Sediment Dredging Areas
Figure 2 – Sediment Capping Sections A, E & F
Figure 3 – Seismic Slope Stability Profiles



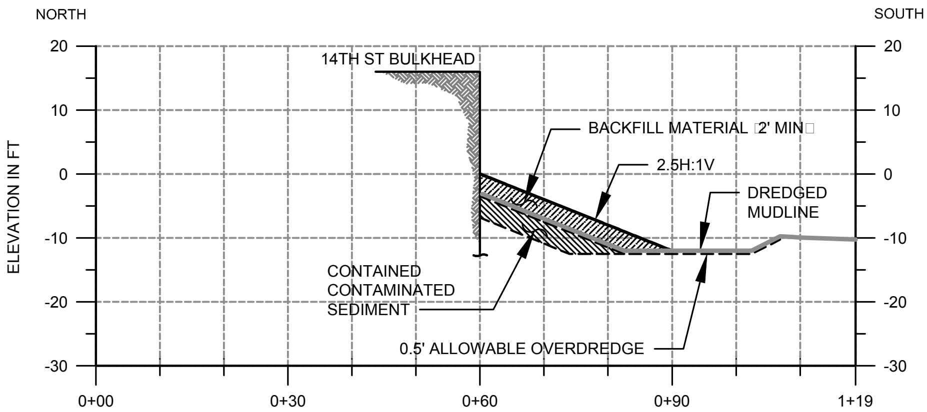
LANDAU ASSOCIATES, INC. | G:\Pro□ects\147\036\040\044\ca□□ing tech memo\TechMemoPlan.d□g □A□"Figure 1" 11/22/2013

LANDAU ASSOCIATES

Sediment Ca□ Slo□e Sta□ility Evaluation
Everett Shi□yard Site
Everett, Washington

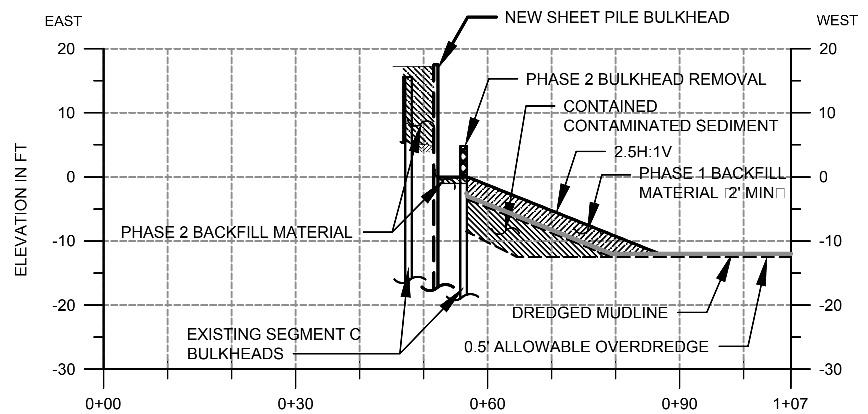
S□d□□ □□□Dr□d□□□□ Ar□□□

Figure 1



A/1 BACKFILL SECTION A
STA: 0+97

0 30 60
Scale in Feet
VERTICAL SCALE 1"=30'



E/1 BACKFILL SECTION E
STA: 5+86

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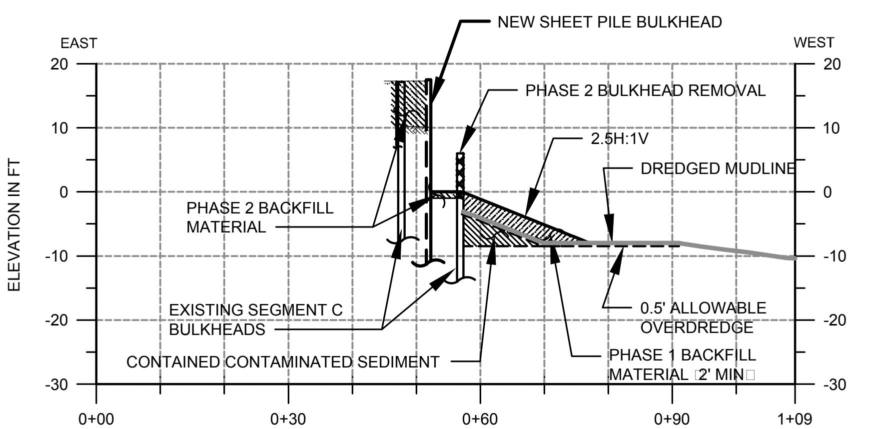
Scale in Feet
VERTICAL SCALE 1"=30'



F/1 BACKFILL SECTION F
STA: 8+57

0 30 60
Scale in Feet
VERTICAL SCALE 1"=30'

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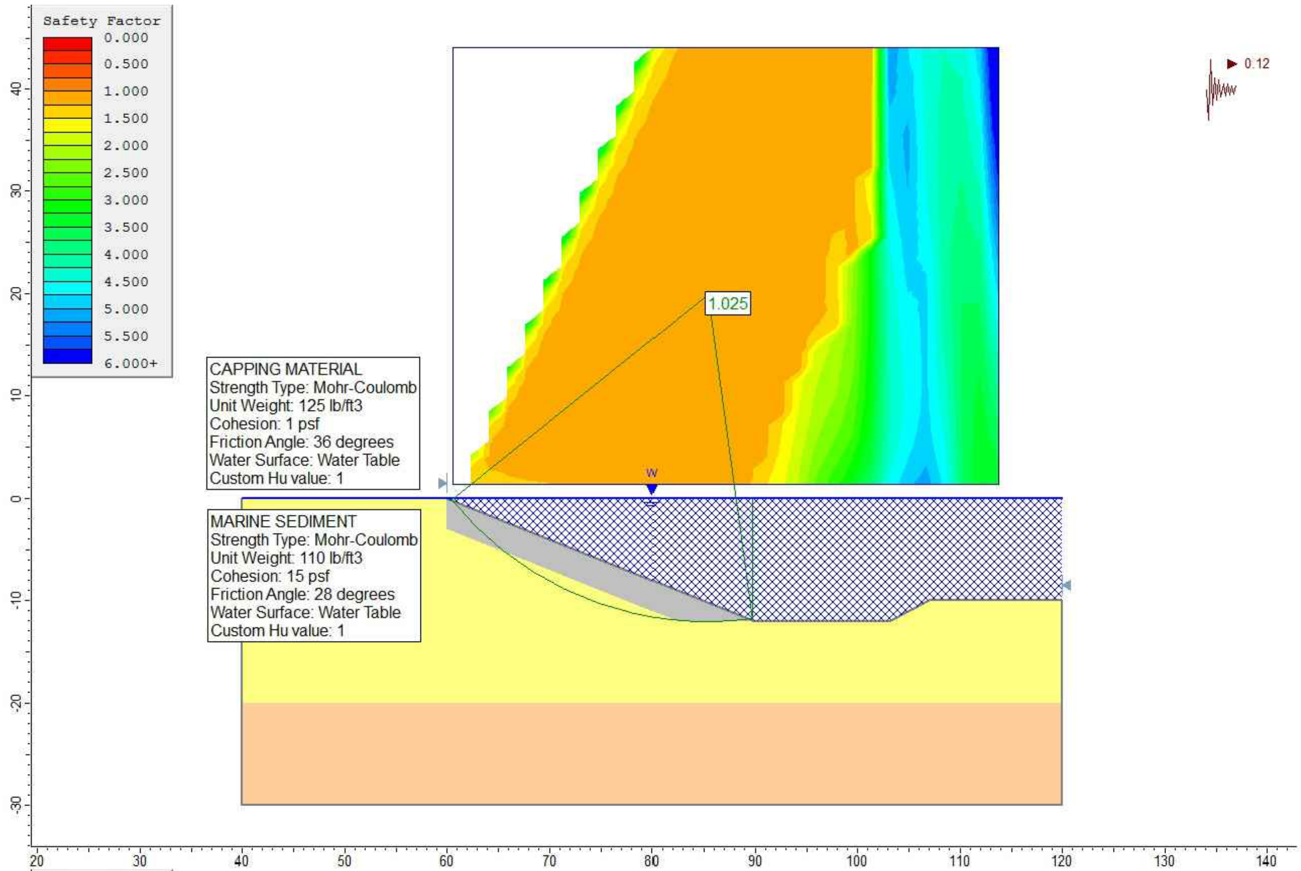
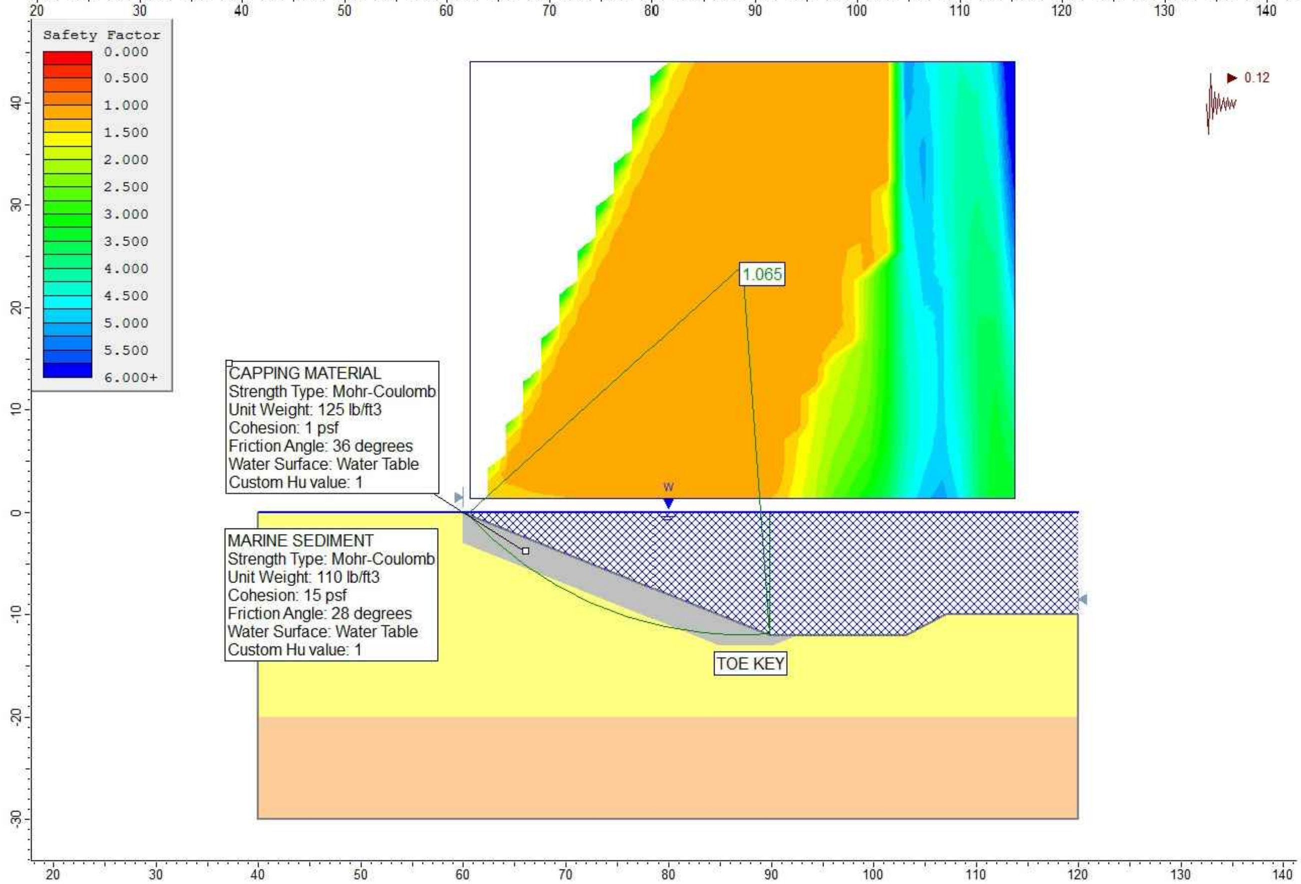
Sediment Ca□ Slo□e Sta□ility Evaluation Everett Shi□yard Site Everett, Washington	**S□d□□ □□□C□□□□□ S□□□□□□ A□E □ F**	Figure 2





LANDAU ASSOCIATES

Sediment Ca□ Slo□e
Sta□ility Evaluation
Everett Shi□yard Site
Everett, Washington

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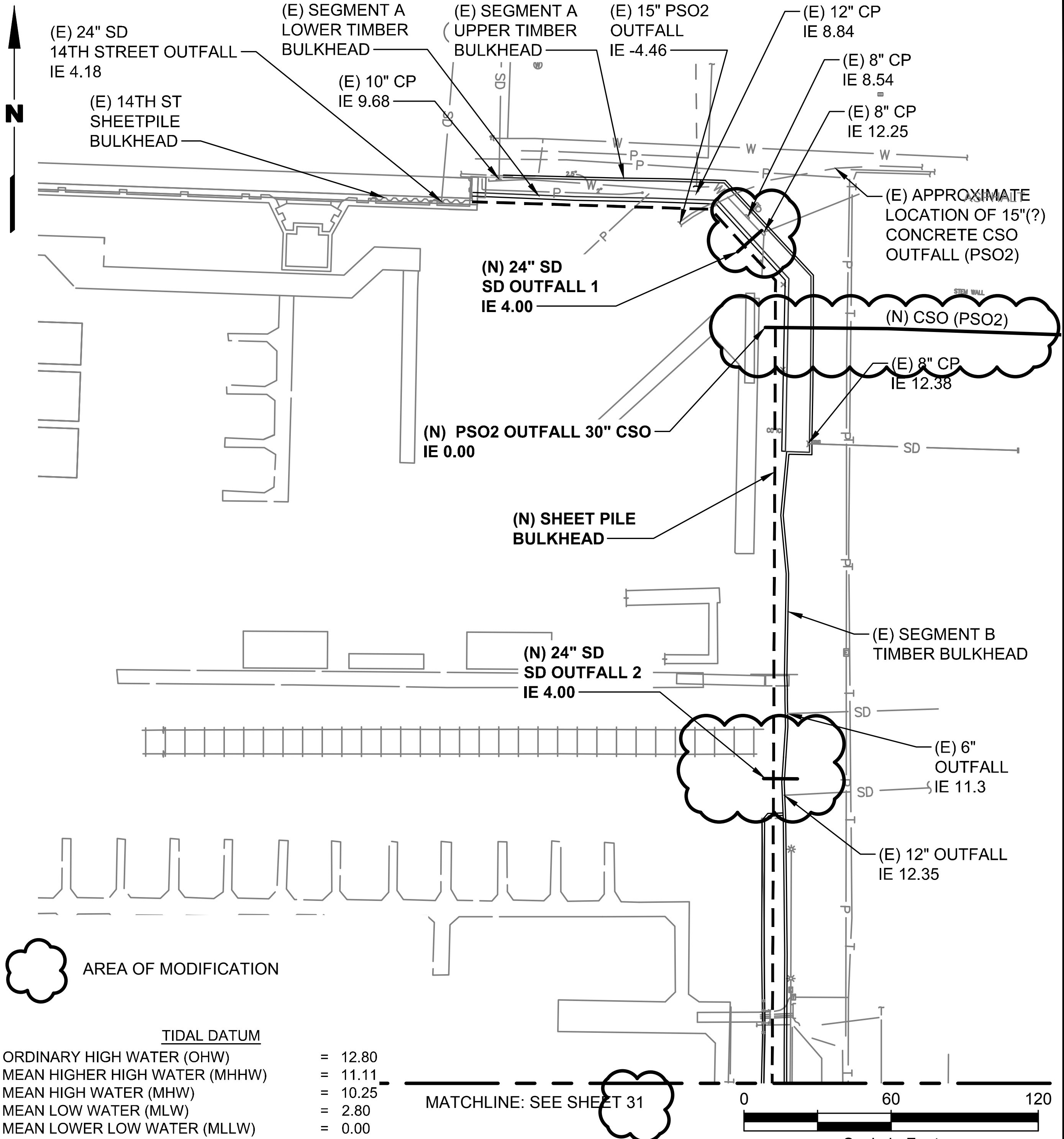
Figure 3

APPENDIX I

Stormwater Modifications



TIDAL DATUM

ORDINARY HIGH WATER (OHW)	=	12.80
MEAN HIGHER HIGH WATER (MHHW)	=	11.11
MEAN HIGH WATER (MHW)	=	10.25
MEAN LOW WATER (MLW)	=	2.80
MEAN LOWER LOW WATER (MLLW)	=	0.00
EXTREME LOW WATER (ELW)	=	-4.50

PURPOSE:
DREDGING TO REMOVE CONTAMINATED SEDIMENT AND MARINE AREA BACKFILLING; DEMOLITION OF MARINE STRUCTURES; BULKHEAD REPLACEMENT; AND MARINA FLOAT REALIGNMENT

DATUM: MLLW= 0.0' (NOS)

TOWNSHIP/RANGE: SEC 18 TWP 29N RGE 5E

ADJACENT PROPERTY OWNERS:
1. CITY OF EVERETT RIGHT-OF-WAY
2. U.S. NAVY

PORT OF EVERETT

EVERETT SHIPYARD SITE SEDIMENT CLEANUP AND CENTRAL MARINA IMPROVEMENTS

PORT OF EVERETT
1205 CRAFTSMAN WAY, SUITE 200
EVERETT, WASHINGTON 98021

STORM DRAIN OUTFALL PLAN
1 OF 2

IN: PORT OF EVERETT CENTRAL MARINA ADJACENT TO THE SNOHOMISH RIVER CHANNEL

AT: PORT OF EVERETT

COUNTY OF: SNOHOMISH

STATE OF: WASHINGTON

APPLICATION BY: PORT OF EVERETT

DATE: SEPTEMBER 2013
MODIFIED: JANUARY 22, 2014

SHEET: 30 OF 31

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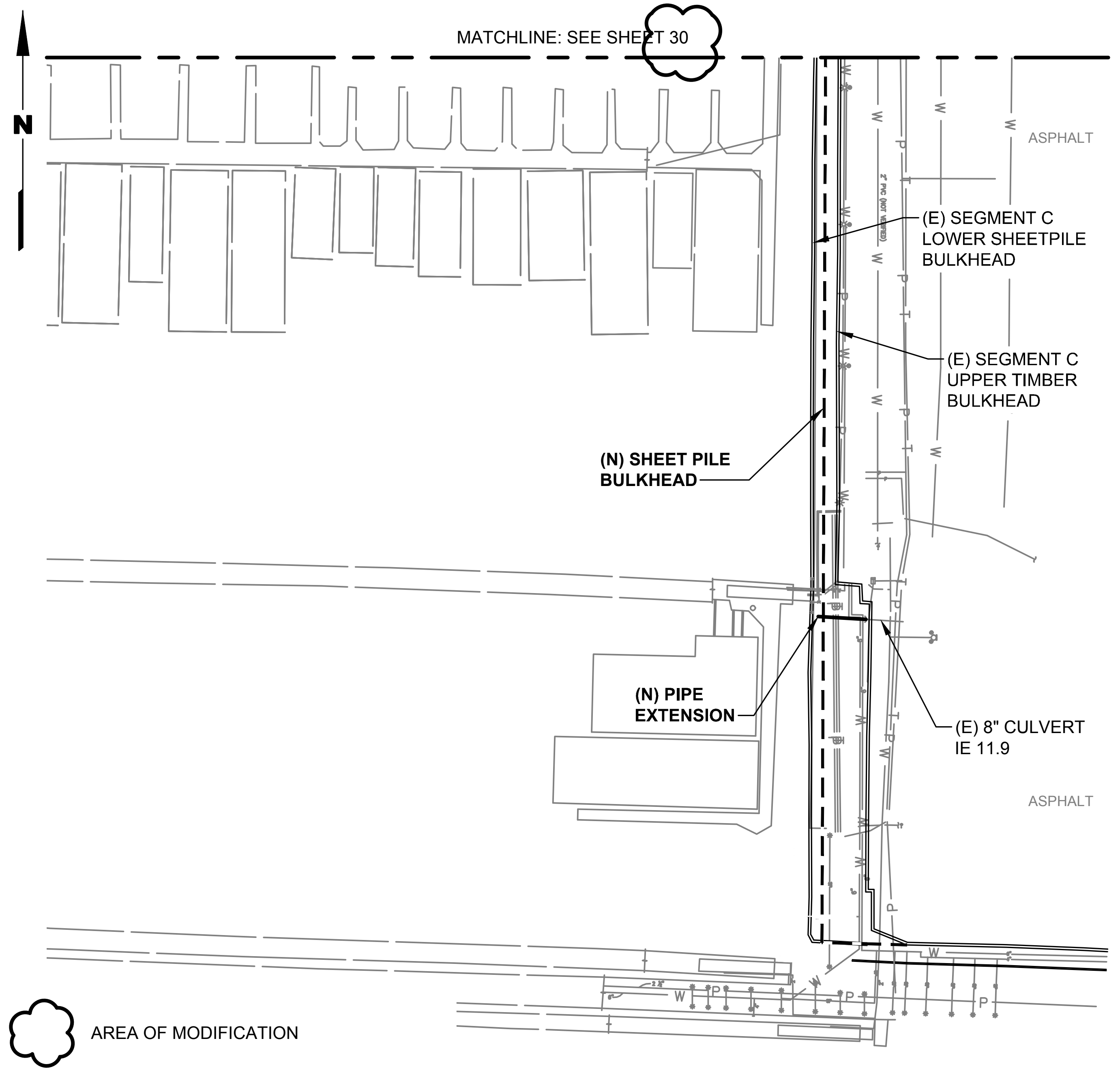

TIDAL DATUM

ORDINARY HIGH WATER (OHW)	=	12.80
MEAN HIGHER HIGH WATER (MHHW)	=	11.11
MEAN HIGH WATER (MHW)	=	10.25
MEAN LOW WATER (MLW)	=	2.80
MEAN LOWER LOW WATER (MLLW)	=	0.00
EXTREME LOW WATER (ELW)	=	-4.50

Landau Associates, Inc. | G:\PROJECTS\147\036\040\044\JARPA - R2\J-SD MOD PLAN.DWG

PURPOSE:
DREDGING TO REMOVE CONTAMINATED SEDIMENT AND MARINE AREA BACKFILLING; DEMOLITION OF MARINE STRUCTURES; BULKHEAD REPLACEMENT; AND MARINA FLOAT REALIGNMENT

DATUM: MLLW= 0.0' (NOS)

TOWNSHIP/RANGE: SEC 18 TWP 29N RGE 5E

ADJACENT PROPERTY OWNERS:
1. CITY OF EVERETT RIGHT-OF-WAY
2. U.S. NAVY

PORT OF EVERETT

EVERETT SHIPYARD SITE SEDIMENT CLEANUP AND CENTRAL MARINA IMPROVEMENTS

PORT OF EVERETT
1205 CRAFTSMAN WAY, SUITE 200
EVERETT, WASHINGTON 98021

STORM DRAIN OUTFALL PLAN
2 OF 2

IN: PORT OF EVERETT CENTRAL MARINA ADJACENT TO THE SNOHOMISH RIVER CHANNEL

AT: PORT OF EVERETT

COUNTY OF: SNOHOMISH

STATE OF: WASHINGTON

APPLICATION BY: PORT OF EVERETT

DATE: SEPTEMBER 2013
MODIFIED: JANUARY 22, 2014

SHEET: 31 OF 31

APPENDIX J

Bulkhead Replacement Design Memorandum

600 University Street, Suite 610

Seattle, WA 98101

MEMORANDUM

To: **Larry Beard/Landau Associates**

From: **Pooja Jain/M&N**

Cc: **Mike Hemphill/ M&N, Erik Gerking/Port of Everett**

Date: **April 2, 2013**

Subject: **Port of Everett East Marina Bulkhead Replacement Project**

Engineering Design Report Support Memorandum [3rd DRAFT]

M&N Job No.: **7872**

The Port of Everett (POE) retained Moffatt & Nichol (M&N) to investigate schematic level options for use of a permanent wall system similar to the 14th Street Bulkhead Replacement that would also provide a temporary containment barrier to allow removal of contaminated material as documented by Landau Associates (Appendix A). The existing timber bulkhead will be demolished to the extent possible as part of the remediation work. This task includes one construction sequence scheme for five distinct conditions that exist within the limits of remediation work.

This memorandum documents the following:

1. Extent of the remediation assumed (provided by Landau Associates).
2. Assumptions made about the staging and phasing of the excavation, dredge and fill.
3. Presentation of one possible construction sequence for each of the five distinct conditions identified.
4. Discussion of challenges and risks associated with working near the existing bulkheads.
5. Temporary Shoring Costs
6. Recommendations

ASSUMPTIONS

1. Timber bulkhead will be demolished to the extent possible as part of the remediation work.
2. The tieback/deadman system for the existing timber bulkheads under consideration for replacement is similar to that of the old timber 14th St bulkhead replaced in 2007.
3. The dredging and excavation will be sequenced to best fit the use of the permanent wall as temporary containment barrier.

4. The replacement bulkhead barrier is not expected to be water tight. Free flow of water shall be permitted via weep holes to maintain hydrostatic equilibrium on both sides of wall during construction. Further, other necessary means may be employed by the contractor to achieve hydrostatic equilibrium. The intent of the wall is to prevent migration of soils from the excavation zone.
5. There is no surcharge expected on the wall during construction.
6. The vertical datum for all elevations noted in this memo is Mean Lower Low Water (MLLW).

EXISTING CONFIGURATION

The existing timber bulkhead to be replaced consists of different types of construction (Figure 1). The bulkhead types are:

- Stepped timber pile bulkhead with timber lagging and tie-backs (labeled Segment A).
- Vertical timber pile bulkhead with tie-backs (labeled Segment B).
- Stepped cantilever sheet pile and timber pile bulkhead with tie-backs (labeled Segment C).

The Port intends to replace Segment A, B and C (900 feet in length). The condition of these timber walls were determined in the 2007 and 2011 condition assessment studies by Moffatt & Nichol and reported using the rating system in the ASCE Underwater Investigations Standard Practice Manual. The lower bulkhead of Segment A was found to be "WORN[1]" and the upper bulkhead was "FAIR[2]" in 2011.

On September 6, 2012 Moffatt & Nichol engineers visited the site and observed that the Segment B bulkhead north of the marine railway had deteriorated from a "FAIR" condition reported in 2011 to a "REPLACE[3]" condition as observed currently. The condition south of the marine railway remains "WORN." Use and service warnings were expressed to the Port of Everett in a memo dated

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[1] WORN is described in the manual as "Component found to exhibit cracking, corrosion, or other indicators of deterioration. The component is still serviceable but requires maintenance attention to achieve or extend its service life. Advanced deterioration or overstressing is observed on widespread portions of the component but does not significantly reduce the load-bearing capacity of the structure."

[2] FAIR is described in the manual as "Component found to be serviceable but not in good condition. Lightly worn usually due to normal wear or weather conditions. Localized areas of moderate to advanced deterioration may be present, but do not significantly reduce the load bearing capacity of component."

[3] REPLACE is described in the manual as "Component found to be worn to the state of needing immediate replacement or major repair.

September 7, 2012 on the subject. This rapid change in condition illustrates the unknown and potentially dangerous condition of the subject structures.

The 14th Street bulkhead is a tieback steel sheet pile wall located west of Segment A. This wall was constructed in 2005/2006. The proposed wall shall have a similar configuration to the extent possible.

REMEDIATION LIMITS

Based on information provided by Landau Associates (Appendix B), remediation work is limited to Segment A, B and C. Further, dredging is expected in front of the 14th St Bulkhead wall completed in 2006. The limits of dredging and excavation are shown in Figure 1 and Appendix A. For the purpose of future discussion, "dredge" implies removal of contaminated soils seaward of existing wall and "excavation" implies removal of contaminated soils landwards of the existing wall.

Based on the limits provided, five distinct conditions are identified.

1. Condition 1 – 14th Bulkhead (Station 0+00 to 0+79)
   a. Length = 79 feet, approximately
   b. Dredge only to -12' MLLW
2. Condition 2 – Segment A (Station 0+79 to 2+00)
   a. Length = 121 feet, approximately
   b. Dredge to -12' MLLW
3. Condition 3 – Segment A/B (Station 2+00 to 3+10)
   a. Length = 110 feet, approximately
   b. Dredge to -12'/excavation to +1' MLLW
4. Condition 4: Segment B (Station 3+10 to 4+25)
   a. Length = 115 feet, approximately
   b. Dredge to -14' MLLW
5. Condition 5: Segment C (Station 4+26 to 5+36 and Station 6+78 to 7+86)
   a. Length = 218 feet, approximately
   b. Dredge varies from -8 to -12' MLLW

CONSTRUCTION PHASING AND FINAL CONFIGURATION

Substantial remediation efforts requiring dredging and excavation are planned for areas near the subject bulkhead as discussed in the preceding section. The timber bulkheads are not expected to remain intact for all stages of construction without temporary support during this process. One possible construction sequence is investigated for each of the three bulkhead segments (Segment A, B & C) and 14th St Bulkhead for removal of contaminated sediments. The permanent wall for final replacement of the bulkhead is used for containment for Segment A and B. Final construction sequence will be developed by the contractor.

To analyze these schemes the following assumptions have been made based on discussions with Landau, the Port of Everett, and review of previous M&N condition memos.

- The timber constructed bulkheads will remain in place during initial stages of excavation as described in each subsequent discussion.
- Excavation will occur in phases to prevent overloading of the new bulkhead sheet piles.
- Zero hydrostatic head is assumed. This will require drain holes in the sheet piles and potentially other methods to maintain hydraulic equilibrium (such as pumping).
- The geotechnical recommendations provided by Shannon & Wilson for the permanent bulkhead were used for this design. Only the static load case is considered with 100psf surcharge.
- Construction live load is limited to 100 psf on the soil during this work. The construction load will be offset a distance of at least 20 feet or more.
- The limits/length of temporary shoring is determined based on horizontal distance corresponding to slope of 2H:1V to mudline from maximum depth of dredge plus 10 feet offset.
- Other general criteria for temporary shoring are discussed in the design criteria document provided as Appendix B (note that the primary focus of this document is the permanent wall construction. However temporary construction condition is addressed as well)

14TH BULKHEAD TEMPORARY SHORING– DREDGE ONLY (CONDITION 1)

The remediation work in the vicinity of the existing 14th Street Bulkhead completed in 2006 is limited to dredging in front of the wall. The maximum dredge depth is expected to be -12' MLLW. The existing wall is not designed for this dredge depth and will require temporary shoring.

One possible temporary shoring configuration is shown in Figure 2 (final temporary shoring shall be developed by the contractor). The system evaluated comprises discrete steel piles (wide flange or H-piles) with a jacking system and waler to function as a second level of lateral support along the existing bulkhead. The H-piles/wide flanges section will allow dredging around the pile. The jacking system will be used to develop adequate reaction at the bulkhead to prevent undesirable movement or stresses in the wall.

SEGMENT A

The remediation work in the vicinity of Segment A includes dredging in front of the entire existing wall as well as excavation behind in the upland Area A TPH area. The new bulkhead will be designed to function as a temporary containment barrier during remediation work for this Segment. Although the final construction sequence will be developed by the contractor, it is important that the excavation/dredge sequence be such that it does not overload the rather light AZ sheet pile section (AZ18).

For the purpose of construction sequencing and discussion; the section of Segment A with both dredging and excavation are termed as “Segment A – Dredge and Excavation” and section with dredging only is termed as “Segment A- Dredge only).

SEGMENT A–DREDGE ONLY (CONDITION 2)

The dredge depth along Segment A extends to -12’ MLLW. The construction of this segment is expected to be similar to the 14th bulkhead constructed in 2007. Figure 3 shows the construction sequence discussed below.

1. Remove deck structure and independent piling above the work area as required.
2. Install AZ sheet piles in front of lower bulkhead.
3. Remove a wedge of material behind the upper bulkhead to elevation of +5.5’ MLLW (minimum) and daylight at 3.5H:1V slope maximum followed by removal of material between the upper and lower bulkheads to the same elevation. Remove tie backs if required.
4. Excavate to a depth of +11.00’ MLLW behind the upper bulkhead up to the proposed deadman location. (No load may be placed on the new sheet piles until tiebacks and deadmen are installed.)
5. Demolish timber bulkheads as necessary.
6. Install steel walers, tiebacks and deadman. Place backfill around the deadman to engage its holding capacity.
7. Dredge contaminated soil in front of steel sheet piles. Back fill in front of lower bulkhead with clean material.
8. Backfill behind the bulkhead to rough final grade, construct pile cap and guardrail.

SEGMENT A – UPLAND EXCAVATION + DREDGING (CONDITION 3)

The dredge depth along Segment A extends to -12’ MLLW and the upland Area A cleanup excavation depth extends to a maximum of 16 feet behind the bulkhead. Based on this sequence, a temporary A-frame lateral support system may be required to support the sheet piles during part of the construction. Figure 4 shows the construction sequence discussed below.

1. Remove deck structure and independent piling above the work area as required.
2. Install AZ sheet piles in front of lower bulkhead.

3. Remove a wedge of material behind upper bulkhead from elevation matching the lower bulkhead fill and daylight at 3.5H:1V slope maximum. Assume a crawler crane to excavate the soil.
4. Demolish upper bulkhead tiebacks.
5. Remove soils to a minimum elevation of +5.5' MLLW from behind the upper bulkhead followed by removal between the upper and lower bulkheads to the same elevation. Remove tie backs if required.
6. Excavate to maximum excavation depth.
7. Demolish timber bulkheads as necessary.
8. Install A-frame piles, steel walers, and tiebacks at +11.85' MLLW.
9. Dredge contaminated soil in front of steel sheet piles. Back fill in front of sheet piles with clean material.
10. Backfill landward of the steel sheet piles to +11.00' MLLW.
11. Install new deadman and connect to tiebacks. Place backfill around the deadman to engage its holding capacity. Remove the A-frame piles.
12. Backfill to final grade, construct pile cap and guardrail.

We understand that there may be need for excavation between the new and existing bulkhead (not shown in figure). The contractor will develop the appropriate method of shoring if necessary for this excavation. We would recommend that excavation be sequenced such that the current retained height behind the upper and lower bulkhead is not exceeded during this work while protecting the lower bulkhead tiebacks in place. It should be noted that Moffatt & Nichol has not undertaken any analysis to validate the performance of the existing bulkhead during construction specific to the condition of excavation between the existing and new bulkhead. The contractor will evaluate the existing wall condition and develop his own means and methods for sequencing the work.

SEGMENT B – DREGDE ONLY (CONDITION 4)

The remediation work in the vicinity of Segment B includes dredging in front of the entire existing wall to a depth of -14' MLLW. The new bulkhead wall will be designed to function as a temporary containment barrier during remediation work. Although the final construction sequence will be developed by the contractor, it is important that the excavation/dredge sequence be such that it does not lead to overloading of the rather light AZ sheet pile section (AZ18).

Based on this sequence, a temporary A-frame lateral support system may be required to support the sheet piles during part of the construction. Figure 5 shows the construction sequence discussed below.

1. Install sheet piles in front of existing bulkhead.

2. Excavate to a depth of +11.00' MLLW behind the existing bulkhead up to the proposed deadman location. (No load may be placed on the new sheet piles until tiebacks and A-frame are installed.)
3. Install A-frame piles, steel walers, and tiebacks at elevation +11.85' MLLW. The new sheet piles may be loaded at this point.
4. Remove existing bulkhead and tiebacks as needed.
5. Dredge contaminated soil in front of steel sheet piles. Back fill in front of sheet piles with clean material.
6. Install new deadman and connect to tiebacks. Remove the A-frame piles.
7. Backfill to final grade, construct pile cap and guardrail.

We understand that there will likely be need for excavation between the new and existing bulkhead (not shown in figure). The contractor will develop the appropriate method of shoring if necessary for this excavation. We would recommend that excavation be sequenced such that the current retained height is not exceeded during this work and that the timber bulkhead shall be tied back with a suitable method. It should be noted that Moffatt & Nichol has not undertaken any analysis to validate the performance of the existing bulkhead during construction specific to the condition of excavation between the existing and new bulkhead. The contractor will evaluate the existing wall condition and develop his own means and methods for sequencing the work.

SEGMENT C TEMPORARY SHORING – DREGDE ONLY (CONDITION 5)

The remediation work in the vicinity of Segment C is limited to zones identified in Figure 1. Dredge depth varied between -8' and -12' MLLW in front of the existing steel sheet pile toe wall. The existing wall is not designed for this dredge depth and will require temporary shoring.

The sheet pile cantilever toe wall was installed in 1994. However, drawings showing the section of sheet piles are not available. The Port provided the necessary dimensions for estimation of the section properties based on field measurements. The web and flange thicknesses provided appeared excessive likely due to error in measurement resulting from corrosion. We assumed that the web and flange thicknesses are half of those reported by the Port. In order to estimate to effect of upper bulkhead behind the toe wall, the cantilever wall was analyzed for existing mudline elevation with increasing surcharge until the wall developed maximum allowable moment or minimum FOS of 1.0. These surcharge pressures are used for temporary shoring with dredge depth to -12' MLLW to simulate the bulkhead landwards of the toe wall.

One possible temporary shoring configuration is shown in Figure 6 (final temporary shoring shall be developed by the contractor). The system evaluated comprises discrete steel piles (wide flange or H-piles) with a jacking system and waler to function as a second level of lateral support along the existing bulkhead. The H-pile/wide flange sections will allow dredging around the pile. The jacking system will be used to develop adequate reaction at the bulkhead to prevent undesirable movement or stressed in the wall.

The assumption regarding wall section needs to be validated against as-built drawings or accurate field measurement.

CHALLENGES AND RISKS

The following construction risks and challenges are identified.

Condition of the existing bulkheads: The existing bulkheads were found to be FAIR AND WORN during the 2011 condition assessment. Areas of settlement are evident behind Segment B and some of it has recently been downgraded to "REPLACE." The condition of the tiebacks and deadman or pile anchors is unknown.

Knowledge of existing construction: Very limited structural information from the original construction is available for Segment A and no information is available for Segment B. No information is available on the tiebacks at any of the locations. These support schemes are based on what is visible in the system and our best estimate as to what is not visible, including the depth of penetration for the Segment B piles, and the tieback locations for Segment A. If conditions deviate significantly the sequence of work may need to be adjusted from those determined by the contractor leading to construction risk and change orders.

Damage during sheet pile installation: Installation of the sheet piles will require either impact hammer or more likely a vibratory hammer. It is quite likely that the vibration could cause settlement of the bulkhead or surrounding soil. The contractor will have to take protective measures in order to prevent premature loading of the AZ18 sheet piles. Given the current state of the existing bulkhead at Segment B, it is possible that the bulkhead may be locally or globally compromised during sheet pile installation. It is a significant construction risk.

Damage during Excavation: Excavation between the new sheet piles and existing bulkheads at Segment A & B could lead to failure of timer bulkheads. M&N has not undertaken analysis to validate the performance of existing bulkhead during this activity due to the lack of information of the existing condition. It is a significant construction risk.

OPINION OF COSTS

We understand that the opinion of costs is not needed at this time.

RECOMMENDATION

1. Limited as-built data is available for Segment A and none has been found for Segment B and C. The study above assumes that the tieback/deadman configuration for these segments is identical to pre-construction configuration shown on the 14th St Bulkhead Record Drawings.

In order to minimize the risks identified previously, it is imperative that necessary investigations be completed to identify the tieback/deadman configuration for these segments of wall.

2. The wall section for Segment C steel sheet pile toe wall is unknown. In the absence of as-built data, field measurements need to be taken to develop the wall section. This is expected to entail locally cleaning the sheets of the rust built-up and take measurements at 2 locations along the wall.
3. The soil pressures used to develop the Segment C temporary shoring are based on best guess of the soil pressures. Numerical modeling needs to be undertaken to understand the interaction /load sharing between the upper timber wall and sheet pile toe wall and develop the final soil pressures acting on the steel sheet pile toe wall.

REFERENCES

East Marina Bulkhead Replacement Condition Assessment and Replacement Alternatives Technical Memorandum dated January 2007 by Moffatt & Nichol.

East Marina Bulkhead Replacement Segment A & B Condition Re-Assessment and Replacement Alternatives Technical Memorandum dated July 2011 by Moffatt & Nichol.

Geotechnical Recommendations for soil pressures from Shannon & Wilson (received via e-mail).

Bulkhead Site Visit Memo dated September 7, 2012.

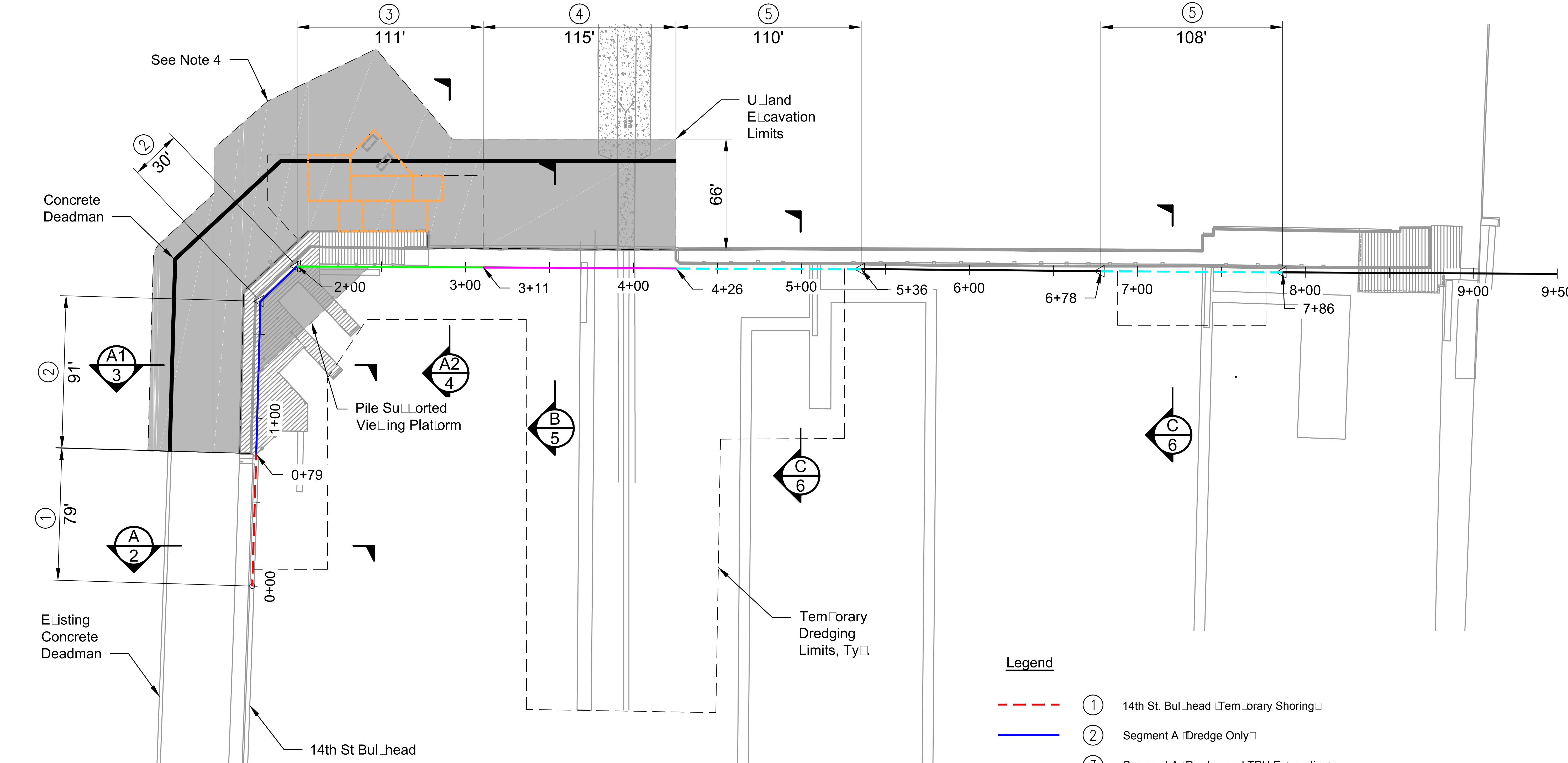
Port of Everett East Marina Bulkhead Replacement Feasibility Study [DRAFT] Memorandum dated October 12, 2012.

Port of Everett, West Bulkhead Improvements Bid drawings dated December 14, 1994.

Port of Everett, 14th Street Bulkhead Replacement Record Drawings dated February 7, 2005.

Port of Everett, 14th Street Boat Basin-Phase I As-Built Drawings dated March 1964.

Figures



Legend

red dashed line	1	14th St. Bulkhead (Temporary Shoring)
blue line	2	Segment A (Dredge Only)
green line	3	Segment A (Dredge and TPH Excavation)
magenta line	4	Segment B (Dredge Only)
cyan dashed line	5	Segment C (Temporary Shoring)
orange dashed box		TPH Excavation Areas

N

0 60 120
Scale in Feet

Notes

1. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12 (feet, MLLW)
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
3. Dredge only areas (Sections 2 and 4) do not require excavation for remediation. Upland excavation is required in these locations for installation of the concrete deadman.
4. Upland excavation extends up to 100 feet from existing bulkhead along TPH area.

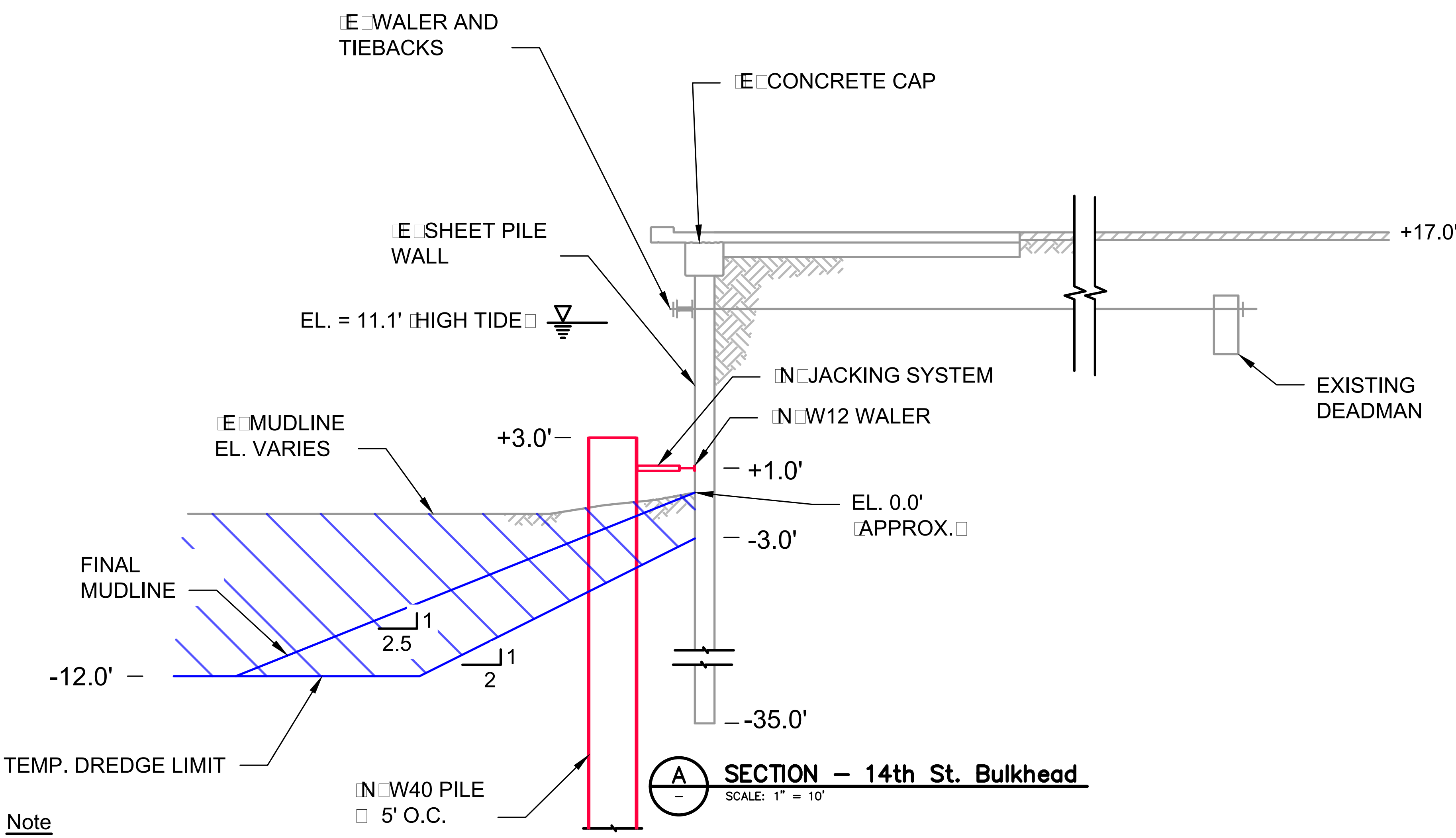
P:\7872 POE Bulkhead Replacement Project\500 CADD\560 Working 3/21/2013

MOFFATT & NICHOL

moffatt & nichol

Engineering Design Report
Support Memorandum
Everett Shipyard Site
Everett, Washington

Figure
1



Note

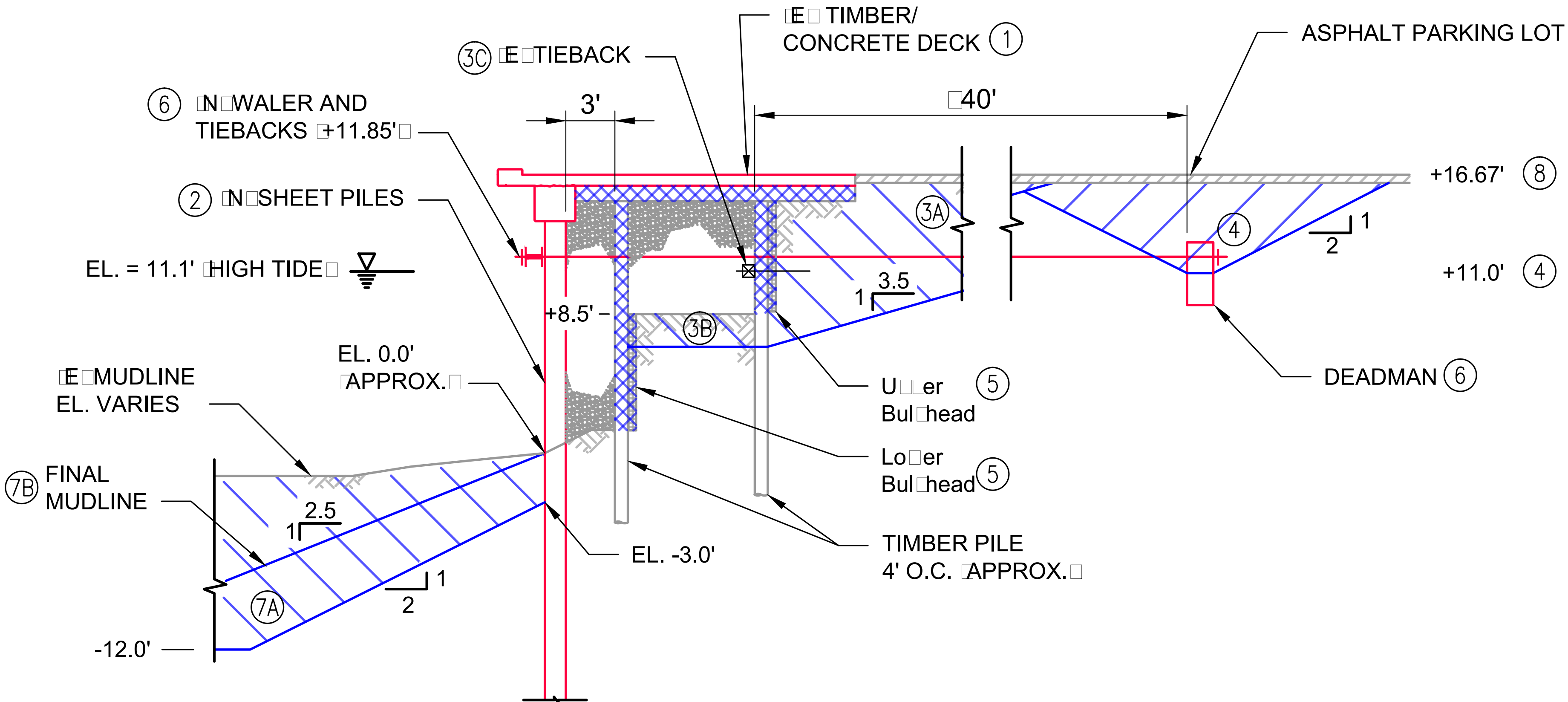
1. ASPHALT AND GUARDRAIL NOT SHOWN FOR CLARITY

moffatt & nichol

0 10 20

SCALE: 1"=10'

Engineering Design Re□ort Su□□ort Memorandum Everett Shi□yard Site Everett, Washington	□4□□ S□r□□□B□□□□□□d T□□ □□r□r□ S□□r□□□ S□□□□□□	Figure 2



A1 SECTION – SEGMENT A
SCALE: 1" = 10'

Notes:

1. ASPHALT, GUARDRAIL, AND EXISTING DEADMAN NOT SHOWN FOR CLARITY
2. FOR DETAILS OF SEQUENCE NUMBERS NOTED, SEE MEMO.

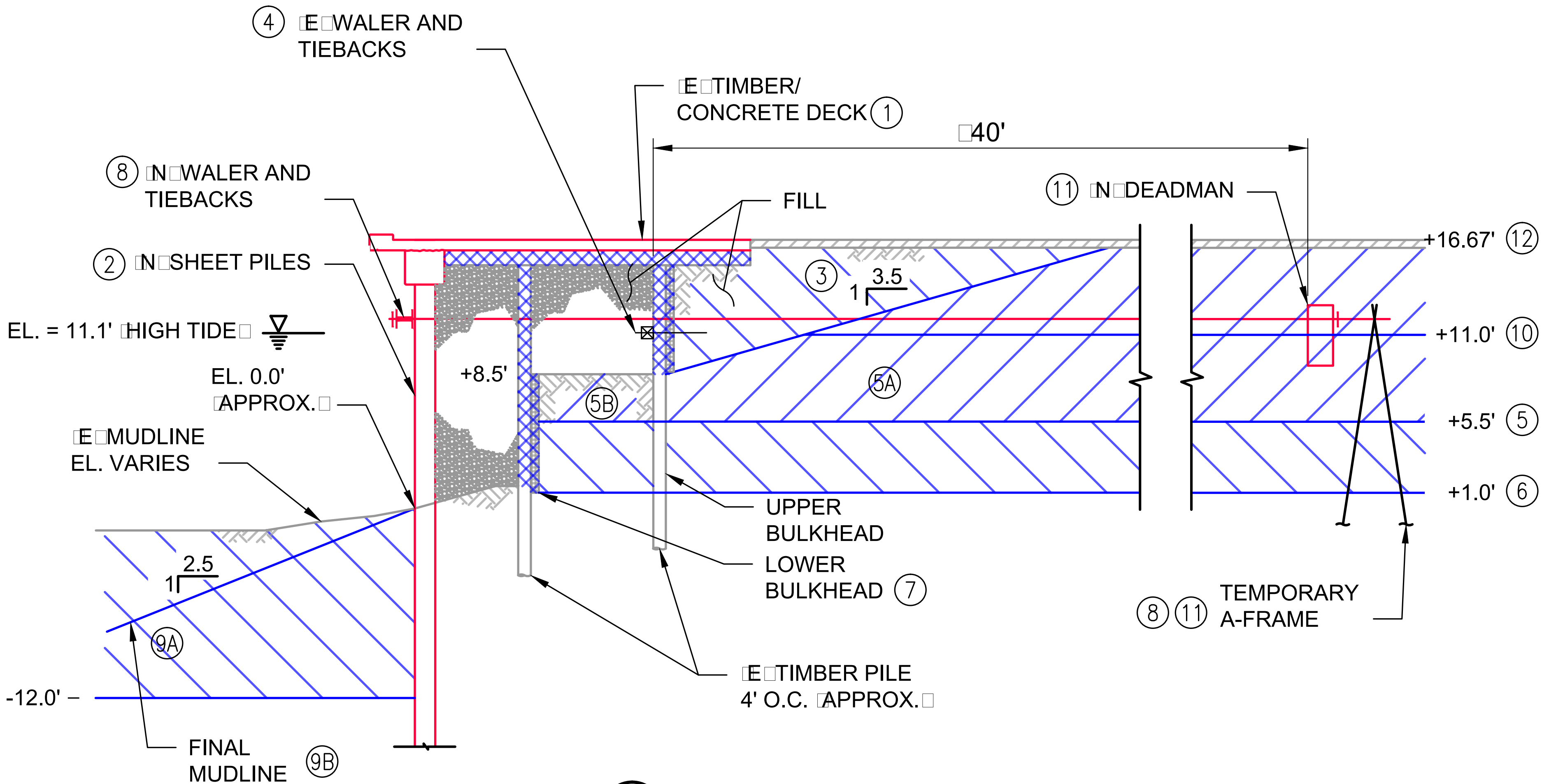
Legend

- Demolition
- Structural Fill
- (X) See Memo for Notes

moffatt & nichol

0 10 20
SCALE: 1" = 10'

Engineering Design Report Support Memorandum Everett Shipyard Site Everett, Washington	S□□□ □□□A □Dr□d□□ O□□□	Figure 3



A2 – SECTION – SEGMENT A
SCALE: 1" = 10'

Note

1. ASPHALT, GUARDRAIL, AND EXISTING DEADMAN NOT SHOWN FOR CLARITY

Legend

Demolition

Structural Fill

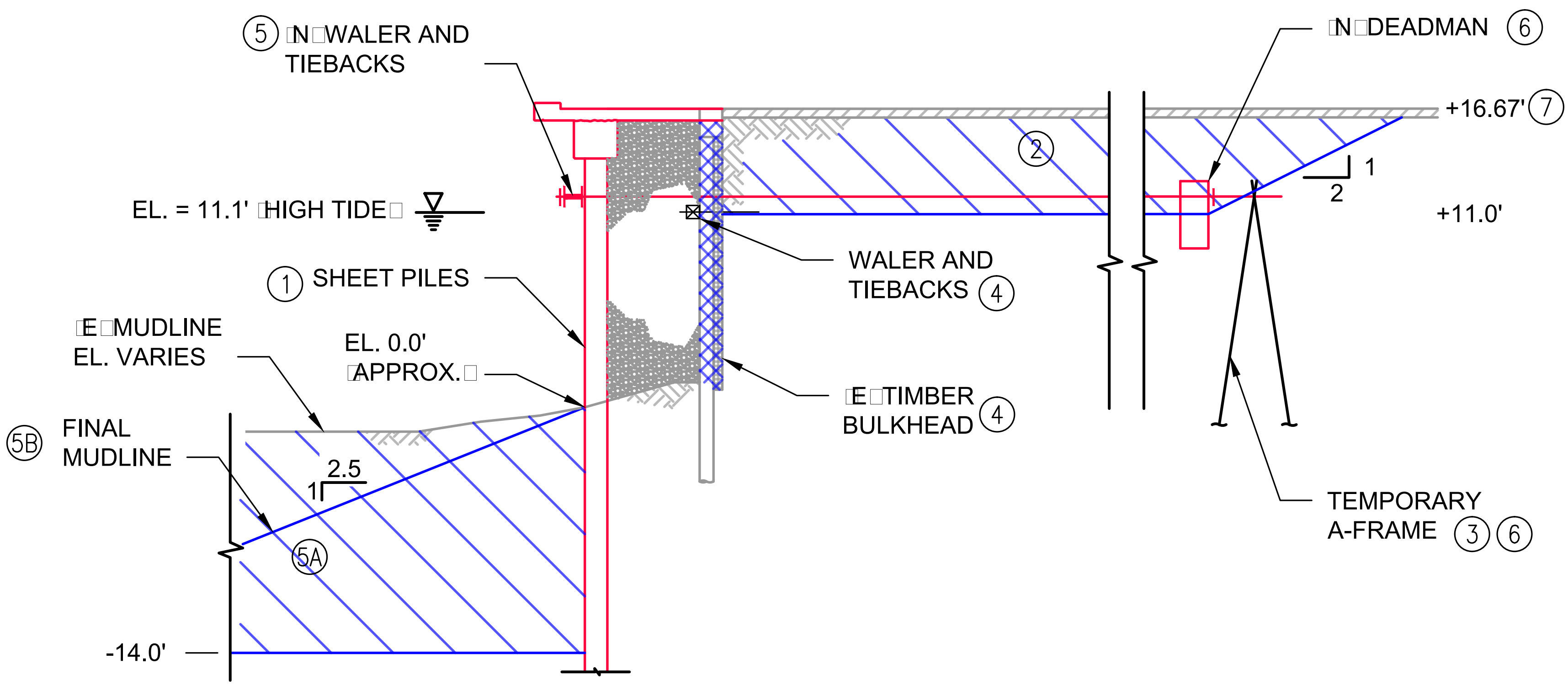
See Memo □or Notes

X

moffatt & nichol

0 10 20
SCALE: 1"=10'

Engineering Design Re□ort Su□□ort Memorandum Everett Shi□yard Site Everett, Washington	S□□□ □□□A □Dr□d□□ □□d E□□□□□□□□□□	Figure 4



B1 SECTION – SEGMENT B
SCALE: 1" = 10'

Note

1. ASPHALT, GUARDRAIL, AND EXISTING DEADMAN NOT SHOWN FOR CLARITY

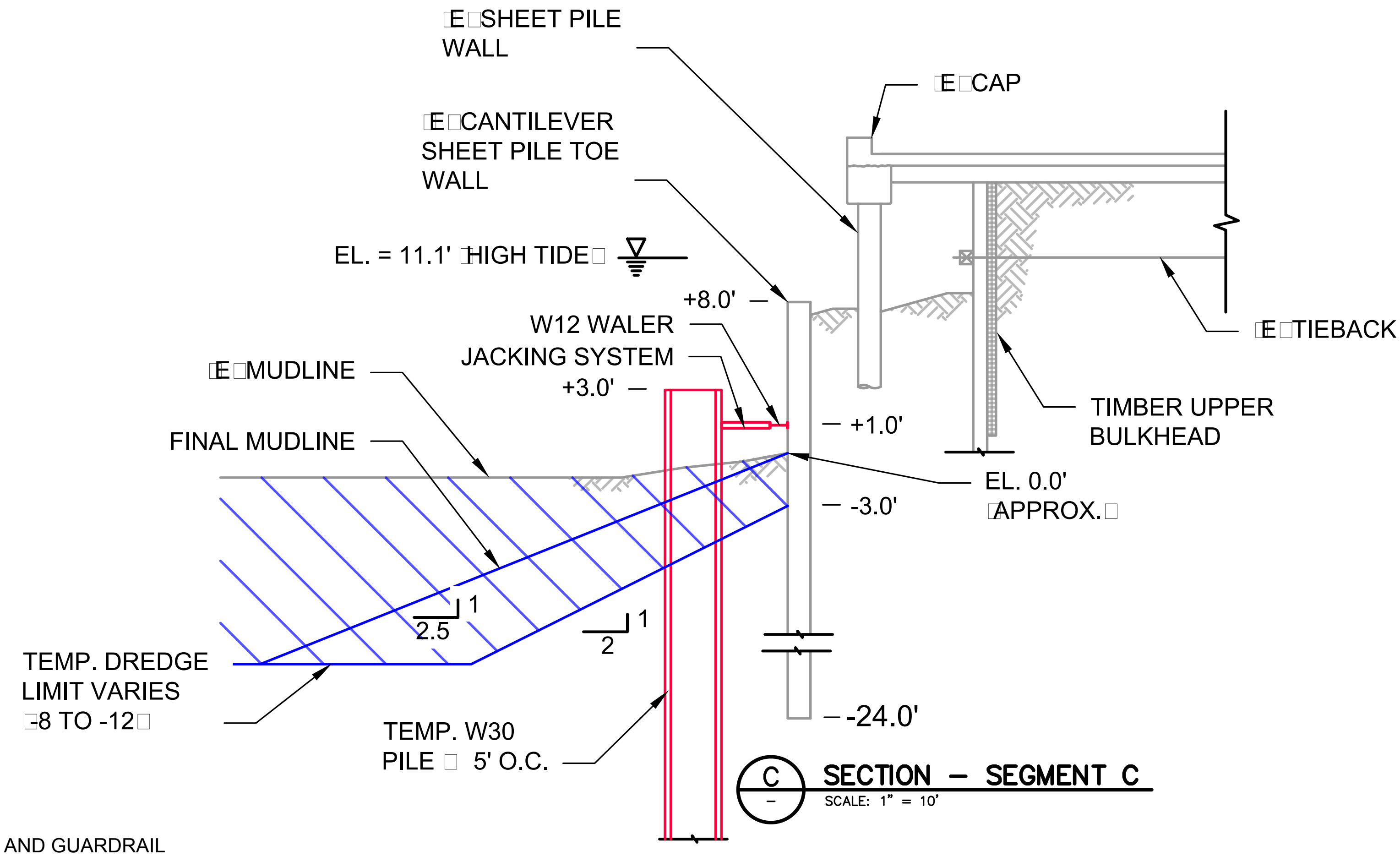
Legend

- Demolition
- Structural Fill
- (X) See Memo for Notes

moffatt & nichol

0 10 20
SCALE: 1"=10'

Engineering Design Report Support Memorandum Everett Shipyard Site Everett, Washington	S B	Figure 5



Note

1. ASPHALT AND GUARDRAIL NOT SHOWN FOR CLARITY

0 10 20

SCALE: 1"=10'

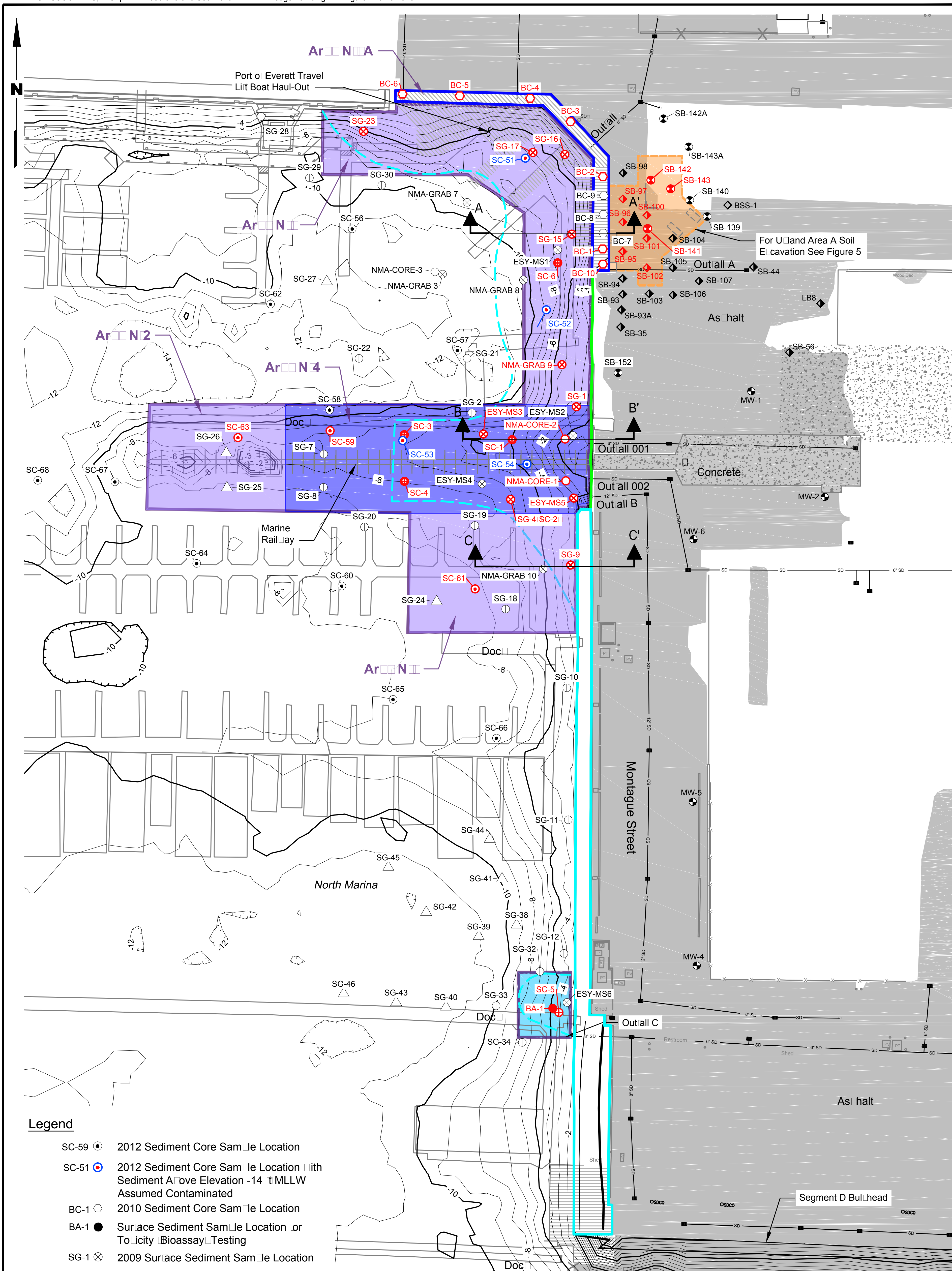
moffatt & nichol

Engineering Design Report
Support Memorandum
Everett Shipyard Site
Everett, Washington

S[illegible] C
Dr[illegible]d[illegible] O[illegible]

Figure
6

Appendix A



Legend

SC-59 — 2012 Sediment Core Sample Location

SC-51 — 2012 Sediment Core Sample Location with Sediment Above Elevation -14 ft MLLW Assumed Contaminated

BC-1 — 2010 Sediment Core Sample Location

BA-1 — Surface Sediment Sample Location for Toxicity (Bioassay) Testing

SG-1 — 2009 Surface Sediment Sample Location

SC-3 — 2009 Sediment Core Sample Location

NMA-CORE-1 — 2004 Sediment Core Sample Location

MW-4 — Existing Monitoring Well Location

BSS-1, SB-104 — 2010 Soil Sampling Location

SB-142 — 2012 Soil Sampling Location

Segment A Bulkhead

Segment B Bulkhead

Segment C Bulkhead

Extent of SMS Exceedances Presented in RI/FS

Potential UST Location Identified and Located by GPR Survey 2012 (URS)

Sediment Cleanup Action Area

Dredge to -14

Dredge to -12

Dredge to -8

Upland Soil Excavation Area A

Source: AMEC 2012, URS 2012

Notes

1. Sample locations shown in RED exceed Site cleanup levels.
2. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12 feet, MLLW
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 60 120

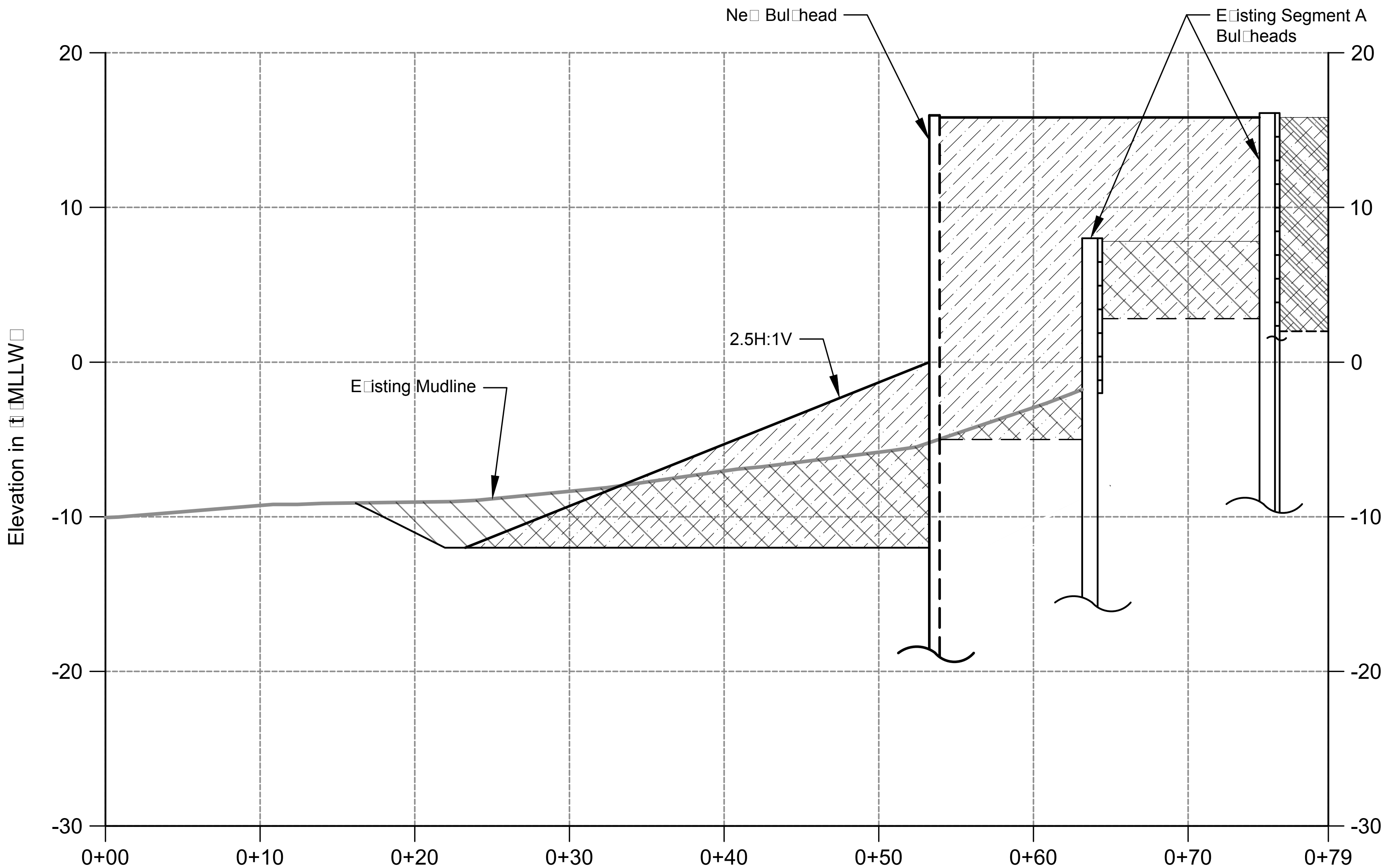
Scale in Feet

LANDAU ASSOCIATES

Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Sediment Dredge Plan and Upland Soil Excavation Area A

Figure 4



Geologic Pro□ile A-A'

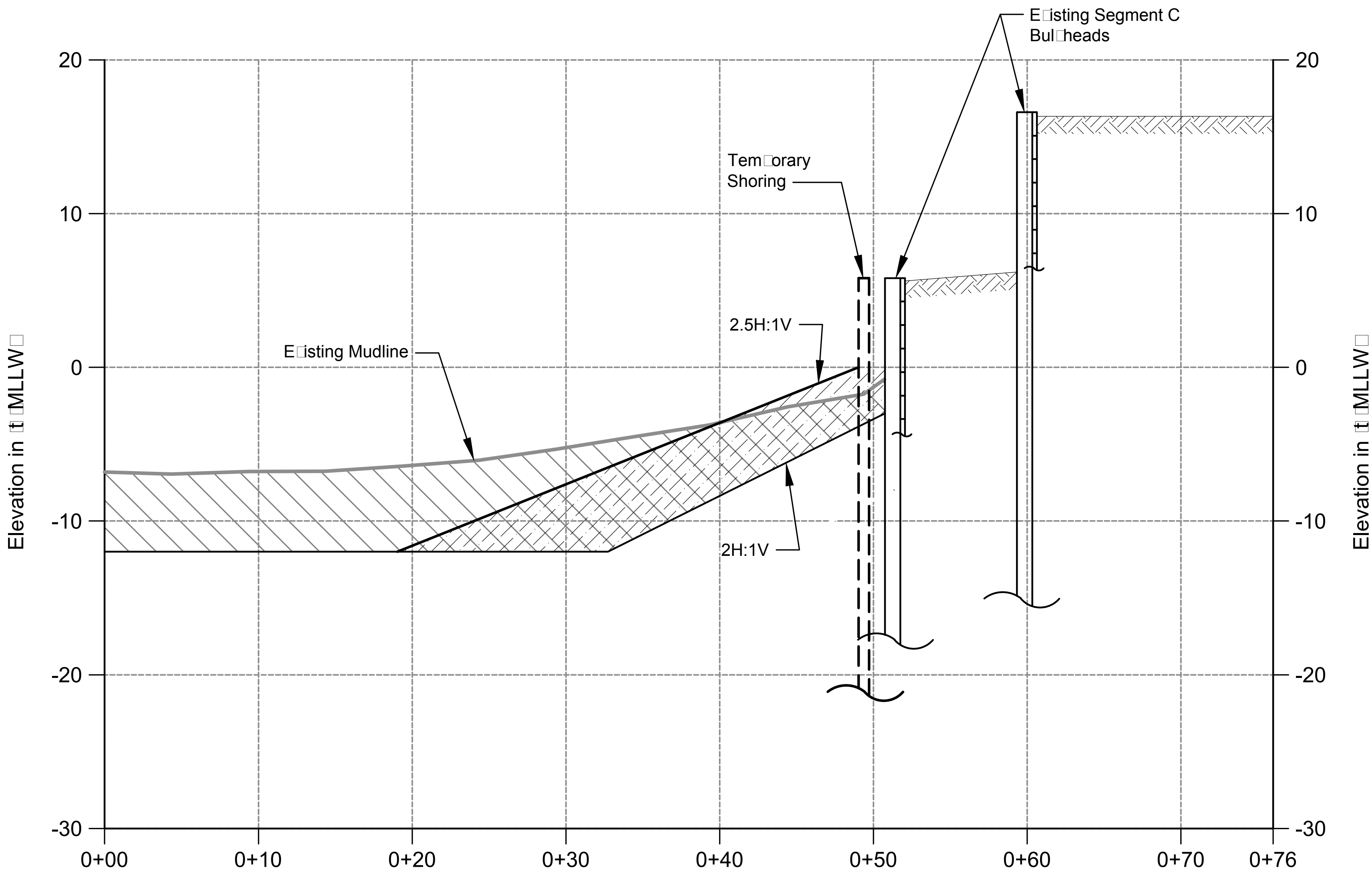
Hori□ontal Scale in Feet: 1"=10'
Vertical Scale in Feet: 1"=10'

Legend

- Dredge Material
- U□land Soil E□cavation
- Bac□ill Material

LANDAU ASSOCIATES

Engineering Design Re□ort For Sediment Cleanu□ Everett Shi□yard Site Everett, Washington	**B□□□□□d S□□□ □□□A T□□□□□Dr□d□□ □r□□□**	Figure 8



Geologic Profile C-C'

Horizontal Scale in Feet: 1"=10'
Vertical Scale in Feet: 1"=10'

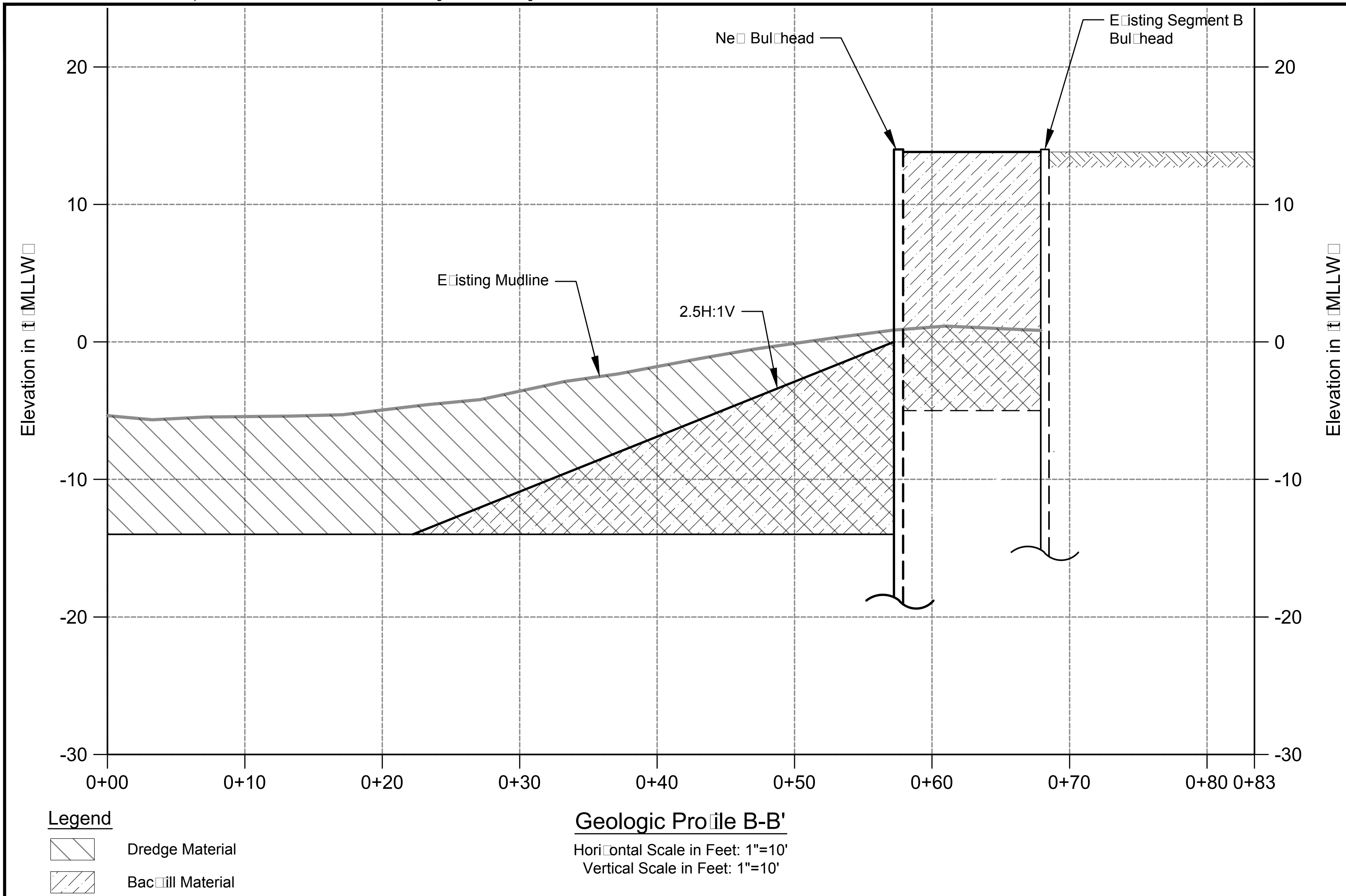
Legend

- Dredge Material
- Backfill Material

Engineering Design Report For Sediment Cleanup Everett Shipyard Site Everett, Washington	[illegible]	Figure 9

LANDAU ASSOCIATES

LANDAU ASSOCIATES, INC. | V:\147\036\010\016\Sediment EDR\F8-F10-Segment Profiles.dwg (A) "B-B'" 4/1/2013



Geologic Profile B-B'

Horizontal Scale in Feet: 1"=10'
Vertical Scale in Feet: 1"=10'

LANDAU ASSOCIATES

Engineering Design Report For Sediment Cleanup Everett Shipyard Site Everett, Washington	[illegible]	Figure 10

Appendix B

Port of Everett East Bulkhead Replacement

Bulkhead Design Criteria

Prepared for:

Port of Everett
P.O. Box 538
Everett, WA 98206

Prepared by

MOFFATT & NICHOL

600 University, Suite 610
Seattle, WA 98101

M&N Project No. 6883-03

Revision	Issue Purpose	Date	Author	Reviewed	Approved
0	DRAFT - For Client Review	09/25/2012	EBD	PC	PJ
1	DRAFT - For Client Review	03/01/2013	SR	MPH	PJ
2	DRAFT – for EDR support Memo	04/01/2013	PJ	PC	PJ

Table of Contents

1.0 - INTRODUCTION

The following Design Criteria document is intended to both record and guide the design assumptions and requirements for the preliminary design of the replacement bulkhead wall at the Port of Everett. The limits of wall under consideration for replacement and to which this document applies is show in Exhibit A (Note that the Segment D is not included).

The existing bulkhead construction consists of a combination of construction from the 1940s to the 1960s. The existing wall consists of several different timber wall systems:

1. Stepped timber pile bulkhead with timber lagging and tie-backs (Segment A),
2. Vertical timber pile bulkhead with tie-backs (Segment B),
3. Stepped cantilever sheet pile and timber pile bulkhead with tie-backs (Segment C), and
4. Stepped timber wall and timber pile bulkhead with timber lagging and tie-backs (Segment D).

A condition assessment was conducted by Moffatt & Nichol in 2007 and findings are documented in the "East Marina Bulkhead Replacement Condition Assessment and Replacement Alternatives" Memorandum dated January 11, 2007.

The Design Criteria outlined in this document applies to Segments A, B and C only. We understand that the Port in not considering Segment D replacement at this time. We understand that it is desirable to develop a replacement system similar to the 14th street bulkhead replacement system installed in 2007. The basis of design reflects that concept.

The bulkhead replacement will be completed under one contract with the remediation activities on site. The remediation works design is being led by Landau Associates. The basis of design takes into account the limits of remediation and temporary construction conditions during the dredge/excavation for clean-up. The temporary shoring design criteria is discussed as well.

These Design Criteria are part of a "living document" that will be updated and resubmitted with the preliminary design documents. While technical details regarding the design are expected to continue to evolve as the design process evolves, changes to the agreed-upon functional performance requirements can only be changed through duly documented discussion and concurrence with the Port of Everett.

2.0 - DISCLAIMER

The design criteria is only part of the design process and provides a summary of the requirements and guidance as noted in Section 1.0. All details should be checked and verified by the designers of the final project design who must exercise their own professional judgment before adopting the design criteria in this document.

3.0 - DESIGN AND CONSTRUCTION PHASING

The design for the various segments of the wall shall be completed in three stages.

- Engineering Design Report (EDR) Support

Landua Associates is leading the remediation design effort for the Port of Everett. M&N shall provide the necessary support including preparation of typical permanent wall section, construction phasing and sequencing recommendations for the Segment A and B (Detailed in proposal dated 2/22/2013 to the Port of Everett). Temporary shoring of a typical section shall be provided for Segment C and 14th Street Bulkhead.

- Preliminary Design

Preliminary design shall be competed for Segment A, B and C to enable the Port to obtain permits for the entire wall considered for replacement.

- Detailed Design

Detailed design shall be completed for Segment A and B only. We understand that the Port intends to proceed with Segment A and B construction at this time. However, allowance will be made in the design for future construction of Segment C. Segment A will tie into the existing 14th Street bulkhead. The design will allow for the transition into the existing bulkhead.

The bulkhead construction shall be completed in conjunction of with the remediation work (dredging and excavation). The most suitable construction phasing plan/sequence shall be developed for each segment of wall with considering to this.

4.0 - CODES, STANDARDS AND DESIGN GUIDELINES

Design of the facilities conforms to the most current version of the following codes and standards:

4.1 - Structural Design

- 2009 International Building Code (IBC) [1]
- US Army Corps of Engineers, Design of Sheet Pile Walls, EM1110-2-2504;
- AISC Steel Construction Manual, 13th edition;
- ACI 318 –Building Code Requirements for Structural Concrete and Commentary;
- GB6

4.2 - Materials Standards

Materials and testing will be specified to conform to the most current edition of the relevant standards, where applicable, as published by the following organizations:

- American Society of Testing and Materials (ASTM).

4.3 - Units of Measurement

Drawings and specifications will be in the Imperial system of units.

4.4 - Project Datum and Grid

The horizontal datum for this project is NAD 83/91. The reference baseline is formed by the following two survey control points (See Exhibit A): Monument No.1 – City of Everett Control Monument (E009 1991), being a 3” aluminum disk in concrete monument in case and Monument No.2 – Centerline R/W Monument at the intersection of West Marine View Drive and 14th Street, being a 4” concrete monument with lead and copper tack. The northing and easting of these monuments are provided in Table 3.1.

Table 3.1: Monument Locations

Monuments	Elevation
Monument 1 Northing	369693.2637
Monument 1 Easting	1300649.3977

[1] IBC will be used for dead and live load considerations only. The Port has directed M&N to proceed with similar reduced seismic loads for the replacement of the Segment A, B and C walls discussed above. The Port understands the risk associated with such reduced criteria and indicated that they are able to a waiver for non-compliance with International Building Code (IBC) 2009 from the City of Everett.

Monument 2 Northing	367511.0631
Monument 2 Easting	1302438.7269

The vertical datum is 0.00’ MLLW (mean lower low water), based on NOAA’s Publication Sheet (Washington 944-7659) dated 09-29-1988 as shown in Exhibit A. The relationship between NGVD and MLLW Datum for Everett, Possession Sound, for the Tidal Epoch 1960-1978 are provided in Table 3.2.

Table 3.2: Tide Levels

Tide Level	Elevation
Highest Recorded Tide: Estimated (EHW)	14.35
Mean Higher High Water (MHHW)	11.11
Mean High Water (MHW)	10.25
NGVD 1929	5.93
Mean Low Water (MLW)	2.80
Mean Lower Low Water (MLLW)	0.0
Lowest Observed Water Level (06/02/1977)	-3.60
Extreme Low Water (ELW)	-4.50

5.0 - GENERAL FUNCTIONAL CRITERIA

The basic functional criteria established are based on direction from Port of Everett unless otherwise noted:

5.1 - Operational & Functional

- Permanent Wall
  - Includes segment A, B and C.
  - Contaminated soils are retained behind Segment A. All contaminated soils behind the wall should be contained during construction. The new bulkhead will act as temporary shoring to resist the construction loads resulting from remediation activities. The remediation limits and excavation depths are show in Exhibit B.
  - Function as temporary shoring to prevent wall failures during dredging in front of Segment A and B. The dredge depths are shown in Exhibit B.
  - The new bulkhead wall shall be adequate to support future development upland of the wall per the master plan included in Exhibit D.
- Temporary Shoring
  - Considered for the existing 14th Street Bulkhead and Segment C only. (Additional temporary shoring may be needed at Segment A if the wall alignment is located between the upper and lower bulkheads. This will be further evaluated for the EDR support.)
  - Prevent failure of existing bulkhead during dredging activities in front of Segment C and 14th Street Bulkhead.

5.2 - Permanent Bulkhead Wall

- The design life of the new bulkhead wall shall be 50 years;
- Length Overall (LOA) = Lengths of Segments A, B and C.
- Wall Alignment: Two options are considered
  a) Wall shall be placed waterwards of the existing wall.
  b) Wall placed between the upper and lower tier walls at Segment C.
- Top of wall El. = Match 14th Street bulkhead top of wall (+16.67’ MLLW)
- Design mudline EL @ waterside = 0.0’ MLLW with the maximum slope of 2.5H:1V (based on 14th Street Bulkhead Drawings);
- The bulkhead shall not support any dead and live loads the buildings. It is our understanding that shall be supported on pile foundations. The building loads shall be offset 20 feet from bulkhead wall;
- There shall be no mooring and berthing forces on the wall; and
- The wall shall be designed to remain elastic under all load conditions.

5.3 - Temporary Shoring @ Segment C & 14th Street Bulkhead

Temporary shoring design will be completed by the contractor. However, following criteria was used to develop concepts for the temporary shoring

- Length Overall (LOA) = 297 feet;
- Mudline EL @ waterside = -12' MLLW @ 14th Street Bulkhead;
- Mudline El @ waterside =-8' MLLW @ Segment C;
- There shall be no surcharge imposed on this wall;
- There shall be no mooring and berthing forces on the wall; and

6.0 - STRUCTURAL DESIGN LOAD CASES

The bulkhead will be analyzed using SupportIT and designed for the load cases described below. The geotechnical data used for each load case are discussed in Section 6.0.

6.1 - Temporary Construction Condition

The wall will be analyzed for construction loads resulting from different phases of the remediation activities. These loads will include the following:

1. Active and Passive pressures from temporary loading condition.
2. Construction load surcharge of 100 psf

Temporary construction condition shall not include any consideration for seismic loads.

6.2 - Permanent Static Condition

The wall will be analyzed and designed for static condition earth pressure loading for two conditions:

1. Dead Load surcharge = 250 psf
2. Live Load Surcharge = 100psf based on IBC (Usage – assembly area)

The soil properties provided by Shannon and Wilson shall be used for analysis (Exhibit C). Any buildings to be constructed as part of the master plan implementation shall be constructed of independent pile foundation.

6.3 - Transient Seismic Condition

The wall will be analyzed and designed for seismic loads with only the dead load surcharge.

The bulkhead will be designed for seismic loads for a seismic event with 200 year return period. We understand that this event will likely not lead to liquefaction/lateral spread loading on the wall (See Exhibit C for further details). This criterion is similar to the seismic design criteria used for the 14th Bulkhead constructed in 2007.

We understand that the 14th Street bulkhead was designed for reduced seismic loads (non-code compliant). The Port has directed M&N to proceed with similar reduced seismic loads for the replacement of the Segment A, B and C walls. The Port understands the risk associated with such reduced criteria and indicated that they are able to a waiver for non-compliance with International Building Code (IBC) 2009 from the City of Everett

The wall section shall be designed to remain elastic under the seismic design condition. The soil properties used for analysis are shown in Exhibit B.

6.4 - Hydrostatic Pressures

The hydrostatic pressure on the bulkhead is a function of the water elevation differential on the waterside and landside of the bulkhead wall. We assume that the ground water level is tidally influenced but may lag behind the actual water level waterside of the bulkhead. We conservatively assume that the most severe differential to be encountered will be 10 feet and this will be used to evaluate the static condition. A typical differential of 2 feet will be used for evaluating the temporary construction, seismic condition and post seismic condition. The lower differential is to reflect the low probability of simultaneous occurrence of a design seismic event and high hydrostatic head.

7.0 - GEOTECHNICAL DATA

The geotechnical criteria and recommendations for the design of the Steel Sheet Pile wall were provided by Shannon & Wilson, Inc. as shown in Exhibit C. The detailed geotechnical recommendations will documented in the geotechnical report to be issued at a later date.

8.0 - CORROSION PROTECTION

Exposure to a corrosive environment can severely reduce the life expectancy of steel structures due to loss of section thickness over a period of time. The steel sheet pile wall system for the project is vulnerable to corrosion due to exposure to salt water environment and potentially corrosive soils. The corrosion rates are amplified in the splash zone and intertidal zones.

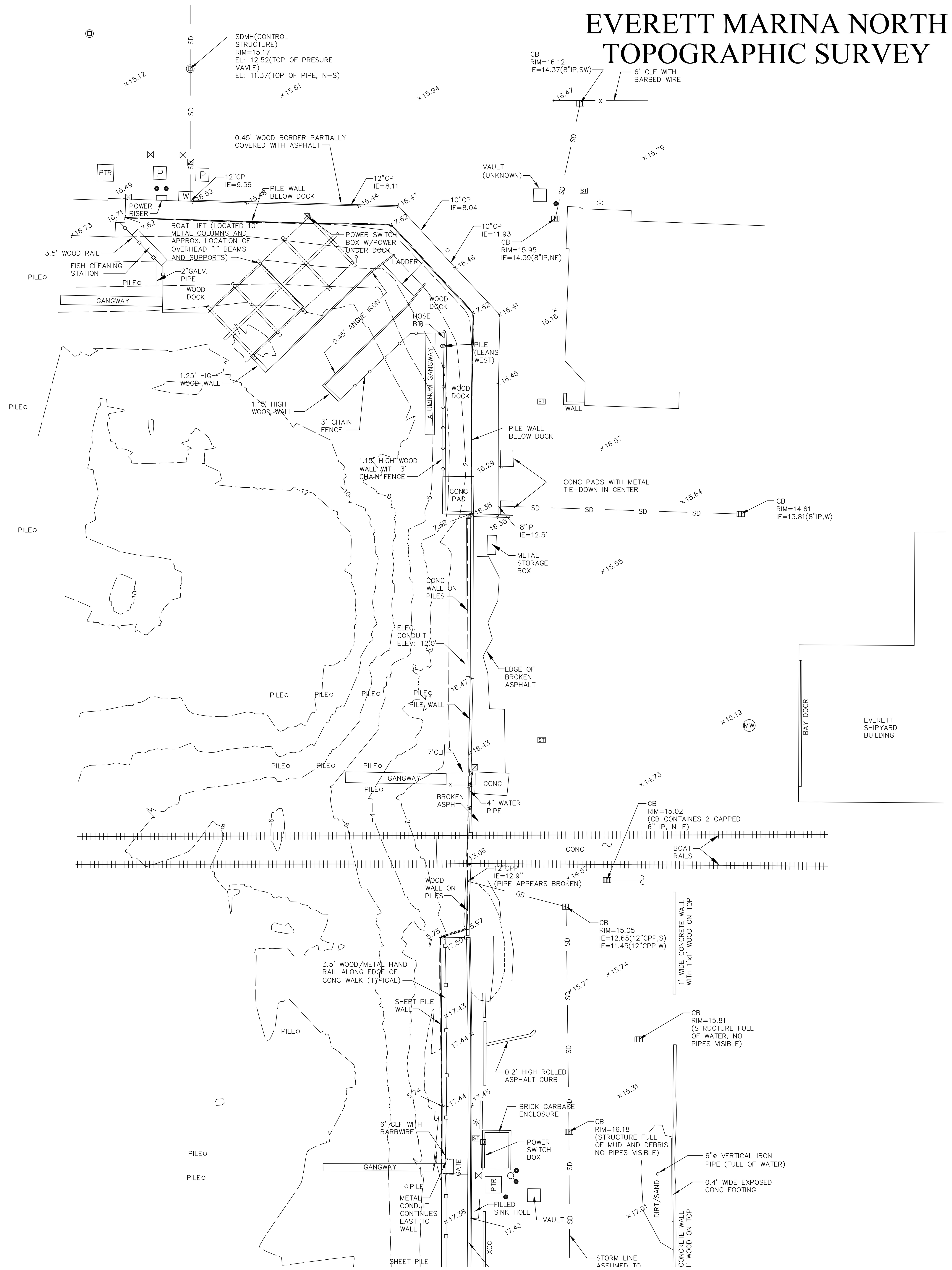
Measures will be taken to prevent loss of section over the design life of the structure due to corrosion during design of the structure. A coating system appropriate for the site exposure shall be used to protect the steel and delay onset of corrosion. Cathodic protection system may be provided to supplement the coating system to protect the steel sheets. Double corrosion protection tiebacks shall be provided to protect the tiebacks from potentially corrosive/contaminated soils.

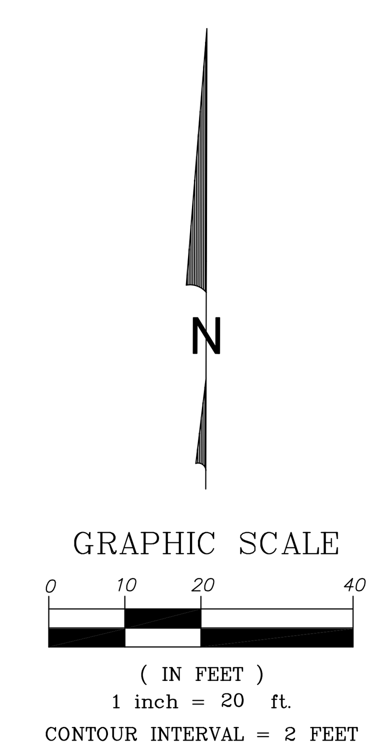
9.0 - REFERENCES

1. "Topographic Survey Everett Marina North" dated January 24, 2006 by Pacific Geomatic Services, Inc.
2. "Port of Everett 14th Street Boat Basin ~Phase 1 Launching Pier Plan and Details" dated March, 1964 by Reid Middleton & Associates, Inc.
3. East Marina Bulkhead Replacement Condition Assessment and Replacement Alternatives" Memorandum dated January 11, 2007 by Moffatt & Nichol.
4. US Army Corps of Engineers, Design of Sheet Pile Walls, EM1110-2-2504.

EXHIBIT A – TOPOGRAPHIC SURVEY AND LIMIT OF WALL

EVERETT MARINA NORTH
TOPOGRAPHIC SURVEY





LEGEND:

- LUMINAIRE
- SANITARY SEWER MANHOLE
- TREE (DECIDUOUS)
- TREE (CONIFER)
- WATER METER
- IE — INVERT ELEVATION
- CP — CONCRETE PIPE
- CLF — CHAINLINK FENCE
- SSMH — SANITARY SEWER MANHOLE
- SD — STORM DRAIN LINE
- SS — SANITARY SEWER LINE
- R/W — RIGHT OF WAY
- PS — POWER SWITCH BOX
- PTR — PAD MOUNTED TRANSFORMER
- P — POWER VAULT
- ST — STREET LIGHT VAULT
- TELEPHONE RISER
- WATER VALVE
- FIRE HYDRANT
- CATCH BASIN
- BOLLARD

PRIMARY BENCHMARK:

VERTICAL DATUM:
MLLW (MEAN LOWER LOW WATER)

BASED ON AN ALUMINUM DISK ON A CONCRETE MONUMENT IN CASE LOCATED IN THE PERIMETER DRIVING LANE FOR THE BOAT LAUNCH PARKING, IN THE NORTHWEST CORNER OF THE PARKING LOT; SAID POINT IS REFERENCED IN THE "PORT OF EVERETT 12TH STREET MARINA" CONSTRUCTION PLANS AS POINT NUMBER 2000/E009, SHEET 6 OF 149.

MLLW ELEV: 17.14'

VERTICAL DATUM:

ELEVATION DATUM FOR THIS PROJECT IS 0.0' MEAN LOWER LOW WATER (MLLW)

TIDAL DATA

BASED ON NOAA'S PUBLICATION SHEET (WASHINGTON 944-7659), DATED 09-29-1988, THE RELATIONSHIP BETWEEN NGVD 29 AND MLLW DATUM FOR EVERETT, POSSESSION SOUND, FOR THE TIDAL EPOCH 1960-1978 IS AS FOLLOWS:

THE HIGHEST RECORDED TIDE: ESTIMATED (EHW) = +14.35
MEAN HIGHER HIGH WATER (MHHM) - +11.11
MEAN HIGH WATER (MHW) = +10.25
NGVD 1929 = +5.93
MEAN LOW WATER (MLW) = +2.80
MEAN LOWER LOW WATER (MLLW) = 0.0
LOWEST OBSERVED WATER LEVEL (6-02-77) = -3.60
EXTREME LOW WATER (ELW) = -4.50

HORIZONTAL DATUM:

HORIZONTAL DATUM FOR THIS SURVEY IS NAD 83/91:
REFERENCE BASELINE: 2 SURVEY CONTROL POINTS AS FOLLOWS

MONUMENT NO. 1 - CITY OF EVERETT CONTROL MONUMENT (E009 1991) - 3" ALUMINUM DISK IN CONCRETE MONUMENT IN CASE.

N: 369693.2637
E: 1300649.3977

MONUMENT NO. 2 - CENTERLINE R/W MONUMENT AT THE INTERSECTION OF WEST MARINE VIEW DRIVE AND 14TH STREET - 4" CONCRETE MONUMENT WITH LEAD AND COPPER TACK.

N: 367511.0631
E: 1302438.7269

STATISTICS:

EQUIPMENT: TRIMBLE 5603 ROBOTIC TOTAL STATION.
TOPCON HYPER XT GPS
METHODOLOGY: FIELD TRAVERSE AND GPS
MEETS OR EXCEEDS SURVEY STANDARD AS PER:
WAC 332-130-050
WAC 332-130-090
WAC 332-130-100
ALL SURVEY WORK OCCURRED IN DECEMBER OF 2006 AND JANUARY OF 2007.

PACIFIC GEOMATIC SERVICES, INC.
LAND SURVEYING & MAPPING SERVICES
QUALITY SERVICE - CREATIVE SOLUTIONS
6608 216TH STREET SW, STE. 304
MOUNTLAKE TERRACE, WA 98043
PHONE:(425) 778-5620 FAX:(425) 775-2849
WEB: www.PacGeoInc.com
PGS INC

SHEET TITLE: TOPOGRAPHIC SURVEY EVERETT MARINA NORTH

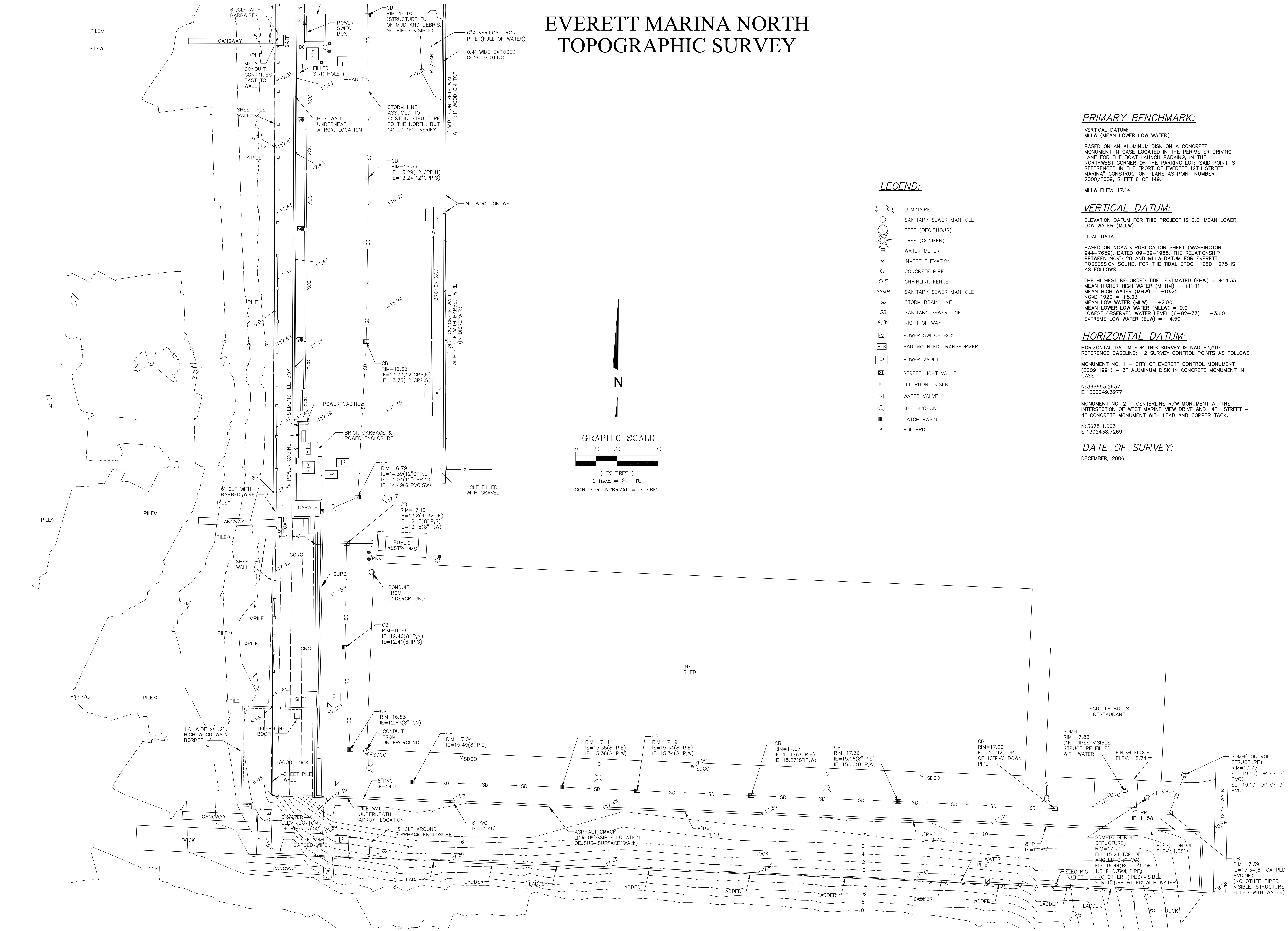
CLIENT: MOFFATT & NICHOL SEATTLE, WASHINGTON

DRAWN BY: RWP
CHECKED BY: RGH
SCALE: 1" = 20'
DATE: 01-24-06
DRAWING NAME: 0611501_TOPO
JOB NUMBER: 06-115-01
SHEET: 1 OF 2

REVISIONS

REV.	DESCRIPTION	BY	DATE

EVERETT MARINA NORTH
TOPOGRAPHIC SURVEY



GRAPHIC SCALE

0 10 20 40

(IN FEET)
1 inch = 20 ft.
CONTOUR INTERVAL = 2 FEET

LEGEND:

- LUMINAIRE
- SANITARY SEWER MANHOLE
- TREE (DECIDUOUS)
- TREE (CONIFER)
- WATER METER
- IE — INVERT ELEVATION
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- —SS— SANITARY SEWER LINE
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- SL — STREET LIGHT VAULT
- TELEPHONE RISER
- WATER VALVE
- FIRE HYDRANT
- CATCH BASIN
- BOLLARD

PRIMARY BENCHMARK:

VERTICAL DATUM:
MLLW (MEAN LOWER LOW WATER)

BASED ON AN ALUMINUM DISK ON A CONCRETE MONUMENT IN CASE LOCATED IN THE PERIMETER DRIVING LANE FOR THE BOAT LAUNCH PARKING, IN THE NORTHWEST CORNER OF THE PARKING LOT; SAID POINT IS REFERENCED IN THE "PORT OF EVERETT 12TH STREET MARINA" CONSTRUCTION PLANS AS POINT NUMBER 2000/E009, SHEET 6 OF 149.

MLLW ELEV: 17.14'

VERTICAL DATUM:

ELEVATION DATUM FOR THIS PROJECT IS 0.0' MEAN LOWER LOW WATER (MLLW)

TIDAL DATA

BASED ON NOAA'S PUBLICATION SHEET (WASHINGTON 944-7659), DATED 09-29-1988, THE RELATIONSHIP BETWEEN NGVD 29 AND MLLW DATUM FOR EVERETT, POSSESSION SOUND, FOR THE TIDAL EPOCH 1960-1978 IS AS FOLLOWS:

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N: 369693.2637
E: 1300649.3977

MONUMENT NO. 2 – CENTERLINE R/W MONUMENT AT THE INTERSECTION OF WEST MARINE VIEW DRIVE AND 14TH STREET – 4" CONCRETE MONUMENT WITH LEAD AND COPPER TACK.

N: 367511.0631
E: 1302438.7269

DATE OF SURVEY:

DECEMBER, 2006

REV.	DESCRIPTION	BY	DATE

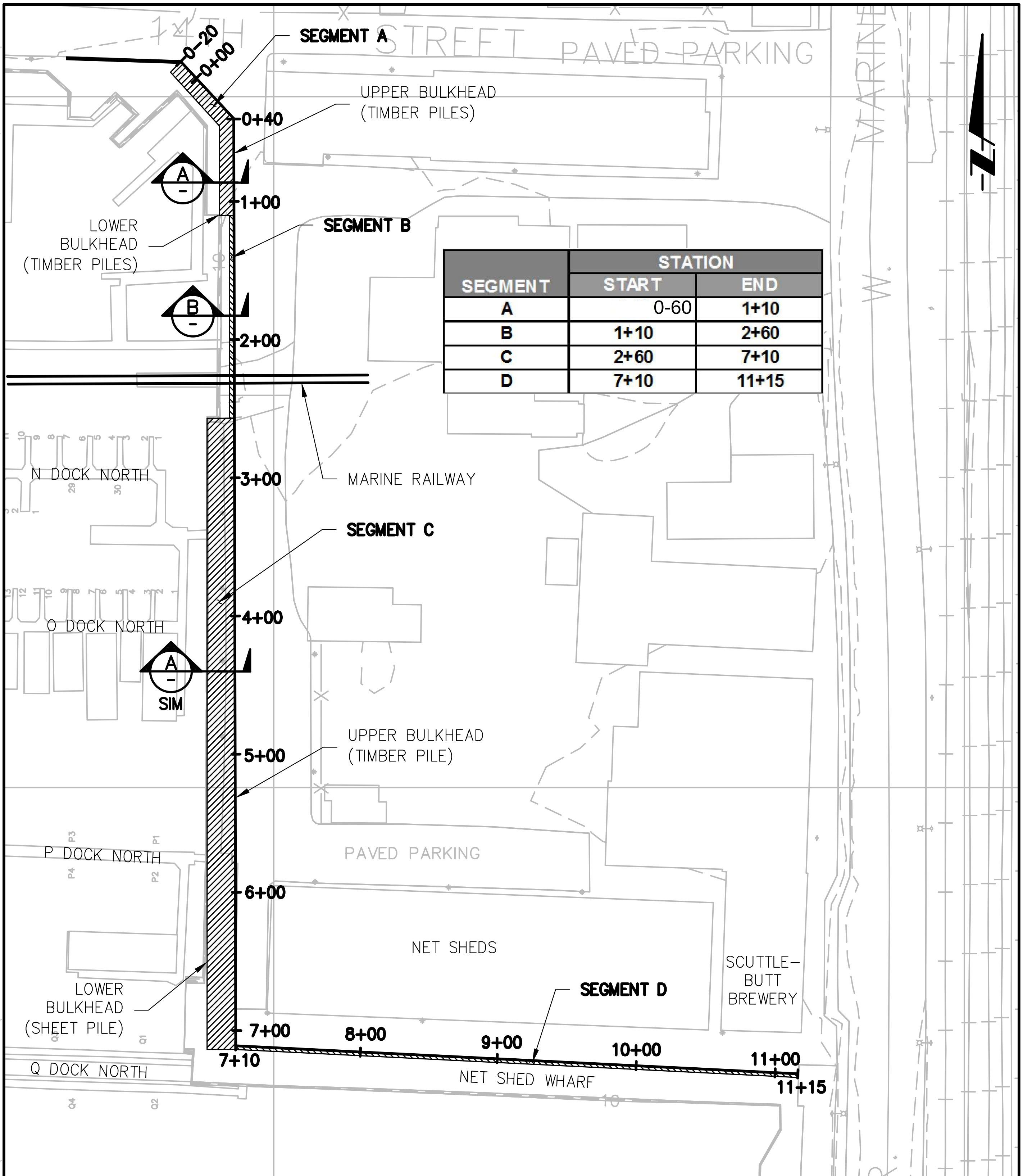
REVISIONS

PACIFIC GEOMATIC SERVICES, INC.
LAND SURVEYING & MAPPING SERVICES
QUALITY SERVICE - CREATIVE SOLUTIONS
6608 216TH STREET SW, STE. 304
MOUNTLAKE TERRACE, WA 98043
PHONE:(425) 778-5620 FAX:(425) 775-2849
WEB: www.PacGeoInc.com
PGS INC

SHEET TITLE: TOPOGRAPHIC SURVEY EVERETT MARINA NORTH

CLIENT: MOFFATT & NICHOL SEATTLE, WASHINGTON

DRAWN BY: RWP
SCALE: 1" = 20'
DATE: 01-24-06
JOB NUMBER: 06-115-01
CHECKED BY: RGH
DRAWING NAME: 0611501_TOPO
SHEET: 2 OF 2



SEGMENT	STATION START	STATION END
A	0-60	1+10
B	1+10	2+60
C	2+60	7+10
D	7+10	11+15

0 50 100
SCALE: 1"=100'

PLOTTED: Oct 11, 2012 - 4:26pm

FILE: P:\7872\500 CADD\520 Submittals\2012-10-10_Submittal\787200C-101

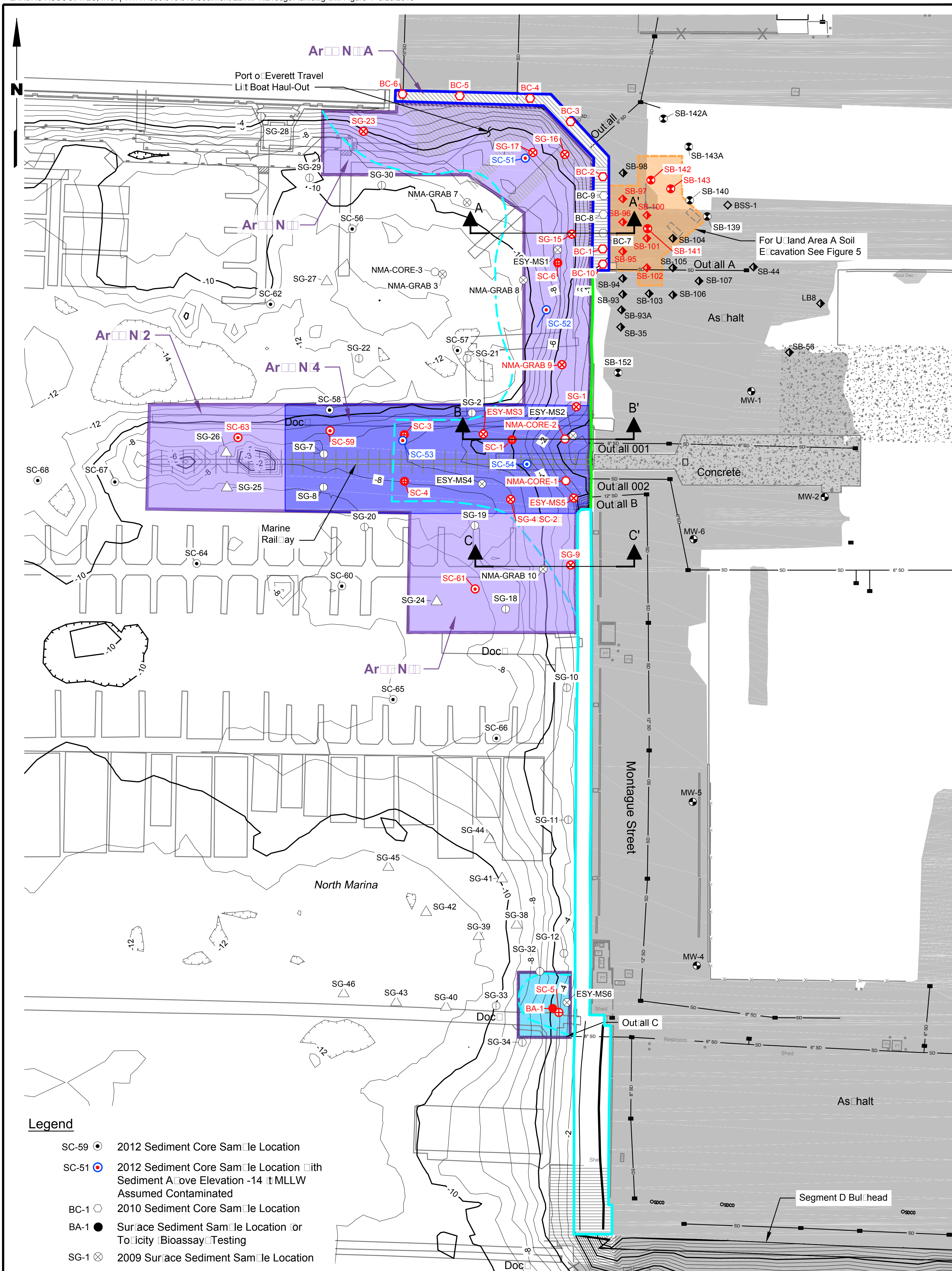
moffatt & nichol
Prepared by: Moffatt & Nichol
Date: OCTOBER 2012

PORT OF EVERETT
MARINA BULKHEAD REPLACEMENT
FEASIBILITY STUDY

BULKHEAD
SEGMENT LAYOUT

Figure 1

EXHIBIT B: REMEDIATION LIMITS



Legend

SC-59	2012 Sediment Core Sample Location
SC-51	2012 Sediment Core Sample Location with Sediment Above Elevation -14 ft MLLW Assumed Contaminated
BC-1	2010 Sediment Core Sample Location
BA-1	Surface Sediment Sample Location for Toxicity (Bioassay) Testing
SG-1	2009 Surface Sediment Sample Location
SC-3	2009 Sediment Core Sample Location
NMA-CORE-1	2004 Sediment Core Sample Location
MW-4	Existing Monitoring Well Location
BSS-1 SB-104	2010 Soil Sampling Location
SB-142	2012 Soil Sampling Location
	Segment A Bulkhead
	Segment B Bulkhead
	Segment C Bulkhead
	Extent of SMS Exceedances Presented in RI/FS
	Potential UST Location Identified and Located by GPR Survey 2012 (URS)
	Sediment Cleanup Action Area
	Dredge to -14
	Dredge to -12
	Dredge to -8
	Upland Soil Excavation Area A

Source: AMEC 2012, URS 2012

Notes

1. Sample locations shown in RED exceed Site cleanup levels.
2. Pacific Geomatic Services, Inc. Bathymetric Survey 3/16/12 feet, MLLW
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

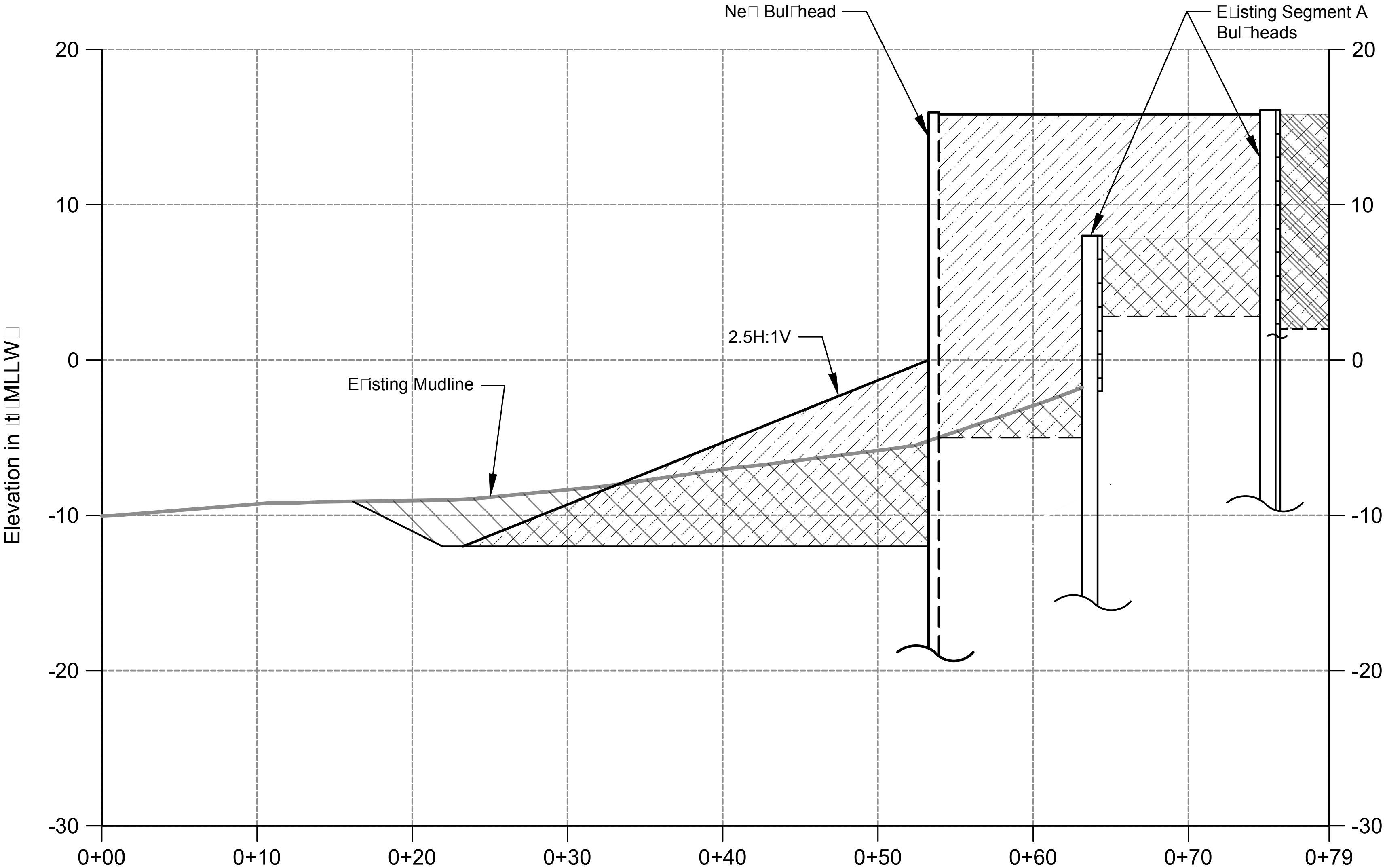
0 60 120
Scale in Feet

LANDAU ASSOCIATES

Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

Sediment Dredge Area and Upland Soil Excavation Area A

Figure 4



Geologic Profile A-A'

Horizontal Scale in Feet: 1"=10'
Vertical Scale in Feet: 1"=10'

Legend

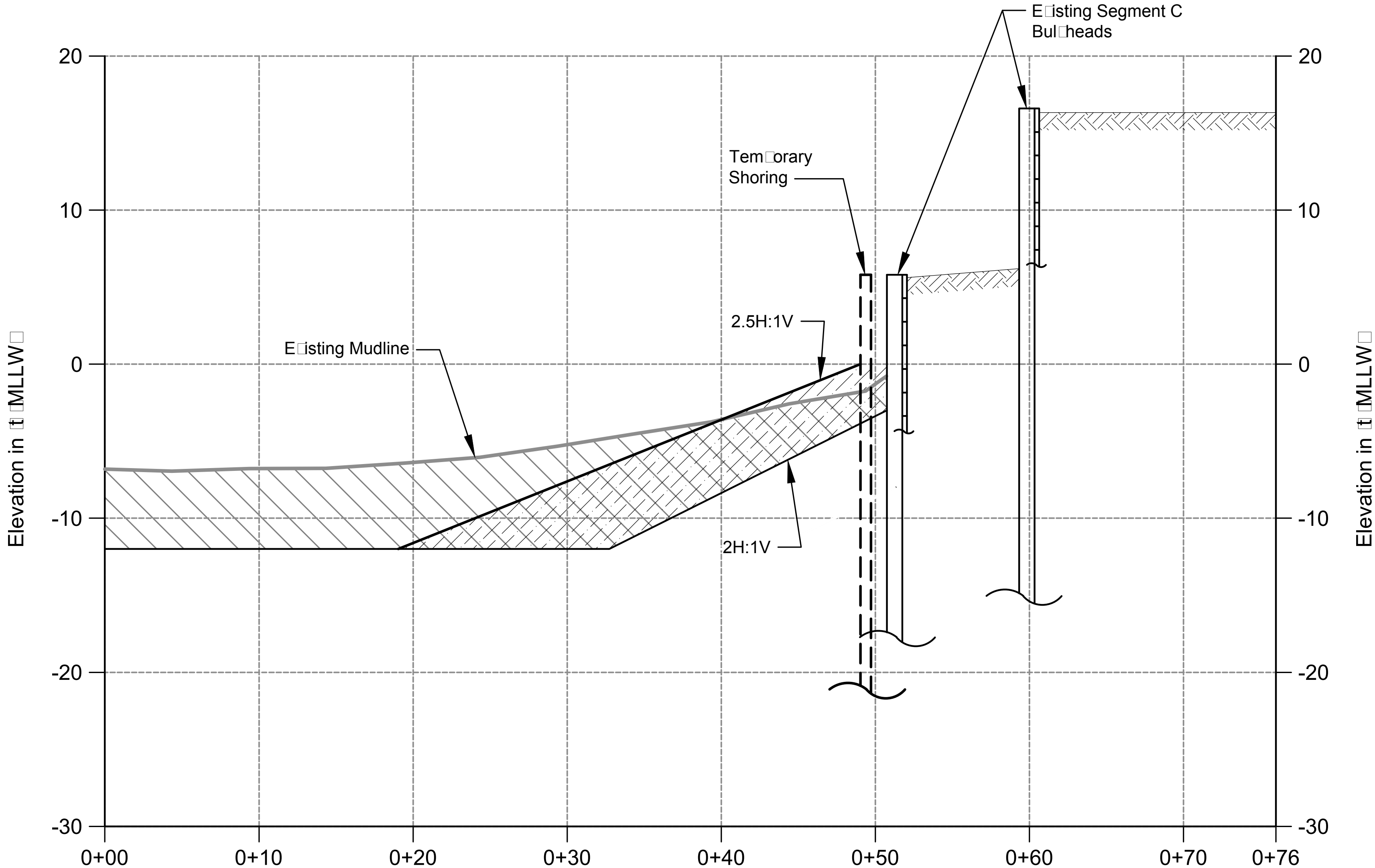
- Dredge Material
- Upland Soil Excavation
- Backfill Material

LANDAU ASSOCIATES

Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

B□□□□□d S□□□ □□□A
T□□□□□Dr□d□□ □r□□□

Figure
8



Legend

Dredge Material

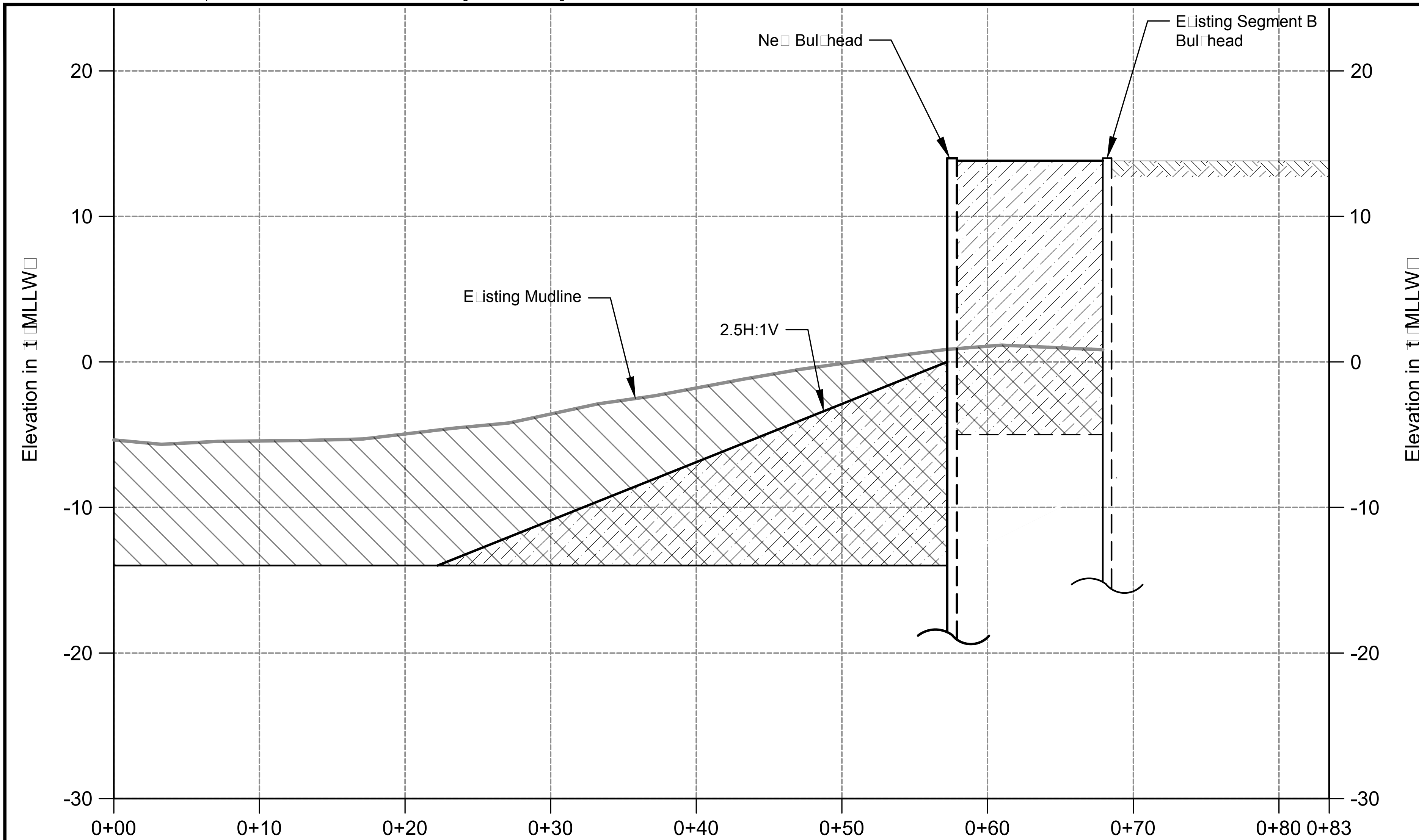
Backfill Material

Geologic Profile C-C'

Horizontal Scale in Feet: 1"=10'
Vertical Scale in Feet: 1"=10'

Engineering Design Report For Sediment Cleanup Everett Shipyard Site Everett, Washington	[illegible]	Figure 9

LANDAU ASSOCIATES



Legend

Dredge Material

Backfill Material

Geologic Profile B-B'

Horizontal Scale in Feet: 1"=10'
Vertical Scale in Feet: 1"=10'

Landau Associates

Engineering Design Report
For Sediment Cleanup
Everett Shipyard Site
Everett, Washington

B[illegible]d S[illegible]B
T[illegible]Dr[illegible]d[illegible]r[illegible]

Figure
10

EXHIBIT C – GEOTECHNICAL RECOMMENDATIONS

LEGEND

B-1 — Boring Designation and Approximate Location

A — Generalized Subsurface Profile (See Figures 3 and 4)

NOTE

Map adapted from aerial imagery provided by Google Earth Pro, reproduced by permission granted by Google Earth ™ Mapping Service.

Port of Everett
Everett, Washington

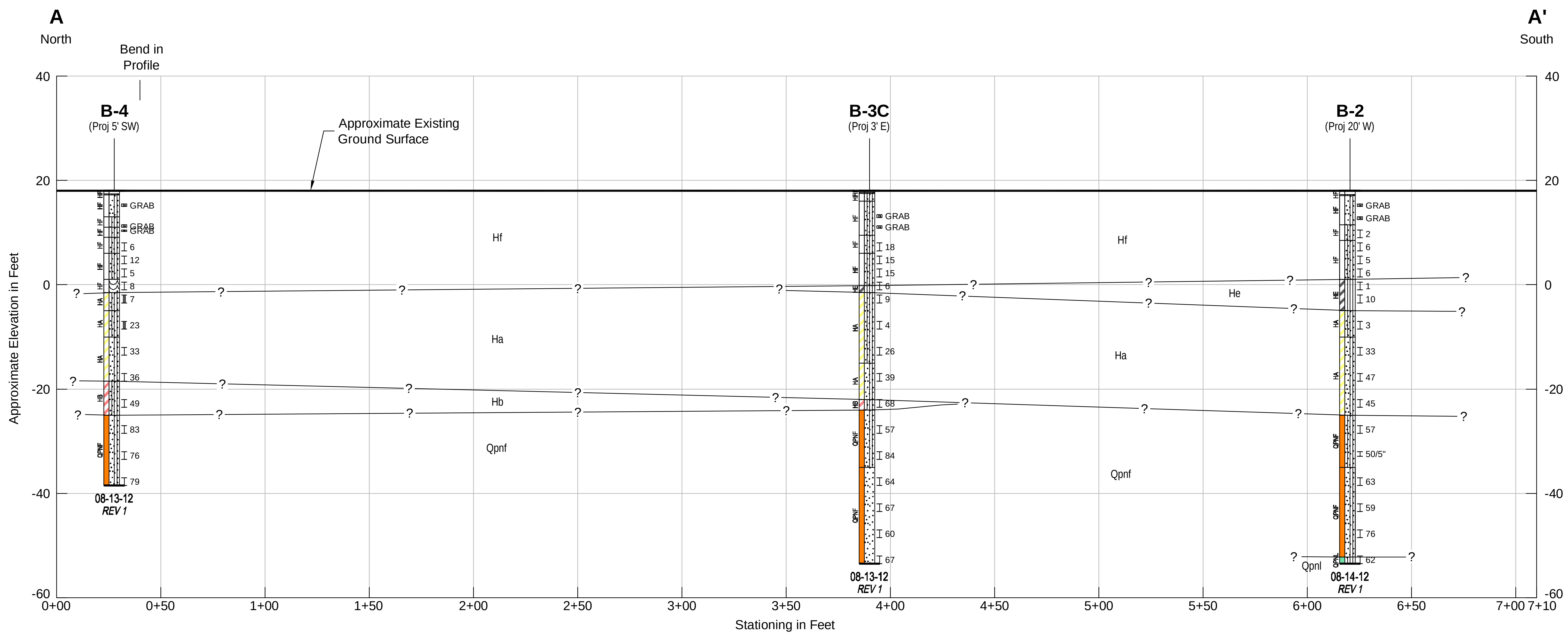
SITE AND EXPLORATION PLAN

September 2012 — 21-1-21761-003

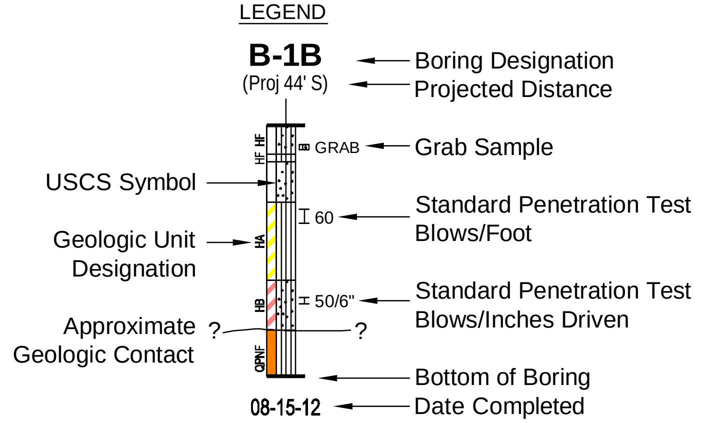
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2

Filename: J:\211\21761-003\21-1-21761-003 Fig 2.dwg   Date: 09-04-2012   Login: SAC



LEGEND



0	20	40

Vertical Scale in Feet

0	50	100

Horizontal Scale in Feet

Vertical Exaggeration = 2.5X

NOTE

This subsurface profile is generalized from materials observed in soil borings. Variations may exist between profile and actual conditions.

DRAFT

Port of Everett
Everett, Washington

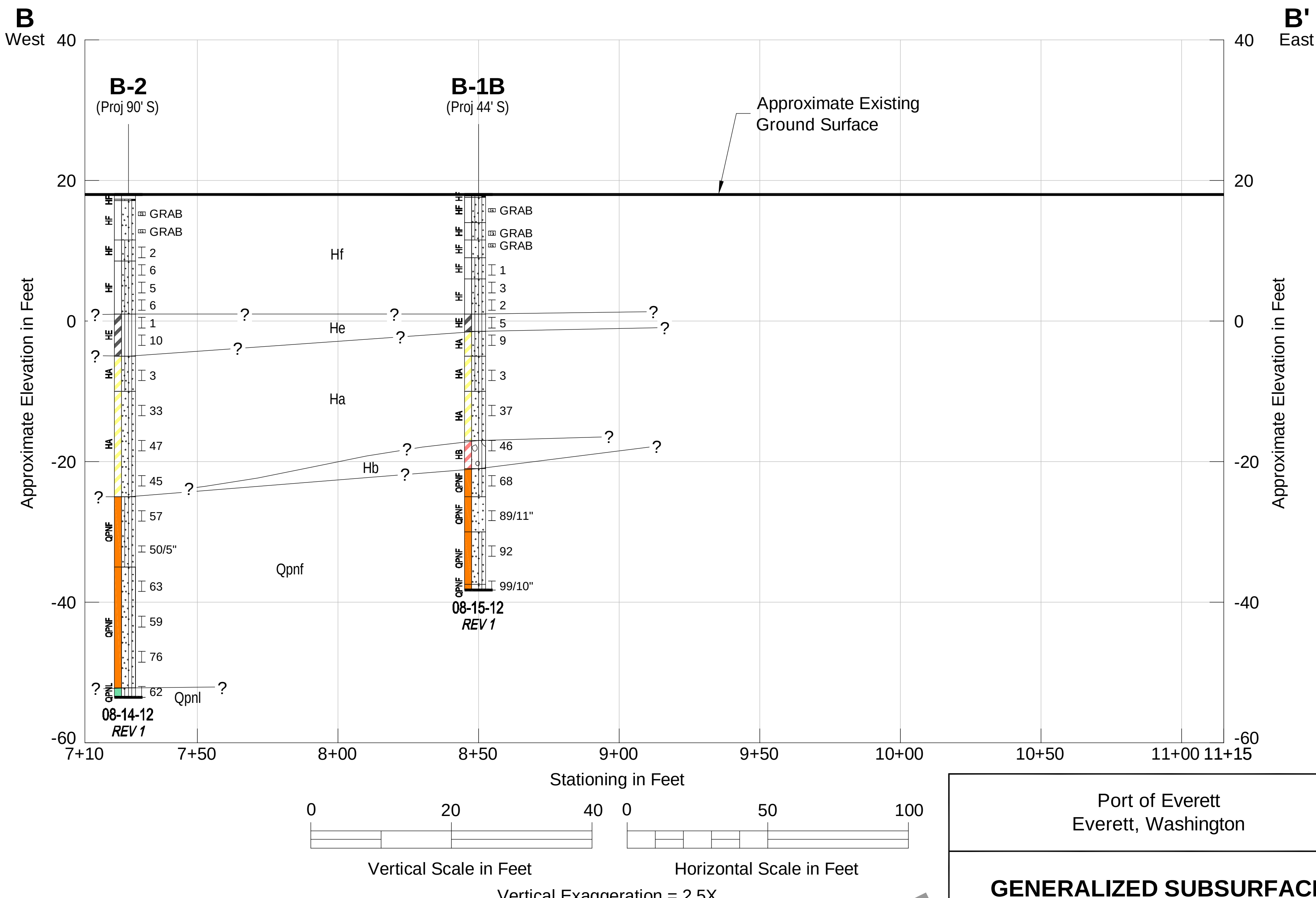
GENERALIZED SUBSURFACE PROFILE A-A'

September 2012 21-1-21761-003

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3

Filename: J:\211\21761-003\21-1-21761-003 Profiles.dwg Date: 09-04-2012 Login: SAC



NOTE

See Figure 3 for profile legend and note.

DRAFT

Port of Everett
Everett, Washington

GENERALIZED SUBSURFACE PROFILE B-B'

September 2012 21-1-21761-003

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Geotechnical and Environmental Consultants

FIG. 4

FIG. 4

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

ALASKA
CALIFORNIA
COLORADO
FLORIDA
MISSOURI
OREGON
WASHINGTON

January 29, 2013

Port of Everett
P.O. Box 538
Everett, WA 98206

Attn: Mr. Erik Gerking

RE: REVISED LATERAL EARTH PRESSURES FOR LOW LEVEL EARTHQUAKE AND LATERAL EARTH PRESSURE COMPARISON, PORT OF EVERETT EAST MARINA BULKHEAD REPLACEMENT PROJECT, EVERETT, WASHINGTON

As requested by the Port of Everett (Port) and Moffatt & Nichol (M&N), we have performed analyses to evaluate lateral earth pressures for the proposed East Marina bulkhead assuming similar seismic design standards used for the North Marina bulkhead located north of the site. Based on our review of a geotechnical report prepared by URS Consultants (URS) (December 2002) for the North Marina bulkhead, URS noted the following:

- *"The 475-year event analyses indicate that liquefaction will occur through the majority of the site in the depth range from approximately the groundwater table to an elevation of approximately -25 feet."* (page 7 of URS report)
- *"During the 200-year earthquake (PGA of 0.18g), limited zones of liquefaction possibly 5 to 10 feet thick are expected to occur in the depth range from the water table to the bottom of Stratum 2 (approximately elevation -25 feet."* (page 12 of URS report)

Our analyses for the East Marina bulkhead indicated similar findings. Per the requirements of the International Building Code, seismic design for the East Marina Bulkhead project was based on two-thirds of the 2,500-year earthquake event, which results in similar liquefaction extent as the 475-year earthquake event. Based on these findings, we provided lateral earth pressure diagrams to M&N for use in their preliminary bulkhead design. These earth pressures included lateral earth pressures due to liquefied soils down to elevation -12 feet.

We understand that the Port would like to evaluate a bulkhead design that does not consider liquefied soils due to a seismic event, similar to the North Marina Bulkhead project. Therefore, we performed additional analyses to estimate the approximate earthquake ground motion level at which the liquefaction potential at the site was mostly mitigated. We estimated the liquefaction

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206-632-8020 FAX 206-695-6777
TDD 1-800-833-6388
www.shannonwilson.com

SHANNON & WILSON, INC.

potential of each soil sample between the groundwater table and elevation -12 feet (a total of 25 samples) for a variety of earthquake ground motion levels using empirical methods. A summary of our analysis shown in the following table:

Earthquake Return Period (years)	Peak Ground Acceleration	Moment Magnitude	Percent of Total Samples that Liquefy
108	0.14g	6.4	0%
224	0.20g	6.5	20%
475	0.28g	6.5	40%
975	0.37g	6.5	64%
2,475	0.51g	6.5	76%

Based on the above analyses and to allow for comparison to the North Marina Bulkhead project, we selected a 200-year return period earthquake (estimated peak ground acceleration of 0.19g) as a condition where less than 20 percent of the samples within the originally defined liquefaction zone (groundwater table to elevation -12 feet) would have a potential to liquefy. Because these liquefied areas are dispersed and localized under the 200-year earthquake event, in our opinion, liquefied soil pressures would not need to be considered for the bulkhead design for a 200-year event. A more detailed discussion of our analyses will be included in our geotechnical report for the project. The estimated lateral earth pressures for the bulkhead considering the 200-year earthquake event are shown in Figure 1. This figure was prepared for comparison purposes only and should not be used for final design of the bulkhead. Recommended lateral earth pressures for use in the bulkhead design will be included in our geotechnical report for the project.

At the request of M&N, we compared the static and seismic lateral earth pressures for the East Marina bulkhead with those for the North Marina bulkhead. Two different earth pressures were reviewed: (1) those recommended by URS in their December 2002 report, and (2) shown on a structural plan prepared by Reid Middleton dated February 2005. We considered the differences in soil layering at the various projects in our comparison. The following should be noted in our comparison:

- Using the URS report recommendations, we estimated lateral earth pressures based on Table 3 and Figure 8 in the URS report. Figure 8 did not indicate how the seismic component of lateral earth pressures should be applied, so we assumed that the component would be applied as a uniform pressure consistent with the Mononobe-Okabe method.

- We used the earth pressure diagram shown on Plan Sheet S0.1 prepared by Reid Middleton in our comparison. However, the seismic component of earth pressure was not shown and no recommendations were included for adding a seismic component. The lateral earth pressures shown on the Reid Middleton plan are not consistent with the recommendations provided in the URS report.

The results of our comparison are shown in Figure 2. Figure 2 is sketched to scale so that direct comparison of the magnitude of earth pressures can be visually observed. Based on a review of the earth pressures, it appears that the recommended earth pressures considering a 200-year return period earthquake for the East Marina bulkhead are similar or less than those used for design of the North Marina bulkhead.

Our geotechnical report for the project will include a discussion of our analyses and the finalized lateral earth pressure recommendations for the bulkhead. If you have any questions, please contact me at 206-695-6837 or maa@shanwil.com.

Sincerely,

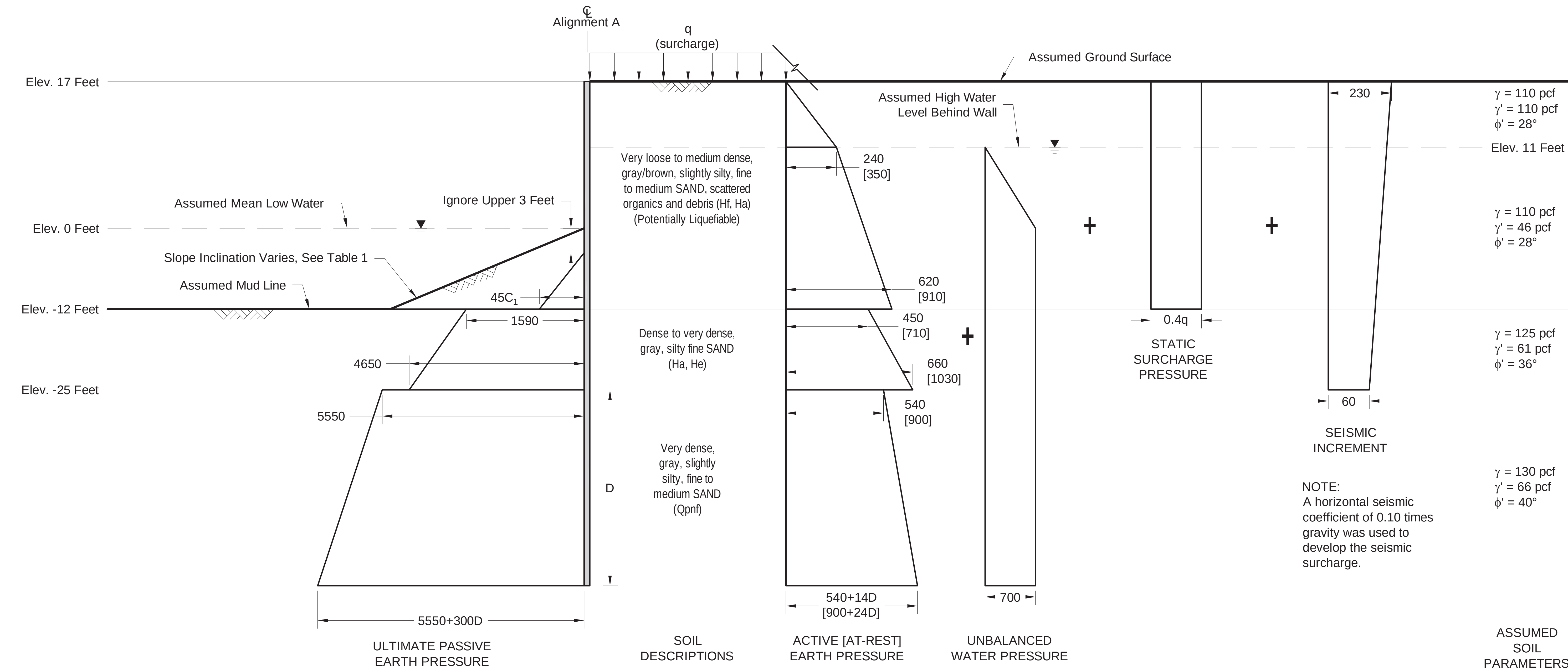
SHANNON & WILSON, INC.

Monique A. Anderson, P.E.
Senior Associate

MAA:THL/maa

Enc: Figure 1 – Recommended Lateral Earth Pressures, Seismic Case for 200-Year Event
Figure 2 – Lateral Earth Pressure Comparison

c: Pooja Jain, Moffatt & Nichol
Mike Hemphill, Moffatt & Nichol



Not to Scale

NOTES

1. These lateral earth pressures shown are for the case of a new sheet pile bulkhead constructed behind the existing bulkhead.
2. All pressures are in units of pounds per square foot (psf). Components of the pressure behind the wall should be added to get the total pressure on the wall for each loading case.
3. Active, at-rest and passive earth pressures are shown per unit width for sheet pile walls. Active lateral earth pressures should be used for flexible wall systems that are able to displace at least 0.001 times the height of the wall. At-rest earth pressures should be used for walls that are not able to displace 0.001 times the height of the wall.
4. Earth pressures are based on either a cantilevered wall system or single anchor wall system.
5. Select coefficient (C_1) based on the slope in front of the retaining wall.
6. The assumed soil profile is generalized from the soils described on current and previous boring logs. Variations between the profile and actual subsurface conditions may exist.
7. Earth pressures are based on the dimensions and elevations shown. If different elevations (such as elevation of top of the mudline slope in front of the wall) are used for design, the earth pressures shown on this figure would not be applicable, and should be revised based on the final configuration of the bulkhead and adjacent slope.
8. The provided passive earth pressures are ultimate values. For allowable, these values should be reduced by a factor of safety of 1.5 for static case and a factor of safety of 1.0 for seismic cases.

LEGEND

▼	Assumed or Measured Water Level
D	Depth of Penetration in Feet Below Elevation
q	Surcharge Pressure in Pounds Per Square Foot
γ'	Effective Unit Weight
γ	Total Unit Weight
ϕ'	Effective Friction Angle
545	Active Earth Pressure
[900]	At-Rest Earth Pressure

Table 1, See Note 5

Slope	C_1 Value
2H : 1V	9
3H : 1V	14
4H : 1V	16

14th St & 16th St - Marina District
Port of Everett
Everett, Washington

ESTIMATED LATERAL EARTH PRESSURES
SEISMIC CASE FOR 200-YR EVENT

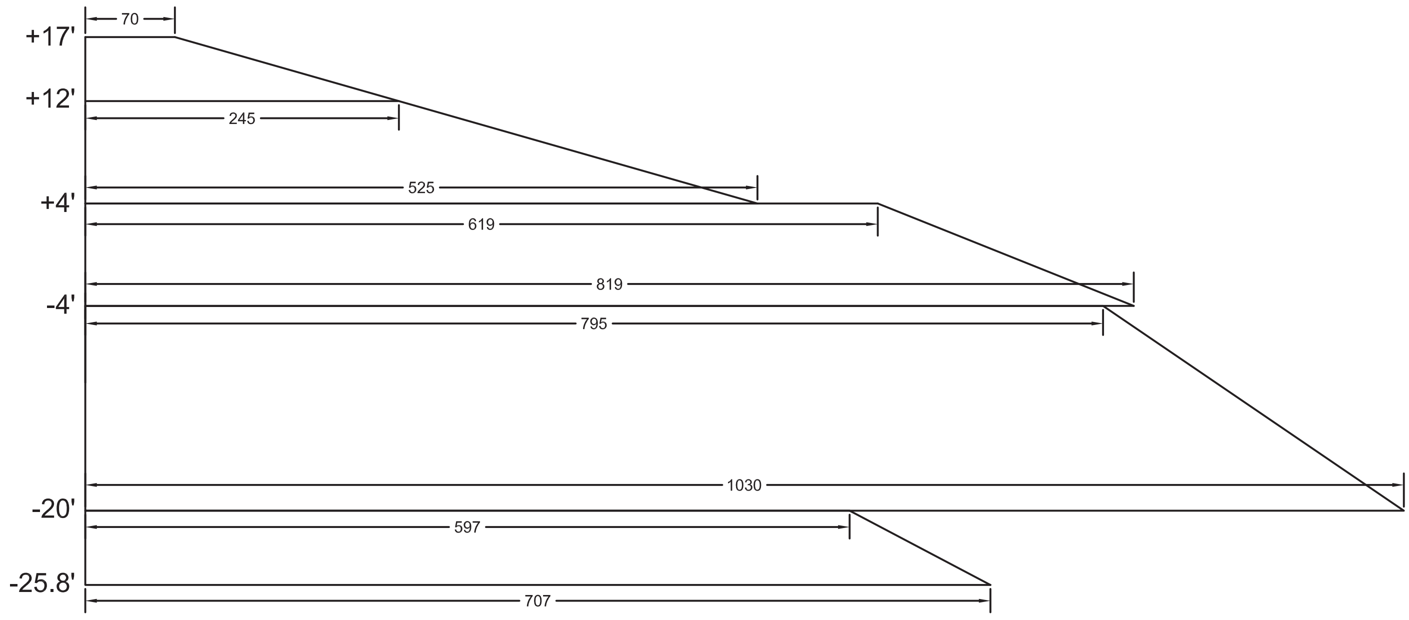
January 2013 21-1-21761-003

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

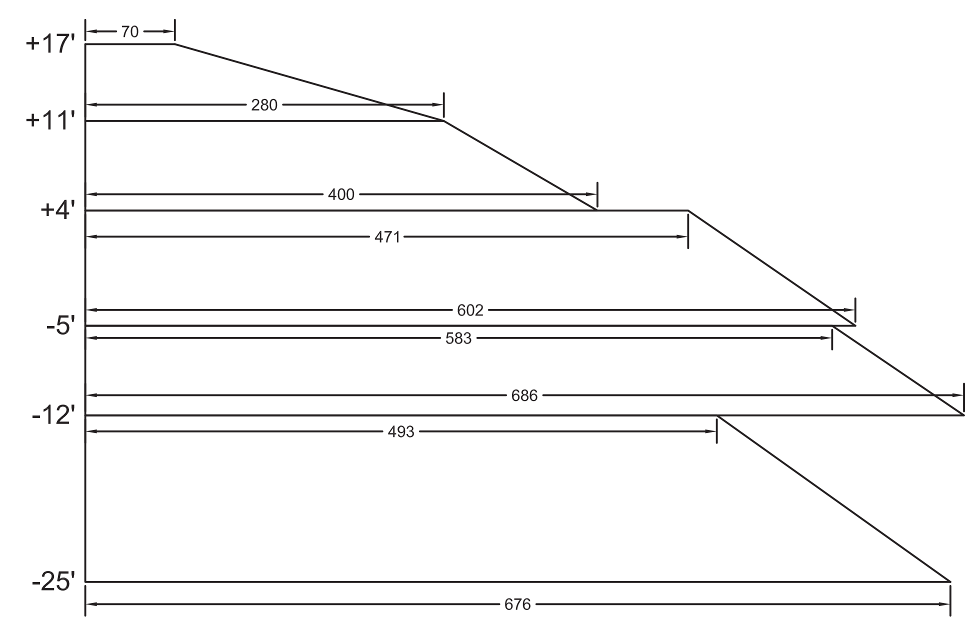
FIG. 1

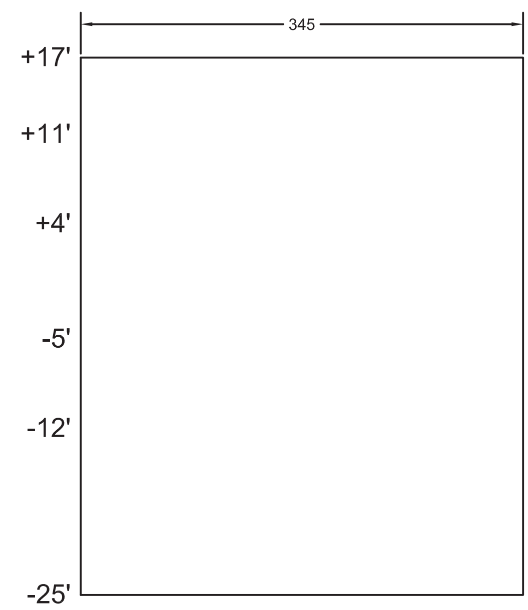
File: J:\211\21761-003\21-1-21761-003 Fig LEPs.dwg Date: 01-14-2013 Author: cnt

SHANNON & WILSON, INC
Port of Everett - East Marina Bulkhead Repalcement
21-1-21761-003
1/22/2013
THL



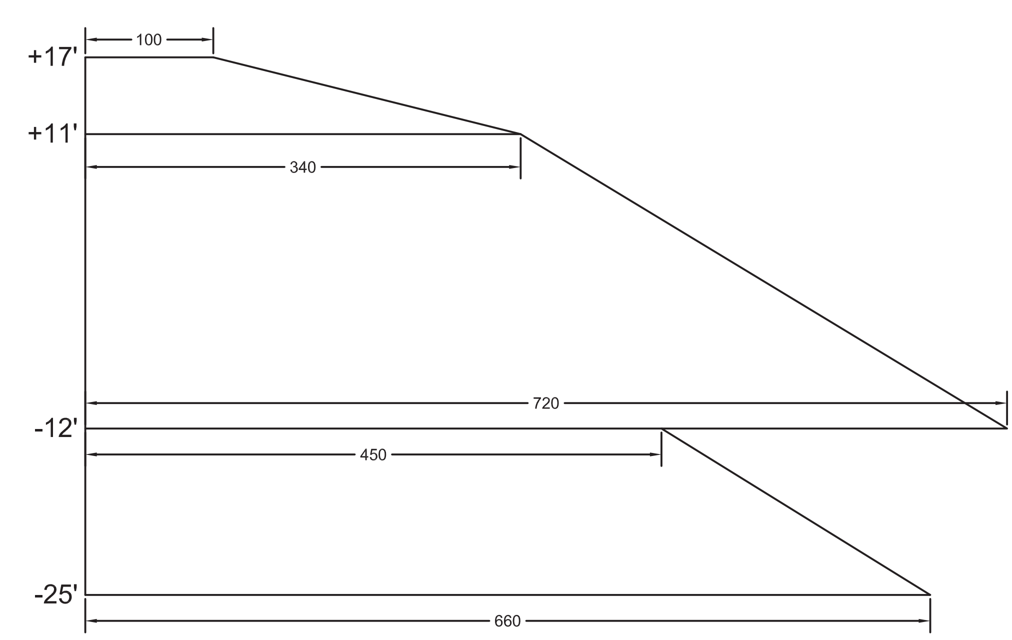
Lateral Earth Pressures from Reid Middleton Plan (2005)
(Seismic Increment unknown)

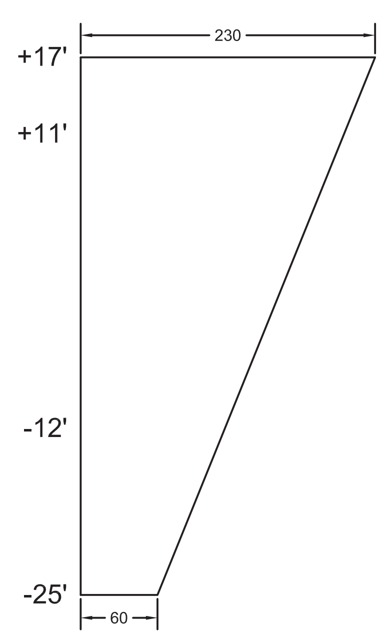




Seismic Increment
(200-yr Event, No Liquefaction)

Lateral Eearth Pressures from URS Geotech Report (2002)
(Required some interpretation)





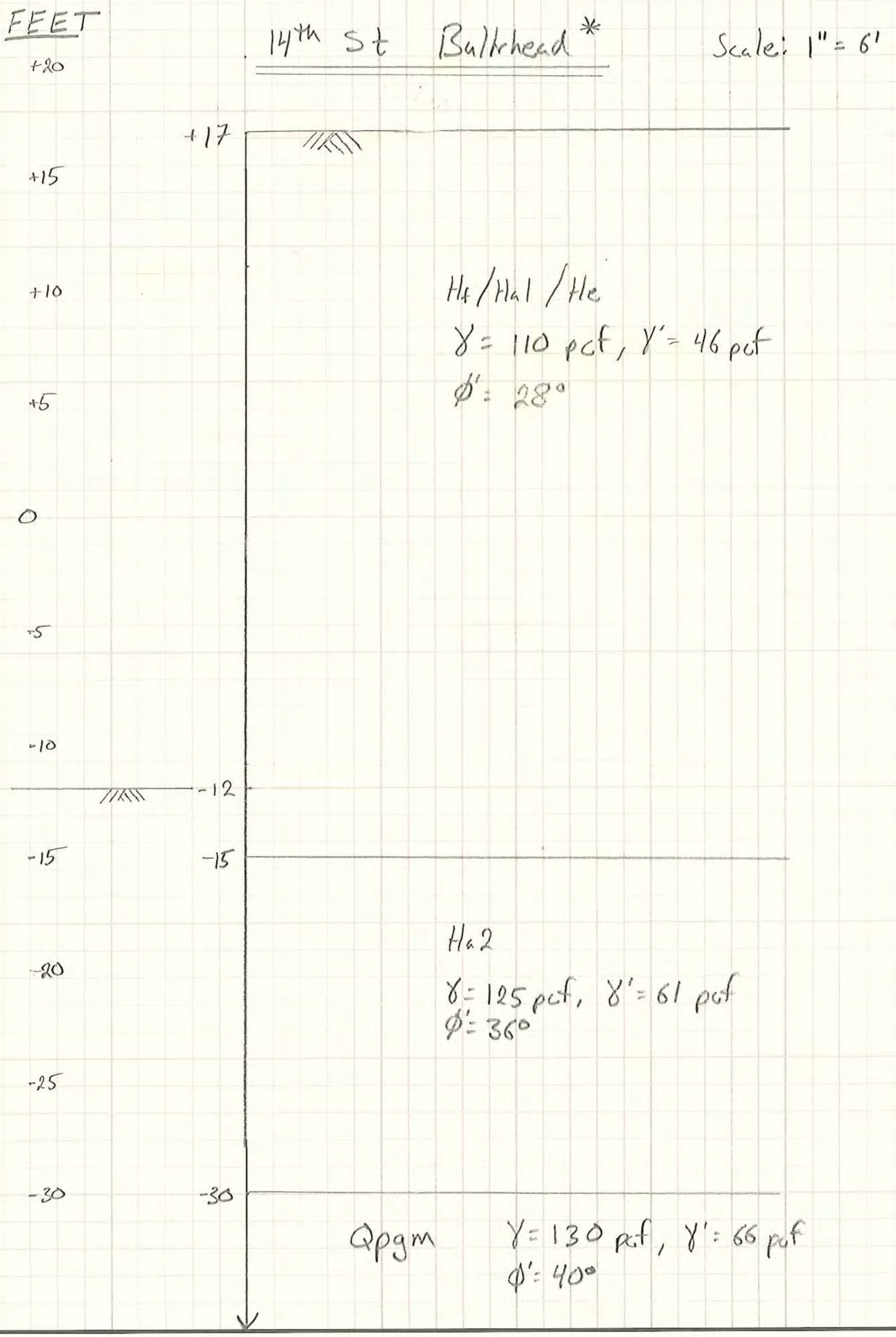
Seismic Increment
(200-yr Event, No Liquefaction)

Lateral Earth Pressures
S&W Recommendations for East Marina Bulkhead

Lateral Earth Pressure Comparison
Figure 2

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

JOB NAME: POE - East Marine Bulkhead | JOB NO.: 21-1-21761-003
SUBJECT: Temporary LEP | DATE: 3/18/12
BY: THL | CHK'D: | SHEET: 1 of 2



NOTES:

γ Soil Unit Weight

γ' Effective or Boyant Unit Weight

ϕ' Effective Friction angle or Angle of internal friction

* The Parameters provided above are intended for the calculation of temporary lateral earth pressures only.

EXHIBIT D – PORT OF EVERETT REDEVELOPMENT MASTER PLAN

DEVELOPMENT STRATEGY

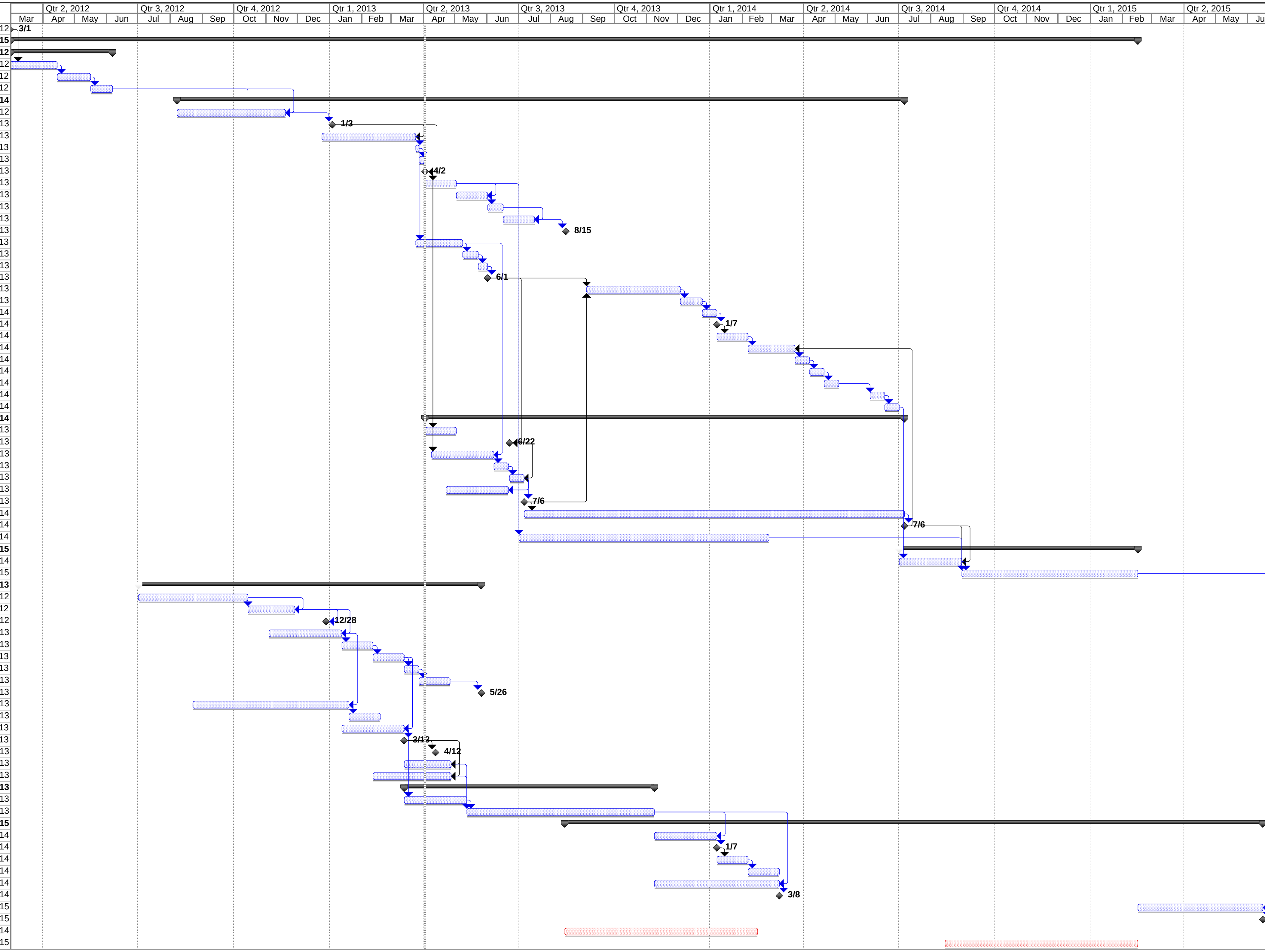
SEPTEMBER 18, 2012

APPENDIX K

Project Schedule

Everett Shipyard Site: Design and Construction Schedule

ID		Task Name	Duration	Start	Finish
1		**Issue Final CAP and CD**	0 days	Thu 3/1/12	Thu 3/1/12
2		**Remedial Design, Permitting and Construction**	**1082 days**	**Thu 3/1/12**	**Sun 2/15/15**
3		**Conduct pre-Design Investigation**	**98 days**	**Thu 3/1/12**	**Wed 6/6/12**
4		Prepare Draft SAP for pre-design investigation	45 days	Thu 3/1/12	Sat 4/14/12
5		Ecology review of Draft SAP	32 days	Sun 4/15/12	Wed 5/16/12
6		Prepare Final SAP	21 days	Thu 5/17/12	Wed 6/6/12
7		**Sediment Design and Permitting**	**698 days**	**Wed 8/8/12**	**Sun 7/6/14**
8		Sediment Field investigation	104 days	Wed 8/8/12	Mon 11/19/12
9		Submit Pre-design Sediment Data to Ecology	0 days	Thu 1/3/13	Thu 1/3/13
10		Prepare Port Review Draft EDR	90 days	Tue 12/25/12	Sun 3/24/13
11		Port EDR Review	3 days	Mon 3/25/13	Wed 3/27/13
12		Address Port EDR Comments	6 days	Thu 3/28/13	Tue 4/2/13
13		Submit Draft EDR to Ecology	0 days	Tue 4/2/13	Tue 4/2/13
14		Ecology Review of Sediment Draft Engineering Design Report	30 days	Wed 4/3/13	Thu 5/2/13
15		Prepare Draft Final Sediment EDR	30 days	Fri 5/3/13	Sat 6/1/13
16		Ecology Review Draft Final Sediment EDR	15 days	Sun 6/2/13	Sun 6/16/13
17		Prepare Final Sediment EDR	30 days	Mon 6/17/13	Tue 7/16/13
18		Ecology Approves Final Sediment EDR	0 days	Thu 8/15/13	Thu 8/15/13
19		Prepare Port Review 30 % Design	45 days	Mon 3/25/13	Wed 5/8/13
20		Port Review 30 % Design	15 days	Thu 5/9/13	Thu 5/23/13
21		Address Port Comments on #0 % Design	9 days	Fri 5/24/13	Sat 6/1/13
22		Finalize 30 % Design	0 days	Sat 6/1/13	Sat 6/1/13
23		Prepare Port Review Draft 90 % Design	90 days	Thu 9/5/13	Tue 12/3/13
24		Port Review 90 % Design	21 days	Wed 12/4/13	Tue 12/24/13
25		Address Port Comments on 90 % Design	14 days	Wed 12/25/13	Tue 1/7/14
26		Submir Sediment 90 % Plans and Specifications to Ecology for Review	0 days	Tue 1/7/14	Tue 1/7/14
27		Ecology Review Sediment 90% Plans and Specifications	30 days	Wed 1/8/14	Thu 2/6/14
28		Prepare Port Review Draft 100 % Design	45 days	Fri 2/7/14	Sun 3/23/14
29		Port Review of !00 % Design	14 days	Mon 3/24/14	Sun 4/6/14
30		Address Port Comments on 100 % Design	14 days	Mon 4/7/14	Sun 4/20/14
31		Submit Sediment 100 % Plans and Specifications to Ecology for Review	14 days	Mon 4/21/14	Sun 5/4/14
32		Ecology Review Sediment 100 % Plans and Specifications	14 days	Wed 6/4/14	Tue 6/17/14
33		Prepare Final Sediment 100 % Plans and Specifications	14 days	Wed 6/18/14	Tue 7/1/14
34		**JARPA Permit**	**460 days**	**Wed 4/3/13**	**Sun 7/6/14**
35		Early Coordination with Services	30 days	Wed 4/3/13	Thu 5/2/13
36		Conduct Pre-Application Meeting with USACE/Services	0 days	Sat 6/22/13	Sat 6/22/13
37		Prepare Port Review Draft JARPA	60 days	Tue 4/9/13	Fri 6/7/13
38		Port JARPA Review	14 days	Sat 6/8/13	Fri 6/21/13
39		Prepare Final JARPA Permit Application	14 days	Sun 6/23/13	Sat 7/6/13
40		Conduct Biological Evaluation for Cleanup	60 days	Tue 4/23/13	Fri 6/21/13
41		Submit JARPA and BE to USACE	0 days	Sat 7/6/13	Sat 7/6/13
42		Coordination/Consultation with USACE & Services	365 days	Sun 7/7/13	Sun 7/6/14
43		Obtain Section10/404	0 days	Sun 7/6/14	Sun 7/6/14
44		Shoreline Permit	240 days	Tue 7/2/13	Wed 2/26/14
45		**Marine Construction**	**229 days**	**Wed 7/2/14**	**Sun 2/15/15**
46		Marine Sediment Procurement	60 days	Wed 7/2/14	Sat 8/30/14
47		Marine Sediment Cleanup (subject to in-water work window)	169 days	Sun 8/31/14	Sun 2/15/15
48		**Upland Design and Permitting**	**329 days**	**Mon 7/2/12**	**Sun 5/26/13**
49		Building Demolition	105 days	Mon 7/2/12	Sun 10/14/12
50		Upland Field investigation	45 days	Mon 10/15/12	Wed 11/28/12
51		Submit Pre-design Upland Data to Ecology	0 days	Fri 12/28/12	Fri 12/28/12
52		Prepare Upland Draft EDR	70 days	Sun 11/4/12	Sat 1/12/13
53		Ecology Review of Upland Draft EDR	30 days	Sun 1/13/13	Mon 2/11/13
54		Prepare Draft Final Upland EDR	30 days	Tue 2/12/13	Wed 3/13/13
55		Ecology Review Draft Final EDR	14 days	Thu 3/14/13	Wed 3/27/13
56		Prepare Final Upland EDR	30 days	Thu 3/28/13	Fri 4/26/13
57		Ecology Approves Final Upland EDR	0 days	Sun 5/26/13	Sun 5/26/13
58		Prepare Upland 90 % Plans and Specifications	150 days	Thu 8/23/12	Sat 1/19/13
59		Ecology Review Upland 90 % Plans and Specifications	30 days	Sun 1/20/13	Mon 2/18/13
60		Prepare Upland 100% Plans and Specifications	60 days	Sun 1/13/13	Wed 3/13/13
61		Submit Upland 100 % Plans and Specs to Ecology	0 days	Wed 3/13/13	Wed 3/13/13
62		Ecology Approves Upland 100 % Plans and Specs	0 days	Fri 4/12/13	Fri 4/12/13
63		Grading permit	45 days	Thu 3/14/13	Sat 4/27/13
64		Construction Stormwater permit	75 days	Tue 2/12/13	Sat 4/27/13
65		**Upland Construction**	**240 days**	**Thu 3/14/13**	**Fri 11/8/13**
66		Upland Procurement	60 days	Thu 3/14/13	Sun 5/12/13
67		Upland Cleanup Construction	180 days	Mon 5/13/13	Fri 11/8/13
68		**Post Construction**	**670 days**	**Thu 8/15/13**	**Mon 6/15/15**
69		Draft Institutional Control (IC) Plan	60 days	Sat 11/9/13	Tue 1/7/14
70		Submit IC Plan to Ecology for review	0 days	Tue 1/7/14	Tue 1/7/14
71		Ecology Review of IC plan	30 days	Wed 1/8/14	Thu 2/6/14
72		Prepare Final IC plan	30 days	Fri 2/7/14	Sat 3/8/14
73		Prepare Upland Construction Documentation Report	120 days	Sat 11/9/13	Sat 3/8/14
74		Submit upland Construction Documentation Report to Ecology	0 days	Sat 3/8/14	Sat 3/8/14
75		Prepare Sediment Construction Documentation Report	120 days	Mon 2/16/15	Mon 6/15/15
76		Submit Construction Documentation Report to Ecology	0 days	Mon 6/15/15	Mon 6/15/15
77		**In-Water Work Period (2013/14)**	**185 days**	**Thu 8/15/13**	**Sat 2/15/14**
78		**In-Water Work Period (2014/15)**	**185 days**	**Fri 8/15/14**	**Sun 2/15/15**



Project: 031113 ESY Internal Cleanup
Date: Tue 4/2/13

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