Draft Final Report
Remedial Investigation/Feasibility Study
West End Site
Everett, Washington

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Prepared for

Port of Everett
Everett, Washington

LANDAU ASSOCIATES
130 2nd Avenue South
Edmonds, WA 98020
(425) 778-0907

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LIST OF ABBREVIATIONS AND ACRONYMS

ACC	American Construction Company
AET	Apparent Effects Threshold
AO	Agreed Order
ARARs	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
ATC/MOC	American Tugboat Company/Manson Osberg Construction
BE	Biological Evaluation
BGS	Below Ground Surface
CAP	Cleanup Action Plan
CCP	Contamination Contingency Plan
CLARC	Cleanup Levels and Risk Calculations
COCs	Constituents of Concern
Cm	Centimeter
Cm/sec	Centimeter per Second
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbons
CSL	Cleanup Screening Level
CSM	Conceptual Site Model
CUL	Cleanup Level
DGI	Data Gaps Investigation
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
FS	Feasibility Study
Ft/day	Feet per Day
HBU	Highest Beneficial Use
HCID	Hydrocarbon Identification
IHS	Indicator Hazardous Substances
LNAPL	Light Nonaqueous Phase Liquid
MDL	Method Detection Limit
MEK	Methyl Ethyl Ketone
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MLLW	Mean Lower Low Water
MNR	Monitored Natural Attenuation
MSRC	Marine Spill Response Corporation
MTCA	Model Toxics Control Act
O&M	Operation and Maintenance
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Act
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PCL	Preliminary Cleanup Level
Port	Port of Everett
PQL	Practical Quantitation Limits
PRB	Permeable Reactive Barrier
PSI	Puget Sound Initiative
PSTL	Puget Sound Truck Lines
PSDDA	Puget Sound Dredged Disposal Analysis
PVC	Polyvinyl Chloride
RAO	Remedial Action Objective

RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SAP	Sampling and Analysis Plan
Site	North Marina West End Site
SMS	Sediment Management Standard
SQS	Sediment Quality Standard
SVE	Soil Vapor Extraction
SVOCs	Semivolatile Organic Compounds
TBT	Tributyl Tin
TEF	Toxicity Equivalency Factors
TEQ	Toxicity Equivalency Quotient
TOC	Total Organic Compound
TPH	Total Petroleum Hydrocarbon
TSCA	Toxics Substance Control Act
TVS	Total Volatile Solids
µg/L	Micrograms per Liter
µS/cm	MicroSiemens per Centimeter
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VOCs	Volatile Organic Compounds
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
Yd^3	Cubic Yards

1.0 INTRODUCTION

This report presents the results of a remedial investigation/feasibility study (RI/FS) conducted for the North Marina West End Site (Site or West End Site), located within the Port of Everett (Port) North Marina Redevelopment project boundary in Everett, Washington. The regional location of the Site is shown on Figure 1. Information obtained during investigations and from an interim action conducted prior to the RI are presented in this report, along with information from the RI, to provide a comprehensive evaluation of the nature and extent of contamination at the Site and to determine an appropriate cleanup action.

The Site is owned by the Port and is part of a larger area, referred to as the North Marina Area (Figure 2), which is being redeveloped into a mixed use development by the Port. Previous investigations of the Site and an interim cleanup action have been conducted under the Washington State Department of Ecology's (Ecology) Voluntary Cleanup Program (VCP). However, Ecology requested that the final cleanup action for the Site be conducted under Ecology's formal program as part of the Puget Sound Initiative (PSI). As a result, the RI/FS is being performed under Agreed Order No. DE 5572 between the Port and Ecology (the Agreed Order).

This report was prepared for submittal to Ecology in accordance with the provisions of the Agreed Order, and was developed to meet the general requirements of an RI and FS as defined by the Washington Model Toxics Control Act (MTCA) Cleanup Regulation (WAC 173-340-350). The RI describes the environmental setting of the Site and identifies the nature and extent of contamination for affected media. The FS develops and evaluates alternatives for cleanup of the Site.

2.0 SITE BACKGROUND

The Site is located within the western portion of the North Marina Area and consists of approximately 17 acres of uplands and 10 acres of adjacent in-water area. The Site is bounded on the north by the 12th Street Marina, on the south by the North Marina, on the west by Port GardnerBay/Snohomish River, and on the east by Port upland property, as shown on Figures 2 and 3. The approximate center of the Site is located at North 48.00029º and West 122.22211º.

Because the environmental investigations and remediation activities conducted prior to the RI/FS that are described in this report were performed under the VCP, some of the terminology used in previous reports does not conform to the terminology used in the MTCA formal process. For instance, active remediation under the interim cleanup actions was described as “cleanup action,” even though, under the formal process, the cleanup action is not performed until after the RI/FS and cleanup action plan (CAP) have been approved. Another example is the reference to “cleanup action areas,” which would normally be referred to as “interim action areas” if the Site had been processed under the formal program from the beginning. For ease of reference, terms used in the VCP documents are carried over where this report discusses activities/reports that were carried out while the Site was under the VCP.

Interim action for the Site was conducted between June 2006 and March 2008 in accordance with two CAPs developed for the North Marina Area under the VCP (Landau Associates 2006a and 2007). The first CAP was developed for the cleanup of soil located across a majority of the North Marina Area (Landau Associates 2006a). The second CAP, the West End CAP (Landau Associates 2007), developed for this Site was for cleanup of soil and groundwater within the western portion of the North Marina Area.

The rest of this section describes the Site development history, historical operations and site uses, current redevelopment plans for the Site and adjacent property, and the Site’s environmental setting. Historical and/or current Site features are shown on Figure 4.

2.1 SITE DEVELOPMENT HISTORY

The North Marina Area has been used for a variety of commercial, industrial, and marine-related activities since the late 1800s. From about 1890 until about 1950, timber-product operations dominated waterfront industrial activities. Over that period, the shoreline of Port Gardner Bay was near the current location of West Marine View Drive, with shingle and lumber mills either along the shoreline or located on wharfs to the west of the shoreline. The North Marina Area was filled to its current configuration between about 1947 and 1955, using dredge fill from the Snohomish River to create the Site uplands from the tidelands to the west of the original shoreline.

After the additional uplands were created, businesses transitioned from primarily the wood products industry to a broader range of industries and commercial enterprises, with a large percentage of marine services operations. Although turnover in businesses has occurred over the intervening years, the area is still dominated by businesses with a marine services orientation.

2.2 HISTORICAL OPERATIONS AND SITE USES

This section identifies and describes the historical uses for properties and leaseholds located within the Site. The Site usage history is based on the Phase I Environmental Site Assessment (ESA; Landau Associates 2001), which should be reviewed for a more thorough description of Site historical uses and recognized environmental conditions. The Phase I ESA can be viewed on Ecology's web site using the following link:

http://www.ecy.wa.gov/programs/tcp/sites/nMarinaWestEnd/nMarinaWestEnd_hp.htm.

A number of leaseholds within the Site were leased by the Port to various tenants. At the time that this report was prepared, all tenants had vacated their leaseholds in anticipation of redevelopment activities. The tenants utilized the leaseholds for a variety of business ventures, primarily related to marine repair and other marine support services. Although a number of historical leaseholds occupied the Site, because some of them occurred in the distant past, the Port does not have any surviving documentation on them. The following list includes the names of the current and known former leaseholds within the Site:

- American Boiler Works, Plant II
- American Construction Company
- American Tugboat Company/Manson Osberg Construction
- Co-op Boatyard
- Everett Engineering
- Mill Town Sailing
- Puget Sound Truck Lines (PSTL)
- United States (U.S.) Coast Guard Station.

In addition to the former leaseholds listed above, the Port operated three parcels within the Site known as the Port of Everett Marine View Reception/Conference Center, Port of Everett Overflow Parking Lot, and Jordan Park.

The following subsections provide a description of each former leasehold listed above, including a description of identified environmental concerns [e.g., Underground Storage Tanks (UST)] known prior to the time interim action (discussed later in this report) commenced and associated with tenant activities. Characterization and intrusive remedial actions (e.g., excavation) performed as parts of an interim action are discussed later in Section 3.0. Each former leasehold/parcel is organized below in alphabetical order of the name of the most recent tenant or facility name. The former leaseholds are labeled on Figures 3 and 4.

2.2.1 AMERICAN BOILER WORKS, PLANT II

The American Boiler Works Plant II (ABW Plant II) former leasehold was located at 801 13th Street, and consisted of one building and the associated work area. The building was demolished in 2006 as part of redevelopment activities. Only a small portion of the former building's western end is included in the Site. The building was approximately 300 ft long by 80 ft wide and was built prior to 1969. The building was located along the north side of a former rail spur and was constructed with several loading docks facing the rail spur. The former leasehold was historically used for boiler manufacturing and more recently was used for custom steel fabrication. Painting and sandblasting activities occurred within the facility. No known USTs were documented in association with the former leasehold. General environmental concerns at this former leasehold included potential heavy metals soil contamination associated with sandblast grit waste, and potential petroleum hydrocarbon contamination related to the machinery operated inside and outside of the former building. Stained soil was observed in the vicinity of the ABW Plant II building during the Phase I ESA (Landau Associates 2001). Other potential sources of hazardous waste associated with Plant II (identified during the Phase I ESA) include the following:

- Paint and paint thinner were stored in 5-gallon and 55-gallon containers at Plant II.
- Sandblast grit and paint thinners were reused onsite.
- An aboveground storage tank (AST) containing methyl ethyl ketone (MEK) was located to the west of the Plant II building.
- Solids from used paint and thinners were placed in drums for disposal.

2.2.2 AMERICAN CONSTRUCTION COMPANY

The former American Construction Company (ACC) leasehold was located at 411 13th Street and consisted of two buildings and a north and south work yard. The buildings were located in the north yard and consisted of an office/shop building and a storage building that were constructed sometime after 1955 and were demolished in 2007. The former office/shop building was located in the southern portion of the north yard and was about 135 ft long by 50 ft wide; the office was located in the western half of the building and the shop was located in the eastern half of the building. The former storage building was located in the eastern portion of the north yard and was about 95 ft long by 30 ft wide. A small shed used for flammable chemical storage was located north of the office/shop building and was about 15 ft wide by 15 ft long.

ACC specialized in pile driving, dredging, and marine construction activities, and operated at this location for approximately 50 years. Historical maritime construction activities on the former ACC leasehold included, among other things, sandblasting, painting, and storage of creosote-treated timbers.

ACC operated two large industrial cranes in the north yard. One crane was situated on a crane rail that ran along the western shoreline of the north yard. The crane rail extended from just north of the office/shop building to the northwest corner of the former leasehold. The other crane was fixed in position in the northeast corner of the north yard. The cranes were typically used for loading and offloading water craft and barges that would dock along the west and north shorelines of the former leasehold, but were also used for moving industrial equipment and materials throughout the north yard.

Two 5,000-gallon ASTs used for storage of diesel and gasoline were located north of the former office/shop building and immediately west of the former flammable chemical storage shed. The ASTs were situated in an unlined containment area that included an unlined gravel floor, a concrete containment dike, and a free draining sump. The sump consisted of a vertical, 2-ft diameter, open-ended concrete pipe; a 4-inch diameter pipe was connected to the east side of the sump and appeared to originate from the floor drain of the former flammable chemical storage building to the east of the ASTs. The fuel dispenser was located immediately east of the containment dike. One 500-gallon AST used for storage of waste oil was located immediately south of the former storage building. The former flammable storage shed had a concrete floor with a central floor drain, which appeared to be connected to the AST sump.

ACC constructed and operated a graving dock in the northern portion of the former leasehold that consisted of a concrete bottom located at approximately 12 to 14 ft below ground surface (BGS), and floodgates penetrating the northern bulkhead. The graving dock was used for construction of concrete bridge pontoons. Once the pontoons were constructed, the northern shoreline was breached and the pontoons were floated out of the graving dock. ACC decommissioned the graving dock by backfilling with soil previously excavated from the graving dock following its use in 1989 and 1991.

A number of potential sources of spills and/or releases of hazardous substances were noted during the Phase I ESA (Landau Associates 2001), with primary concerns being potential heavy metal contamination associated with sandblasting activities, contamination by carcinogenic polycyclic aromatic hydrocarbons (cPAH) resulting from the presence of creosoted timbers and piling, and petroleum hydrocarbon releases from the ASTs and heavy equipment. Stained soil was observed on the ground surface in the north and south yards during the Phase I ESA. Also, roughly 50 drums containing motor oil, used antifreeze, and hydraulic oil were noted along the north yard's east leasehold line. The environmental quality of the soil used to backfill the graving dock was also a concern.

The ACC south yard was used by ACC for support of its maritime construction activities, including storage of materials and equipment from 1989 until 2004. Prior to ACC, the American Tugboat Company and Manson Osberg Construction leased the same leasehold, as described in Section 2.2.3

ACC vacated its south yard leasehold in 2006 and its north yard leasehold in 2007, in advance of redevelopment activities. The cranes and other industrial equipment and materials were removed, the buildings were demolished, and the three ASTs were decommissioned and removed from the Site in conjunction with the departure of ACC.

2.2.3 AMERICAN TUGBOAT COMPANY/MANSON OSBERG CONSTRUCTION (ATC / MOC)

The American Tugboat Company leased the ACC south yard as part of a larger leasehold from 1963 to 1965, and Manson Osberg Construction leased the same leasehold from 1975 to 1985. Specific activities that occurred in this area prior to ACC's tenancy are not known, but likely included activities similar to ACC since the previous tenants also used the leasehold for support of marine construction activities.

2.2.4 CO-OP BOATYARD

The Co-op Boatyard former leasehold was located to the north of 13th Street behind the former Everett Engineering Building, which was located at 731 13th Street. The boatyard did not include any buildings and came into operation sometime after 1989. The boatyard had a gravel surface, was surrounded by a security fence, and was historically leased and operated by a private entity. Boat maintenance activities were terminated in the boatyard in 2007 in advance of redevelopment activities. This area appeared to be used by Everett Engineering (described below) prior to it being used as a boatyard. Primary environmental concerns for the boatyard were related to boat maintenance activities, and included shallow soil heavy metals contamination and potential petroleum hydrocarbons associated with used oil or other fluids associated with vessel maintenance.

2.2.5 EVERETT ENGINEERING

The former Everett Engineering leasehold was located at 731 13th Street and consisted of one building and an outdoor work/storage yard. The building was demolished in the summer of 2006, in advance of Site redevelopment activities. Everett Engineering reportedly fabricated and repaired equipment, primarily related to marine-based businesses. The building was located along 13th Street, was approximately 140 ft long by 80 ft wide, and was constructed sometime prior to 1970. For reference, the building was also known as Building 10 or Building M-11.

The work yard was located north of the building and was used for extensive storage of industrial machinery and materials; poor housekeeping was noted in this area during previous investigations, including the Phase I ESA (Landau Associates 2001). General environmental concerns at this former leasehold included potential heavy metals soil contamination associated with industrial sandblasting, and potential petroleum hydrocarbon contamination associated with used oil or other fluids.

2.2.6 MILL TOWN SAILING

The Milltown Sailing former leasehold building is located at 410 14th Street and consists of one current building and associated paved parking areas, and was constructed sometime prior to 1969. The building is about 80 ft long by 40 ft wide. The Milltown Sailing building is currently used by sailing or other hobby clubs. It is unknown what type of businesses operated on this leasehold prior to Milltown Sailing. No specific conditions of environmental concern were identified for this former leasehold.

2.2.7 PORT OF EVERETT MARINE VIEW RECEPTION/CONFERENCE CENTER

The Port of Everett Marine View Reception/Conference Center and associated paved parking areas are located in the southwest corner of the Site at 404 14th Street. The building is about 175 ft long by 100 ft wide, and was built sometime after 1965. No specific conditions of environmental concern were noted for this parcel. However, the Port of Everett maintains a marina fueling system that includes USTs used to store diesel and gasoline, including associated conveyance piping to the marina fuel dock. The original USTs were located within the paved parking areas associated with this parcel. The USTs were relocated in the 1990's to the center of the parking area located west of Jordan Park as shown on Figure 4.

The relocated USTs were located immediately south of the Milltown Sailing building and consisted of five gasoline and diesel tanks and associated piping, and were decommissioned in 1992. About 80 cubic yards (yd^3) of stained soil was removed from around the tank fill pipes at the time of decommissioning, and was remediated by aeration. Of the 14 soil samples collected from the excavation sidewalls and bottom and 2 water samples collected from the excavation, none contained detectable concentrations of petroleum hydrocarbons. The data submitted to Ecology appear adequate to conclude that the tanks were appropriately closed and minor releases associated with spillage at the fill pipes were adequately remediated (Phase I ESA Appendix E; Landau Associates 2001). In addition, groundwater samples were collected from three direct-push borings (H-3, H-4, and H-5) during the Phased II ESA (Landau Associates 2004a) in the vicinity of the former USTs and piping. The samples did not contain any detectable concentrations of gasoline- or diesel-range petroleum hydrocarbons, indicating that no residual petroleum hydrocarbon contamination remains from the former USTs.

2.2.8 PORT OF EVERETT OVERFLOW PARKING

The Port of Everett Overflow Parking is located off of 13th Street, east of PSTL. The entire lot is unpaved. A majority of the lot was accessible to the public for general parking uses, and the northern portion of the lot was fenced off and was used by the Port for storage of general equipment and marine supplies (e.g., crab pots, rope, cable, etc). Based on a review of aerial photographs of this area, it appears that some soil fill was placed within the fenced portion of the property sometime prior to 1993, but its placement could not be confirmed. With the exception of the potential filling activities, no conditions of environmental concern were noted in this area.

2.2.9 PUGET SOUND TRUCK LINES

The PSTL former leasehold was located at 615 13th Street and consisted of one building and a partially paved work yard. The building is approximately 80 ft long by 40 ft wide, and was built sometime prior to 1970. Available information indicates that two diesel USTs and a heating oil UST were located on the property, as shown on Figure 4. PSTL also operated a diesel AST on the property following removal of the diesel USTs, also shown on Figure 4, but removed it prior to vacating the property in 2002.

PSTL removed its diesel USTs (10,000 and 4,000-gallon tanks) in 1990 and its heating oil UST in 2002. Releases from the diesel UST locations were encountered during tank removal and contaminated soil (approximately 140 yd^3) was landfarmed onsite prior to being used for surface fill on the property. Although PSTL filed a tank removal report with Ecology for removal of the diesel USTs, Ecology determined that the information in its files is incomplete and did not provide an adequate basis for Ecology to issue a no further action (NFA) determination (Phase I ESA Appendix E; Landau Associates 2001). It does not appear that PSTL filed a report on the heating oil UST removal with Ecology.

Documented and potential releases from the USTs and ASTs were the only identified environmental concerns for the PSTL former leasehold prior to conducting environmental characterization in this area. Subsequent environmental characterization also indicated the presence of arsenic (As) in shallow soil.

2.2.10 U.S. COAST GUARD STATION

The U.S. Coast Guard Station was located in the southern portion of the Site on 14th Street (no known address). The Coast Guard Station, demolished sometime in 2002, was approximately 50 long by 30 ft wide and was built sometime prior to 1970. No conditions of environmental concern were identified for this former leasehold.

2.2.11 JORDAN PARK

Jordan Park is a small recreational park. A portion of the park is located within the Site boundary, as shown on Figure 3. The park consists of several grass-covered embankments constructed of fill material of unknown origin. The embankments were separated by concrete pathways. No specific areas of environmental concern were identified for this area, other than the unknown fill source for the park.

2.3 PORT REDEVELOPMENT PLANS

The Port is currently in the process of redeveloping the North Marina Area, which includes the Site. Redevelopment will include a mix of marina support, retail, restaurant, hotel, office, residential, and public recreational uses. The Port currently owns the property within the Site, although the lots located within the Gardner Way perimeter road may ultimately be transferred to private ownership as part of the redevelopment. Survey information for future tax lots, tracts, and planned streets that are included within the Site boundary are shown on Figure 5. These include tax lots 8, 11, 13, and 14, Tract 997, and Ballard Street, Dillon Street, McKenzie Walk, Farrington Place, North Gardner Way, South Gardner Way, and West Gardner Way.

It is noted that a Contamination Contingency Plan (CCP) was developed for the North Marina Area (Landau Associates 2008a). Any unanticipated soil or groundwater contamination encountered at the Site during future redevelopment activities will be managed using the approach and procedures outlined in the CCP.

3.0 PREVIOUS INVESTIGATIONS AND INTERIM ACTION

This section briefly describes the environmental investigations and the interim action previously conducted at the Site. These investigations and the interim action are documented in several reports including the West End Interim Action Report (Landau Associates 2008b), which provides a comprehensive overview of the previous investigations and the interim action at the Site. The West End Interim Action report can be viewed by using the web link provided in Section 2.2. A list of the documents is provided in Appendix A. The investigations and the interim action were conducted when the Site was part of the North Marina Redevelopment site and was under Ecology's VCP. At that time, the former North Marina Area was subdivided into Investigation Areas A through L. The Site includes Investigation Areas D, E, and H, and a portion of Investigation Areas F and JP, as shown on Figure 3.

Sampling location identifications were assigned prefixes that match the investigation area in which they are located. For example, sample location E-GC-4f was collected from Investigation Area E. Similarly, identifications of interim action areas have a prefix that matches the investigation area in which they are located. For example, Interim Action Area D-9 is located in Investigation Area D. For organizational purposes and easy reference, these letter designations have been carried forward in this work plan.

3.1 ENVIRONMENTAL INVESTIGATIONS

A number of environmental investigations were conducted while the Site was under the VCP to determine the nature and extent of contamination in soil and groundwater at the Site and the larger North Marina Area. The investigations started with a Phase I ESA conducted in 2001 (Landau Associates 2001) and several subsequent investigations including a Phase II ESA conducted in late 2003 and early 2004 (Landau Associates 2004a) and a data gaps investigation (DGI) conducted in late 2004 and early 2005 (Landau Associates 2005). Brief descriptions of each environmental investigation are provided in Appendix B.

Investigations of the in-water portions of the Site have not been as extensive as the investigations in the Uplands portion of the Site. The in-water portion of the Site has been dredged and much of the sediment characterization has been associated with disposal/relocations requirements of the dredged sediment.

The number of soil, groundwater, and sediment samples collected for characterization purposes and the types of chemical analyses performed for each are described below.

3.1.1 SOIL

Over 500 soil samples have been collected throughout the Site and submitted for laboratory analysis during previous investigations. Laboratory analysis of the soil samples included volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) including cPAHs, organotins [e.g., tributyl tin (TBT) ion] metals, and petroleum hydrocarbons, as summarized in Table 1. Previous environmental soil sampling locations are shown on Figure 6.

3.1.2 GROUNDWATER

Investigation of groundwater quality at the Site has consisted of laboratory analysis of groundwater samples collected from 16 monitoring wells and 39 soil boring locations (temporary well points). These locations are shown on Figure 7. Groundwater samples were analyzed for VOCs, SVOCs including cPAHs, metals, and petroleum hydrocarbons, as summarized in Table 2.

3.1.3 SEDIMENT

Two sediment investigations were conducted prior to the RI that included collection of sediment samples within the in-water portion of the Site. The first investigation was conducted to characterize sediment designated to be dredged from the 12th Street Marina and designated for open-water disposal. Three sediment cores were collected within the in-water portion of the Site that extends into the 12th Street Marina. The locations of the sediment cores are identified as stations A-4, A-8, and A-12 on Figure 8. The samples were analyzed for Puget Sound Dredged Disposal Analysis (PSDDA) conventionals and constituents of concern (COCs). A summary of the analytical results is provided in Tables 3 and 4. Further documentation of the investigation is provided in the *Puget Sound Dredged Disposal Analysis Full Characterization for the 12th Street Marina* (Pentec 2001).

The second investigation was conducted by Landau Associates for the Port in 2004. During this investigation, one surface sample (NMA-grab 4) and two subsurface samples [NMA-core 4 (0.5-3.0) and NMA-core 4 (3.0-6.0)] were collected within the in-water portion of the Site that extends into the North Marina; and two surface samples (NMA-grab 5 and NMA-grab 6) and six subsurface samples [NMA-core 5 (0.5-1.4), NMA-core 5 (1.4-2.3), NMA-core 5 (2.3-4.8), NMA-core 6 (0.5-2.0), NMA-core 6 (2.0-3.5), and NMA-core 6 (4.0-6.0)] were collected within the in-water portion of the Site that extends into the Snohomish River. The locations of the sediment samples are shown on Figure 8. The samples were analyzed for the Sediment Management Standard (SMS) suite of chemicals. A summary of the analytical results both as organic carbon normalized and as dry weight is provided in Tables 3 and 4, respectively. Further documentation of the investigation is provided in the *Sediment Quality Investigation Data Report* (Landau Associates 2004b).

3.2 INTERIM ACTION

An interim action was conducted at the Site between June 2006 and March 2008 to address contaminated soil and groundwater at 50 interim action areas identified based on previous Site characterization activities. The interim action included excavation and offsite disposal of arsenic, copper, cPAH, lead, mercury, 1-methylnaphthalene and/or petroleum hydrocarbon-impacted soil; *in-situ* soil agitation; free product and contaminated water recovery; and the collection and analysis of compliance monitoring samples to verify that interim action cleanup levels (CULs) were achieved. Interim action areas are shown on Figure 9. A summary of the interim action implemented within each area is provided in Table 5; a more detailed description of the interim actions is provided in the *West End Site Interim Action Report* (Landau Associates 2008b).

4.0 REMEDIAL INVESTIGATION ACTIVITIES

RI activities were designed to address data gaps identified in the *Final-Remedial Investigation/Feasibility Study Work Plan, West End Site, Everett, Washington* (Work Plan; Landau Associates 2009), including the evaluation of groundwater quality at the potential conditional point of compliance at the groundwater/surface water interface. The West End RI/FS Work Plan can be viewed by using the web link provided in Section 2.2. The initial Work Plan activities included groundwater sampling in Areas D, E, and F, as well as sediment sampling in the vicinity of stormwater outfalls. An expansion of the activities was detailed in the *Draft Remedial Investigation/ Feasibility Study Work Plan Addendum No. 1* (Work Plan Addendum; Landau Associates 2010). This document can be viewed using the web link provided in Section 2.2. The expanded activities included additional sampling at wells with constituents that exceeded the preliminary cleanup levels (PCLs; see Section 5.0) during initial RI sampling, installation of an angled well to evaluate groundwater quality near the groundwater/surface water interface, and surface water sampling adjacent to an upland location exhibiting the highest concentrations of arsenic in groundwater.

RI field activities were completed in general accordance with the Work Plan and Work Plan Addendum. This section describes the RI activities and any deviations from the procedures specified in the Work Plan and Work Plan Addendum.

4.1 MARINE SEDIMENT

In accordance with the Work Plan, surface sediment grab samples were collected from a total of 19 sampling stations, identified as RI-SED-1 through RI-SED-19 on Figure 10. Seven samples were collected in the 12th Street Marina along the north side of the Site, nine samples were collected in the North Marina along the south side of the Site, and three samples were collected in the Port Gardner Bay/Snohomish River along the west side of the Site. Modifications to the sample locations presented in the Work Plan were required as follows:

- Sample station RI-SED-1 was moved approximately 60 ft to the northeast due to the presence of riprap at the proposed location.
- Sample station RI-SED-11 was planned closer to the shoreline, but access was blocked by overhead structures and the sample was instead collected along the southern edge of the dock.

Sediment samples were collected using the procedures described in the Sediment Investigation Sampling and Analysis Plan (SAP; Work Plan Appendix H). Samples were retrieved at each sampling station using a 36-ft sampling vessel with a Pneumatic Power Grab sampler. Samples for laboratory analysis were collected from the upper 10 centimeters (cm) of sediment in the sampler using a decontaminated stainless-steel spoon and, except for samples collected for total sulfides, homogenized in a stainless-steel bowl, and placed in the appropriate sample container. Samples for total sulfide analysis were placed directly into the sample container. In accordance with the Work Plan, the sediment samples were analyzed for the following list of Sediment Management Standard (SMS) chemicals: metals (arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc); SVOCs; polychlorinated biphenyls (PCBs); and conventional parameters [grain size, total organic carbon (TOC), total volatile solids (TVS), total solids, ammonia, and total sulfides]. Sediment samples were also analyzed for organotin pore water and samples were archived for possible bulk organotin analyses.

For data validation purposes, a blind field duplicate sample was collected at station RI-SED-14 (duplicate sample identified as RI-SED-20). Matrix spike and matrix spike duplicate samples were also collected at RI-SED-8 and RI-SED-20. The blind field duplicates and the matrix spike and matrix spike duplicates were analyzed for all of the above analytes.

At each sample station, a sample of the upper 10 cm of sediment was also collected for analysis of the sediment porewater. These samples were collected using the procedures described above except that the samples were not homogenized. The porewater was extracted from the sediment sample at the laboratory and analyzed for organotins.

4.2 GROUNDWATER

Groundwater investigation activities associated with the RI occurred between April 22, 2009 and May 14, 2010. Eighteen monitoring wells were installed in Area D (Former American Construction North Yard Leasehold), Area E (PSTL Leasehold), and Area F (Multiple Tenants/Former Leasehold) following completion of the interim action. Grab samples were collected from direct-push borings at 17 locations in Area E and Area F. Monitoring wells and grab sample locations were positioned either to characterize groundwater near its point of discharge to surface water along the north and west shorelines, to investigate the extent of arsenic groundwater contamination, or to further characterize interior areas of interest, as described in Sections 7.0 and 8.0 of the Work Plan, and in the Work Plan Addendum. An angled well was installed, as described in the Work Plan Addendum, to characterize the interface of groundwater with surface water close to the point of groundwater discharge.

Additional discussion of the groundwater sampling activities is provided below. Analytical results are discussed in Section 6.0.

4.2.1 DIRECT-PUSH GROUNDWATER GRAB SAMPLING

On June 17 and 18, 2009, groundwater grab samples were collected from 17 direct-push borings at the locations shown on Figure 11. The locations are similar to those shown in the Work Plan.

Boreholes were drilled using a truck-mounted direct-push drill rig. Four-foot long stainless-steel well screens were placed in the boreholes at depths ranging between 10 and 15 ft BGS.

The temporary wells were purged using a peristaltic pump until the water was clear. Samples were collected in accordance with the procedures described in the Work Plan. Samples were collected at low tide from shoreline locations GW-3, GW-4, GW-5, and GW-6, and interior wells were generally sampled in order of increasing distance from the shoreline to minimize marine surface water influence. Immediately after completing the sample collection, the screens and casing were removed and the boreholes were filled with bentonite chips. All of the direct-push groundwater grab samples were analyzed for dissolved arsenic with the exception of GW-7 and GW-10, two samples were analyzed for petroleum hydrocarbons, and five samples were analyzed for vinyl chloride, as presented in the Work Plan. Matrix spike and matrix spike duplicates were collected. Trip blanks accompanied samples analyzed for vinyl chloride and gasoline-range petroleum hydrocarbons; the results for the trip blanks were evaluated during data validation. The analyses and results for specific wells are discussed in more detail in Section 6.0.

The pH, temperature, conductivity, turbidity, oxidation reduction potential (ORP), dissolved oxygen (DO), and ferrous iron of each sample were also measured in field.

4.2.2 MONITORING WELL INSTALLATION AND SAMPLING

Eighteen monitoring wells were installed and were initially sampled in two events as planned in the Work Plan. Based on the results, two additional sampling events were implemented for wells where constituents had been detected above PCLs, as described in the Work Plan Addendum.

The eighteen RI shallow groundwater monitoring wells were installed and developed between April 22 and April 23, 2009. Locations of monitoring wells are shown on Figure 11 and are similar to the locations proposed in the Work Plan. Well installation and development was conducted using the procedures described in the Upland Sampling and Analysis Plan (Work Plan Appendix G). Three-quarter-inch diameter wells with prefabricated filter packs (Plus-10 Prepak Economy, GeoInsight, Inc.) were installed to depths ranging from 10 to 15 ft BGS. Boreholes for the wells were drilled using a truck-mounted direct-push drilling rig. Well screens were constructed of an inner and outer mesh made of inert filtration media and a filter pack of 120 US sieve size washed silica sand was placed between the mesh layers. Monitoring well boring logs and well construction details are presented in Appendix C of this report.

The monitoring wells were sampled in a total of four events, the first two as part of the work specified in the Work Plan, and the second two as part of the Work Plan Addendum. The first event took place between June 12 and June 18, 2009, the second between September 16 and September 18, 2009, the third on April 1, 2010, and the fourth on May 14, 2010. Samples collected at wells installed along the shoreline were collected within one hour of low tide to minimize marine surface water influence. Wells farther inland were sampled within 2 hours of low tide. The exceptions to this are wells RI-MW-6 and RI-MW-7, which had to be sampled over the course of a day due to extremely slow recharge.

During the first two events, all eighteen wells were sampled. Wells that had any constituent above the PCL in either of the first two monitoring events were sampled in the third event. The wells sampled in the third event included monitoring wells RI-MW-1, RI-MW-3, RI-MW-4, RI-MW-7, RI-MW-11, RI-MW-12, and RI-MW-13. The angled well (RI-MW-11A) was also sampled during the third event and is discussed further in Section 4.2.3. As specified in the Work Plan Addendum, the fourth sampling event consisted of sampling only well RI-MW-7, RI-MW-11, and the RI-MW-11A. Results are discussed in Section 6.0.

During each sampling event, blind field duplicates and matrix spike and matrix spike duplicates were collected and analyzed. During the June 2009 event, blind field duplicate samples were collected from RI-MW-1 (duplicate sample identified as RI-MW-19) and RI-MW-11 (duplicate sample identified as RI-MW-111). During the September 2009 event, blind field duplicate samples were collected from RI-MW-1 (identified as RI-MW-101), RI-MW-11 (identified as RI-MW-111), and RI-MW-8 (identified as RI-MW-88). During the April and May 2010 events, a blind field duplicate sample was collected from RI-MW-11 (identified as RI-MW-111).

During the first two sampling events, all of the monitoring well groundwater samples were analyzed for dissolved arsenic, and selected monitoring wells were also analyzed for copper (RI-MW-1 to RI-MW-6), petroleum hydrocarbons (RI-MW-1 and -2, RI-MW-8 to -10), or vinyl chloride (RI-MW-11 and -12, RI-MW-15). During the third and fourth events, each sample was analyzed for those constituents that had previously exceeded the PCL at the same location.

During each monitoring event, pH, temperature, conductivity, turbidity, ORP, and DO were measured at each monitoring well. Temperature, conductivity, and pH were measured using a YSI 556 multiprobe. Turbidity and dissolved oxygen were measured using Hach probes and ORP was measured using an Oakton PH11 probe. Ferrous iron was also measured at each well during the June 2009, September 2009, and April 2010 monitoring events using Hach field test kits. Trip blanks accompanied samples analyzed for vinyl chloride and gasoline-range petroleum hydrocarbons and the results for the trip blanks were evaluated during data validation. The analyses and results for specific wells are discussed in more detail in Section 6.0.

4.2.3 ANGLED MONITORING WELL INSTALLATION AND SAMPLING

Installation of the angled well took place on March 11 and 12, 2010, and required several attempts. A location very near the shoreline was chosen initially, but after riprap collapsed into the borehole during well installation, the location had to be moved farther south. A second borehole was drilled approximately 3 ft south of the first location (3 ft farther from the shoreline) and again riprap obstructed well installation. A third attempt was made approximately 7 ft south of the 1st location and adjacent to MW-11A. At this location, a borehole was drilled at an approximately 40 degree angle to avoid intersecting riprap. The well was successfully installed at this location. The location of well MW-11A is shown on Figure 12. The length of the well measured 37 ft, although 3 ft was since removed during placement of the well monument. A cross-section showing the as-built drawing of the angled monitoring well is presented on Figure 12.

The angled well was developed on March 20, 2010, and was sampled on April 1, 2010 and May 14, 2010. Prior to purging at the angled well for sampling during the April event, field parameters were measured at various depths (27.5 ft, 24.5 ft, 21.5 ft, and 18.5 ft). This was accomplished by lowering a measured depth of tubing into the well, and pumping just enough water from the well to take a reading using a field-calibrated YSI 556 Multimeter. The tubing was raised 3 ft between each reading and the flow rate was kept extremely low to avoid disturbing any stratification of saltwater and freshwater. Conductivity measurements ranged from 3,588 microSiemens per centimeter (µS/cm) to 3,656 µS/cm. These measurements are higher than the conductivity measured at MW-11 (approx 16 µS/cm), but significantly less than the conductivity measured for the surface water sample (13,987 µS/cm). These measurements indicate that the freshwater/saltwater interface was greater than 27.5 ft. During the May event, the conductivity was measured using the same method described for the April event, with similar results.

The well was sampled during both low tide and mid tide during the April event and at low tide during the May event. During both events, samples were analyzed for arsenic and vinyl chloride. RI results are discussed in detail in Section 6.0.

4.2.4 GROUNDWATER LEVEL MEASUREMENTS

Groundwater levels were measured at all of the wells on April 29, June 12, and September 16, 2009, using and electronic water level indicator. The water levels were measured at low tide to minimize influence by marine surface water. The depth to groundwater at each well was measured from a surveyed reference point at the top of the polyvinyl chloride (PVC) well casing.

4.3 SURFACE WATER

During the April 2010 groundwater monitoring event, a surface water sample was collected from the 12th Street Yacht Basin just offshore of RI-MW-11, as shown on Figure 11, and analyzed for dissolved arsenic. The sample was collected by holding an unpreserved clean laboratory-supplied bottle under the surface of the water with the cap in place. The cap was slowly detached from the bottle to allow water to flow into the bottle without any surface debris entering the bottle, and the cap was replaced before removing the bottle from the water. Using a peristaltic pump, the water from the bottle was then pumped through a 0.45 micron filter into a preserved laboratory bottle, and put on ice to be transferred to the laboratory. Field parameters were also collected from the surface water using a YSI multimeter. Results are presented in Section 6.0.

5.0 DISCUSSION OF CLEANUP LEVELS

Soil and groundwater analytical data were compared to preliminary cleanup levels (PCLs) developed for the Site based on applicable MTCA criteria for unrestricted site use. Sediment analytical data were compared to SMS Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL) to support evaluation of the nature and extent of contamination. MTCA provides three approaches for establishing soil and groundwater cleanup levels: Method A, Method B, and Method C. The Method A approach is appropriate for sites that have few hazardous constituents. The Method B approach is applicable to all sites. The Method C approach is applicable for specific site uses and conditions. The Method B and Method C approaches use applicable state and federal laws and risk equations to establish cleanup levels. However, the Method B approach establishes cleanup levels using exposure assumptions and risk levels for unrestricted land uses, whereas the Method C approach uses exposure assumptions and risk levels for restricted land uses. MTCA also requires that cleanup levels developed using MTCA Method B and Method C approaches not be set at levels below the practical quantitation limit (PQL) or natural background.

Exposure pathways and receptors based on current and likely future Site uses were identified as part of evaluating the nature and extent of contamination. In general, the Method B approach was used for the development of the soil and groundwater PCLs presented herein. However, Method A cleanup levels were applied to certain constituents for which Method B cleanup levels have not been promulgated (e.g., lead and petroleum hydrocarbons), and for constituents with unique considerations addressed by Ecology in development of the Method A values (e.g., arsenic).

Sediment quality was evaluated in accordance with the SMS (WAC 173-204) requirements, using the SQS and the CSL.

5.1 CURRENT AND FUTURE LAND AND WATER USES

The Site is located in the City of Everett, which has a population of approximately 98,000. The Site is currently zoned as waterfront commercial, which allows for commercial, residential, and limited commercial and light industrial use. The only industrial use allowed is associated with research/testing labs (does not include mass production or manufacturing of goods). It is not anticipated that the zoning will change following redevelopment. Multi-family residential units in the form of condominiums may be constructed in the central portion of the Site. Drinking water for the Site is currently supplied by the City of Everett Water District.

Groundwater at, or potentially affected by, the Site is not currently used for drinking water. It is not considered to be a reasonable future source of drinking water due to its to proximity to marine surface water, the limited productivity of the shallow groundwater zone, and the likelihood that, if groundwater was pumped for drinking water use, the proximity of the Site to the marine surface water is likely to cause saltwater intrusion and result in increased groundwater salinity at the point of use. Additionally, the availability of a municipal water supply, and City ordinances requiring parties within the city limits to connect to the municipal water supply, effectively preclude the use of Site groundwater as a potable water supply.

5.2 POTENTIAL RECEPTORS AND EXPOSURE PATHWAYS

The potential receptors that may be exposed to the contaminants present at the Site and the potential exposure pathways depend in part on the current and likely future land uses for the Site. This section identifies potential receptors and the potential exposure pathways for the receptors based on the future land uses described in Section 5.1.

5.2.1 POTENTIAL RECEPTORS

Potential receptors of Site contaminants could be humans, terrestrial ecological receptors (i.e., wildlife, soil biota, and plants), and aquatic organisms. Each of these was evaluated based on the future land use of the Site, as follows:

- **Humans.** Because the Site is zoned waterfront commercial, which allows for commercial, residential, and limited commercial and light industrial use, and multi-family residential units may be constructed in the central portion of the Site, humans are considered to be potential receptors.
- **Terrestrial Ecological Receptors.** Following redevelopment, the Site will be almost entirely covered with buildings and pavement, with landscaping confined to small areas around buildings, along roadways, and within parking areas; therefore, terrestrial ecological receptors (wildlife, soil biota, and plants) are not considered to be potential receptors. Also, in accordance with WAC 173-340-7491(1)(c)(i), sites that contain less than 1.5 acres of contiguous undeveloped area are excluded from having to conduct a terrestrial ecological evaluation. Because the Site will be mostly covered with buildings and pavement following redevelopment, the Site meets the exclusion for a terrestrial ecological evaluation. Ecology's Terrestrial Ecological Exclusion form is included as Appendix D.
- **Benthic and Aquatic Organisms.** Due to the Site's proximity to marine surface water, benthic organisms in sediment and aquatic organisms in Port Gardner Bay are considered to be potential receptors.

5.2.2 POTENTIAL EXPOSURE PATHWAYS

Potential exposure pathways were identified for the receptors identified in Section 5.2.1 and are presented by medium below.

5.2.2.1 Soil

The potential human health exposure pathways for Site soil are:

- Incidental ingestion and dermal contact with constituents in Site soil
- Exposure through inhalation of soil contaminants (as particulates) that have migrated to air as windblown or fugitive dust.

5.2.2.2 Groundwater

As discussed in Section 5.1, groundwater at or potentially affected by the Site is not currently used for drinking water and is not a reasonable future source of drinking water due to its proximity to marine surface water and the availability of a municipal water supply. However, the shallow hydrostratigraphic unit discharges to the adjacent marine surface water. Exposure pathways associated with marine sediment and surface water are discussed in Sections 5.2.2.3 and 5.2.2.4, respectively.

Because vinyl chloride was detected in groundwater during the RI and at one location during a previous investigation, inhalation of vinyl chloride vapors in indoor air that volatize from groundwater is a potential exposure pathway. As discussed in Section 5.1, future use of the Site may include commercial, residential, and limited light industrial. The area where vinyl chloride is present in groundwater is within 100 ft of the shoreline and because residential structures are not allowed within 200 ft of the shoreline, based on development alternative approved in the Environmental Impact Statement (EIS) for the planned property development, any future buildings constructed in the vinyl chloride-affected area in the future would likely be used for hospitality services (e.g., restaurants, hotels, etc.) or for other commercial or light industrial uses. For these reasons, the reasonable maximum exposure for vinyl chloride in soil vapor is considered commercial/industrial use.

5.2.2.3 Sediment

The potential exposure pathways for sediment include:

- Exposure of benthic organisms, which may result in acute or chronic effects, to hazardous substances released from the Site (e.g., groundwater to surface water discharge, storm runoff, etc.) in the biologically active zone of sediment (the upper 10 cm below the mudline). This may result in the uptake and bioaccumulation of contaminants in these organisms.
- Ingestion of contaminated benthic organisms as prey by higher trophic level organisms in the food chain (e.g., foraging fish, aquatic birds, marine mammals, etc.).
- Human ingestion of marine organisms contaminated by Site hazardous substances that have migrated to sediment.
- Direct contact of sediments due to collection of marine organisms and/or retrieval of equipment or materials from the floor of the marina.

5.2.2.4 Surface Water

The potential exposure pathways for surface water include:

- Exposure of aquatic organisms, which may result in acute or chronic effects, to hazardous substances released from the Site to surface water. This may result in the uptake and bioaccumulation of contaminants in these organisms.
- Ingestion of contaminated aquatic organisms as prey by higher trophic-level organisms in the food chain (e.g., foraging fish, aquatic birds, marine mammals, etc.).

Human ingestion of contaminated marine organisms contaminated by Site hazardous substances that have migrated to surface water

5.3 DEVELOPMENT OF PRELIMINARY SOIL AND GROUNDWATER CLEANUP LEVELS

Soil and groundwater PCLs were developed in accordance with MTCA and sediment cleanup levels were developed based on SMS SQS and CSL. These cleanup levels were developed based on the potential receptors and potential exposure pathways described above, and were developed for all constituents detected during the RI and present in Site media following completion of the interim action. Proposed soil and groundwater cleanup levels are developed in Section 8.0 based on the constituents that are present in Site media at concentrations exceeding the PCLs. Sediment cleanup levels are identified in Section 8.0 for all constituents that exceeded either the SQS.

5.3.1 GROUNDWATER

Groundwater PCLs were developed for those constituents previously detected in groundwater (see Table 2). Because human ingestion of hazardous substances in groundwater is not a potential exposure pathway, as described in Section 5.2.2.2, potable groundwater cleanup levels were not developed for Site groundwater. Instead, cleanup levels protective of marine surface water were developed because Site groundwater discharges directly to Port Gardner Bay. Except for arsenic and total petroleum hydrocarbons (TPH), MTCA Method B marine surface water PCLs were developed in accordance with WAC 173-340-730(3) for detected constituents in groundwater. However, in the absence of an applicable marine surface water cleanup level, MTCA Method B potable groundwater cleanup levels were used for screening purposes in accordance with WAC 173-340-720 (4). The MTCA Method A cleanup levels were used for arsenic and TPH (WAC 173-340-900 – Table 720-1). PCLs were adjusted to be no less than the PQL and background concentrations in accordance with WAC 173-340-730(5)(c). Reporting limits for the groundwater analytical methods were used as PQLs. Groundwater PCLs for detected constituents are presented in Table 6.

The vinyl chloride preliminary groundwater cleanup level for protection of human health based on the protection of indoor air quality was developed using the Johnson and Ettinger model (Johnson and Ettinger 1991). As discussed in Section 5.2.2.2, the reasonable maximum exposure (RME) for the vapor migration pathway is limited commercial/industrial use rather than residential use due to the limitations on land use in the vinyl chloride-affected area. The model was run using a Site-specific soil type of silty fine sand Johnson and Ettinger default parameters for an industrial scenario, with the following exceptions: the MTCA Method C default parameter for exposure duration (20 years) and an air exchange rate of 0.5 hr^{-1} as recommended in Ecology's draft guidance document (Ecology 2009) were used, as requested by Ecology. Additionally, a Qsoil default value of 5 L/m for residential structures was used in the model, as requested by Ecology. Based on these input parameters, the maximum vinyl chloride concentration in groundwater that is protective of indoor air in an industrial building with a carcinogenic risk of 1 in 1,000,000 is 46 micrograms per Liter (µg/L), which is well above the PCL protective of surface water (2.4 µg/L). A summary of the input parameters used and the resulting calculations are provided in Appendix E. As discussed later in Section 6.2.1.3, the maximum concentration of vinyl chloride detected in groundwater is 12 µg/L, which is significantly less than the concentration protective of indoor air for a commercial/industrial building.

5.3.2 SOIL

Soil PCLs were developed for hazardous substances detected in soil remaining at the Site following the interim action. The PCLs were developed to be protective of the potential receptors identified in Section 5.2.1. The receptors include humans and groundwater (as marine surface water). The proposed soil PCLs protective of human health and groundwater for the constituents detected in soil remaining at the Site are presented in Table 7. Soil PCLs protective of human health were developed using applicable human health risk assessment procedures specified in WAC 173-340-708. These procedures include development of PCLs based on the reasonable maximum exposure to occur at the Site. Ecology has determined that residential land use is generally the site use requiring the most protective PCLs and that exposure to hazardous substances under unrestricted land use conditions represents the reasonable maximum exposure scenario. As discussed in Section 5.1, the future potential use of the Site includes multi-family residential; therefore, soil PCLs protective of human health were developed based on the requirements under WAC 173-340-740 for unrestricted (residential) land use. Under WAC 173-340-740, Method B soil cleanup levels must be as stringent as:

- Concentrations established under applicable state and federal laws
- Concentrations protective of direct human contact with soil
- Concentrations protective of groundwater.

These criteria were considered during development of the soil PCLs.

Except for the toxics substance control act (TSCA), there are no soil PCLs established under applicable state or federal laws. TSCA establishes cleanup levels for PCBs; however, since no PCBs were detected in the soil remaining at the site, TSCA cleanup levels are not applicable. Except for arsenic and TPH, standard MTCA Method B soil PCLs protective of direct human contact were determined in accordance with WAC 173-340-740(3) using Ecology's Cleanup Levels and Risk Calculations (CLARC) database. The MTCA Method A soil cleanup levels for unrestricted site use were used to address arsenic and TPH in soil. These cleanup levels are shown in Table 7. The cleanup level for benzo(a)pyrene will be used for the sum of cPAHs using toxicity equivalency factors (TEFs) to calculate a toxicity equivalency quotient (TEQ) for total cPAHs in accordance with WAC 173-340-708(8)(e).

Soil PCLs protective of groundwater were determined using the fixed parameter three-phase partitioning model in accordance with WAC 173-340-747(4). Because groundwater is not a current or likely future source of drinking water and because it discharges to marine surface water, groundwater PCLs were developed based on marine surface water cleanup levels protective of human health and aquatic organisms in accordance with WAC 173-340-730. However, in the absence of an applicable marine surface water cleanup level, MTCA Method B potable groundwater PCLs were used. Soil PCLs protective of groundwater as marine surface water are shown in 7.

To develop a single soil PCL for each constituent, the lowest protective criterion was selected as the PCL, as indicated by shaded values in Table 7. Following selection of the lowest criterion, the PCL was adjusted as appropriate, as described below.

Soil cleanup screening levels may be adjusted to be no less than the PQL in accordance with WAC 173-340-730(5)(c) and/or no less than natural background levels in accordance with WAC 173-340-740(5)(c). The PQL for each constituent, based on ten times the current method detection limit (MDL), and background concentrations for metals, based on Puget Sound 90th percentile values (Ecology 1994) are shown in Table 7 and were compared to the soil PCLs protective of human direct contact and groundwater. No adjustments upward to the PQL were necessary. The soil PCLs protective of groundwater as marine surface water for arsenic, copper, and mercury are below the natural background; therefore, these PCLs were adjusted upward to the natural background level.

For some constituents present in soil but not detected in groundwater at concentrations above their respective groundwater PCLs [i.e., cadmium, copper (all areas except for Area D), lead, mercury, zinc], the soil criteria protective of human health (i.e., Method B direct human contact) was selected as the soil PCL regardless if it was higher than PCL based on groundwater protection. In accordance with WAC 173-340-747(9), if an empirical demonstration can be made that concentrations present in soil are not causing exceedances of the groundwater cleanup levels, then development of a soil criterion protective of groundwater is not necessary. WAC 173-340-747(9)(b) lists specific requirements for empirically demonstrating that measured soil concentrations will not cause an exceedance of applicable groundwater cleanup levels. Demonstration that the site area meets these requirements is provided in Appendix F.

5.3.3 SEDIMENT

Sediment cleanup standards were developed according to SMS requirements. Two SMS criteria are promulgated by Ecology as follows:

- The marine SQS (WAC 173-204-320), the concentration below which effects to biological resources and human health are unlikely.
- The marine CSL (WAC 173-204-520), the concentration above which more than minor adverse biological effects may be expected.

The SQS and CSL values have been developed for a suite of analytes that includes metals, polycyclic aromatic hydrocarbons (PAHs) and other SVOCs, PCBs, and ionizable organic compounds. The SQS are the most stringent SMS numeric criteria and represent the goal for sediment cleanups. The suite of SMS analytes and the associated SQS and CSL, some of which are expressed on a TOC-normalized basis, are listed in Table 8. Ecology recommends that, in areas with low TOC values (which results in higher reporting limits), the use of dry-weight equivalents to the SMS TOC-normalized SQS and CSL be considered along with the organic carbon-normalized criteria. As a result, the Apparent Effects Threshold values (AETs), which are the dry weight equivalents to these criteria, are also presented in Table 8.

6.0 RI RESULTS

A total of 19 marine surface sediment samples (and 1 blind field duplicate sediment sample) and porewater samples were collected from the in-water portion of the Site and 65 groundwater samples (and 7 blind field duplicate groundwater samples) were collected from the upland portion of the Site during the RI.

This section presents the results, including Site geology and hydrogeology; the analytical results for the RI sediment, groundwater, and surface water samples; and the nature and extent of contamination.

6.1 ENVIRONMENTAL SETTING

This section describes the Site environmental setting, which includes the Site geology, hydrogeology, and the setting of the in-water area, including habitat, biota, and vegetation. The results of previous investigations are integrated with the RI data to provide a comprehensive understanding of Site conditions.

6.1.1 GEOLOGY

In general, Site geologic conditions encountered within the depth range of environmental explorations consisted primarily of a pavement section or a granular fill trafficking layer overlying hydraulic fill. Hydraulic fill is typically a loose to medium dense, poorly graded fine to medium sand with silt or silty fine to medium sand. Native marine sediment consisting of soft to loose silt to silty sand directly underlies the hydraulic fill. The hydraulic fill is about 20 ft thick throughout most of the Site, but appears to thicken to 30 ft or more toward the western end, where the contact with the marine sediment slopes downward from east to west. Glacial soil, consisting of dense, granular soil of variable composition, underlies the marine sediment and slopes steeply downward from east to west, resulting in a thickening layer of marine sediment to the west. The thickness of the marine sediment ranges from about 20 ft in the eastern portion of the Site to about 177 ft or more in the western portion of the Site.

Organic material in the form of wood chips, bark, and related material was encountered in the hydraulic fill in many of the borings. Organic material ranged from small wood fragments intermixed with fill to distinct layers of wood debris. Wood debris is intermittently present throughout much of the Site, although it is most consistently present over the northern half. An east-west geologic cross section (A-A’) through the Site is presented on Figure 13 and the alignment of line A-A’ is shown on Figure 14.

6.1.2 HYDROGEOLOGY

The uppermost hydrostratigraphic unit at the Site consists of the fill unit that overlies the finer-grained marine sediment unit. The marine sediment unit forms the uppermost aquitard throughout the site. The depth to water ranged from 3.0 to 7.5 ft BGS. The depth to water generally appears to be shallower toward the center of the Site and deeper in the vicinity of the shoreline, which is consistent with groundwater flow from the interior of the Site toward marine surface water. The groundwater elevation contour map from the DGI report (Landau Associates 2005) presented on Figure 14 shows that groundwater flows radially outward from the center of the Site toward surface water. Groundwater elevation contours maps for water level measured during the RI that represent a wet season and a dry season are presented on Figures 15 and 16, respectively. These contours also indicate groundwater flows radially outward toward the marine surface water. During the June 2009 monitoring event, some groundwater mounding was observed in the area of wells RI-MW-17 and RI-MW-18. This area was previously used for discharge of groundwater during dewatering activities associated with the Site development and the groundwater mounding observed in June is likely a remnant of these activities. The mounding was not observed during the September monitoring event. The measured water levels for these two events are also presented in Table 9.

The hydraulic conductivity for the hydraulic fill unit was estimated to be about 1 x 10^{-3} centimeters per second (cm/sec) [3 feet per day (ft/day)], and the linear velocity for groundwater was estimated to average about 0.1 ft/day in the DGI report (Landau Associates 2005).

6.1.3 IN-WATER AREA

The Site is located on the eastern shoreline of Port Gardner Bay, which is an inlet of Possession Sound (Figure 1). The Snohomish River flows past the west end of the Site into the bay, as shown on Figure 1. Two waterways connected to Port Gardner, the 12th Street Marina and the North Marina, border the Site to the north and south, respectively. The in-water portion of the Site consists of the intertidal and subtidal areas along the northern, southern, and western edges of the Site, based on the preliminary Site boundary developed prior to implementation of the RI/FS (Figure 3). Significant portions of the northern and western in-water areas contain riprap along the shoreline. The riprap functions to prevent erosion and create slope stability. Sediment below an elevation of -4 ft mean lower low water (MLLW) is a mixture of silt and sand (Pentec 2004).

The 12th Street Marina and North Marina area have been altered by dredging and filling over several decades to convert portions of the shoreline to industrial and commercial uses and to provide navigation. Currently, the two waterways are used as marinas. A biological evaluation (BE) conducted by Pentec Environmental (Pentec 2004) describes the habitat, biota, and vegetation within the 12th Street Waterway and North Marina.

According to the Pentec BE, the lower Snohomish River basin, including the North Marina waterways, are habitat for juvenile salmonid rearing and migration, saltwater-freshwater transition, and possibly adult migration. Salmonid species believed to be present in the Site vicinity include chinook salmon and bull trout, which are listed as threatened species under the federal Endangered Species Act. Coho salmon are also believed to be present in the Site vicinity, and are a candidate specie that may be listed in the future.

Scattered rockweed has been observed on riprap and pilings in the 12th Street Waterway. Little algae and no marsh plants are found on the floats or along the shorelines within the North Marina area. Eelgrass is not present in either waterway. Forage fish documented in the Port Gardner area include Pacific herring, Pacific sand lance, and surf smelt and may be present in either waterway.

6.2 ANALYTICAL RESULTS

All sediment and groundwater samples were submitted to the Analytical Resources, Inc., laboratory in Tukwila, WA, for analysis.

6.2.1 QUALITY ASSURANCE

The sediment and groundwater samples were analyzed and validated according to the quality control procedures described in the upland and sediment SAPs, Appendices G and H of the Work Plan, respectively. Quality control for the project included maintaining a chain-of-custody record for each set of samples submitted to the laboratory, proper storage and preservation of the samples, equipment decontamination, and analysis of quality controls samples, in accordance with the SAP. In addition, the analytical data were validated to determine the acceptability of the data for use in adequately characterizing the sediment and groundwater. All of the data were determined to be acceptable for use and no data were rejected.

6.2.1.1 Sample Containers, Preservation, and Storage

Groundwater and sediment samples submitted to the analytical laboratory for analysis were collected in the appropriate sample container provided by the analytical laboratory. The samples were preserved by cooling to a temperature of 4°C and as required by the analytical method. The time between sample collection, extraction, and analysis was determined to be within analytical method -specified holding times for all analyses associated with the groundwater samples and within holding times specified in Ecology’s Sediment Sampling and Analysis Plan (SAPA; Ecology 2008), with the exception of the ammonia, total sulfides, and TVS analyses for the sediment samples. In addition to the holding time exceedances, the ammonia, total sulfides, and TVS samples were stored frozen for a short time and the total sulfide samples were not preserved as specified by the analytical method. Results for ammonia, total sulfides, and TVS or each sediment sample were qualified as estimates due to holding time exceedances and improper preservation.

6.2.1.2 Sample Custody

Sample custody was documented by means of a chain-of-custody record, which was initially completed by the sampler and, thereafter, signed by those individuals who accepted custody of the sample. All samples shipped to a laboratory were placed in coolers and the cooler secured with signed custody seals and taped shut with strapping tape.

6.2.1.3 Equipment decontamination

All sampling equipment used (i.e., stainless-steel bowls, stainless-steel spoons, and core tubes) were dedicated and pre-cleaned using a three-step process, which included scrubbing surfaces of the equipment that would be in contact with the sample with a brush and an Alconox solution; rinsing the equipment with tap water; and a final rinse with deionized water.

6.2.1.4 Quality Control samples

Laboratory quality control samples included matrix spike (MS), matrix spike duplicate (MSD), method blanks, and control samples. These samples were analyzed at the frequency described in the SAP. Blind field duplicate groundwater samples were collected at wells RI-MW-1 and RI MW-11 during the June 2009 groundwater monitoring event and at wells RI-MW-1, RI-MW-8, and RI MW-11 during the September 2009 groundwater monitoring event. A blind field duplicate groundwater sample was collected at well RI-MW-11 during the April and May 2010 groundwater monitoring events. One blind field duplicate sediment sample was collected at station RI-SED-14 during the RI.

6.2.1.5 Data Quality Evaluation

An internal data quality evaluation was performed by Landau Associates on all the groundwater and sediment analytical data collected as part of the RI to determine acceptability of the analytical results. The data quality evaluation conducted included the following review:

- Chain-of-custody records
- Holding times
- Laboratory method blanks
- Laboratory control samples/
- Surrogate recoveries
- Laboratory matrix spikes and matrix spike duplicates

- Blank spikes/laboratory control samples
- Laboratory duplicates
- Completeness
- Overall assessment of data quality.

Qualification of the sediment data was required based on the data validation, and flags were added to the data as summarized below; however, no data were rejected. No qualification of the groundwater data was required. Ammonia, total sulfides, and TVS results for each sediment sample were qualified with a "J" flag, indicating the concentrations are estimates because the holding times for these analyses were exceeded.

6.3 MARINE SEDIMENT QUALITY

The purpose of the marine sediment sampling was to determine if previous Site activities had impacted sediment quality to an extent that could pose a threat to human health or adversely affect biological resources. To make this determination, the analytical results for the sediment samples were compared to the SQS and CSL criteria. Some of the SQS and CSL are expressed on a TOC-normalized basis and, therefore, applicable sample results have been organic carbon-normalized. Table 10 presents non-organic carbon-normalized results and Table 11 presents carbon-normalized results.

Sediment data compared to the SQS and CSL and the dry weight equivalent to these criteria, the AETs, are also presented in Tables 10 and 11. This comparison of the sediment sample analytical results to the SMS criteria indicates that no concentrations exceed the CSL and, except for the concentration of fluoranthene in sample RI-SED-18, no constituents were detected at concentrations exceeding the SQS. The organic carbon-normalized fluoranthene result for sample RI-SED-18 was 221.2 milligrams per kilogram (mg/kg) compared to the SQS of 160 mg/kg. Sample RI-SED-18 is located east of the Site in the North Marina area, as shown on Figure 3.

Porewater extracted from each sediment sample was analyzed for organotins. Butyltin and TBT were detected in some of the porewater samples at low concentrations. TBT does not have promulgated SQS and CSL values. However, PSDDA evaluation criteria for open water disposal identifies a no effects TBT marine sediment porewater criteria of 0.05 μg/L and a potential adverse affects marine sediment porewater criteria of 0.15 μg/L for open water disposal of dredged material. These PSSDA criteria provide a reasonable basis for assessing the potential effects of TBT on marine biota. For the purposes of this RI data evaluation, a TBT porewater concentration of 0.05 μg/L is considered analogous to the SQS and a TBT porewater concentration of 0.15 μg/L is considered analogous to the CSL. The highest TBT pore water concentration measured in the 19 surface sediment samples tested for TBT porewater was 0.03 μg/L, well below the SQS-equivalent criteria TBT porewater criteria of 0.05 μg/L.

Reporting limits for four constituents (hexachlorobenzene; 1,2,4-trichlorobenzene; 1,2-dichlorobenzene, and 1,4-dichlorobenzene) exceeded the SMS carbon-normalized criteria in some samples. However, the dry-weight reporting limits were below the SMS recommended PQLs and the TOC values were within the range typically found in Puget Sound. Also, the dry-weight concentrations for these constituents were below the AETs that are based on dry-weight concentrations. Ecology recommends that, in areas with low TOC values (which results in higher reporting limits), the use of dry-weight AETs be considered along with the organic carbon-normalized criteria.

As previously mentioned, ammonia, total sulfides, and TVS results were qualified as estimates due to holding time exceedances. The samples were also stored frozen for a short time; the total sulfide sample was not preserved as specified by the analytical method. Results for these analyses were used to evaluate potential adverse effects on sediment due to high organic content, wood debris, etc. Although organic matter was observed in the upper 1 or 2 cm at each sediment sample location, no wood debris or only a trace of wood debris was observed at all but two of the sampling locations along the southern edge of the Site. TOC also ranged from 1.03 to 2.35 percent at 17 of the sediment sample locations and at two locations the TOC was 0.489 percent and 0.808 percent. Based on these data, wood debris does not appear to be a significant environmental concern for Site sediment.

6.4 GROUNDWATER QUALITY

The purpose of the RI groundwater monitoring was two fold: 1) to fill the data gaps presented in the Work Plan and 2) to evaluate groundwater quality at the point of discharge to surface water. Groundwater quality data gaps were identified in the Work Plan for Area D (former American Construction leasehold); Area E (PSTL leasehold); and Area F (multiple tenants/former leasehold). Previous groundwater samples from these areas identified arsenic in groundwater above the PCL. Copper and petroleum hydrocarbons also required additional characterization to determine whether concentrations currently exceed their respective groundwater PCLs in Area D. In Area E, petroleum hydrocarbons required additional characterization to confirm that concentrations were below their respective groundwater PCLs and, in Area F, vinyl chloride was previously detected at a concentration above the PCL at a single location.

This section presents the RI groundwater results for evaluating the data gaps and for evaluating the groundwater quality at the point of discharge to surface water.

6.4.1 DATA GAPS EVALUATION

The most extensive groundwater monitoring was conducted in June and September 2009. Groundwater samples were collected from 18 monitoring wells distributed throughout Areas D, E, and F and from 17 direct-push borings located in Areas E and F, as shown on Figure 11. Analytical results for these events were intended to fill the data gaps identified in the Work Plan. The analytical results for these two events are presented by area below and are summarized in Table 12. To determine the extent and magnitude of impacts to groundwater, the analytical results were compared to the PCLs identified in Section 5.2.

6.4.1.1 Area D

The groundwater investigation conducted in Area D in 2009 included collection of samples from five shoreline wells (RI-MW-1 through RI-MW-5), and two wells installed farther upland (RI-MW-6 and RI-MW-7). Sample analyses included dissolved arsenic, dissolved copper, and gasoline-range, diesel-range, and lube oil-range petroleum hydrocarbons. Analytical results for dissolved arsenic and dissolved copper are presented on Figure 17. Samples from the southernmost wells on the western shoreline (RI-MW-1 and RI-MW-2) were also analyzed for petroleum hydrocarbons due to their proximity to the former Area D-7 excavation where soil impacted by two former gasoline and diesel ASTs had been removed.

A comparison of the results to the PCLs presented in Table 12 shows that arsenic was detected at concentrations exceeding the PCL at two of the shorelines wells, MW-1 and MW-4, during both sampling events and only during the initial sampling event at well MW-5. The dissolved arsenic concentrations at these locations were only slightly above the PCL of 5 µg/L (ranging from 5.2 µg/L to 7.3 µg/L) except during the September 2009 event at well MW-4 when dissolved arsenic was detected at a concentration of 22.4 µg/L.

In addition to the shoreline wells in Area D, wells RI-MW-6 and RI-MW-7 were installed farther inland; MW-6 at the location of the former graving dock and MW-7 at the downgradient edge of the former AST petroleum hydrocarbon contamination area. A large amount of arsenic-contaminated soil extending well below the water table was removed at the location of the former graving dock during the Site interim action and RI-MW-6 was sampled to investigate whether any arsenic groundwater contamination remained. Arsenic groundwater quality was evaluated in the former AST area to assess whether remnant reduced groundwater conditions resulting from the former petroleum contamination in this area was causing elevated arsenic concentrations in groundwater. The concentrations of dissolved arsenic in the two samples collected from RI-MW-6 were 9.7 µg/L and 13.2 µg/L, which exceed the arsenic PCL, but are well below the arsenic concentration of 146 µg/L detected in the vicinity of RI-MW-6 prior to implementation of the interim action, indicating that the interim action effectively removed the source of arsenic groundwater contamination in this area. Arsenic concentrations for the two samples collected from RI-MW-7 were both 10.8 µg/L, which exceeds the arsenic groundwater PCL of

5 µg/L, but the arsenic concentration detected downgradient from MW-7 at the shoreline (RI-MW-1) only slightly exceeded the arsenic PCL and was significantly lower than the concentration of 10.3 µg/L detected near MW-1 prior to the interim action.

Dissolved copper was detected at concentrations exceeding the PCL at shoreline wells RI-MW-1 and -MW-3. Concentrations ranged from 2.6 µg/L to 5 µg/L compared to a PCL for copper of 3.1 µg/L, which are well below the maximum concentration of 56.8 µg/L detected in the vicinity of RI-MW-1 prior to implementation of the interim action. The copper concentration farther inland at RI-MW-6 ranged from 2.2 µg/L to 2.9 µg/L, which indicates that there is not an inland residual source of copper groundwater contamination.

Oil-range petroleum hydrocarbons were detected at a concentration (1,500 µg/L) exceeding the PCL (500 µg/L) during the June groundwater monitoring event in the sample collected from RI-MW-7, but was not detected in the September 2009 or the April and May 2010 sampling events. Based on these results, and the fact that oil-range petroleum hydrocarbons were not previously identified as a COC in this area, the single exceedances of the oil-range petroleum hydrocarbon PCL is considered anomalous and not representative of groundwater quality in this area. Gasoline-range, diesel-range, and lube oil-range petroleum hydrocarbons were not detected in any of the shoreline wells in Area D.

6.4.1.2 Area E

The purpose of the RI groundwater investigation in Area E was to evaluate post-interim action arsenic and diesel-, oil-, and gasoline-range petroleum hydrocarbon groundwater conditions in interim action areas E-3 and E-4. Three monitoring wells (RI-MW-8, RI-MW-9, and RI-MW-10) and two temporary groundwater sampling borings (GW-1 and GW-2) were located near or within Areas E-3 and E-4, and were sampled for dissolved arsenic and petroleum hydrocarbons in the diesel-, oil- and gasoline-ranges. The groundwater analytical results, summarized in Table 12 and shown on Figure 17, show that concentrations of petroleum hydrocarbons were below the reporting limits in all eight samples collected from Area E. Arsenic was detected at concentrations of 7.9 µg/L to 9.9 µg/L in samples collected from RI-MW-9 during the June and September monitoring events, and at a concentration of 10.9 µg/L in the sample collected from RI-MW-10 during the September monitoring event, exceeding the arsenic PCL of 5 µg/L. The elevated arsenic concentrations appear to result from remnant reducing conditions associated with the petroleum hydrocarbon contamination removed during the interim action and is anticipated to dissipate over time.

6.4.1.3 Area F

RI groundwater quality monitoring was conducted in Area F to characterize post-interim action arsenic groundwater quality in the area based on widely distributed elevated arsenic concentrations detected during previous investigations, and a more limited area of vinyl chloride groundwater contamination detected during these previous investigations. To address these objectives, eight groundwater monitoring wells (RI-MW-11 through RI-MW-18), and fifteen direct-push groundwater grab samples (GW-3 through GW-17) were located within Area F.

Four monitoring wells (RI-MW-11 through RI-MW-14) were installed along the shoreline across the estimated width of the arsenic-affected area, and the western two shoreline wells were also downgradient from the previous vinyl chloride exceedance location. Three monitoring wells (RI-MW-16 through RI-MW-18) were installed along the estimated centerline of the arsenic groundwater plume, starting at the shoreline and extending south to the estimated upgradient extent of the plume. Thirteen of the fifteen direct-push sampling locations (GW-3 through GW-6, GW-8, GW-9, and GW-11 through GW-17) were installed laterally outward from the estimated centerline of the arsenic plume across three transects. The groundwater samples from all of these locations were analyzed for dissolved arsenic.

The groundwater analytical results are summarized in Table 12 and shown on Figure 17. The highest concentrations of dissolved arsenic were located at shoreline wells RI-MW-11 and RI-MW-13, and nearby upland wells RI-MW-15 and RI-MW-16. The arsenic concentrations at these wells exceeded the PCL (5 µg/L) during each sampling event and ranged from 23.2 µg/L to 69.3 µg/L. At RI-MW-12, located on the shoreline between RI-MW-11 and RI-MW-13, the arsenic concentrations in June and April (6 µg/L and 9.8 µg/L) were slightly above the PCL, but the concentration detected in September (3.2 µg/L) was below the PCL. Arsenic did not exceed the PCL at any other sampling location in Area F. The RI results indicate that the arsenic-affected groundwater area does not extend as far inland (south) as it did prior to the interim action. Prior to the interim action, an arsenic concentration of 32.3 µg/L was detected within about 100 ft of 13th Street (P-16), but during the RI no exceedances of the arsenic PCL was detected within 300 ft of 13th Street, indicating a significant reduction in the size of the arsenic-affected area following the interim action.

To determine the extent of vinyl chloride contamination in Area F, samples were collected and analyzed for vinyl chloride at locations surrounding the original vinyl chloride exceedance (shown on Figure 17). The locations included three groundwater monitoring wells (RI-MW-11, RI-MW-12, and RI-MW-15), and five direct-push groundwater sampling locations (GW-4, and GW-7 through GW-10). Only wells RI-MW-11 and RI-MW-15 were identified for vinyl chloride analysis in the Work Plan, but RI-MW-12 was analyzed for vinyl chloride during the second monitoring event based on the results of the first monitoring event. As shown on Figure 17 and in Table 12, vinyl chloride was not detected in the three samples collected at locations east of the original exceedance, but was detected in all of the samples located west of the original exceedance. Three of the eleven samples (which includes a field duplicate result) collected during the June monitoring event had vinyl chloride concentrations in excess of the PCL of 2.4 µg/L (concentrations ranged from 4.5 µg/L to 12 µg/L). These samples were collected from shoreline well RI-MW-11 and inland well RI-MW-15, respectively, which are both located downgradient (north) of the original vinyl chloride exceedance. Vinyl chloride was not detected at concentrations exceeding the PCL in any wells during the September monitoring event.

Although not specified in the Work Plan, diesel-range and lube oil-range petroleum hydrocarbons were analyzed for at well RI-MW-16 during both monitoring events due to a slight sheen observed on the water initially purged from the well during the first sampling event. The sample was initially analyzed using Ecology's Hydrocarbon Identification (HCID) Method and lube oil was detected in the sample using this method. The sample was subsequently analyzed by Ecology's Method NWTPH-Dx. An acid silica gel cleanup was performed prior to analysis by the NWTPH-Dx method to remove naturally occurring organic material. Lube oil was not detected above the reporting limit in the sample using the NWTPH-Dx method during either of the monitoring events.

6.4.2 GROUNDWATER QUALITY AT POINT OF DISCHARGE TO MARINE SURFACE WATER EVALUATION

As shown on Figure 11, nine monitoring wells are located along the western and northern shoreline of the Site. Although a map view shows these wells located at the shoreline, the groundwater at these locations is a significant distance from the actual point of groundwater discharge to surface water during periods (low tides) when groundwater discharge to surface water is greatest. As a result, the groundwater quality at the existing shoreline well is not representative of the groundwater quality discharging to surface water. To better evaluate groundwater quality at the point of groundwater discharge to marine surface water, a supplemental groundwater investigation was conducted in 2010. The investigation consisted of installing an angled well, RI-MW-11-A along the northern shoreline of the Site near monitoring well RI-MW-11, which is the shoreline well location where the highest concentrations of arsenic (61.8 µg/L and 51.2 µg/L) were previously detected in groundwater and the location downgradient from the highest vinyl chloride detection.

The intent was to construct a well and collect groundwater samples approximately 4 ft inland from the point of groundwater discharge to surface water. Riprap along the slope of the shoreline would preclude installing a well any closer than 4 ft of the point of discharge. Unfortunately, the presence of shoreline riprap to a greater depth than anticipated near the top of the slope caused the borehole to collapse at the planned angle and the installed well is still more than 12 ft from the groundwater/surface water interface when groundwater samples are collected at a tidal stage below elevation 4 ft MLLW. As a result, the angled well intercepts the groundwater table about half the distance between the vertical well and the shoreline, as illustrated on Figure 12.

Groundwater samples collected from the angled well were analyzed for dissolved arsenic and vinyl chloride. Groundwater samples were also collected from shoreline wells RI-MW-1, RI-MW-3, RI-MW-4, RI-MW-11, RI-MW-12, and RI-MW-13 and analyzed as for dissolved arsenic and/or copper. Vinyl chloride was also analyzed for at well RI-MW-11. Field parameters pH, temperature, conductivity, DO, turbidity, and ORP were also measured at each sampling location during the 2010 groundwater monitoring evens. Ferrous iron was measured at each sampling location during the April 2010 groundwater monitoring event. The analytical results and field parameter measurements for the angled well groundwater samples and the shoreline well groundwater samples collected in 2010 are presented in Table 12. In addition to collecting the above groundwater samples, a surface water sample was collected from the 12th Street Yacht Basin just offshore of RI-MW-11. The sample was analyzed for dissolved arsenic to provide supplemental information for evaluating surface water quality in the vicinity of the elevated groundwater conditions observed in RI-MW-11.

As shown in Table 12, the concentration of arsenic at the angled well (RI-MW-11A) ranged from 5.5 to 9.0 µg/L for the two sampling events, compared to 48 to 51 µg/L for RI-MW-11. Based on these results, a concentration reduction factor between about 5 and 8 was achieved for dissolved arsenic between RI-MW-11 and RI-MW-11A. The concentration of vinyl chloride in RI-MW-11A ranged from 0.4 to 0.56 µg/L compared to 2.3 to 2.6 µg/L for Well MW-11, which represents a concentration reduction factor of about 5 between RI-MW-11 and RI-MW-11A. Dissolved arsenic was not detected in the surface water sample (SW-1) above the laboratory reporting limit of 2 µg/L.

The ORP measured at RI-MW-11A [-49 millivolts (mv) to -64 mv] was more than twice as high as the ORP measured at RI-MW-11 (-123 mv to -143 mv). The DO concentrations measured at RI-MW-11A [0.25 to7.06 milligrams per liter (mg/L)] were about 3 to more than 10 times higher than the DO concentrations measured in RI-MW-11 (0.02 to 0.33 mg/L). Based on the ORP and DO results, it appears that groundwater in RI-MW-11A is significantly more oxygenated than in RI-MW-11, likely the result of intermixing of groundwater with more highly oxygenated surface water and the infusion of atmospheric oxygen into the vadose zone near the shoreline due to “tidal pumping”; tidal pumping is the cyclic displacement and replenishment of vadose zone vapor due to tidally induced groundwater fluctuations. Both ORP and DO in the surface water sample (see Table 12) are significantly greater than the concentrations measured in RI-MW-11A, indicating that significant additional mixing and oxygenation occurs in groundwater between RI-MW-11A and the groundwater/surface water interface.

The vinyl chloride concentrations are consistent between sampling events for both wells, and appear to be unaffected by ORP and DO concentrations, indicating that dispersion is the primary mechanism causing the reduction in vinyl chloride concentration between RI-MW-11 and RI-MW-11A. Conversely, dissolved arsenic concentrations in RI-MW-11A are more variable, and higher dissolved arsenic concentrations in RI-MW-11A appear to be associated with lower ORP and DO concentrations. This relationship between dissolved arsenic concentrations and ORP/DO is consistent with geochemical changes that result in the conversion of arsenite ($As+^3$) to less soluble arsenate ($As+^5$) through oxidation in groundwater closer to the surface water interface.

6.5 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination at the Site has been defined based on the results of chemical testing of soil, groundwater, and sediment samples. The Site is divided into upland and the marine areas for discussion of the nature and extent of contamination below.

6.5.1 UPLAND AREA

The extent of contamination in the upland portion of the Site consists of soil in the northwest portion of the Site and groundwater in the northern and western portions of the Site. The extent of contamination for each media is described in more detail below.

6.5.1.1 Soil

The extent of soil contamination presented is based on soil samples collected prior to the RI and that are representative of soil that remains at the Site following completion of the interim action. The locations for samples representing soil remaining are shown on Figure 18 and on Figure G-1 of Appendix G. The analytical results for soil remaining after implementation of the interim action are presented in tabular format in Appendix G. The PCLs discussed in Section 5.3 are included in Tables G-1 through G-5 for comparison to the detected concentrations of contaminants in soil remaining. As shown in Tables G-1 through G-5, the extent of soil contamination at the Site is very limited. Only arsenic and copper have been detected in soil at concentrations exceeding the PCLs. The locations of the soil PCL exceedances shown on Figure 18.

Due to slope stability concerns associated with the cleanup in Area D-3, arsenic is present in soil remaining at concentrations exceeding the PCL at two locations in the former ACC North Yard (D3-b1 and D3-b2 shown on Figure 18). However, the concentrations associated with the arsenic exceedances, 24 mg/kg and 29 mg/kg, are only slightly greater than the PCL of 20 mg/kg. A statistical evaluation of the arsenic results for soil remaining in the area of the two arsenic exceedances (Appendix H) indicates that soil meets the arsenic PCL based on the MTCA regulations governing evaluation of soil compliance monitoring data [WAC 173-340-740(7)]. As a result, arsenic is not considered a COC for Site soil.

Copper is present in soil remaining at concentrations exceeding the copper PCL based on the protection of groundwater (36 mg/kg), as shown on Figure 18. Soil samples collected during the interim action indicated that some of these exceedances may be associated with naturally occurring copper in the ballast rock for the former crane-rail located in this area. Several minor copper exceedances (a total of four) occurred outside of the ballast rock area and ranged from 37.9 to 41.3 mg/kg. This represents less than 10 percent of the final compliance monitoring samples, and no result was greater than two times the PCL. The copper PCL protective of groundwater is only applicable to areas where copper contamination is present in Site groundwater, which is limited to the northwest Site shoreline where the copper groundwater PCL is slightly exceeded. The copper soil PCL applicable to areas where copper groundwater concentrations do not exceed the PCL (the majority of the Site) is 3,000 mg/kg based on direct human contact and is not exceeded at the Site; in fact, the highest remaining copper soil concentration at the Site (388 mg/kg detected in sample F1d.1-B11), is almost an order of magnitude below the PCL based on direct contact.

The copper preliminary soil PCL for the protection of marine surface water (36 mg/kg), is based on natural background soil concentrations for Washington state. This concentration is so low that it is commonly exceeded where no known source of copper contamination is present and often at locations where copper groundwater contamination is not present. These conditions are exhibited at the Site in that copper soil concentrations exceed the PCL based on the protection of marine surface water at numerous locations throughout the Site where the copper groundwater PCL is not exceeded. In the northwest portion of the Site where the copper groundwater PCL is slightly exceeded, ballast rock associated with the crane-rail contains elevated concentrations of naturally occurring copper. However, because copper groundwater concentrations in the northwest shoreline area only slightly exceed the groundwater PCL, and the copper soil concentrations in this area are similar to concentrations elsewhere on the Site where the copper groundwater PCL is not exceeded, it does not appear that the residual soil copper concentrations in the northwest shoreline area, including the ballast rock, are the source of the slightly elevated copper groundwater concentrations in this area. This is further supported by the significant reduction in copper groundwater concentrations in the RI-MW-1 vicinity subsequent to the interim action, where the copper groundwater concentration has declined from 56.8 µg/L to 5 µg/L. Based on these considerations, it appears that the source of copper groundwater contamination was removed during the interim action, even though a specific copper source was not identified, and the slightly elevated copper groundwater concentrations are residual groundwater contamination that will dissipate with time. As a result, copper is not considered a COC for Site soil.

Based on the foregoing evaluation, it is concluded that Site soil contamination was fully remediated during the interim action and no soil COCs remain for the Site. As a result, soil is not considered a media of concern for the Site and will not be addressed in the FS.

6.5.1.2 Groundwater

The nature and extent of groundwater contamination is evaluated on a Site-wide basis and also at the point of groundwater discharge to Port Gardner and the 12th Street Yacht Basin. Only analytical results for samples collected during the RI (post-interim action) were used in the evaluation because these are representative of current Site conditions.

Site Wide

As discussed in Section 6.3, only dissolved arsenic, dissolved copper, oil-range petroleum hydrocarbons, and vinyl chloride were detected at concentrations exceeding the PCL in groundwater during the RI. The analytical results that are the basis for delineating the extent of the dissolved arsenic and copper groundwater contamination are presented on Figure 17. The extent of oil-range petroleum hydrocarbons is not presented on Figure 17 because only one sample exceeded the oil-range petroleum hydrocarbon groundwater PCL, so it is not considered a groundwater COC, as discussed in Section 6.3.1.1. The extent of the vinyl chloride groundwater PCL exceedances is presented on Figure 17. As shown on Figure 17 exceedances of the arsenic PCL in groundwater are limited to the northern and western areas of the Site, with the highest concentration in the north-central portion of the Site (RI-MW-15 and RI-MW-16). Copper exceedances are more limited than arsenic and occur at only two locations (RI-MW-1 and RI-MW-3,) near the western shoreline. As shown on Figure 17, exceedances of the vinyl chloride PCL in groundwater are limited to a localized area in the north-central portion of the Site in the vicinity of wells RI-MW-11 and RI-MW-15.

The extent and magnitude of the copper groundwater exceedances are relatively small. The maximum copper concentration detected in groundwater at the Site was 5 µg/L compared to the PCL of 3.1 µg/L. As previously discussed in Section 6.3.1.1, the maximum RI groundwater copper concentration is significantly lower than the concentration of 48 µg/L detected prior to the interim action and appears to be a remnant of pre-interim action groundwater quality impacts that is anticipated to dissipate over time.

Arsenic groundwater concentrations in Area D exhibits similar characteristics to copper in that the current arsenic concentrations are only slightly above the groundwater PCL, concentrations of arsenic in groundwater have decreased significantly since completion of the interim action, and current concentrations are anticipated to continue decreasing as qroundwater quality continues to adjust to post-interim action equilibrium

Lube oil-range petroleum hydrocarbon concentrations exceeded the groundwater PCL once during the initial RI sampling event at a single location, well RI-MW-7, but was not detected at this location in the subsequent three sampling events (June 2009, April 2010, and May 2010).

Point of Groundwater Discharge to Port Gardner and 12th Street Yacht Basin

To evaluate the extent of contamination in groundwater at the Site, groundwater quality at the point of groundwater discharge to Port Gardner and 12th Street Yacht Basin must be evaluated. As previously mentioned in Section 6.3.2, groundwater at the shoreline wells are a significant distance from the actual point of discharge to surface water during periods (low tides) when groundwater discharge to surface water is greatest. To evaluate the groundwater quality at the point of discharge to marine surface water, the dissolved arsenic and vinyl chloride concentrations in the angled well (MW-11A) were compared to the concentrations measured at RI-MW-11 to determine the percent reduction in concentration achieved by monitoring groundwater closer to the groundwater/surface water interface. This percent reduction in concentration was then applied to groundwater data for existing vertical shoreline wells to calculate the concentration of relevant constituents at the point of groundwater discharge to surface water. The Port developed this approach to evaluating compliance with PCLs at the point of groundwater discharge to marine surface water in cooperation with Ecology. Ecology and the Port agreed that the use of an angled well for this evaluation would provide more representative groundwater data in order to make compliance determinations for the groundwater to surface water pathway (Kallus 2010).

As shown in Table 12, the concentration of vinyl chloride in the angled well is significantly below the groundwater PCL. As a result, it is directly demonstrated through groundwater quality monitoring that the vinyl chloride PCL is achieved at the proposed conditional point of compliance established at the groundwater/surface water interface. The minimum observed concentration reduction factor of 4.6 observed between RI-MW-11 and RI-MW-11A for both arsenic and vinyl chloride also indicates that the groundwater PCLs for all constituents, including dissolved arsenic and dissolved copper, are being achieved at the point of groundwater discharge to marine surface water near the shoreline wells that exhibited PCL exceedances in the northwest corner of the Site.

Although the groundwater PCL for dissolved arsenic was not achieved in RI-MW-11A, it approached to within a factor of 2. As discussed in Section 6.2.3, the point of discharge for groundwater to surface water remains about 12 ft north of the angled well. Both the amount of dispersion and the degree of oxygenation will increase significantly between RI-MW-11A and the shoreline. Based on the field parameters measured during this investigation, DO will increase by more than a factor of 10 (0.97 to 11.48 mg/L) and ORP will increase by a factor of 3 (-49 to 98 mv) between RI-MW-11A and the surface water interface. The impact of increased ORP is likely to have at least as significant, if not greater, impact on dissolved arsenic concentrations at the surface water interface than dispersion due to the geochemical conversion of arsenite to arsenate.

Based on RI-MW-11A being located only about half the distance between RI-MW-11 and the shoreline, and the minimum 5.3 concentration reduction factor exhibited in dissolved arsenic concentrations between RI-MW-11 and RI-MW-11A, it is reasonable and conservative to assume that a concentration reduction factor of 5 will be achieved between RI-MW-11A and the shoreline. Based on the maximum dissolved arsenic concentration of 9 µg/L detected in MW-11A and a concentration reduction factor of 5, the estimated maximum arsenic concentration at the surface water interface is 1.8 µg/L, which is well below the groundwater PCL of 5 µg/L. Other considerations that support the conclusion that the dissolved arsenic groundwater PCL is being achieved at the point of groundwater discharge to surface water, and that human health and the environment are adequately protected, include:

- Dissolved arsenic is below laboratory reporting limits in surface water measured directly adjacent to the RI-MW-11 area.
- Dissolved arsenic concentrations in groundwater are not impacting sediment near the Site. Dissolved arsenic results for the 2009 sediment sampling event ranged from 6 to 30 mg/kg, which are significantly below the SMS SQS (57 mg/kg) and CSL of (93 mg/kg) for dissolved arsenic.
- Applicable water quality criteria are based on chronic exposure, whereas, at a tidally influenced shoreline such as that present at the Site, groundwater discharge to surface water only occurs at lower tidal elevations. As a result, exposure is not continuous and instead is likely to be limited to about 50 percent of the time. As a result, criteria based on chronic exposure over-estimates the risk posed by Site groundwater to surface water receptors by about a factor of 2.
- Fish tissue testing conducted by SAIC for Ecology in Port Gardner Bay indicates that concentrations of dissolved arsenic in Site groundwater are not impacting fish and shellfish in the Site vicinity. Dissolved arsenic concentrations in English sole tissue samples (whole body), Dungeness crab hepatopancreas samples, and Dungeness Crab meat samples collected in areas along the western shore of the Site were lower than, or similar to, the concentrations for samples collected at locations more than 1.5 miles west and south of the Site (SAIC 2009). The arsenic tissue concentration for English sole was lower in the sample collected near the Site than in the other two samples collected in Port Gardner Bay.

6.5.2 MARINE SEDIMENT

Marine Site sediment did not exceed SMS cleanup standards except for a single exceedance of the fluoranthene SQS criteria. The exceedance occurred at sampling location RI-SED-18 located at the eastern edge of the North Marina as shown on Figure 19. Results for sample RI-SED-17, which is located west of RI-SED-18, and a sediment sample located east of RI-SED-18 that was collected as part of the Everett Shipyard RI (shown on Figure 19), define the approximate extent of fluoranthene in sediment exceeding the SQS at the Site is very limited.

7.0 CONCEPTUAL SITE MODEL

The conceptual Site model (CSM) was developed based on historic land use, environmental data, and the contaminant fate and transport processes that control the migration of contaminants in the natural environment. A schematic representation of the Site CSM is presented on Figure 20, and the following sections discuss the factors affecting the CSM, including contaminants and sources present at the Site, the nature and extent of contamination and exposure pathways and receptors.

7.1 CONTAMINANTS AND SOURCES

Only limited contaminants remain at the Site following interim action, and no definable sources remain. The only hazardous substances and affected media that remain at the Site in excess of the PCLs are arsenic, copper, and vinyl chloride in groundwater. The only hazardous substance found in sediment at the Site in excess of the SQS cleanup standard is fluoranthene. As described in Section 6.4.1.1, no hazardous substances exceed the soil PCLs.

As described in Section 6.4.1.2, the arsenic and copper PCL exceedances detected in groundwater appear to primarily be remnants of pre-interim action sources that were removed during the interim action, although arsenic groundwater concentrations in the north-central portion of the Site may also be affected by reduced groundwater conditions associated with wood debris present in Site hydraulic fill. With the removal of the primary source of groundwater contamination, the arsenic and copper concentrations are expected to dissipate over time.

The concentrations of vinyl chloride present in groundwater (12 µg/L and 2.4 µg/L) are well below a concentration that would suggest the presence of an ongoing contaminant source. Vinyl chloride is primarily a breakdown product of other chlorinated compounds and the absence of any of its parent compounds, such as trichloroethene, also support the conclusion that an ongoing source of vinyl chloride is not present. As a result, vinyl chloride concentrations are also anticipated to dissipate over time.

As described in Section 6.5.2, the SQS cleanup level for fluoranthene was exceeded at a single location. The source of this exceedance is most likely the wooden 14th Street bulkhead formerly located immediately north of the location of the exceedance. This former bulkhead was constructed using creosote-treated pilings and timbers; fluoranthene is a common chemical associated with creosote. The bulkhead was replaced in 2006 with an epoxy-coated steel sheetpile structure, eliminating the bulkhead as a potential future source of fluoranthene contamination to sediment. Additionally, all upland structures and associated businesses in the vicinity of the fluoranthene exceedance have been removed and future development in this area will include stormwater treatment prior to discharge, which minimizes the potential for upland sources to impact sediment quality in the future.

7.2 POTENTIAL RECEPTORS AND EXPOSURE PATHWAYS.

The impacted media at the Site are groundwater and sediment, which limits the potential receptors and exposure pathways. Because Site groundwater is not considered a potential source of drinking water, the only potential for groundwater to impact human health and the environment is future migration of contaminants in groundwater to surface water. However, as discussed previously in Section 7.1, groundwater concentrations for arsenic, copper, and vinyl chloride are expected to decrease over time due to the lack of an ongoing source and, therefore, impact to surface water is not anticipated. Potential receptors for the groundwater to surface water migration pathway include: 1) benthic organisms present in sediment affected by Site groundwater; 2) higher trophic level organisms in the food chain (e.g., foraging fish, aquatic birds, marine mammals, etc.) who prey on benthic organisms; and 3) humans who may ingest fish and benthic organisms.

The potential sediment impact to human health and the environment is: 1) exposure of benthic organisms to the contaminated sediment, 2) exposure of higher trophic level organisms by ingestion of contaminated benthic organisms, and 3) exposure of humans by direct contact with contaminated sediment or by ingestion of contaminated benthic organisms.

8.0 DISCUSSION OF CLEANUP STANDARDS

This section develops proposed groundwater cleanup standards for the Site. The proposed groundwater cleanup standards are based on the PCLs developed in Section 5.0, but are only developed for those media and those hazardous substances that exceeded the PCLs in data collected for the RI. As a result, proposed cleanup standards are only developed for copper, arsenic, and vinyl chloride in groundwater. Cleanup standards for sediment are also presented in this section.

8.1 CLEANUP STANDARDS

This section discusses Site cleanup standards for chemical constituents that were detected in affected Site media at concentrations above the cleanup levels presented in Section 5.0. These affected media include groundwater and sediment. Cleanup standards consist of: 1) cleanup levels defined by regulatory criteria that are adequately protective of human health and the environment, and 2) the point of compliance at which the cleanup levels must be met. The cleanup standards developed in this section are used as the basis for developing media-specific remedial action objectives (RAOs) for the cleanup action in Section 9.3.

8.1.1 GROUNDWATER

This section develops proposed cleanup standards for groundwater at the Site. Final cleanup standards for groundwater will be selected by Ecology and presented in the Site CAP.

8.1.1.1 Development of Proposed Groundwater Cleanup Levels

The cleanup levels proposed for groundwater and presented in this section will be used to develop, and evaluate the effectiveness of, cleanup action alternatives for the FS.

Cleanup levels for groundwater developed under MTCA represent the concentration of COCs that are protective of human health and the environment for identified potential exposure pathways, based on the highest beneficial use (HBU) and the reasonable maximum exposure (RME) for each affected media. The process for developing cleanup levels consists of identifying the HBU and RME for affected media, determining those that represent the greatest risk to human health or the environment, and determining the cleanup levels for the COC in affected media.

As described in Section 5.1, the highest beneficial use (HBU) for groundwater is considered discharge to surface water (Port Gardner and the 12th Street Yacht Basin). Based on a groundwater HBU of discharge to surface water, the RME for groundwater is the more conservative of: 1) uptake by aquatic organisms based on aquatic water quality criteria, and 2) ingestion of affected aquatic organisms by humans. As a result, federal [National Toxics Rule (40 CFR 131.36) and National Recommended Water

Quality Criteria (EPA 2006)] and state (MTCA Method B formula values and Chapter 173-201A) surface water criteria based on human consumption of fish, and on federal [National Recommended Water Quality Criteria (EPA 2006)] and state (MTCA Method B formula values and Chapter 173-201A), surface water quality criteria protective of aquatic life were evaluated as potential cleanup levels for groundwater. The most stringent of the applicable criteria, adjusted to the PQL or background concentrations, if appropriate, is identified on a preliminary basis as the Site groundwater cleanup value, as summarized in Table 13.

As discussed in Section 6.4.1, at least one sample exceeded the groundwater PCLs for dissolved arsenic, dissolved copper, vinyl chloride, and lube oil. The lube oil exceedance occurred during the initial RI groundwater monitoring event just following the interim action. Lube oil was not detected for three consecutive monitoring events following the initial event; therefore, lube oil is not carried forward as a COC for Site groundwater. The remaining constituents that exceeded the groundwater PCLs are carried forward as COCs for Site groundwater, as summarized in Table 13.

8.1.2 GROUNDWATER POINTS OF COMPLIANCE

Under the MTCA, the point of compliance is the point or location on the Site where the cleanup levels must be attained. The point(s) of compliance for affected media will be selected by Ecology and presented in the Site CAP. However, it is necessary to identify proposed point(s) of compliance to develop, and evaluate the effectiveness of, cleanup action alternatives in the FS. As a result, the proposed points of compliance for groundwater is identified in this section.

The point of compliance for groundwater is typically throughout the Site when groundwater is considered a potential source of potable drinking water. If groundwater discharge to surface water represents the highest beneficial use, MTCA provides for a conditional point of compliance at the point of discharge of groundwater to the surface water receiving body. It is anticipated that the downgradient edge of the Site, as close as technically possible to the point of entry of groundwater to Port Gardner and the 12st Marina, will be the conditional point of compliance for Site groundwater. The achievement of groundwater cleanup levels will be measured at the conditional point of compliance using a network of groundwater monitoring wells located at the downgradient edge of the Site, including the angled well located along the northern shoreline. The compliance monitoring is discussed further in the FS portion of this document. The compliance monitoring locations will be determined during development of the CAP.

8.1.3 SEDIMENT CLEANUP STANDARDS

Sediment cleanup standards were developed according to SMS requirements. As mentioned in Section 5.0, two SMS criteria are promulgated by Ecology as follows:

- The marine SQS (WAC 173-204-320), the concentration below which effects to biological resources and human health are unlikely.
- The marine CSL (WAC 173-204-520), the concentration above which more than minor adverse biological effects may be expected.

The SQS and CSL values have been developed for a suite of analytes that includes metals, polycyclic aromatic hydrocarbons (PAHs) and other SVOCs, PCBs, and ionizable organic compounds. The SQS are the most stringent SMS numeric criteria and represent the goal for sediment cleanups. Because only fluoranthene has been detected in sediment above the SQS, only fluoranthene is carried forward as a COC for Site sediment, as summarized in Table 14.

The point of compliance will be the predominantly biologically active zone within the area of fluoranthene impacted sediment, as shown on Figure 21. The compliance monitoring is discussed further in the FS portion of this document.

9.0 FEASIBILITY STUDY

The purpose of the FS is to develop an appropriate final cleanup action for the Site based on the evaluation of a range of potential cleanup alternatives identified as applicable and technically feasible approaches to achieve the cleanup standards identified in Section 8.0 (Development of Proposed Cleanup Standards). This FS is intended to comply with the requirements under the MTCA for performance of a FS and selection of a cleanup alternative, as specified at WAC 173-340-350 and -360.

Because soil contamination at the Site was remediated through an interim action conducted in 2007/2008 (see Section 3.2), the nature and extent of residual Site contamination is very limited and the number of practicable cleanup action alternatives applicable to the Site is limited. The MTCA regulations allow Ecology to determine that a detailed analysis of certain cleanup alternatives is unnecessary if the alternatives clearly do not meet the minimum requirements specified in WAC 173-340-360, including alternatives for which costs are clearly disproportionate under WAC 173-340-360(3)(e) [WAC 173-340-350(8)(b)(i)]. As a result, this FS has been streamlined by eliminating impracticable alternatives during the screening process, and conducting a detailed evaluation of the one remaining practicable alternative that focuses on demonstrating that it achieves the threshold requirements and other requirements specified in WAC 173-340-360.

The FS is organized into the following sections: Applicable or Relevant and Appropriate Requirements (Section 9.1); Relationship to Previous Interim Action (Section 9.2); Development of Cleanup Action Objectives (Section 9.3); Residual Contamination (Section 9.4); Screening of Potential Cleanup Alternatives (Section 9.5); Description of Cleanup Alternative (Section 9.6); Evaluation Criteria (Section 9.7); Analysis of Alternative (Section 9.8); and Preferred Cleanup Alternative (Section 9.9).

9.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

In accordance with the MTCA, all cleanup actions must comply with applicable state and federal laws (WAC 173-340-710(1). The 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). The starting point for ARARs is the MTCA cleanup levels and regulations that address implementation of a cleanup under MTCA (Chapter 173.105D RCW; Chapter 173-340 WAC). Other potential ARARs include the following:

- Washington State SMS (Chapter 173-204 WAC)
- State Water Pollution Control Act (Chapter 90.48 RCW).
- EPA National Recommended Water Quality Criteria – Section 304 Clean Water Act

- EPA Water Quality Standards (National Toxics Rule) – 40 CFR 131
- Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 RCW).
- Washington Pollution Control Act and the implementing regulations, Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC)
- Washington Hazardous Waste Management Act and the implementing regulations, Dangerous Waste Regulations (Chapter 173-303 WAC), to the extent that any dangerous wastes are discovered or generated during the cleanup action
- The federal Clean Water Act, with respect to in-water work associated with dredging or sediment capping
- Washington's Shoreline Management Act, with respect to construction activities conducted near the shoreline during the cleanup action.
- Endangered Species Act, due to the listing of Puget Sound chinook, Coastal/Puget Sound bull trout, and certain species of rock fish.
- Washington Clean Air Act (Chapter 70.94 WAC)
- Occupational Safety and Health Act (OSHA), 29 CFR Subpart 1910.120
- Washington Industrial Safety and Health Act (WISHA).

9.2 RELATIONSHIP TO PREVIOUS INTERIM ACTION ACTIVITIES

As discussed in Section 3.2, an extensive interim action was conducted at the Site in 2007 through early 2008 to remediate contaminated soil and groundwater at the Site. The interim action was conducted under the VCP with the intent of fully remediating contaminated soil in advance of redeveloping the Site as part of the North Marina Redevelopment Project. Although soil was the focus of the interim action, groundwater was remediated in areas of petroleum hydrocarbon contamination through saturated soil agitation [to release light nonaqueous phase liquid (LNAPL)], LNAPL recovery, and groundwater extraction from the excavations.

The plan for the interim action was presented in two independent action cleanup plans (Landau Associates 2006a, 2006b) that were reviewed and approved by Ecology under its VCP. Both plans were fully implemented and achieved the goals of the interim actions. A total of about 40,600 tons (about 27,000 yd^3) of contaminated soil were removed from the Site during the interim action, and residual soil contamination at the Site following the interim action was limited to minor arsenic and copper exceedances of the proposed cleanup levels developed in Section 5.2. With the exception of these limited arsenic and copper exceedances, discussed in Section 6.4, contaminated soil was remediated to cleanup levels for unrestricted use throughout the Site, including protection of groundwater, consistent with the proposed cleanup levels developed for the Site in this report.

Following completion of the interim action, the Port entered into the Agreed Order with Ecology for conducting the Site RI/FS and preparing the draft CAP. At the time Ecology and the Port entered into the Agreed Order, both parties recognized that, although only limited sediment quality characterization had occurred prior to the RI, contaminated Site soil had largely been remediated during the interim action and that only localized upland contamination likely remained. As a result, it was not anticipated that the RI would identify significant upland Site contamination or that significant additional upland remedial action would be required, although additional characterization was needed to confirm this expectation.

The interim action removed almost all of the contaminant mass from the Site including the potential sources of residual groundwater contamination. The degree to which an alternative permanently reduces the toxicity, mobility, or volume of hazardous substances is the basis for assessing the permanence of an alternative [WAC 173-340-360(3)(f)(ii)]. Because almost all of the contaminant mass was removed from the Site in advance of the RI, the practicability of cleanup action alternatives for final Site cleanup cannot be reasonably assessed without consideration of the impact of the interim action on the nature and extent of contamination. Further, the removal of almost all contaminant mass from the Site in advance of the RI/FS largely eliminates most remedial technologies typically used to develop a broad range of potential cleanup alternatives for evaluation in the FS, leaving primarily costly technologies and resulting alternatives that would remove little additional contaminant mass and that would be determined impracticable for similar sites with a more typical distribution of contaminant mass and identifiable source areas. As a result, the screening of potential cleanup action alternatives in Section 9.5 will consider the amount of contaminant mass removed during the interim action and the lack of remaining source areas when evaluating the practicability of the potential cleanup action alternatives.

9.3 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

The RAOs identify the goals that must be achieved by a cleanup alternative in order to achieve cleanup standards and provide adequate protection of human health and environment. The RAOs must address all affected media and a cleanup alternative must achieve all RAOs to be considered a viable cleanup action. The characterization of Site conditions presented in Section 3.0 (RI Results), the cleanup standards developed in Section 4.0 (Discussion of Cleanup Standards), and review of ARARs have culminated in the development of RAOs for the Site.

RAOs can be either action-specific or media-specific. Action-specific RAOs are based on actions required for environmental protection that are not intended to achieve a specific chemical criterion. Media-specific RAOs are based on the proposed cleanup levels developed in Section 8.0 (Development of Proposed Cleanup Standards). The action-specific and media-specific RAOs identified for the Site are as follows:

- RAO-1: Prevent human ingestion of Site groundwater containing COCs above the proposed groundwater cleanup levels based on human consumption. RAO-1 is applicable across the entire Site.

- RAO-2: Prevent the exposure of marine aquatic organisms to hazardous substances at concentrations above the groundwater cleanup levels based on protection of marine surface water. RAO-2 is applicable at the downgradient point of compliance, which is generally defined as the shoreline to Port Gardner Bay, and applies to arsenic, copper, and vinyl chloride.
- RAO-3: Prevent human exposure to marine sediment containing COCs above the SQS by direct contact. RAO-3 is applicable to the southeast portion of the Site that lies within the North Marina.
- RAO-4: Prevent the exposure of marine aquatic organisms to hazardous substances at concentrations above the SQS. RAO-4 is applicable to the southeast portion of the Site that lies within the North Marina.

The extent to which these RAOs are met will be determined in the following sections by applying the specific evaluation criteria identified in the MTCA regulations.

9.4 RESIDUAL CONTAMINATION

Residual contamination that needs to be addressed by the final Site cleanup action consists of:

- Arsenic groundwater contamination in the northern and western areas of the Site, with the highest concentrations in the north-central portion of the Site
- Copper groundwater contamination at the western shoreline of the Site
- Vinyl chloride groundwater contamination in the north-central portion of the Site
- Fluoranthene contamination in sediment in the southeastern portion of the Site.

As described in Section 7.1, the known sources associated with the residual sediment contamination were removed during redevelopment and replacement of the 14th Street bulkhead, and the known sources for the residual groundwater contamination conditions were removed during the interim action. However, reduced groundwater conditions resulting from high organic content in the dredge fill present at the Site appears to be mobilizing naturally occurring arsenic from soil to groundwater, as discussed in Section 6.4. The elevated arsenic and groundwater concentrations may also be, at least in part, residual groundwater contamination associated with soil contamination sources that were removed during the interim action.

The copper groundwater contamination is localized along the west shoreline and is only slightly above the proposed groundwater cleanup level, which is based on protection of aquatic organisms. The copper groundwater cleanup level (3.1 µg/L) is commonly exceeded in urban areas of Washington state, even when no known source of copper contamination is present. Similarly, the proposed copper soil cleanup level based on the protection of marine surface water (36 mg/kg), which is based on natural background concentrations for Washington state, is commonly exceeded where no known source of copper contamination is present and often at locations where copper groundwater contamination is not present. These conditions are exhibited at the Site in that copper soil concentrations exceed the proposed soil cleanup level based on the protection of marine surface water at numerous locations throughout the Site where the copper proposed groundwater cleanup level is not exceeded, as discussed in Section 6.4.1.1. The copper proposed soil cleanup level applicable to areas where copper groundwater concentrations do not exceed the proposed cleanup level (the majority of the Site) is 3,000 mg/kg, based on direct human contact, and is not exceeded at the Site; in fact, the highest remaining copper soil concentration at the Site (388 mg/kg) is almost an order of magnitude below the proposed cleanup level.

Although the highest concentration of vinyl chloride (12 µg/L) is above the proposed groundwater cleanup level of 2.4 µg/L, it is well below a concentration that would suggest the presence of an ongoing contaminant source. Vinyl chloride is primarily a breakdown product of other chlorinated compounds and the absence of any of its parent compounds, such as trichloroethene, also support the conclusion that an ongoing source of vinyl chloride is not present.

Based on the limited extent of residual soil contamination or other potential contaminant sources, there is little practical value to evaluating cleanup action alternatives that address soil. Although there is ballast rock that exceeds the copper soil cleanup level based on the protection of marine surface water in the vicinity of the minor copper groundwater exceedances, similar copper soil concentrations are present elsewhere throughout the Site where groundwater copper concentrations do not exceed the proposed cleanup level, indicating that the minor copper groundwater cleanup level exceedances are not likely associated with the ballast rock. It should also be noted that the highest copper groundwater concentration detected in the west shoreline area during the RI (5 µg/L), at MW-1 and MW-3, is significantly lower than the highest concentration detected prior to the interim action (46.8 µg/L) at P-21 in the vicinity of MW-1. Thus, it appears that the source of the copper groundwater contamination in this area was removed during the interim action, even though copper was not a targeted COC for the interim action.

9.5 SCREENING OF CLEANUP ACTION ALTERNATIVES

Based on the lack of identifiable source material that could potentially be targeted for removal as part of a final cleanup action alternative, the only feasible approach to actively remediating Site groundwater contamination would be containment by a shoreline barrier wall in conjunction with a long-term groundwater extraction and treatment system. Other potential technologies that provide containment without groundwater extraction and treatment, such as permeable reactive barrier (PRB) walls, would not likely be effective at the Site because of gradient reversals resulting from tidal fluctuations and potential interferences in PRB performance caused by saline water in the near-shore reaction zone.

Arsenic is difficult and expensive to treat due to the low concentrations required to achieve the proposed arsenic groundwater cleanup level, and a barrier wall would be required along the shoreline to minimize the amount of surface water extracted to maintain containment. Because the apparent cause of residual arsenic groundwater contamination (reduced groundwater conditions) would not be removed through groundwater extraction, containment would be required in perpetuity. Based on the lack of an identifiable source of arsenic groundwater contamination, the high cost of constructing and operating an effective groundwater containment, extraction/treatment system at the Site, and because it can be demonstrated that cleanup standards can be achieved at a conditional point of compliance at the shoreline, a containment remedy clearly would be impracticable for this portion of the Site, particularly when considered in the context of the extensive amount of contaminant mass removed from the Site during the interim action.

The other groundwater contamination issue, vinyl chloride, exhibits low concentrations that indicate a limited and diffuse potential source area; the vinyl chloride concentrations do not exceed the cleanup standards at the proposed conditional point of compliance. This condition represents a *de minimus* condition with no practicable opportunity for source removal or mass reduction given that the potential remedies would be containment technologies similar to those described above for arsenic or air sparging/soil vapor extraction (SVE) or bioremediation treatment technologies that would be similarly impracticable due to the lack of a substantive and defined source area.

Based on the lack of remaining contaminant mass and definable source areas, the high cost of actively remediating the limited remaining groundwater contamination, and the demonstrated ability to achieve groundwater cleanup standards at a conditional point of compliance at the shoreline, cleanup action alternatives that rely on active remediation are considered impracticable for the Site. As a result, a single cleanup action alternative consisting of long-term compliance monitoring and institutional controls will be evaluated for the Site (the Cleanup Alternative). The following sections develop and evaluate this alternative.

Based on the limited area of sediment contamination (Figure 21), the low level of the exceedance (less than 50 percent greater than the SQS), and the apparent removal of the potential sources of the contamination, monitored natural recovery (MNR) is considered the only practicable alternative for sediment cleanup. As discussed in Section 7.1, the single exceedances of the fluoranthene SQS likely results from the presence of creosote-treated wood commonly used for historic marine structures. The most probable source of fluoranthene is the former 14th Street bulkhead located immediately north of the SQS exceedances, which was constructed using creosote-treated pilings and timbers. However, the bulkhead was replaced in 2006 with an epoxy-coated steel sheetpile structure, eliminating the bulkhead as a potential future source of fluoranthene contamination to sediment. Additionally, all upland structures and associated businesses in the vicinity of the fluoranthene exceedance have been removed and future development in this area will include stormwater treatment prior to discharge, which minimizes the potential for upland sources to impact sediment quality in the future. Based on these considerations, dredging or other methods of active remediation are not considered necessary or practicable for cleanup of contaminated Site sediment.

9.6 DESCRIPTION OF THE CLEANUP ALTERNATIVE

This section describes the cleanup alternative and the degree to which it would be expected to meet the RAOs for the Site. Sufficient detail is provided for the alternative to provide the reader a conceptual understanding of the design intent and to provide an adequate basis for developing the cost estimate for the cleanup alternative.

As indicated in the previous section, the cleanup alternative would consist of long-term groundwater compliance monitoring and institutional controls to address upland contamination and MNR to address sediment contamination. Institutional controls would consist of deed restrictions to prevent the use of contaminated groundwater at the Site, and to specify how groundwater encountered during construction or other future Site activities would be managed. The institutional controls would be placed over the entire Site to prevent the use of groundwater for potable purposes, and over the areas of residual groundwater contamination shown on Figure 20 for other purposes (e.g., construction dewatering).

Long-term compliance monitoring would consist of monitoring groundwater quality from 8 existing monitoring wells along the shoreline and monitoring sediment at one location in the southeast corner of the Site, as shown on Figure 21. For cost estimating purposes, it was assumed that groundwater quality would be monitored quarterly for 1 year to demonstrate compliance with cleanup standards. Sediment quality would be monitored at a single location in the vicinity of RI monitoring station RI-SED-18 in the summer of 2012 (3 years following the collection of RI-SED-18) and no additional monitoring will be conducted if compliance with the fluoranthene SQS is achieved. Based on the anticipated schedule for, the fourth quarter of groundwater monitoring, the sediment monitoring event would be conducted concurrent with the fourth quarter groundwater monitoring event. Table 15 identifies the analytical parameters that will be monitored at each compliance monitoring location.

As described in Section 6.4.1, water quality data associated with the angled well evaluation indicate that a concentration reduction factor of at least 25 times occurs between vertical wells at the shoreline and the actual groundwater/surface water interface. As a result, a concentration reduction factor of 25 would be applied to the groundwater compliance monitoring data collected from vertical wells to evaluate whether groundwater cleanup standards are being achieved and maintained at the Site.

9.7 EVALUATION CRITERIA

MTCA requires that cleanup alternatives be compared to a number of criteria to evaluate the adequacy of each alternative in achieving the intent of the regulations, and as a basis for comparing the relative merits of the cleanup alternatives developed. Consistent with MTCA, the cleanup alternative was evaluated with respect to compliance with threshold requirements, permanence, and restoration timeframe as discussed in Sections 9.71 (Threshold Requirements) through 9.73 (Requirement for a Reasonable Restoration Timeframe). Public participation is also a requirement as discussed in Section 9.7.4. MTCA specifies preferences for remedial technologies that minimize the amount of untreated hazardous substances remaining at a site, which is discussed in Section 9.7.2 (Requirement for Permanent Solution to the Maximum Extent Practicable).

9.7.1 THRESHOLD REQUIREMENTS

As specified in WAC 173-340-360(2)(a), all cleanup actions are required to meet the following threshold requirements:

- Protection of human health and the environment
- Compliance with cleanup standards specified under MTCA
- Compliance with applicable state and federal laws
- Provisions for compliance monitoring.

It is assumed that compliance with MTCA and SMS cleanup standards will ensure protection of human health and the environment and that any cleanup action performed in accordance with the requirements of MTCA will be in compliance with applicable state and federal laws. Compliance monitoring is a component of the Cleanup Alternative.

9.7.2 REQUIREMENT FOR PERMANENT SOLUTION TO THE MAXIMUM EXTENT PRACTICABLE

WAC 173-340-200 defines a permanent solution as one in which cleanup standards can be met without further action being required at the original Site or any other site involved with the cleanup action, other than the approved disposal site of any residue from the treatment of hazardous substances. Ecology recognizes that permanent solutions may not be practicable for all sites and provides criteria for determining whether a cleanup action is permanent to the "maximum extent practicable" in WAC 173-340-360(3)(f). These criteria include:

- ***Overall protectiveness*** of human health and the environment, including the degree to which Site risks are reduced, risks during implementation, and improvement of overall environmental quality

- L*ong-term effectiveness*, including the degree of certainty that the alternative will be successful, long-term reliability, the magnitude of residual risk, and the effectiveness of controls required to manage treatment residues and remaining wastes
- ***Management of short-term risks***, including the protection of human health and the environment during construction and implementation
- ***Permanent reduction in toxicity, mobility, and volume of hazardous substances***, including the reduction or elimination of hazardous substance releases and sources of releases
- ***Implementability***, including consideration of whether the alternative is technically possible; the availability of necessary offsite facilities, services, and materials; administrative and regulatory requirements; scheduling, size, and complexity of construction; monitoring requirements; access for construction, operations, and monitoring; and integration with existing and future facility operations (i.e., Site uses)
- ***Cleanup costs*** including capital costs and operation and maintenance (O&M) costs
- ***Consideration of public concerns,*** which will be addressed through public comment on this RI/FS report and the CAP that will be subsequently developed by Ecology.

9.7.3 REQUIREMENT FOR A REASONABLE RESTORATION TIMEFRAME

WAC 173-340-360(6)(a) specifies that the following factors be considered in establishing a "reasonable" timeframe:

- Potential risks to human health and the environment
- Practicability of achieving a shorter restoration timeframe
- Current use of the Site, surrounding areas, and associated resources that are, or may be, affected by releases from the Site
- Potential future use of the Site, surrounding areas, and associated resources that are, or may be, affected by releases from the Site
- Availability of alternate water supplies
- Likely effectiveness and reliability of institutional controls
- Ability to control and monitor migration of hazardous substances from the Site
- Toxicity of the hazardous substances at the Site
- Natural processes that reduce concentrations of hazardous substances and have been documented to occur at the Site or under similar Site conditions.

9.7.4 REQUIREMENT FOR CONSIDERATION OF PUBLIC CONCERNS

Prior to implementation of a cleanup action, Ecology will issue a draft CAP for public comment as specified in WAC 173-340-360(11). Consideration of public concerns is an inherent part of the Site cleanup process under MTCA and will be addressed following publication of this draft RI/FS for public review.

9.8 ANALYSIS OF THE CLEANUP ACTION ALTERNATIVE

This section provides an analysis of the cleanup alternative with respect to the MTCA criteria discussed in Section 9.7 (Evaluation Criteria). The evaluation of the cleanup alternative is organized by criteria, and is presented in the following sections. Because only one cleanup action alternative is being carried forward for detailed evaluation, a disproportionate cost analysis was not conducted and a comparative evaluation of alternatives is not necessary.

9.8.1 THRESHOLD REQUIREMENTS

In order for a cleanup alternative to meet the threshold requirements it must adequately protect human health and the environment, comply with cleanup standards, comply with state and federal laws, and provide for compliance monitoring. The cleanup alternative meets these requirements. Almost all contaminant mass was removed from the Site during the interim action, eliminating any potential for direct human contact with soil containing COC concentrations above the proposed cleanup levels. Institutional controls will prevent direct contact with or ingestion of contaminated groundwater, and groundwater and sediment compliance monitoring will confirm that cleanup standards are achieved and maintained at the conditional point of compliance at the groundwater/surface water interface at the shoreline, and throughout the predominantly biologically active zone for Site sediment. The Cleanup Alternative will comply with MTCA, all other state laws, and all federal laws.

9.8.2 PERMANENCE

As described in Section 9.7.2 (Requirement for Permanent Solution to the Maximum Extent Practicable), MTCA requires that cleanup actions be permanent to the maximum extent practicable, and identifies a number of criteria to evaluate whether this requirement is achieved. The remainder of this section provides an evaluation of the cleanup alternative against the permanence criteria.

9.8.2.1 Overall Protectiveness

The cleanup alternative will provide a high level of overall protectiveness of human health and the environment. Long-term groundwater and sediment compliance monitoring and institutional controls will reduce the risk that human or ecological receptors are exposed to groundwater exceeding the proposed groundwater CULs. Additionally, risks during implementation will be minimal because the cleanup alternative does not include construction activities.

9.8.2.2 Long-Term Effectiveness

The cleanup alternative provides a high degree of certainty that it will be successful. Because contaminant mass and potential future sources of contamination have largely been removed from the Site, compliance with the groundwater cleanup standards has been demonstrated at the proposed conditional point of compliance at the shoreline, and the extent of sediment contamination is very limited, the potential for the cleanup alternative to not be successful is negligible. Because the cleanup alternative does not require active remediation to achieve cleanup standards, its long-term reliability is assured, and the lack of residual contaminant mass results is a very low residual risk.

9.8.2.3 Management of Short-Term Risks

Because the cleanup action alternative does not involve additional active remediation, protection of human health and the environment during construction and implementation is not a consideration, resulting in very high short-term effectiveness.

9.8.2.4 Permanent Reduction of Toxicity, Mobility, and Volume of Hazardous Substances

As previously discussed, about 40,600 tons, almost all of the contaminant mass, was removed from the Site during the interim action and groundwater quality monitoring demonstrates that the residual groundwater contamination is not migrating beyond the shoreline. As a result, the cleanup alternative substantially reduces the volume of hazardous substances at the Site when considered in conjunction with the interim action, and none of the potential cleanup action alternatives screened out in Section 9.5 would increase the permanence of the final remedy beyond that provided by the cleanup alternative.

9.8.2.5 Implementability

The Cleanup Alternative is easily implemented. Groundwater compliance monitoring will be conducted using existing monitoring wells, and institutional controls in the form of deed restrictions could be implemented by the Port following finalization of the CAP.

9.8.2.6 Cleanup Costs

An itemized cost estimate for the cleanup alternative is provided in Table 16. The estimated cost for implementing the institutional controls and conducting long-term groundwater compliance monitoring, including reporting, is $41,000.

9.8.3 RESTORATION TIME FRAME

The MTCA identifies a number of factors to be considered when establishing a reasonable restoration timeframe, as described in Section 9.7.3 (Requirement for a Reasonable Restoration Timeframe). The cleanup alternative would achieve upland cleanup standards immediately following implementation, which would address potential risks to human health and the environment. Sediment cleanup standards would be achieved as soon as sediment compliance monitoring demonstrates that the fluoranthene SQS has been achieved through MNR, which is anticipated to occur by the first round of sediment compliance monitoring in 2012. Given that the cleanup standards would be achieved immediately following implementation, or shortly thereafter, achieving a shorter restoration timeframe is not practicable. The cleanup alternative would be compatible with current and potential future use of the Site; the primary consideration for future land use would be the proper management of extracted groundwater if construction dewatering is required and the integration of the groundwater compliance monitoring wells into the development. The City of Everett provides municipal water to the Site, and Site groundwater is not considered a potable water supply, so availability of an alternate water supply is not an issue. Site institutional controls would be largely limited to requirements for management of extracted groundwater, which can be easily and reliably implemented. The control and monitoring of hazardous substances would be easily achieved by the cleanup alternative because contamination is limited to localized areas of groundwater and sediment contamination that will be monitored by the compliance monitoring program. Additionally, with the contaminant mass largely removed from the Site during the interim action, natural processes are anticipated to further reduce concentrations of hazardous substances in groundwater and sediment.

9.9 PREFERRED CLEANUP ALTERNATIVE

Based on the evaluation summarized in the previous sections, it is concluded that the cleanup alternative achieves all of the MTCA requirements for a cleanup action and is considered permanent to the maximum extent practicable. As a result, the cleanup alternative is the preferred cleanup alternative for final Site cleanup. As previously described, the preferred cleanup alternative will consist of institutional controls to ensure that any groundwater extracted from the areas of residual groundwater contamination shown on Figure 21 is properly managed to prevent unacceptable risks to human health and the environment, and that long-term groundwater and sediment compliance monitoring is conducted to confirm that cleanup standards are achieved and maintained.

10.0 USE OF THIS REPORT

This RI/FS report has been prepared for the exclusive use of the Port of Everett for specific application to the North Marina West End Site located in Everett, Washington. The use of this report 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.

This report has been prepared under the supervision and direction of the undersigned. If you have any questions or comments regarding this report, please contact us at (425) 778-0907.

LANDAU ASSOCIATES, INC.

Stacy Lane

Stacy J. Lane, L.G.
Senior Geologist

David A Pischer

David A. Pischer, P.E.
Senior Associate

Lawrence D. Beard, P.E., L.G.
Principal

DAP/SJL/LDB/tam

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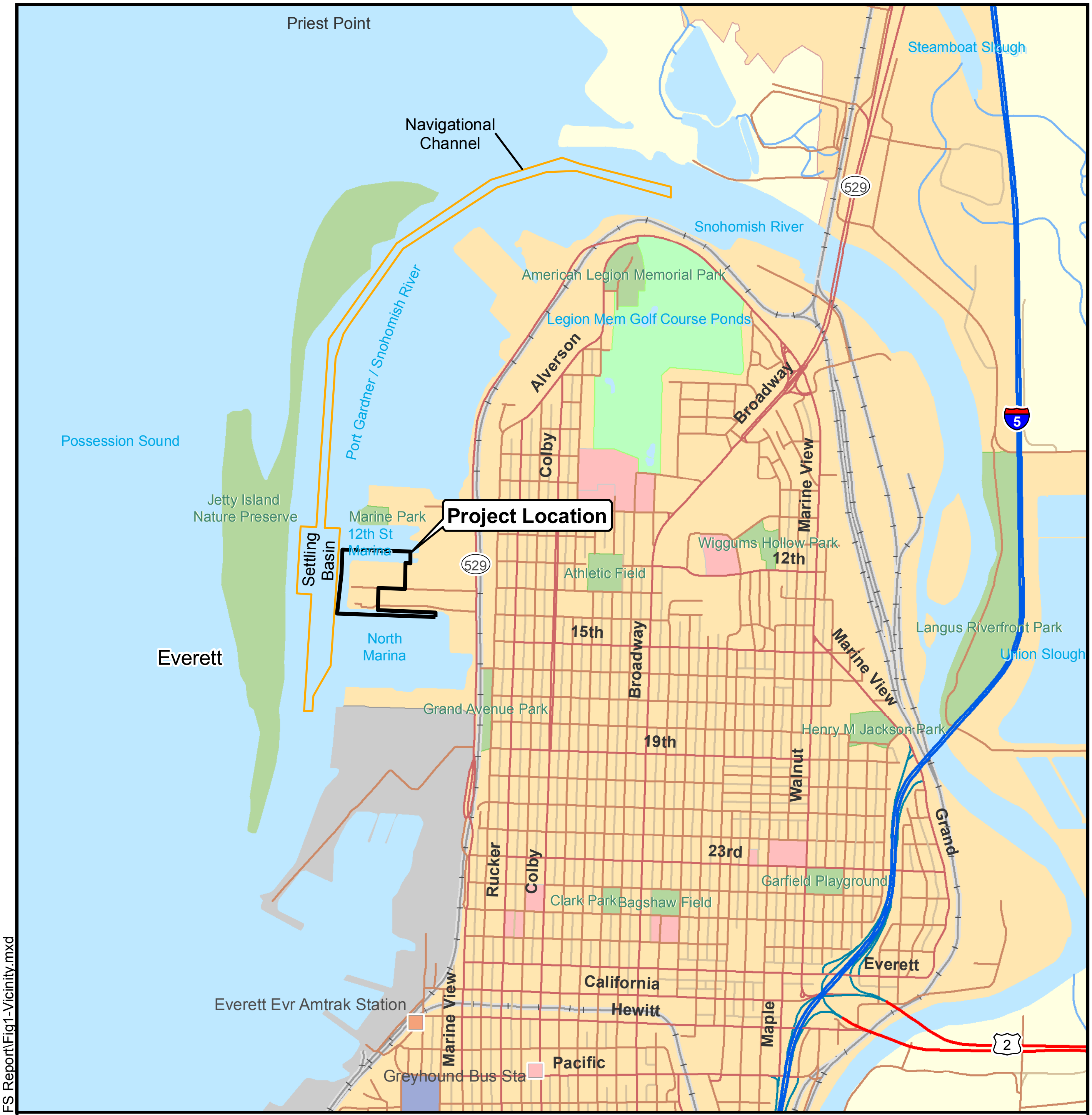

Data Source: ESRI 2008

Y:\Projects\147029\Mapdocs\West End Site\RIFS Report\Fig1-Vicinity.mxd

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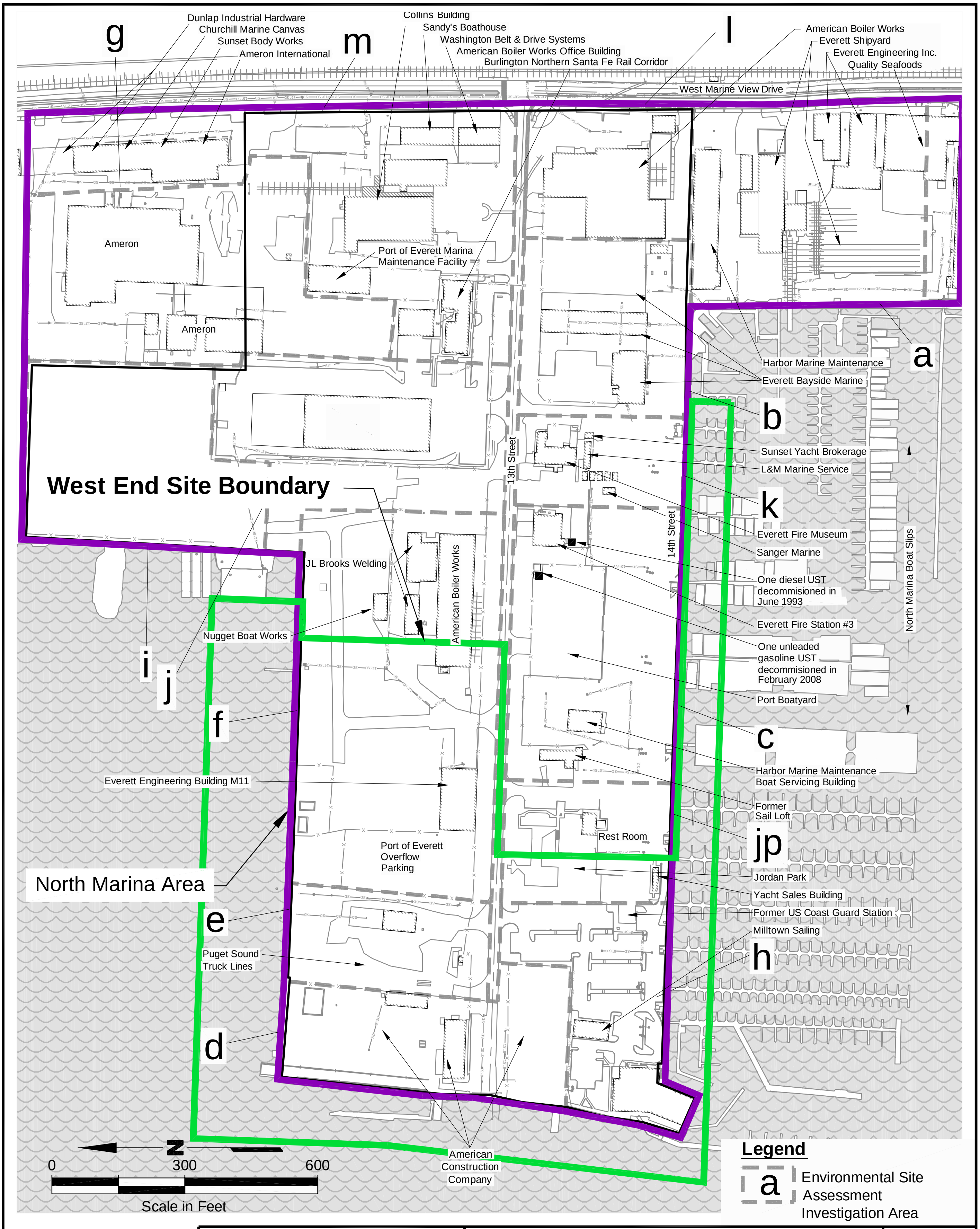
North Marina West End Site RI/FS Report Everett, Washington	**Vicinity Map**	Figure 1



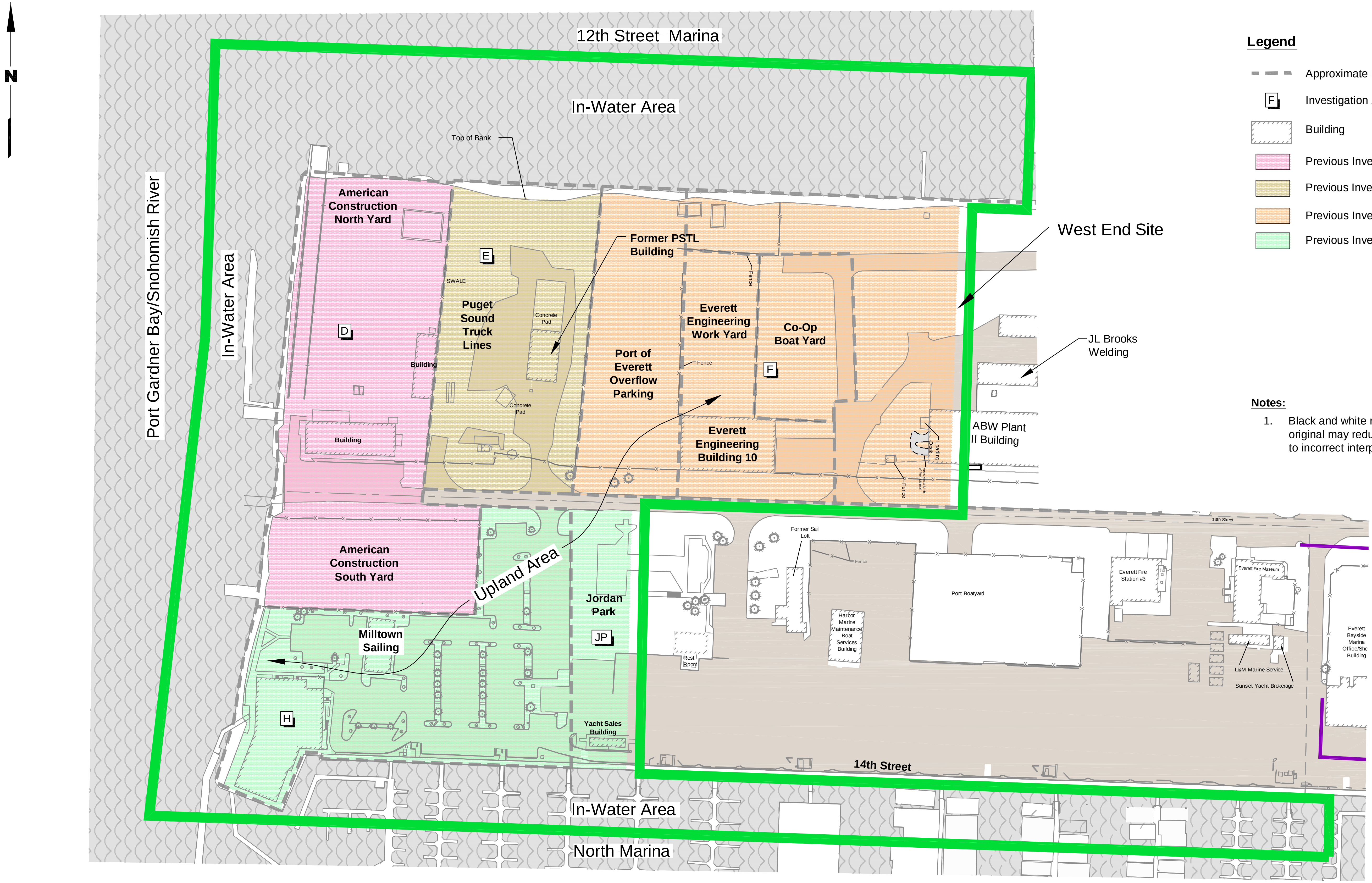
Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RIFS Report\Fig2.dwg (A) "Figure 2" 1/7/2011

LANDAU ASSOCIATES

North Marina West End Site
RI/FS Report
Port of Everett, Washington

Location Plan

Figure
2



Legend

- - - Approximate Boundary of Former Leasehold
- F Investigation Areas (Former and Current)
- ▨ Building
- 🟪 Previous Investigation Area D
- 🟫 Previous Investigation Area E
- 🟧 Previous Investigation Area F
- 🟩 Previous Investigation Areas H & JP

Notes:

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

0 150 300
Scale in Feet

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RI/FS Report\Figure 3.dwg (A) "Figure 3" 1/7/2011

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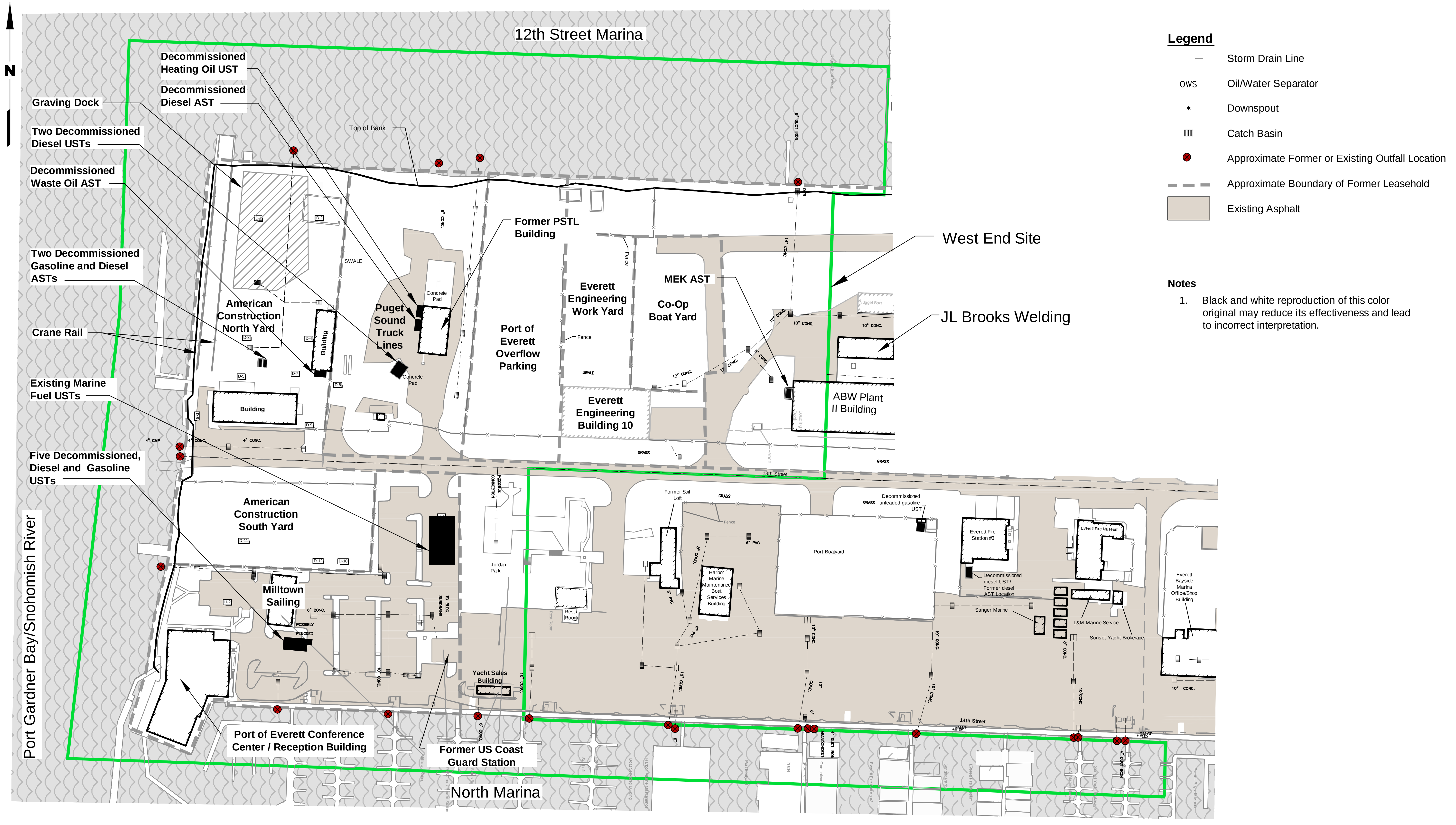
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Site Plan

Figure
3



Legend

— — —	Storm Drain Line
OWS	Oil/Water Separator
*	Downspout
▥	Catch Basin
⊗	Approximate Former or Existing Outfall Location
▬ ▬	Approximate Boundary of Former Leasehold
▨	Existing Asphalt

Notes

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

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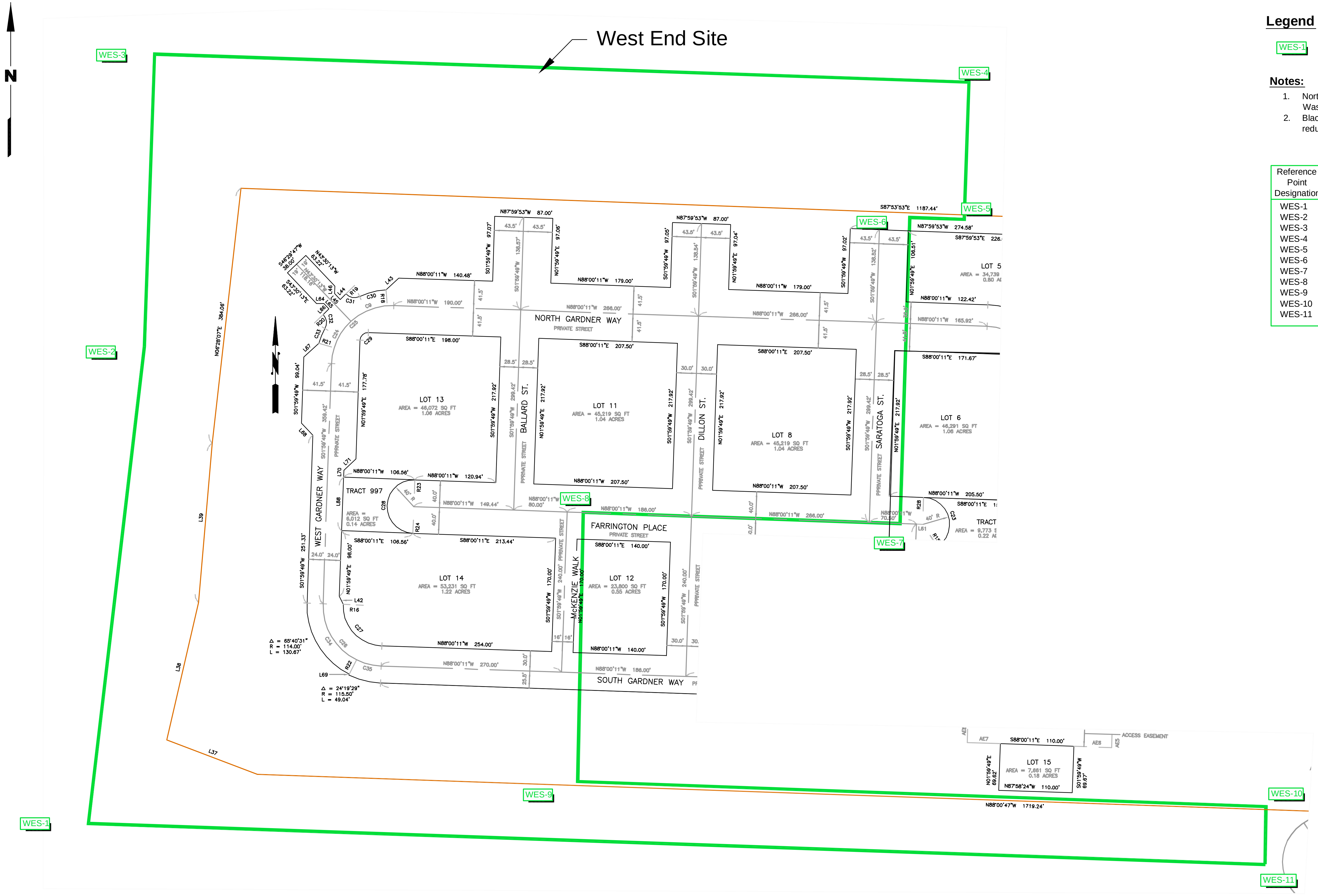
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Current and/or Historical Site Features

Figure
4

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RI FS Report\Figure 4.dwg (A) "Figure 4" 2/23/2011



Legend

🟩 WES-1 Reference Point Designation

Notes:

1. Northings and Eastings are in US State Plane1983, Washington North 4601, NAD 83 (CONUS)
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Reference Point Designation	Reference Point Northings	Reference Point Eastings
WES-1	367490.86	1299961.32
WES-2	368204.39	1300044.82
WES-3	368641.82	1300060.11
WES-4	368599.82	1301278.05
WES-5	368394.44	1301270.87
WES-6	368397.29	1301189.42
WES-7	367939.51	1301174.92
WES-8	367956.08	1300700.99
WES-9	367553.60	1300692.95
WES-10	367524.55	1301742.21
WES-11	367438.38	1301740.85

Port of Everett\North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RIFS Report\Figure 5.dwg (A) "Figure 5" 1/7/2011

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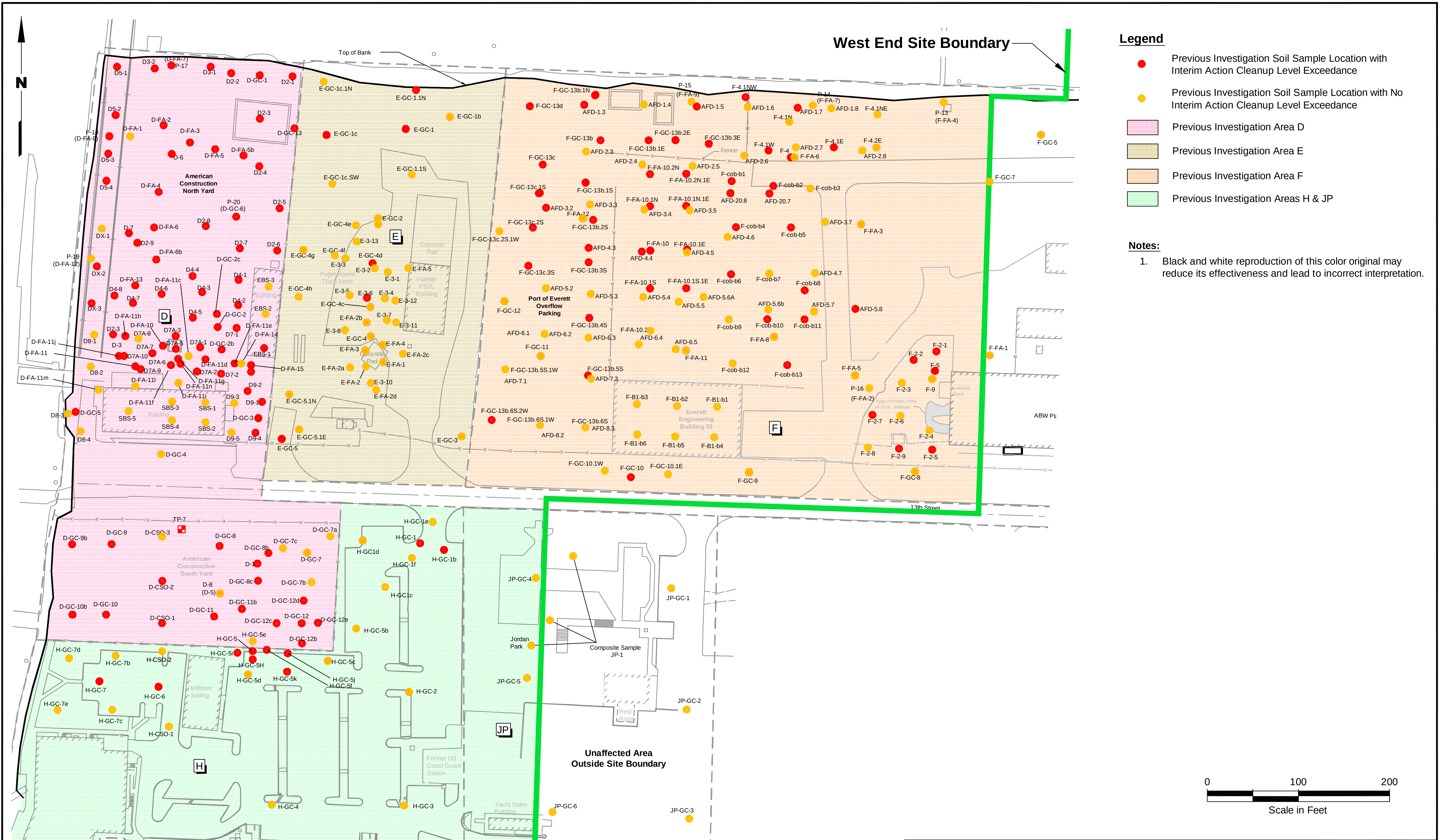
0 150 300
Scale in Feet

Source: Binding Site Plan, Division 2
of Port of Everett North Marina,
Reid Middleton July 12, 2007

North Marina West End Site
RI/FS Report
Port of Everett, Washington

Redevelopment Plan

Figure
5



Legend

🔴 Previous Investigation Soil Sample Location with Interim Action Cleanup Level Exceedance

🟡 Previous Investigation Soil Sample Location with No Interim Action Cleanup Level Exceedance

🟪 Previous Investigation Area D

🟨 Previous Investigation Area E

🟧 Previous Investigation Area F

🟩 Previous Investigation Areas H & JP

Notes:

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

Port of Everett\North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RI/FS Report\Figure 6.dwg (A) "Figure 6" 12/27/2010

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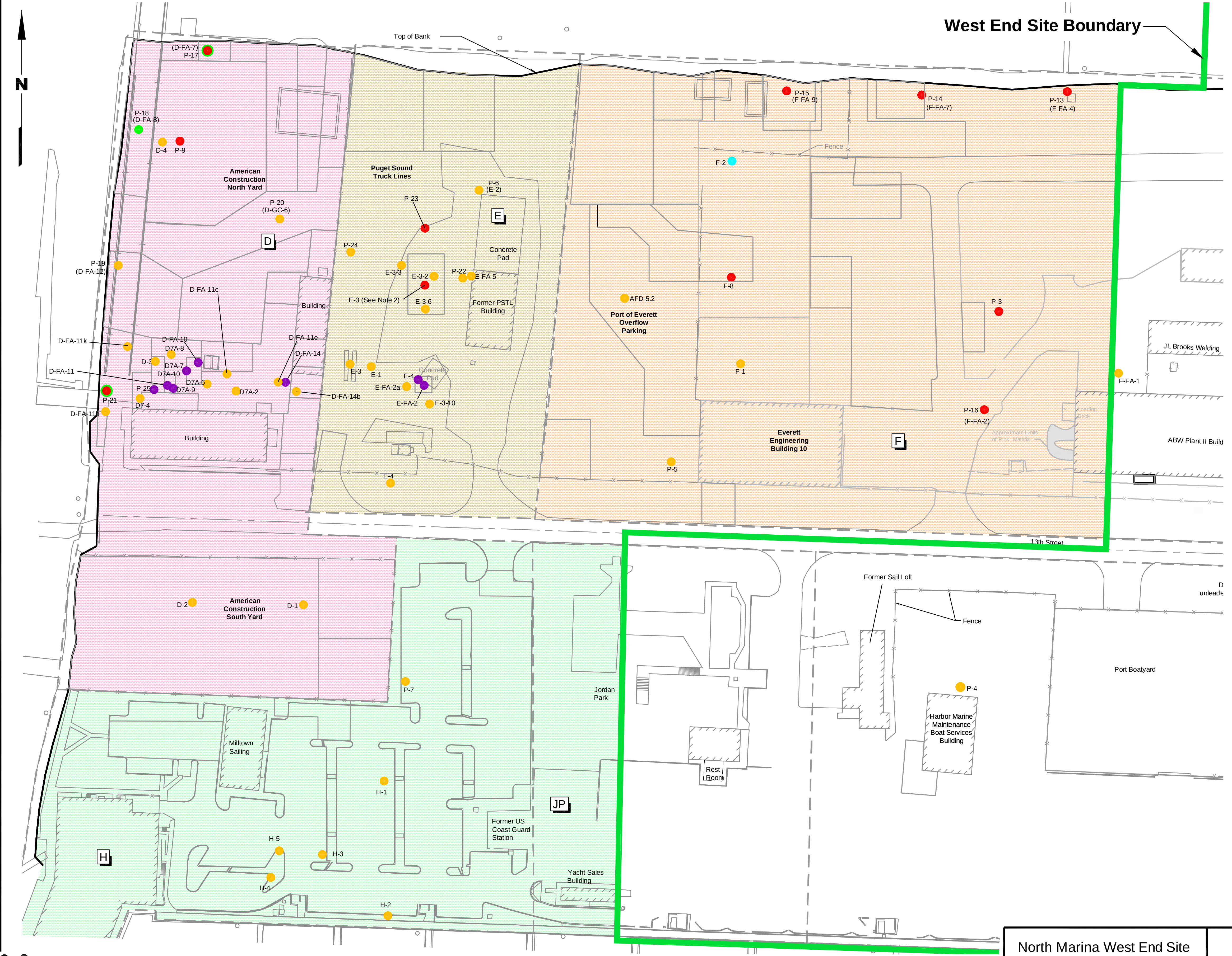
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Previous Investigation Soil Sample Locations

Figure
6



Legend

- ● Previous Investigation Groundwater Sample Location with Arsenic Cleanup Screening Level Exceedance
- ● Previous Investigation Groundwater Sample Location with Vinyl Cloride Cleanup Screening Level Exceedance
- ● Previous Investigation Groundwater Sample Location with No Cleanup Screening Level Exceedance
- ● Previous Investigation Groundwater Sample Location with Copper Cleanup Screening Level Exceedance
- ● Previous Investigation Groundwater Sample Location with Petroleum Hydrocarbon Cleanup Screening Level Exceedance
- ◉ Previous Investigation Groundwater Sample Location with Arsenic and Copper Cleanup Screening Level Exceedance
- ▨ Previous Investigation Area D
- ▨ Previous Investigation Area E
- ▨ Previous Investigation Area F
- ▨ Previous Investigation Areas H & JP

Notes:

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
2. Interim Action Compliance Monitoring Sample Location

0 100 200
Scale in Feet

North Marina West End Site
RI/FS Report
Port of Everett, Washington

Previous Investigation Groundwater Sampling Locations

Figure
7

Landau Associates

Y:\Projects\147029\Mapdocs\West End Site\RIFS Report\Fig8-PreviousSedimentSampling.mxd 1/7/2011

Legend

- ⊗ Outfall Location
- ● Previous Sediment Sampling Location (Landau Associates 2004)
- ○ Previous Sediment Sampling Location (Pentec 2001)
- ━ West End Site Boundary
- ■━ Catch Basins and Piping
- ╍ Approximate Boundary of Leasehold
- ─ Bathymetry (MLLW) Based on Data Collected in 2003 & 2004
- ─ Harbor Line and River Center Line
- ─ Site Features

0 160 320

Scale in Feet

Data Source: ESRI Image Server (2005 Image); Elevation Contours, Harbor Line, and Centerline of Snohomish River: Port of Everett Hydrographic Survey of Tall Ship Moorage (2005, PND Engineers)

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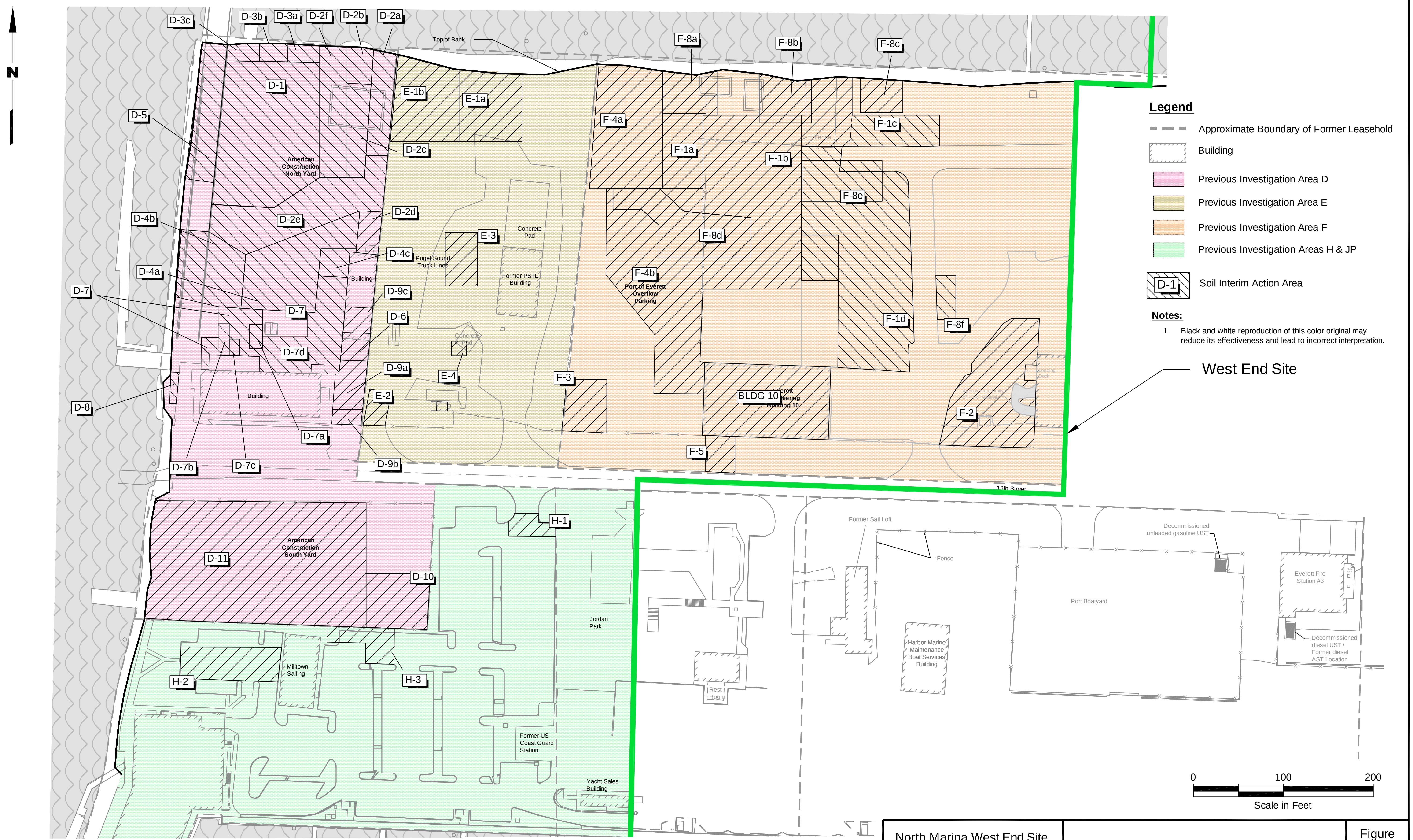
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Previous Investigation Sediment Sample Locations

Figure
8



Notes:

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

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RIFS Report\Figure 9.dwg (A) "Figure 9" 9/10/2010

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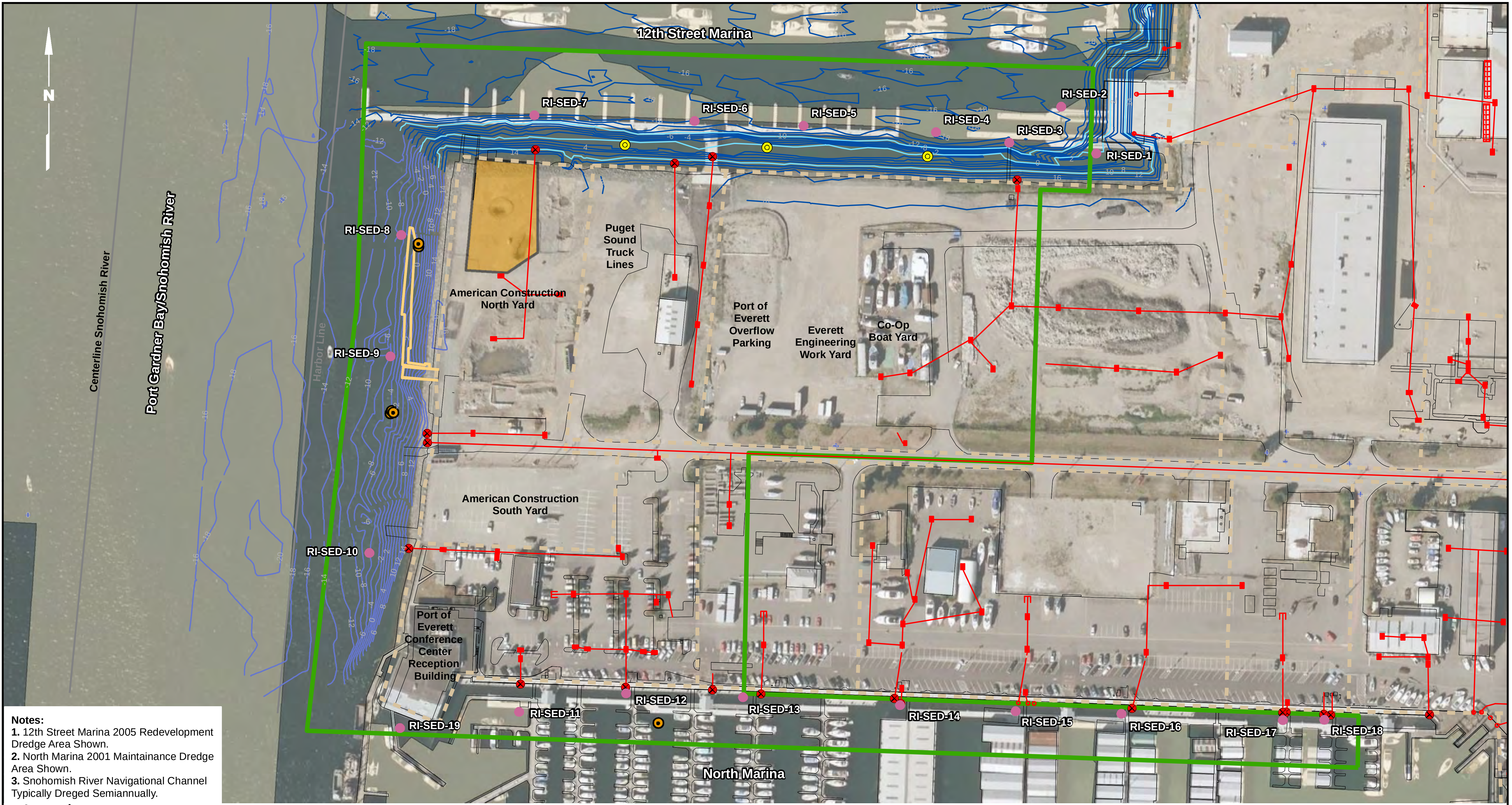
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Interim Action Areas

Figure
9



Notes:
1. 12th Street Marina 2005 Redevelopment Dredge Area Shown.
2. North Marina 2001 Maintainance Dredge Area Shown.
3. Snohomish River Navigational Channel Typically Dreged Semiannually.

Legend

- ● 2009 Sediment Sampling Locations (Landau Associates)
- ● 2004 Sediment Sampling Location (Landau Associates)
- ○ 2001 Sediment Sampling Location (Pentec)
- ⊗ Outfall Location
- 🟥 Catch Basins and Piping
- Former Vessel Docking Structure
- West End Site Boundary
- Approximate Boundary of Leasehold
- Post Dredge Minor Contour (2' Interval, MLLW)
- Post Dredge Major Contour (10' Interval, MLLW)
- Bathymetry (MLLW) Based on Data Collected in 2003 & 2004
- Harbor Line and River Center Line
- 🟧 Former Graving Dock Footprint
- ▢ Approximate Dredging Areas (See Notes)

0 160 320
Scale in Feet

Data Source: Google Earth (2008 Image); Elevation Contours, Harbor Line, and Centerline of Snohomish River: Port of Everett Hydrographic Survey of Tall Ship Moorage; Post Dredge Elevation Contours (2005, PND Engineers)

Y:\Projects\1470029\Mapdocs\West End Site\RIFS Report\Fig10-SedimentSamples2009.mxd 1/7/2011

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North Marina West End Site
RI/FS Report
Port of Everett, Washington

RI Sediment
Sample Locations

Figure
10

Legend

● RI Surface Water Sample Location

⊙ RI Direct - Push Groundwater Grab Sample Location

● RI Groundwater Monitoirng Well Location

— Post Dredge Minor Contour (2' Interval, MLLW)

— Post Dredge Major Contour (10' Interval, MLLW)

— West End Site Boundary

- - Approximate Boundary of Leasehold

— Bathymetry (MLLW) Based on Data Collected in 2003 & 2004

— Harbor Line and River Center Line

0 160 320

Scale in Feet

Data Source: Google Earth (2008 Image); Elevation Contours, Harbor Line, and Centerline of Snohomish River: Port of Everett Hydrographic Survey of Tall Ship Moorage; Post Dredge Elevation Contours (2005, PND Engineers)

Notes:
1. At locations where lube oil was analyzed, diesel and gasoline range petroleum hydrocarbons were also analyzed but were not detected.

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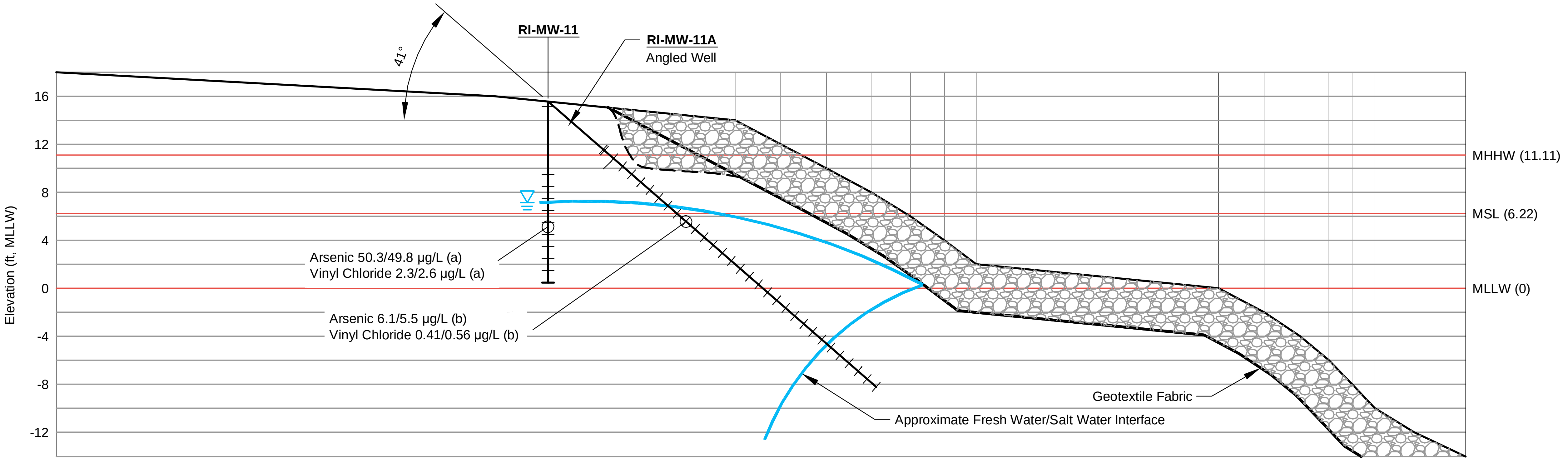
North Marina West End Site
RI/FS Report
Port of Everett, Washington

RI Groundwater and Surface Water Monitoring Locations

Figure
11

Y:\Projects\147029\Mapdocs\West End Site\RIFS Report\Fig11-GWSurface.mxd 1/7/2011



Legend

RI-MW-11 — Boring Number

Groundwater Table Elevation at Low Tide

Well Screen

(a) Parent Sample Concentration / Blind Field Duplicate Sample Concentration

(b) Low Tide Sample Concentration / Mid-Tide Sample Concentration

Bottom of Exploration

▨ Rip Rap

Notes

1. Water levels measured on 4/1/2010 during a low tide (-1.0ft MLLW).
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 10 20
Scale in Feet

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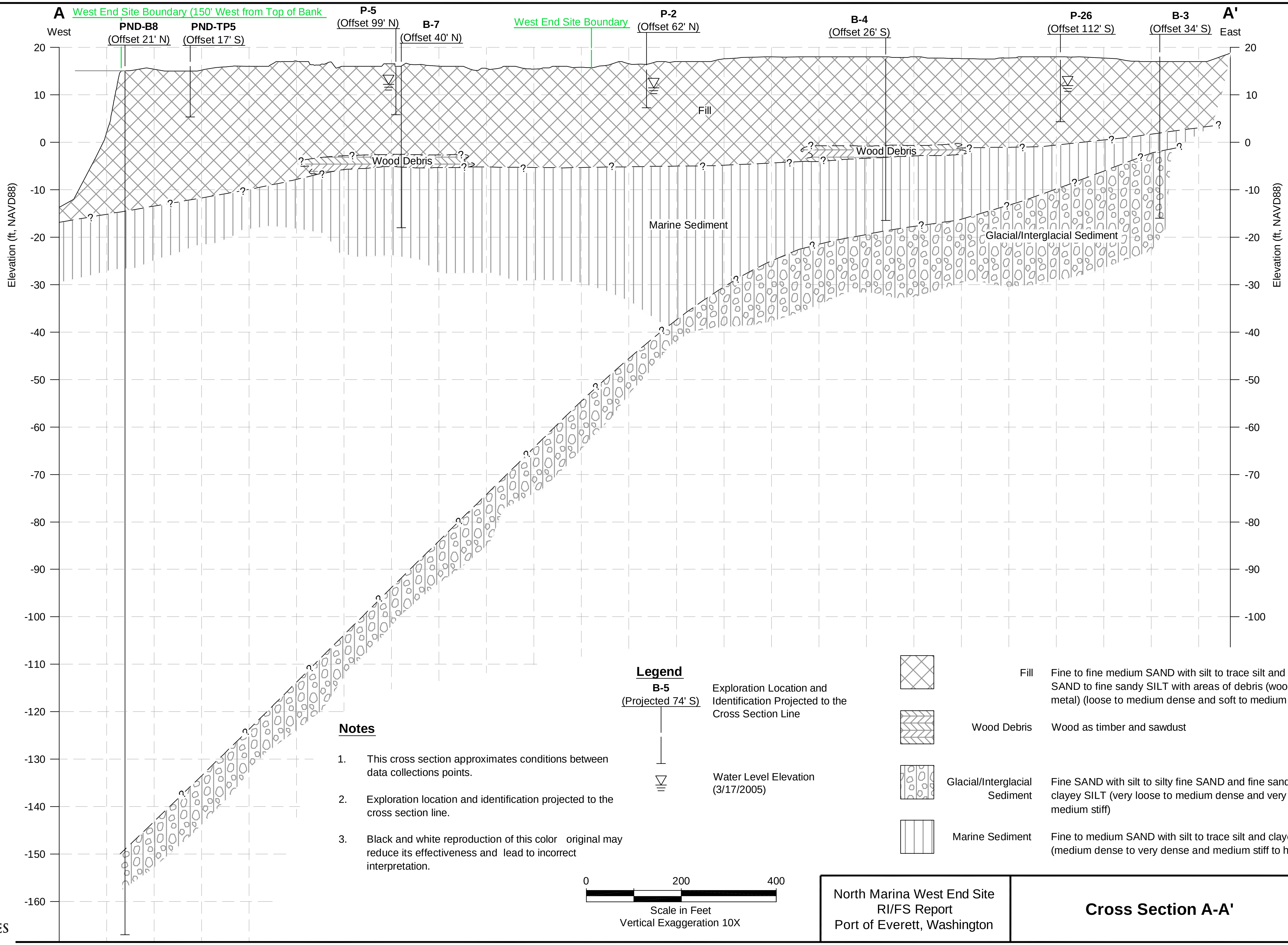
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Angled Well
Draft Conceptual Drawing

Figure
12

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RIFS Report\Figure 12.dwg (A) "Figure 12" 9/10/2010



Notes

1. This cross section approximates conditions between data collections points.
2. Exploration location and identification projected to the cross section line.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Legend

B-5
(Projected 74' S)
Exploration Location and Identification Projected to the Cross Section Line

∇ Water Level Elevation (3/17/2005)

▨	Fill	Fine to fine medium SAND with silt to trace silt and silty fine SAND to fine sandy SILT with areas of debris (wood, concrete, metal) (loose to medium dense and soft to medium stiff)
▨	Wood Debris	Wood as timber and sawdust
▨	Glacial/Interglacial Sediment	Fine SAND with silt to silty fine SAND and fine sandy SILT to clayey SILT (very loose to medium dense and very soft to medium stiff)
▥	Marine Sediment	Fine to medium SAND with silt to trace silt and clayey SILT (medium dense to very dense and medium stiff to hard)

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RIFS Report\Figure 13.dwg (A) "Figure 13" 9/10/2010

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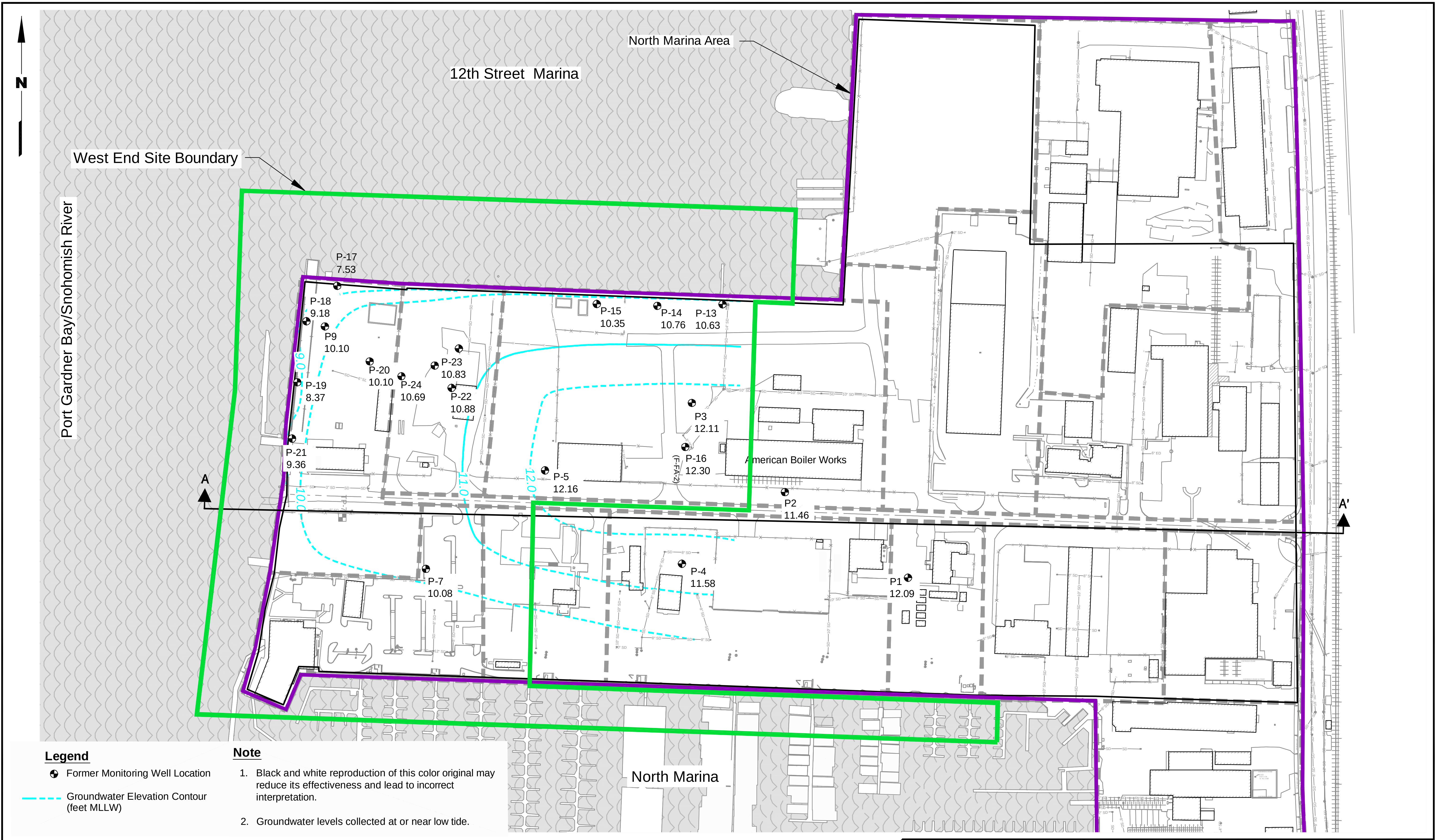
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Cross Section A-A'

Figure
13



Legend

⊕ Former Monitoring Well Location

--- Groundwater Elevation Contour (feet MLLW)

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
2. Groundwater levels collected at or near low tide.

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RIFS Report\Figure 14.dwg (A) "Figure 14" 1/7/2011

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North Marina West End Site
RI/FS Report
Port of Everett, Washington

Groundwater Elevation Contour Map for March 17, 2005

Figure
14

0 160 320
Scale in Feet

Legend

- ● 2009 Groundwater Monitoirng Well Location
- — Groundwater Elevation Contour (ft)
- 🟩 West End Site Boundary

Data Source: Google Earth (2008 Image)

Y:\Projects\147029\Mapdocs\West End Site\RIFS Report\Fig15-June09GWContours.mxd 1/7/2011

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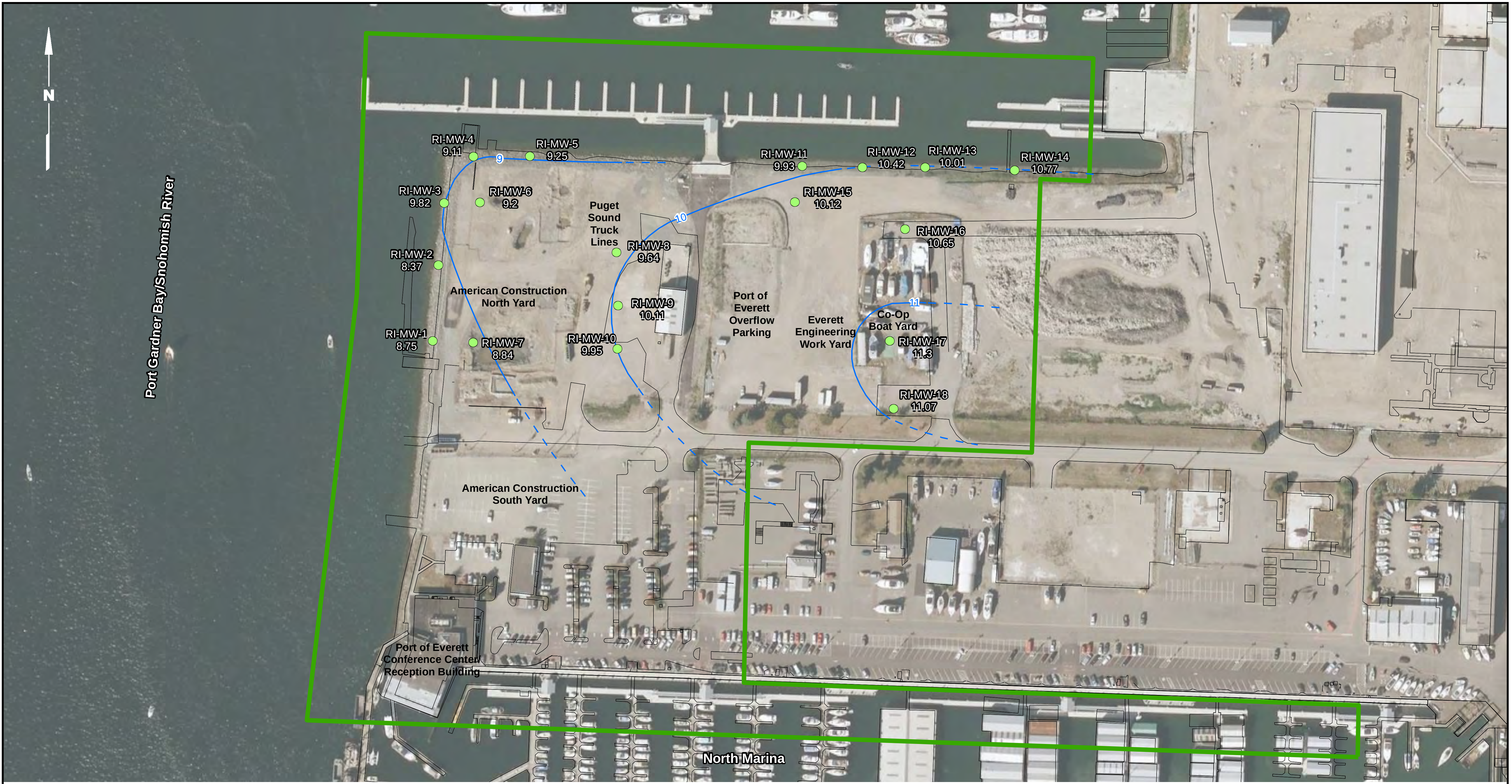
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Groundwater Elevation Contour Map for June 12, 2009

Figure
15



Legend

● 2009 Groundwater Monitoirng Well Location

— Groundwater Elevation Contour (ft)

🟩 West End Site Boundary

0 160 320

Scale in Feet

Data Source: Google Earth (2008 Image)

Y:\Projects\147029\Mapdocs\West End Site\RIFS Report\Fig16-Sept09GWContours.mxd 1/7/2011

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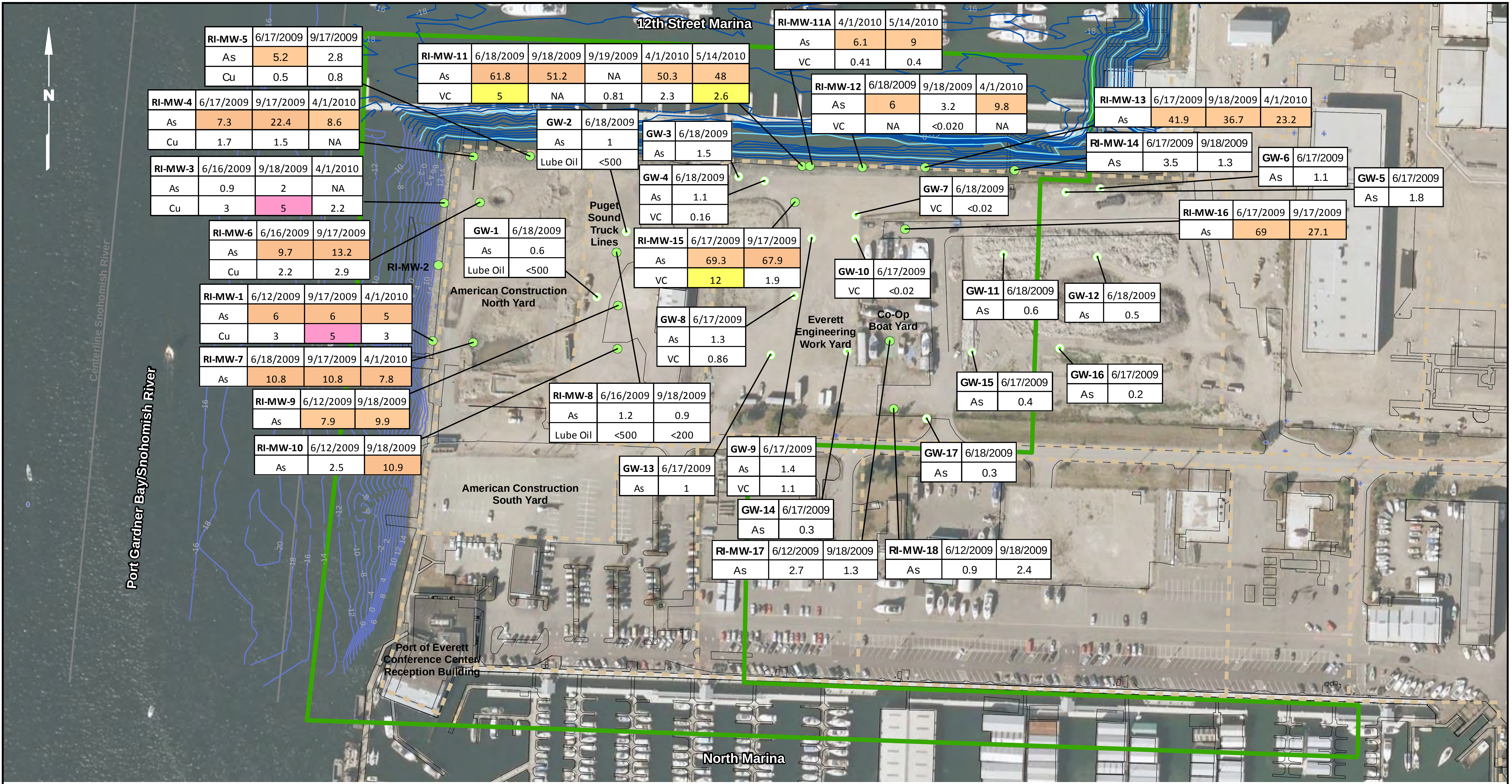
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Groundwater Elevation Contour Map for September 16, 2009

Figure
16



RI-MW-5	6/17/2009	9/17/2009
As	5.2	2.8
Cu	0.5	0.8

RI-MW-4	6/17/2009	9/17/2009	4/1/2010
As	7.3	22.4	8.6
Cu	1.7	1.5	NA

RI-MW-3	6/16/2009	9/18/2009	4/1/2010
As	0.9	2	NA
Cu	3	5	2.2

RI-MW-6	6/16/2009	9/17/2009
As	9.7	13.2
Cu	2.2	2.9

RI-MW-1	6/12/2009	9/17/2009	4/1/2010
As	6	6	5
Cu	3	5	3

RI-MW-7	6/18/2009	9/17/2009	4/1/2010
As	10.8	10.8	7.8

RI-MW-9	6/12/2009	9/18/2009
As	7.9	9.9

RI-MW-10	6/12/2009	9/18/2009
As	2.5	10.9

RI-MW-11	6/18/2009	9/18/2009	9/19/2009	4/1/2010	5/14/2010
As	61.8	51.2	NA	50.3	48
VC	5	NA	0.81	2.3	2.6

GW-2	6/18/2009
As	1
Lube Oil	<500

GW-3	6/18/2009
As	1.5

GW-4	6/18/2009
As	1.1
VC	0.16

GW-1	6/18/2009
As	0.6
Lube Oil	<500

RI-MW-15	6/17/2009	9/17/2009
As	69.3	67.9
VC	12	1.9

GW-8	6/17/2009
As	1.3
VC	0.86

RI-MW-8	6/16/2009	9/18/2009
As	1.2	0.9
Lube Oil	<500	<200

GW-13	6/17/2009
As	1

GW-9	6/17/2009
As	1.4
VC	1.1

GW-14	6/17/2009
As	0.3

RI-MW-17	6/12/2009	9/18/2009
As	2.7	1.3

RI-MW-18	6/12/2009	9/18/2009
As	0.9	2.4

RI-MW-11A	4/1/2010	5/14/2010
As	6.1	9
VC	0.41	0.4

RI-MW-12	6/18/2009	9/18/2009	4/1/2010
As	6	3.2	9.8
VC	NA	<0.020	NA

RI-MW-13	6/17/2009	9/18/2009	4/1/2010
As	41.9	36.7	23.2

RI-MW-14	6/17/2009	9/18/2009
As	3.5	1.3

GW-6	6/17/2009
As	1.1

GW-5	6/17/2009
As	1.8

GW-7	6/18/2009
VC	<0.02

RI-MW-16	6/17/2009	9/17/2009
As	69	27.1

GW-10	6/17/2009
VC	<0.02

GW-11	6/18/2009
As	0.6

GW-12	6/18/2009
As	0.5

GW-15	6/17/2009
As	0.4

GW-16	6/17/2009
As	0.2

GW-17	6/18/2009
As	0.3

Legend

- ● 2009 Direct - Push Groundwater Grab Sample Location
- ● 2009 Groundwater Monitoirng Well Location
- — Post Dredge Minor Contour (2' Interval, MLLW)
- — Post Dredge Major Contour (10' Interval, MLLW)
- — West End Site Boundary
- - - Approximate Boundary of Leasehold
- — Bathymetry (MLLW) Based on Data Collected in 2003 & 2004
- — Harbor Line and River Center Line

Preliminary Cleanup Levels µg/L	
As	5
Cu	3.1
VC	2.4

Notes:
1. Shaded box indicates preliminary cleanup level exceedance.
2. At locations where lube oil was analyzed, diesel and gasoline range petroleum hydrocarbons were also analyzed but were not detected.
3. NA = Not Analyzed.

0 160 320

Scale in Feet

Data Source: Google Earth (2008 Image); Elevation Contours, Harbor Line, and Centerline of Snohomish River: Port of Everett Hydrographic Survey of Tall Ship Moorage; Post Dredge Elevation Contours (2005, PND Engineers)

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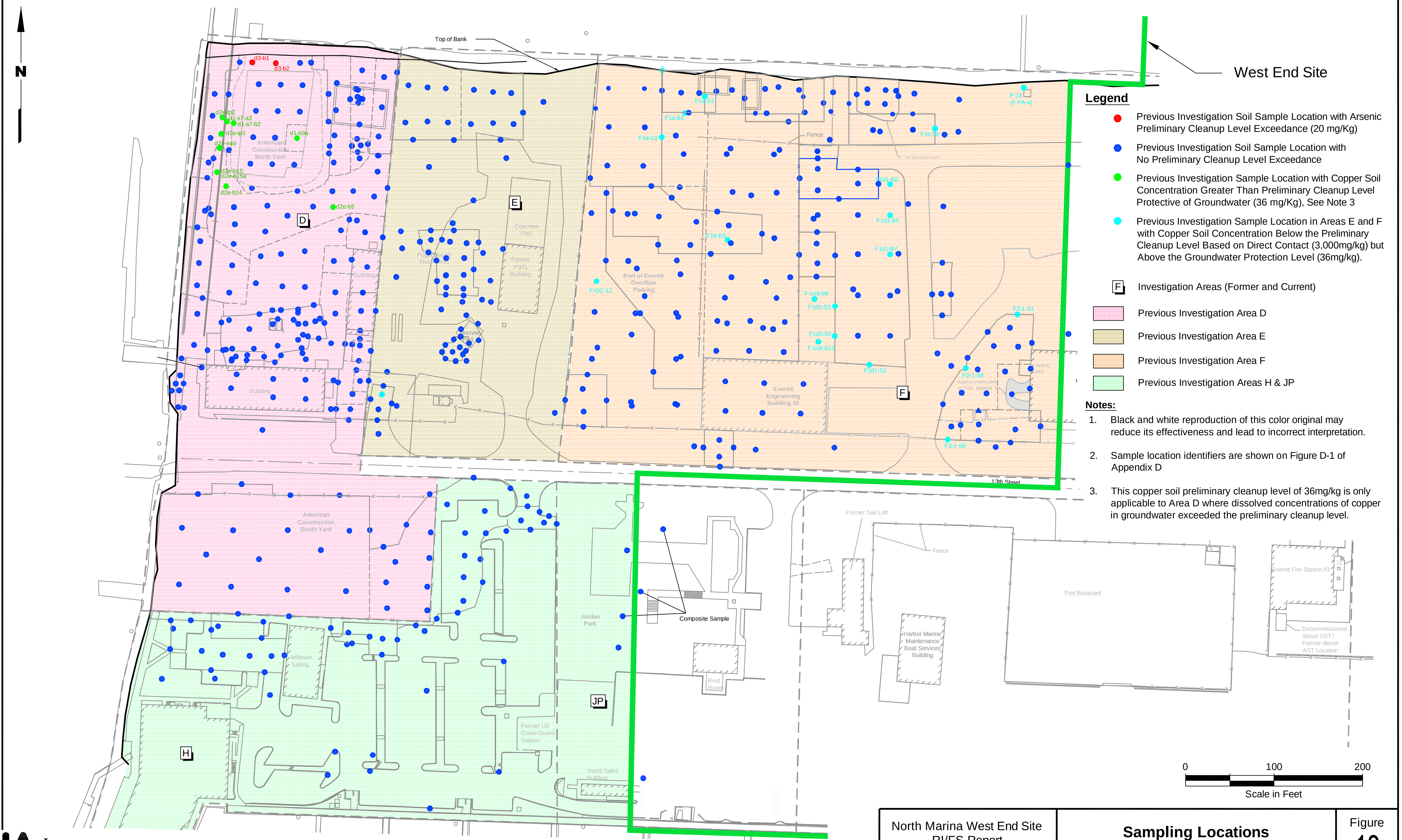
North Marina West End Site
Port of Everett, Washington

RI Groundwater Arsenic, Copper, and Vinyl Chloride Results

Figure
17

Y:\Projects\147029\Mapdocs\West End Site\RIFS Report\Fig17-AsCuVc-Exceedance.mxd 1/7/2011



Legend

● Previous Investigation Soil Sample Location with Arsenic Preliminary Cleanup Level Exceedance (20 mg/Kg)

● Previous Investigation Soil Sample Location with No Preliminary Cleanup Level Exceedance

● Previous Investigation Sample Location with Copper Soil Concentration Greater Than Preliminary Cleanup Level Protective of Groundwater (36 mg/Kg), See Note 3

● Previous Investigation Sample Location in Areas E and F with Copper Soil Concentration Below the Preliminary Cleanup Level Based on Direct Contact (3,000mg/kg) but Above the Groundwater Protection Level (36mg/kg).

F Investigation Areas (Former and Current)

🟥 Previous Investigation Area D

▨ Previous Investigation Area E

🟧 Previous Investigation Area F

🟩 Previous Investigation Areas H & JP

Notes:

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
2. Sample location identifiers are shown on Figure D-1 of Appendix D
3. This copper soil preliminary cleanup level of 36mg/kg is only applicable to Area D where dissolved concentrations of copper in groundwater exceeded the preliminary cleanup level.

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RIFS Report\Figure 18 Report.dwg (A) "Figure 18" 1/7/2011

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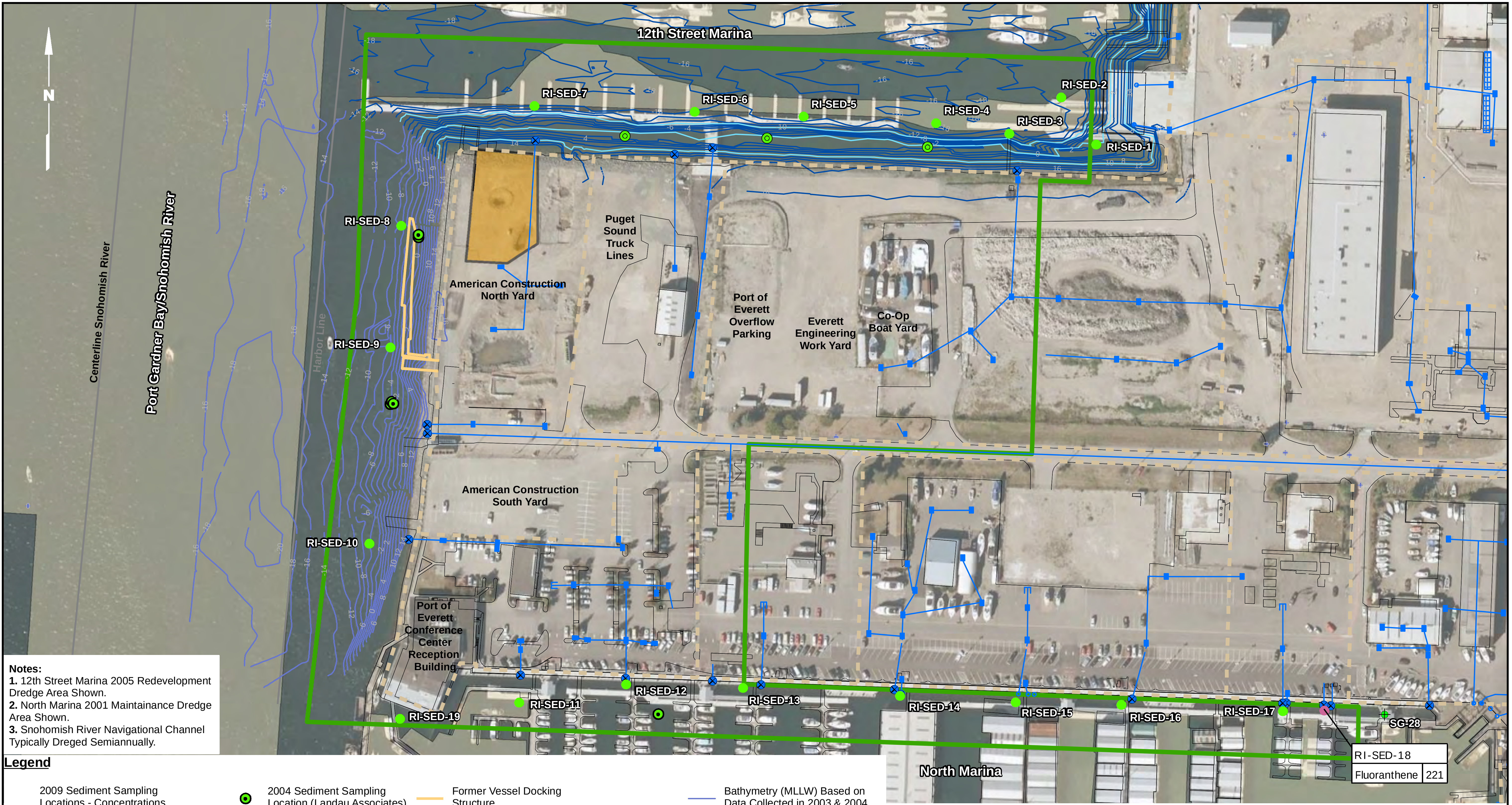
North Marina West End Site
RI/FS Report
Port of Everett, Washington

Sampling Locations Representing Soil Remaining

Figure
18



Notes:
1. 12th Street Marina 2005 Redevelopment Dredge Area Shown.
2. North Marina 2001 Maintainance Dredge Area Shown.
3. Snohomish River Navigational Channel Typically Dreged Semiannually.

Legend

- ● 2009 Sediment Sampling Locations - Concentrations Above SQS and Below CSL (Landau Associates)
- ● 2009 Sediment Sampling Location - Concentrations Below SQS (Landau Associates)
- ⊕ Everett Shipyard RI Sediment Location
- ⊙ 2004 Sediment Sampling Location (Landau Associates)
- ⊙ 2001 Sediment Sampling Location (Pentec)
- ⊗ Outfall Location
- ■— Catch Basins and Piping
- Former Vessel Docking Structure
- West End Site Boundary
- Approximate Boundary of Leasehold
- Post Dredge Minor Contour (2' Interval, MLLW)
- Post Dredge Major Contour (10' Interval, MLLW)
- Bathymetry (MLLW) Based on Data Collected in 2003 & 2004
- Harbor Line and River Center Line
- ▨ Former Graving Dock Footprint
- ▭ Approximate Dredging Areas (See Notes)

Cleanup Levels (mg/kg OC)		
Constituent	SQS	CSL
Fluoranthene	160	1,200

0 160 320
Scale in Feet

Data Source: Google Earth (2008 Image); Elevation Contours, Harbor Line, and Centerline of Snohomish River: Port of Everett Hydrographic Survey of Tall Ship Moorage; Post Dredge Elevation Contours (2005, PND Engineers)

Landau Associates

North Marina West End Site
RI/FS Report
Port of Everett, Washington

Sediment SQS Cleanup Level Exceedance

Figure
19

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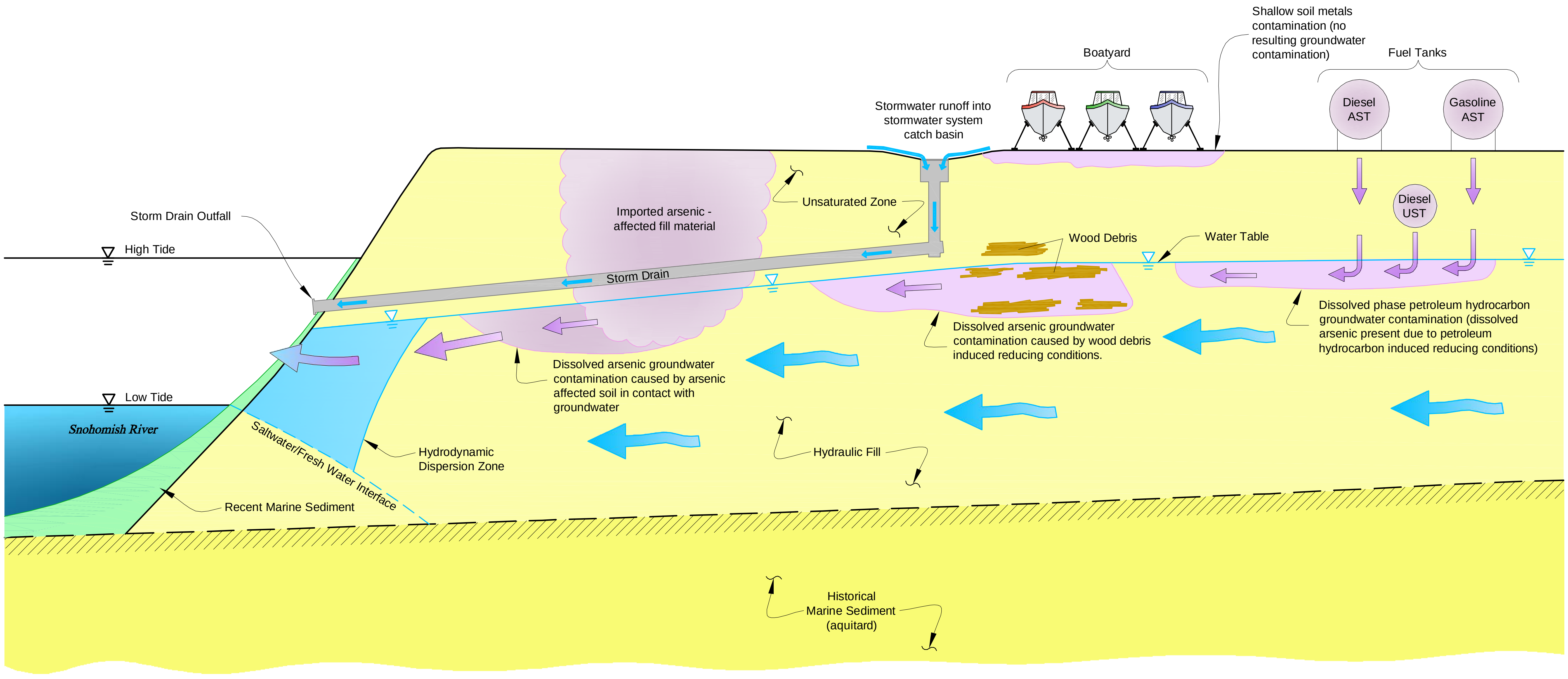


Legend

- Water Table
- Tidally Influenced Water Level
- Groundwater Flow Direction
- Potential Transport of Dissolved Metals and Petroleum Fuel Product
- Wood Debris

Note

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

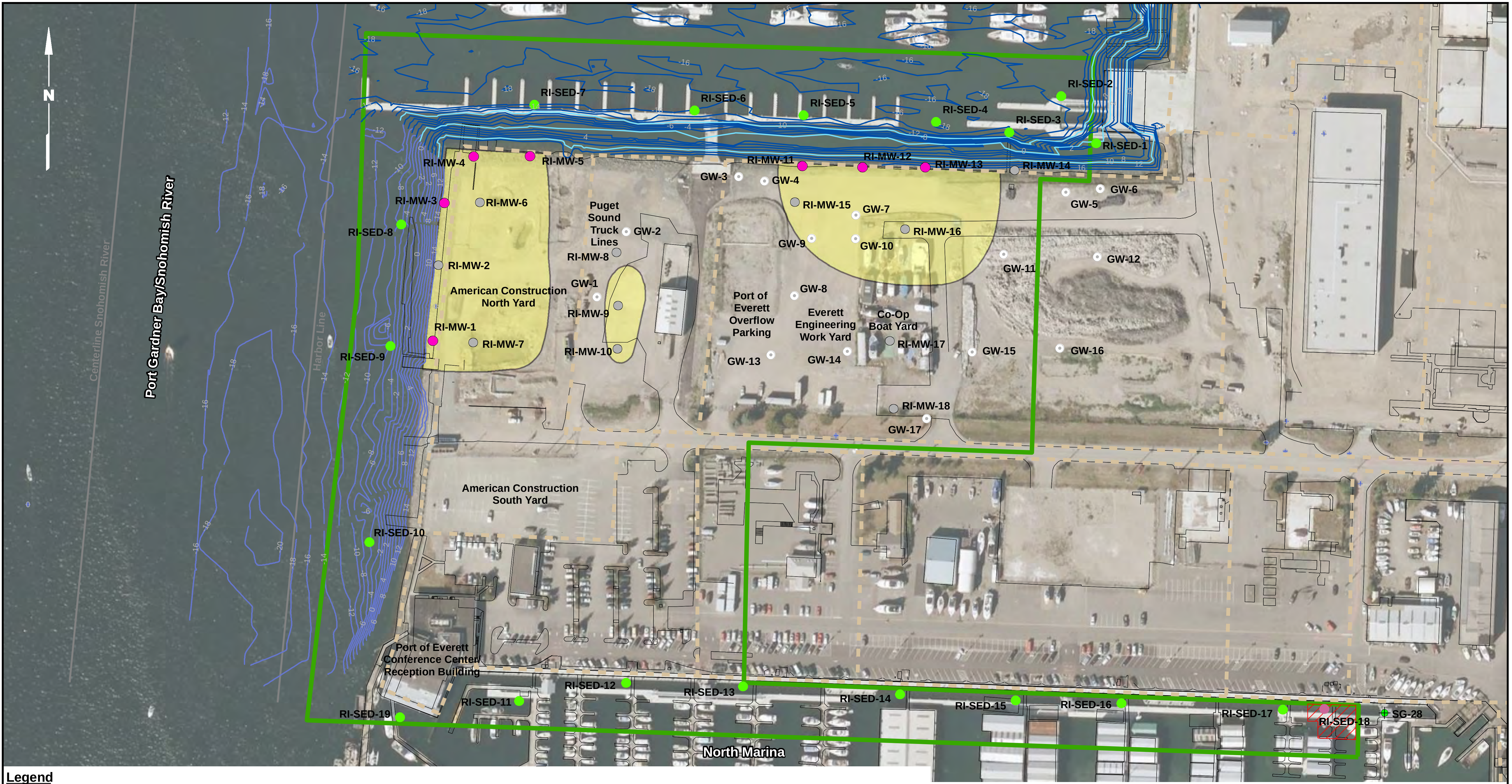
Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RIFS Report\Figure 20 Conceptual.dwg (A) "Figure 20" 1/7/2011

LANDAU ASSOCIATES

North Marina West End Site
RI/FS Report
Port of Everett, Washington

Conceptual Site Model

Figure
20



Legend

● 2009 Sediment Sampling Locations - Concentrations Above SQS and Below CSL (Landau Associates)

● 2009 Sediment Sampling Location - Concentrations Below SQS (Landau Associates)

⊕ Everett Shipyard RI Sediment Location

● Proposed Groundwater Compliance Monitoring Location

● Previous Groundwater Compliance Monitoring Location

⊙ Previous Direct - Push Groundwater Grab Sample Location

▨ Approximate Extent of Sediment Exceeding Fluoranthene SQS

— Post Dredge Minor Contour (2' Interval, MLLW)

— Post Dredge Major Contour (10' Interval, MLLW)

— West End Site Boundary

- - Approximate Boundary of Leasehold

— Bathymetry (MLLW) Based on Data Collected in 2003 & 2004

— Harbor Line and River Center Line

▭ Groundwater Management Area

0 160 320

Scale in Feet

Data Source: Google Earth (2008 Image); Elevation Contours, Harbor Line, and Centerline of Snohomish River: Port of Everett Hydrographic Survey of Tall Ship Moorage; Post Dredge Elevation Contours (2005, PND Engineers)

Notes:
1. At locations where lube oil was analyzed, diesel and gasoline range petroleum hydrocarbons were also analyzed but were not detected.

LANDAU ASSOCIATES

North Marina West End Site
RI/FS Report
Port of Everett, Washington

Cleanup Alternative Groundwater and Sediment Management and Compliance Monitoring Locations

Figure
21

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TABLE 1
PREVIOUS INTERIM ACTION SOIL INDICATOR HAZARDOUS SUBSTANCE EVALUATION
WEST END SITE, PORT OF EVERETT, WASHINGTON

Analyte (a)	Number of Soil Samples Analyzed	Number of Samples with Detected Concentrations	Frequency of Detection (%)	Number of Soil Samples with Concentrations Exceeding Cleanup Levels	Units	Cleanup Level	Min Reporting Limit (b)	Max Reporting Limit (b)	Min Detection	Max Detection	Chemical Previously Selected As an Interim Action IHS?	Rationale Inclusion or Exclusion as IHS
cPAHs												
Method 8270-SIM												
Benzo[a]anthracene	274	132	48.2	--	µg/kg	TEQ	7.0	84.0	7.2	8,100	Yes	Analyte is used in the cPAH TEQ, which exceeds the cleanup level
Chrysene	274	156	56.9	--	µg/kg	TEQ	7.0	80.0	9.9	25,000	Yes	Analyte is used in the cPAH TEQ, which exceeds the cleanup level
Benzo[b]fluoranthene	274	129	47.1	--	µg/kg	TEQ	7.0	84.0	9.8	14,000	Yes	Analyte is used in the cPAH TEQ, which exceeds the cleanup level
Benzo[k]fluoranthene	274	129	47.1	--	µg/kg	TEQ	7.0	86.0	9.8	11,000	Yes	Analyte is used in the cPAH TEQ, which exceeds the cleanup level
Benzo[a]pyrene	274	113	41.2	49	µg/kg	140	7.0	86.0	9.1	6,600.0	Yes	Analyte exceeded the cleanup level
Indeno[1,2,3-cd]pyrene	274	70	25.5	--	µg/kg	TEQ	7.0	190.0	8.0	6,400.0	Yes	Analyte is used in the cPAH TEQ, which exceeds the cleanup level
Dibenz[a,h]anthracene	274	29	10.6	--	µg/kg	TEQ	7.0	190.0	8.0	1,600.0	Yes	Analyte is used in the cPAH TEQ, which exceeds the cleanup level
cPAH TEQ	274	156	56.9	74	µg/kg	140	---	---	0.2	11,340	Yes	Analyte exceeded the cleanup level
Metals												
Method 6000-7000 Series												
Arsenic	429	370	86.2	163	mg/kg	20	3	120	3.3	810	Yes	Analyte exceeded the cleanup level
Barium	1	1	100.0	0	mg/kg	1,650	---	---	196	196	No	Analyte did not exceed the cleanup level
Cadmium	131	66	50.4	0	mg/kg	80	0.2	5	0.2	3.9	No	Analyte did not exceed the cleanup level
Chromium	34	34	100.0	0	mg/kg	120,000	---	---	20.4	2,030	No	Analyte did not exceed the cleanup level
Copper	144	144	100.0	0 / 39 (c)	mg/kg	3,000 / 36 (c)	---	---	9	1,190	Yes	Analyte exceeded the cleanup level
Lead	148	146	98.6	3	mg/kg	250	2	50	2.6	351	Yes	Analyte exceeded the cleanup level
Mercury	141	57	40.4	1	mg/kg	24	0.04	0.06	0.04	26.3	Yes	Analyte exceeded the cleanup level
Zinc	142	142	100.0	0	mg/kg	24,000	---	---	0.06	7,770	No	Analyte did not exceed the cleanup level
Tributyl Tin (TBT)												
TBT Ion by SIM												
TBT as TBT Ion	4	4	100.0	0	ug/kg	7,400	--	--	4.3	1,000	No	Analyte exceeded the cleanup level
Petroleum Hydrocarbons												
Method NWTPH-Dx, NWTPH-Gx, and/or NWTPH-HCID												
Gasoline range	10	4	40.0	4	mg/kg	100/30 (d)	5.9	7.2	89	7,000	Yes	Analyte exceeded the cleanup level
Diesel range	126	96	76.2	16	mg/kg	2000	5	30	6	20,000	Yes	Analyte exceeded the cleanup level
Motor oil range	126	90	71.4	6	mg/kg	2000	10	1,200	10	27,000	Yes	Analyte exceeded the cleanup level
Volatile Organic Compounds (VOCs)												
VOCs by 8021 or 8260B												
Benzene	15	3	20.0	0	µg/kg	290	1.6	360	38	160	No	Analyte did not exceed the cleanup level
Ethylbenzene	15	6	40.0	0	µg/kg	18,000	67	1.6	34	6,300	No	Analyte did not exceed the cleanup level
Acetone	2	1	50.0	0	µg/kg	3,200	13	13	280	280	No	Analyte did not exceed the cleanup level
1,1-Dichloroethane	2	1	50.0	0	µg/kg	4,300	4	4	150	150	No	Analyte did not exceed the cleanup level
Methyl ethyl ketone	2	1	50.0	0	µg/kg	48,000,000	13	13	78	78	No	Analyte did not exceed the cleanup level
1,1,1-Trichloroethane	2	1	50.0	0	µg/kg	3,400,000	4	4	460	460	No	Analyte did not exceed the cleanup level
Trichloroethene	2	1	50.0	0	µg/kg	200	4	4	6.1	6	No	Analyte did not exceed the cleanup level

TABLE 1
PREVIOUS INTERIM ACTION SOIL INDICATOR HAZARDOUS SUBSTANCE EVALUATION
WEST END SITE, PORT OF EVERETT, WASHINGTON

Analyte (a)	Number of Soil Samples Analyzed	Number of Samples with Detected Concentrations	Frequency of Detection (%)	Number of Soil Samples with Concentrations Exceeding Cleanup Levels	Units	Cleanup Level	Min Reporting Limit (b)	Max Reporting Limit (b)	Min Detection	Max Detection	Chemical Previously Selected As an Interim Action IHS?	Rationale Inclusion or Exclusion as IHS
Tetrachloroethene	2	1	50.0	0	µg/kg	40	4	4	13	13	No	Analyte did not exceed the cleanup level
Toluene	2	1	50.0	0	µg/kg	110,000	4	4	2400	2,400	No	Analyte did not exceed the cleanup level
Ethylbenzene	2	1	50.0	0	µg/kg	59,000	4	4	830	6,300	No	Analyte did not exceed the cleanup level
m,p-Xylene	15	1	6.7	0	µg/kg	15,000	4	4	3200	3,200	No	Analyte did not exceed the cleanup level
o-Xylene	15	1	6.7	0	µg/kg	147,000	4	4	1400	3,100	No	Analyte did not exceed the cleanup level
1,2,4-Trimethylbenzene	1	1	100.0	0	µg/kg	4,000,000	--	--	2400	2,400	No	Analyte did not exceed the cleanup level
1,3,5-Trimethylbenzene	1	1	100.0	0	µg/kg	--	--	--	870	870	No	Analyte has no cleanup level
Isopropylbenzene	1	1	100.0	0	µg/kg	8,000,000	--	--	200	200	No	Analyte did not exceed the cleanup level
n-Propylbenzene	1	1	100.0	0	µg/kg	--	--	--	400	400	No	Analyte has no cleanup level
sec-Butylbenzene	1	1	100.0	0	µg/kg	--	--	--	95	95	No	Analyte has no cleanup level
4-Isopropyltoluene	1	1	100.0	0	µg/kg	--	--	--	72	72	No	Analyte has no cleanup level
n-Butylbenzene	1	1	100.0	0	µg/kg	--	--	--	240	240	No	Analyte has no cleanup level
Naphthalene	1	1	100.0	0	µg/kg	140,000	--	--	280	280	No	Analyte did not exceed the cleanup level
Semivolatile Organic Compounds (SVOCs)												
SVOCs by 8270												
Naphthalene	59	15	25.4	0	µg/kg	140,000	13	1,800	81	9,600	No	Analyte did not exceed the cleanup level
1-Methylnaphthalene	59	18	30.5	3	µg/kg	24,000	62	66	66	32,000	Yes	Analyte exceeded the cleanup level
2-Methylnaphthalene	59	17	28.8	0	µg/kg	320,000	62	1,800	68	61,000	No	Analyte did not exceed the cleanup level
Dibenzo / furan	3	1	33.3	0	µg/kg	160,000	430	1,800	420	420	No	Analyte did not exceed the cleanup level
Fluorene	3	1	33.3	0	µg/kg	553,000	430	1,800	1,600	1,600	No	Analyte did not exceed the cleanup level
Phenanthrene	3	1	33.3	0	µg/kg	--	430	1,800	5,100	5,100	No	Analyte has no cleanup level
Carbazole	3	1	33.3	0	µg/kg	50,000	430	1,800	1,800	1,800	No	Analyte has no cleanup level
Anthracene	3	1	33.3	0	µg/kg	12,000,000	430	1,800	4,800	4,800	No	Analyte did not exceed the cleanup level
Fluoranthene	3	2	66.7	0	µg/kg	89,000	1,800	1,800	210	2,500	No	Analyte did not exceed the cleanup level
Pyrene	3	1	33.3	0	µg/kg	2,400,000	1,800	1,600	1,600	1,600	No	Analyte did not exceed the cleanup level
Bis(2-Ethylhexyl)phthalate	3	2	66.7	0	µg/kg	4,900	430	430	700	2,400	No	Analyte did not exceed the cleanup level

---

TEQ = Toxicity Equivalency Quotient. TEQ is based on individual Toxicity Equivalency Factors (TEFs) of benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, ideno(1,2,3-cd)pyrene, and dibenz(a,h)anthracene.

(a) Only detected compounds are presented in this table.

(b) Copper soil cleanup level is 36 for the ACC North Yard based on its presence in groundwater in that portion of the site.

(c) Minimum and maximum reporting limits include only samples with results that are below laboratory reporting limits.

(d) TPH-G cleanup level is 100 mg/kg in areas where benzene is not present and 30 mg/kg where benzene is present.

TABLE 2
SUMMARY OF PREVIOUS INTERIM ACTION GROUNDWATER INDICATOR HAZARDOUS SUBSTANCE EVALUATION
WEST END SITE, PORT OF EVERETT, WASHINGTON

Analyte (a)	Number of Water Samples Analyzed	Number of Samples with Detected Concentrations	Frequency of Detection (%)	Number of Water Samples with Concentrations Exceeding Cleanup Levels	Units	Cleanup Level	Min Reporting Limit	Max Reporting Limit	Min Detection	Max Detection	Chemical Previously Selected as an Interim Action IHS?	Rationale Inclusion or Exclusion as IHS
Volatile Organic Compounds												
Method 8260												
Vinyl chloride	15	2	13.3	1	µg/L	2.4	0.2	1.0	0.5	17	Yes	Analyte exceeds cleanup level
Chloroethane	15	1	6.7	0	µg/L	15	1.0	1.0	4.1	4.1	No	Analyte did not exceed cleanup level
Acetone	15	5	33.3	0	µg/L	800	1.0	5.0	1.6	5.7	No	Analyte did not exceed cleanup level
Carbon disulfide	15	2	13.3	0	µg/L	800	0.2	1.0	0.2	0.2	No	Analyte did not exceed cleanup level
1,1-Dichloroethane	15	1	6.7	0	µg/L	800	0.2	1.0	7.3	7.3	No	Analyte did not exceed cleanup level
trans-1,2-Dichloroethene	15	1	6.7	0	µg/L	10,000	0.2	1.0	0.2	0.2	No	Analyte did not exceed cleanup level
cis-1,2-Dichloroethene	15	2	13.3	0	µg/L	70	0.2	1.0	0.4	0.8	No	Analyte did not exceed cleanup level
1,1,1-Trichloroethane	15	1	6.7	0	µg/L	420,000	0.2	1.0	34	34	No	Analyte did not exceed cleanup level
Trichloroethene	15	1	6.7	0	µg/L	30	0.2	1.0	1.4	1.4	No	Analyte did not exceed cleanup level
1,3,5-Trimethylbenzene	10	1	10.0	0	µg/L	400	0.2	0.2	0.4	0.4	No	Analyte did not exceed cleanup level
1,2,4-Trimethylbenzene	10	1	10.0	0	µg/L	400	0.2	0.2	0.9	0.9	No	Analyte did not exceed cleanup level
Petroleum Hydrocarbons												
Method TPH-Dx and TPH-Gx												
Gasoline	30	8	26.7	3	mg/L	0.8	0.25	0.25	0.25	1.3	Yes	Analyte exceeded cleanup level
Diesel	44	11	25.0	7	mg/L	0.5	0.20	0.22	0.22	6.1	Yes	Analyte exceeded cleanup level
Motor Oil	44	3	6.8	2	mg/L	0.5	0.20	0.30	0.61	0.73	Yes	Analyte exceeded cleanup level
PAHs												
Method 8270-SIM												
Benzo(a)anthracene	17	6	35.3	2	µg/L	0.1	0.01	0.26	0.015	0.26	No	Analyte exceedances were caused by particulate interferences
Chrysene	17	6	35.3	2	µg/L	0.1	0.01	0.1	0.012	0.24	No	Analyte exceedances were caused by particulate interferences
Benzo(b)fluoranthene	17	5	29.4	1	µg/L	0.1	0.01	0.1	0.013	0.12	No	Analyte exceedances were caused by particulate interferences
Benzo(k)fluoranthene	17	6	35.3	2	µg/L	0.1	0.01	0.1	0.012	0.21	No	Analyte exceedances were caused by particulate interferences
Benzo(a)pyrene	17	6	35.3	1	µg/L	0.1	0.01	0.1	0.012	0.19	No	Analyte exceedances were caused by particulate interferences
Indeno(1,2,3-cd)pyrene	17	4	23.5	0	µg/L	0.1	0.01	0.1	0.014	0.10	No	Analyte did not exceed cleanup level
Dibenz(a,h)anthracene	17	1	5.9	0	µg/L	0.1	0.01	0.1	0.042	0.042	No	Analyte did not exceed cleanup level
Napthalene	14	2	14.3	0	µg/L	4,900	0.5	5.0	10	660	No	Analyte did not exceed cleanup level
cPAH TEQ	17	7	41.2	2	µg/L	0.1	--	--	0.00012	0.26	No	Analyte exceedances were caused by particulate interferences
Metals												
Method 6000-7000 Series												
Arsenic (Dissolved)	38	36	94.7	19	µg/L	5	1	1	1	146	Yes	Analyte exceeded cleanup level
Chromium (Dissolved)	10	1	10.0	0	µg/L	240,000	1.0	5.0	77.5	77.5	No	Analyte did not exceed cleanup level
Copper (Dissolved)	22	10	45.5	4	µg/L	3.1	0.5	4	4	81.3	Yes	Analyte exceeded cleanup level; however, because copper only exceeded its cleanup level in the ACC North Yard, copper is identified as a groundwater IHS in the ACC North Yard only.
Lead (Dissolved)	25	2	8.0	1	µg/L	8.1	0.02	5	1	90.6	No	Although analyte exceeded at one location, the sample does not represent actual groundwater concentrations. Results were skewed high due to failure of the field filter during sampling.
Zinc (Dissolved)	22	1	4.5	1	µg/L	81	4	20	5	271	No	Although analyte exceeded at one location, the sample does not represent actual groundwater concentrations. Results were skewed high due to failure of the field filter during sampling.
BETX												
Method 8021/8260B												
Toluene	31	2	6.5	0	µg/L	15,000	0.2	1	1.4	3.8	No	Analyte did not exceed cleanup level
Ethylbenzene	16	2	12.5	0	µg/L	2,100	0.2	1	1.8	1.9	No	Analyte did not exceed cleanup level
m,p-Xylene	16	3	18.8	0	µg/L	1,600	0.4	1	1.5	4.6	No	Analyte did not exceed cleanup level
o-Xylene	16	2	12.5	0	µg/L	16,000	0.4	1	1.1	1.1	No	Analyte did not exceed cleanup level

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(a) Only detected chemicals are presented in this table

TABLE 3
SUMMARY OF PREVIOUS SEDIMENT SAMPLE ANALYTICAL RESULTS - ORGANIC CARBON NORMALIZED
WEST END SITE
EVERETT, WASHINGTON

Station Identification:			A-4	A-8	A-12	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
DMMU Sample Designation:			CM-1	CM-2	CM-3	--	--	--	--	--	--	--
Laboratory Identification:			21090064	21090058	21090051	GU78B/GV02/HD32A	GU97E	GU97F	GU78C/GV02	GU78I	GU97G	GU97J
Sample Depth Interval (ft, MLLW):			-1.4 to -5.4	-1.7 to -5.7	0.1 to -3.9	0-10 cm	0.5-3.0 ft	3.0-6.0 ft	0-10 cm	0-10cm	0.5-1.4 ft	0.5-1.4 ft
Sample Collection Date:	Preliminary Cleanup Levels (a)		11/9/2000	11/8/2000	11/7/2000	7/1/2004	7/2/2004	7/2/2004	7/1/2004	7/1/2004	7/5/2004	7/5/2004
Analyte	SQS	CSL										
Conventionals												
Total Solids (TS) (%)	--	--	71.9	72.6	67.6	56.60	67.10	59.20	68.20	65.90	68.60	68.60
Preserved TS (%)	--	--	69	69.8	58	NA	NA	NA	NA	NA	NA	NA
N Ammonia (mg N/kg)	--	--	45	25	20	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	--	--	71	19	16	NA	NA	NA	NA	NA	NA	NA
TOC (%)	--	--	1.4	1.7	1.7	1.65	1.76	5.23	1.08	1.30	1.68	1.62
TVS (%)	--	--	4.6	4.6	6.3	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)												
Antimony	--	--	7 U	6 U	7 U	NA	NA	NA	NA	NA	NA	NA
Arsenic	57	93	10	10	10	9 U	7	8 U	8 U	7 U	7	7
Cadmium	5.1	6.7	0.3 U	0.3	0.3 U	0.3 U	0.4	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chromium	260	270	41.9	41.1	53.4	50.4	41.6	28.7	35.4	37.4	37.7	36.1
Copper	390	390	39	31	47	62.9	45.0	25.3	45.3	52.9	38.6	39.4
Lead	450	530	12	31	10	13	11	8	10	13	12	12
Mercury	0.41	0.59	0.06	31	0.09	0.08	0.08	0.06	0.06	0.12	0.1	0.07 U
Nickel	--	--	39	31	49	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1	0.4 U	31 U	0.6	0.5 U	0.4 U	0.5 U	0.5 U	0.4 U	0.4 U	0.4 U
Zinc	410	960	62	31	76	88	81.5	41.7	66.5	71.5	72.8	72.8
Oganometallic Compounds (Pore Water) (µg/L)												
Tributyltin	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tributyltin Chloride	--	--	0.02 U	0.07 U	0.02 U	0.043	NA	NA	0.025 U	0.025 U	NA	NA
Dibutyltin Dichloride	--	--	NA	NA	NA	0.050 U	NA	NA	0.050 U	0.050 U	NA	NA
Butyltin Trichloride	--	--	NA	NA	NA	0.050 U	NA	NA	0.050 U	0.050 U	NA	NA
TBT as TBT ion	0.15	0.05	NA	NA	NA	0.039	NA	NA	0.022 U	0.022 U	NA	NA
Organotin (Bulk) (µg/kg)												
Tributyltin Chloride	--	--	NA	NA	NA	5.7 U	5.7	5.7 U	NA	NA	5.8 U	5.6 U
Dibutyltin Dichloride	--	--	NA	NA	NA	5.7 U	5.6 U	5.7 U	NA	NA	5.8 U	5.6 U
Butyltin Trichloride	--	--	NA	NA	NA	5.7 U	5.6 U	5.7 U	NA	NA	5.8 U	5.6 U
TBT as TBT ion	--	73	NA	NA	NA	5.7 U	5.1	5.1 U	NA	NA	5.1 U	5.0 U
Semivolatile Organic Compounds (SVOCs) (mg/kg OC)(b)												
Total LPAH	370	780	6.93	4.76	8.59	1.82	3.58	7.76	26.94	47.45	36.07	21.23
Naphthalene	99	170	3.79	2.88	4.18	1.15 U	2.27 U	0.71	1.76 U	1.54 U	3.93	5.86
Acenaphthylene	66	66	1.36 U	1.18 U	1.24	1.15 U	2.27 U	0.38 U	1.85	2.15	2.32 U	1.17 U
Acenaphthene	16	57	1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.96	2.13	2.69	3.93	2.35
Fluorene	23	79	1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	1.13	2.22	3.15	3.21	2.47
Phenanthrene	100	480	3.14	1.88	3.18	1.82	3.58	3.06	14.81 J	33.08 J	19.05 J	6.79 J
Anthracene	220	1200	1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	1.91	5.93	6.38	5.95	3.77
2-Methylnaphthalene	38	64	1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.36
Ttoal HPAH	960	5300	15.43 J	7.76 J	15.47	25.52	40.80	30.13	259.17	360.24	236.96	125.99
Fluoranthene	160	1200	4.71	2.76	5.18	7.27	6.82	7.46	72.22 J	123.08 J	54.17 J	12.96 J
Pyrene	1000	1400	4.29	2.41	4.12	5.21	13.64	8.41	62.96 J	92.31 J	77.38 J	43.21 J
Benzo(a)anthracene	110	270	1.71	1.12 J	1.35	2.55	2.84	3.44	19.44 J	26.92 J	16.07	11.73
Chrysene	110	460	2.07	1.47	2.24	4.24	4.43	4.40	35.19 J	43.85 J	28.57 J	17.90 J

TABLE 3
SUMMARY OF PREVIOUS SEDIMENT SAMPLE
ANALYTICAL RESULTS - ORGANIC CARBON NORMALIZED
WEST END SITE
EVERETT, WASHINGTON

											Dup of NMA-grab-5		Dup of NMA-core-5
			Station Identification:	A-4	A-8	A-12	NMA-grab 4	NMA-core 4	NMA-core 4	NMA-grab 5	NMA-grab-11	NMA-core 5	NMA-core 5
			DMMU Sample Designation:	CM-1	CM-2	CM-3	--	--	--	--	--	--	--
			Laboratory Identification:	21090064	21090058	21090051	GU78B/GV02/HD32A	GU97E	GU97F	GU78C/GV02	GU78I	GU97G	GU97J
			Sample Depth Interval (ft, MLLW):	-1.4 to -5.4	-1.7 to -5.7	0.1 to -3.9	0-10 cm	0.5-3.0 ft	3.0-6.0 ft	0-10 cm	0-10cm	0.5-1.4 ft	0.5-1.4 ft
	Preliminary Cleanup Levels (a)		Sample Collection Date:	11/9/2000	11/8/2000	11/7/2000	7/1/2004	7/2/2004	7/2/2004	7/1/2004	7/1/2004	7/5/2004	7/5/2004
Analyte	SQS	CSL											
Benzofluoranthenes	230	450		2.64 J	1.18 U	2.59	4.73	10.45	4.97	50.00	52.31	46.43 J	27.16 J
Benzo(b)fluoranthene	---	---		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	---	---		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	99	210		1.36	1.18	1.41	1.52	2.61	1.45	13.89	14.62	11.90	8.64
Indeno(1,2,3-c,d)pyrene	34	88		1.36	1.18	1.18	1.15 U	2.27 U	0.38 U	3.15	4.15	2.44	2.53
Dibenzo(a,h)anthracene	12	33		1.36	1.18	1.18	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
Benzo(g,h,i)perylene	31	78		1.36	1.18	1.18	1.15 U	2.27 U	0.38 U	2.31	3.00	2.32 U	1.85
Chlorinated Benzenes (mg/kg OC)(b)													
1,2-dichlorobenzene	2.3	2.3		0.10 U	0.08 U	0.09 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
1,3-dichlorobenzene	---	--		0.10 U	0.08 U	0.09 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
1,4-dichlorobenzene	3.1	9		0.10 U	0.08 U	0.09 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
1,2,4-trichlorobenzene	0.81	1.8		0.49 U	0.41 U	0.46 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
Hexachlorobenzene	0.38	2.3		1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
Phthalate Esters (mg/kg -OC)(b)													
Dimethylphthalate	53	53		1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.38 U	21.30 J	1.54 U	2.32 U	1.17 U
Diethylphthalate	61	110		1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
Di-n-butyl phthalate	220	1700		1.71 UJ	2.00 UJ	1.59 UJ	1.64 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
Butyl benzyl phthalate	4.9	64		1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
Bis(2-ethylhexyl)phthalate	47	78		1.57	2.00	2.00	3.21 U	5.34 U	0.80 U	6.67 U	4.69 U	8.33 U	4.20 U
Di-n-octyl phthalate	58	4500		1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.38 U	3.52	1.54 U	2.32 U	1.17 U
Phenols (µg/kg -dry weight)													
Phenol	420	1200		54	24	36	53	40 U	20 U	19 U	20 U	39 U	19 U
2-Methyl phenol	63	63		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U
4-Methylphenol	670	670		41	31	39	19 U	40 U	20 U	19 U	20 U	39 U	53
2,4-Dimethylphenol	29	29		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U
Pentachlorophenol	360	690		93 U	98 U	99 U	97 U	200 U	98 U	97 U	98 U	200 U	97 U
Misc. Extractables (mg/kg-OC)(b)													
Dibenzofuran	15	58		1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.80	1.76 U	1.69	2.32 U	1.73
Hexachloroethane	--	--		1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
Hexachlorobutadiene	3.9	6.2		1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
N-nitrosodiphenylamine	11	11		1.36 U	1.18 U	1.18 U	1.15 U	2.27 U	0.38 U	1.76 U	1.54 U	2.32 U	1.17 U
Total PCBs	130			2.5 U	2.3 U	2.2 U	NA	NA	NA	NA	NA	NA	NA
Misc. Extractables (µg/kg-dry weight)													
Benzyl alcohol	57	73		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U
Benzoic acid	650	650		190 U	200 U	200 U	190 U	400 U	200 U	190 U	200 U	390 U	190 U

TABLE 3
SUMMARY OF PREVIOUS SEDIMENT SAMPLE
ANALYTICAL RESULTS - ORGANIC CARBON NORMALIZED
WEST END SITE
EVERETT, WASHINGTON

			Station Identification:	A-4	A-8	A-12	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
			DMMU Sample Designation:	CM-1	CM-2	CM-3	--	--	--	--	--	--	--
			Laboratory Identification:	21090064	21090058	21090051	GU78B/GV02/HD32A	GU97E	GU97F	GU78C/GV02	GU78I	GU97G	GU97J
			Sample Depth Interval (ft, MLLW):	-1.4 to -5.4	-1.7 to -5.7	0.1 to -3.9	0-10 cm	0.5-3.0 ft	3.0-6.0 ft	0-10 cm	0-10cm	0.5-1.4 ft	0.5-1.4 ft
	Preliminary Cleanup Levels (a)		Sample Collection Date:	11/9/2000	11/8/2000	11/7/2000	7/1/2004	7/2/2004	7/2/2004	7/1/2004	7/1/2004	7/5/2004	7/5/2004
Analyte	SQS	CSL											
Volatile Organic Compounds (VOCs) (µg/kg-dry weight)													
Trichloroethene	--	--		1.4 U	1.4 U	1.6 U	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	--	--		1.4 U	1.4 U	1.6 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	--	--		1.4 U	1.4 U	1.6 U	NA	NA	NA	NA	NA	NA	NA
Total xylene	--	--		1.4 U	1.4 U	1.6 U	NA	NA	NA	NA	NA	NA	NA
Pesticides and PCBs (µg/kg- dry weight)													
4,4'-DDE	--	--		1.7 U	2.0 U	1.9 U	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	--	--		1.7 U	2.0 U	1.9 U	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	--	--		1.7 U	2.0 U	1.9 U	NA	NA	NA	NA	NA	NA	NA
Total DDT	--	--		1.7 U	2.0 U	1.9 U	NA	NA	NA	NA	NA	NA	NA
Aldrin	--	--		1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA	NA
Chlordane (alpha)	--	--		1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA	NA
Dieldrin	--	--		2.0 U	2.0 U	2.0 U	NA	NA	NA	NA	NA	NA	NA
Heptachlor	--	--		1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA	NA
Lindane	--	--		1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016	--	--		17.0 U	20.0 U	19.0 U	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	--	--		17.0 U	20.0 U	19.0 U	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	--	--		17.0 U	20.0 U	19.0 U	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	--	--		17.0 U	20.0 U	19.0 U	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	--	--		17.0 U	20.0 U	19.0 U	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	--	--		35.0 U	39.0 U	37.0 U	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	--	--		17.0 U	20.0 U	19.0 U	NA	NA	NA	NA	NA	NA	NA

TABLE 3
SUMMARY OF PREVIOUS SEDIMENT SAMPLE
ANALYTICAL RESULTS - ORGANIC CARBON NORMALIZED
WEST END SITE
EVERETT, WASHINGTON

			Station Identification:	NMA-core 5	NMA-core 5	NMA-grab 6	NMA-core 6	NMA-core 6	NMA-core 6
			DMMU Sample Designation:	--	--	--	--	--	--
			Laboratory Identification:	GU97H	GU97I	GU78D/GV02	GU97K	GU97L	GU97M
			Sample Depth Interval (ft, MLLW):	1.4-2.3 ft	2.8-4.8 ft	0-10 cm	0.5-2.0 ft	2.0-3.5 ft	4.0-6.0 ft
	Preliminary Cleanup Levels (a)		Sample Collection Date:	7/5/2004	7/5/2004	7/1/2004	7/2/2004	7/2/2004	7/2/2004
Analyte	SQS	CSL							
Conventionals									
Total Solids (TS) (%)	--	--		73.70	79.10	67.80	69.40	73.40	76.90
Preserved TS (%)	--	--		NA	NA	NA	NA	NA	NA
N Ammonia (mg N/kg)	--	--		NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	--	--		NA	NA	NA	NA	NA	NA
TOC (%)	--	--		1.25	0.564	0.940	1.32	5.61	0.567
TVS (%)	--	--		NA	NA	NA	NA	NA	NA
Metals (mg/kg)									
Antimony	--	--		NA	NA	NA	NA	NA	NA
Arsenic	57	93		6 U	6 U	7 U	8	7	6 U
Cadmium	5.1	6.7		0.3 U	0.2 U	0.3 U	0.3 U	0.3 U	0.2 U
Chromium	260	270		36.5	35.7	35.9	35.1	25.2	37.9
Copper	390	390		29.8	26.1	35.1	33.4	19.3	28.7
Lead	450	530		30	4	7	8	5	5
Mercury	0.41	0.59		0.05	0.05	0.14	0.06	0.07 U	0.06 U
Nickel	--	--		NA	NA	NA	NA	NA	NA
Silver	6.1	6.1		0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Zinc	410	960		56.6	46.2	61.7	59.6	42.4	45.9
Oganometallic Compounds (Pore Water) (μg/L)									
Tributyltin	--	--		NA	NA	NA	NA	NA	NA
Tributyltin Chloride	--	--		NA	NA	0.025 U	NA	NA	NA
Dibutyltin Dichloride	--	--		NA	NA	0.050 U	NA	NA	NA
Butyltin Trichloride	--	--		NA	NA	0.050 U	NA	NA	NA
TBT as TBT ion	0.15	0.05		NA	NA	0.022 U	NA	NA	NA
Organotin (Bulk) (μg/kg)									
Tributyltin Chloride	--	--		5.6 U	5.9 U	NA	5.9 U	5.9 U	5.9 U
Dibutyltin Dichloride	--	--		5.6 U	5.9 U	NA	5.9 U	5.9 U	5.9 U
Butyltin Trichloride	--	--		5.6 U	5.9 U	NA	5.9 U	5.9 U	5.9 U
TBT as TBT ion	--	73		5.0 U	5.2 U	NA	5.3 U	5.3 U	5.3 U
Semivolatile Organic Compounds (SVOCs) (mg/kg OC)(b)									
Total LPAH	370	780		5.92	3.55 U	110.43	82.05	0.36 U	3.53 U
Naphthalene	99	170		3.20 U	3.55 U	12.77	8.33	0.36 U	3.53 U
Acenaphthylene	66	66		3.20 U	3.55 U	2.13 U	5.53	0.36 U	3.53 U
Acenaphthene	16	57		3.20 U	3.55 U	17.02	5.30	0.36 U	3.53 U
Fluorene	23	79		3.20 U	3.55 U	12.77	1.52 U	0.36 U	3.53 U
Phenanthrene	100	480		5.92	3.55 U	61.70	50.76	0.36 U	3.53 U
Anthracene	220	1200		3.20 U	3.55 U	6.17	12.12	0.36 U	3.53 U
2-Methylnaphthalene	38	64		3.20 U	3.55 U	4.15	3.64	0.36 U	3.53 U
Ttoal HPAH	960	5300		112.40	3.55 U	204.68	269.39	0.36 U	3.53 U
Fluoranthene	160	1200		22.40	3.55 U	63.83	56.82	0.36 U	3.53 U
Pyrene	1000	1400		36.80	3.55 U	64.89	75.00	0.36 U	3.53 U
Benzo(a)anthracene	110	270		8.00	3.55 U	17.02	23.48	0.36 U	3.53 U
Chrysene	110	460		12.80	3.55 U	19.15	28.03	0.36 U	3.53 U

TABLE 3
SUMMARY OF PREVIOUS SEDIMENT SAMPLE ANALYTICAL RESULTS - ORGANIC CARBON NORMALIZED
WEST END SITE
EVERETT, WASHINGTON

			Station Identification:	NMA-core 5	NMA-core 5	NMA-grab 6	NMA-core 6	NMA-core 6	NMA-core 6
			DMMU Sample Designation:	--	--	--	--	--	--
			Laboratory Identification:	GU97H	GU97I	GU78D/GV02	GU97K	GU97L	GU97M
			Sample Depth Interval (ft, MLLW):	1.4-2.3 ft	2.8-4.8 ft	0-10 cm	0.5-2.0 ft	2.0-3.5 ft	4.0-6.0 ft
	Preliminary Cleanup Levels (a)		Sample Collection Date:	7/5/2004	7/5/2004	7/1/2004	7/2/2004	7/2/2004	7/2/2004
Analyte	SQS	CSL							
Benzofluoranthenes	230	450		24.80	3.55 U	24.47	49.24	0.36 U	3.53 U
Benzo(b)fluoranthene	---	---		NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	---	---		NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	99	210		7.60	3.55 U	8.30	22.73	0.36 U	3.53 U
Indeno(1,2,3-c,d)pyrene	34	88		3.20 U	3.55 U	3.83	7.58	0.36 U	3.53 U
Dibenzo(a,h)anthracene	12	33		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
Benzo(g,h,i)perylene	31	78		3.20 U	3.55 U	3.19	6.52	0.36 U	3.53 U
Chlorinated Benzenes (mg/kg OC)(b)									
1,2-dichlorobenzene	2.3	2.3		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
1,3-dichlorobenzene	---	--		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
1,4-dichlorobenzene	3.1	9		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
1,2,4-trichlorobenzene	0.81	1.8		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
Hexachlorobenzene	0.38	2.3		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
Phthalate Esters (mg/kg -OC)(b)									
Dimethylphthalate	53	53		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
Diethylphthalate	61	110		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
Di-n-butyl phthalate	220	1700		3.20 U	3.55 U	2.77 U	1.52 U	0.36 U	3.53 U
Butyl benzyl phthalate	4.9	64		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
Bis(2-ethylhexyl)phthalate	47	78		5.60 U	5.67 U	6.60 U	1.74 U	0.36 U	3.53 U
Di-n-octyl phthalate	58	4500		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
Phenols (µg/kg -dry weight)									
Phenol	420	1200		40 U	20 U	20 U	20 U	20 U	20 U
2-Methyl phenol	63	63		40 U	20 U	20 U	20 U	20 U	20 U
4-Methylphenol	670	670		40 U	20 U	20 U	58	20 U	20 U
2,4-Dimethylphenol	29	29		40 U	20 U	20 U	20 U	20 U	20 U
Pentachlorophenol	360	690		200 U	100 U	98 U	98 U	98 U	98 U
Misc. Extractables (mg/kg-OC)(b)									
Dibenzofuran	15	58		3.20 U	3.55 U	8.30	4.09	0.36 U	3.53 U
Hexachloroethane	--	--		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
Hexachlorobutadiene	3.9	6.2		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
N-nitrosodiphenylamine	11	11		3.20 U	3.55 U	2.13 U	1.52 U	0.36 U	3.53 U
Total PCBs	130			NA	NA	NA	NA	NA	NA
Misc. Extractables (µg/kg-dry weight)									
Benzyl alcohol	57	73		40 U	20 U	20 U	20 U	20 U	20 U
Benzoic acid	650	650		400 U	200 U	200 U	200 U	200 U	200 U

TABLE 3
SUMMARY OF PREVIOUS SEDIMENT SAMPLE
ANALYTICAL RESULTS - ORGANIC CARBON NORMALIZED
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)		Station Identification:	NMA-core 5	NMA-core 5	NMA-grab 6	NMA-core 6	NMA-core 6	NMA-core 6
			DMMU Sample Designation:	--	--	--	--	--	--
			Laboratory Identification:	GU97H	GU97I	GU78D/GV02	GU97K	GU97L	GU97M
			Sample Depth Interval (ft, MLLW):	1.4-2.3 ft	2.8-4.8 ft	0-10 cm	0.5-2.0 ft	2.0-3.5 ft	4.0-6.0 ft
			Sample Collection Date:	7/5/2004	7/5/2004	7/1/2004	7/2/2004	7/2/2004	7/2/2004
Analyte	SQS	CSL							
Volatile Organic Compounds (VOCs) (μg/kg-dry weight)									
Trichloroethene	--	--		NA	NA	NA	NA	NA	NA
Tetrachloroethene	--	--		NA	NA	NA	NA	NA	NA
Ethylbenzene	--	--		NA	NA	NA	NA	NA	NA
Total xylene	--	--		NA	NA	NA	NA	NA	NA
Pesticides and PCBs (μg/kg- dry weight)									
4,4'-DDE	--	--		NA	NA	NA	NA	NA	NA
4,4'-DDD	--	--		NA	NA	NA	NA	NA	NA
4,4'-DDT	--	--		NA	NA	NA	NA	NA	NA
Total DDT	--	--		NA	NA	NA	NA	NA	NA
Aldrin	--	--		NA	NA	NA	NA	NA	NA
Chlordane (alpha)	--	--		NA	NA	NA	NA	NA	NA
Dieldrin	--	--		NA	NA	NA	NA	NA	NA
Heptachlor	--	--		NA	NA	NA	NA	NA	NA
Lindane	--	--		NA	NA	NA	NA	NA	NA
Aroclor 1016	--	--		NA	NA	NA	NA	NA	NA
Aroclor 1242	--	--		NA	NA	NA	NA	NA	NA
Aroclor 1248	--	--		NA	NA	NA	NA	NA	NA
Aroclor 1254	--	--		NA	NA	NA	NA	NA	NA
Aroclor 1260	--	--		NA	NA	NA	NA	NA	NA
Aroclor 1221	--	--		NA	NA	NA	NA	NA	NA
Aroclor 1232	--	--		NA	NA	NA	NA	NA	NA

NA = Not Analyzed.
SQS = Sediment Quality Standard
CSL = Cleanup Screening Level
U = The analyte was not detected in the sample at the given reporting limit.
J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate.
Boxed cells indcate an exceedance of the cleanup screening level.
(a) Preliminary Cleanup Levels are based on Washington Sediment Management Management Standards.
(b) Organic carbon normalized.

TABLE 4
SUMMARY OF PREVIOUS SEDIMENT SAMPLES DRY WEIGHT ANALYTICAL RESULTS
WEST END SITE
EVERETT, WASHINGTON

				A-4	A-8	A-12									
				CM-1	CM-2	CM-3					Dup of NMA-grab-5		Dup of NMA-core-5		
			Sample ID:	21090064	21090058	21090051	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
			Depth:	-1.4 to -5.4	-1.7 to -5.7	0.1 to -3.9	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
	Dry Weight Equivalent to SMS Criteria (a)		Lab ID:	Surface	Surface	Surface	GU78B/HD32A	GU97E	GU97F	GU78C	GU78I	GU97G	GU97J	GU97H	GU97I
	SQS (b)	CSL (c)	Sample Date:	11/9/2000	11/8/2000	11/7/2000	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
Metals (mg/kg)															
Antimony	--	--		7 U	6 U	7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	57	93		10	10	10	9 U	7	8 U	8 U	7 U	7	7	6 U	6 U
Cadmium	5.1	6.7		0.3 U	0.3	0.3 U	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
Chromium	260	270		41.9	41.1	53.4	50.4	41.6	28.7	35.4	37.4	37.7	36.1	36.5	35.7
Copper	390	390		39	31	47	62.9	45.0	25.3	45.3	52.9	38.6	39.4	29.8	26.1
Lead	450	530		12	8	10	13	11	8	10	13	12	12	30	4
Mercury	0.41	0.59		0.06	0.07	0.09	0.08	0.08	0.06	0.06	0.12	0.1	0.07 U	0.05	0.05
Nickel	--	--		39	37	49	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	6.1	6.1		0.4 U	0.4 U	0.6	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
Zinc	410	960		62	58	76	88	81.5	41.7	66.5	71.5	72.8	72.8	56.6	46.2
Organotin (Pore Water) (µg/L)															
Tributyl Tin Chloride	--	--		0.02 U	0.07 U	0.02 U	0.043	NA	NA	0.025 U	0.025 U	NA	NA	NA	NA
Dibutyl Tin Dichloride	--	--		NA	NA	NA	0.050 U	NA	NA	0.050 U	0.050 U	NA	NA	NA	NA
Butyl Tin Trichloride	--	--		NA	NA	NA	0.050 U	NA	NA	0.050 U	0.050 U	NA	NA	NA	NA
TBT as TBT	0.15	0.15		NA	NA	NA	0.039	NA	NA	0.022 U	0.022 U	NA	NA	NA	NA
Organotin (Bulk) (µg/kg)															
Tributyl Tin Chloride	--	--		NA	NA	NA	5.7 UJ	5.7	5.7 U	NA	NA	5.8 U	5.6 U	5.6 U	5.9 U
Dibutyl Tin Dichloride	--	--		NA	NA	NA	5.7 UJ	5.6 U	5.7 U	NA	NA	5.8 U	5.6 U	5.6 U	5.9 U
Butyl Tin Trichloride	--	--		NA	NA	NA	5.7 UJ	5.6 U	5.7 U	NA	NA	5.8 U	5.6 U	5.6 U	5.9 U
TBT as TBT	--	--		NA	NA	NA	5.7 UJ	5.1	5.1 U	NA	NA	5.1 U	5.0 U	5.0 U	5.2 U
PAHs (µg/kg)															
Total LPAHs	5200	5200		97	81	146	30	63	706	291	617	606	366	74	ND
Naphthalene	2100	2100		53	49	71	19 U	40 U	37	19 U	20 U	66	95	40 U	20 U
Acenaphthylene	560	560		19 U	20 U	21	19 U	40 U	20 U	20	28	39 U	19 U	40 U	20 U
Acenaphthene	500	500		19 U	20 U	20 U	19 U	40 U	50	23	35	66	38	40 U	20 U
Fluorene	540	540		19 U	20 U	20 U	19 U	40 U	59	24	41	54	40	40 U	20 U
Phenanthrene	1500	1500		44	32	54	30	63	160	160 J	430 J	320 J	110 J	74	20 U
Anthracene	960	960		19 U	20 U	20 U	19 U	40 U	100	64	83	100	61	40 U	20 U
2-Methylnaphthalene	670	670		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	22	40 U	20 U
Total HPAHs	12000	17000		236 J	132 J	287	421	718	1576	2799	4683	3981	2041	1405	ND
Fluoranthene	1700	2500		66	47	88	120	120	390	780 J	1600 J	910 J	210 J	280	20 U
Pyrene	2600	3300		60	41	70	86	240	440	680 J	1200 J	1300 J	700 J	460	20 U
Benzo(a)anthracene	1300	1600		24	19 J	23	42	50	180	210 J	350 J	270	190	100	20 U
Chrysene	1400	2800		29	25	38	70	78	230	380 J	570 J	480 J	290 J	160	20 U
Benzofluoranthenes	3200	3600		37 J	20 U	44	NA	NA	NA	NA	NA	NA	NA	NA	
Benzo(b)fluoranthene	3200 (a)	3600 (a)		NA	NA	NA	43	100	130	320	420	410 J	270 J	160	20 U
Benzo(k)fluoranthene	3200 (a)	3600 (a)		NA	NA	NA	35	84	130	220	260	370 J	170 J	150	20 U
Benzo(a)pyrene	1600	1600		19 U	20 U	24	25	46	76	150	190	200	140	95	20 U
Indeno(1,2,3-cd)pyrene	600	690		19 U	20 U	20 U	19 U	40 U	20 U	34	54	41	41	40 U	20 U
Dibenz(a,h)anthracene	230	230		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
Benzo(g,h,i)perylene	670	720		19 U	20 U	20 U	19 U	40 U	20 U	25	39	39 U	30	40 U	20 U
Chlorinated Benzenes (µg/kg)															
1,2-Dichlorobenzene	35	50		1.4 U	1.4 U	1.6 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
1,3-Dichlorobenzene	--	--		1.4 U	1.4 U	1.6 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
1,4-Dichlorobenzene	110	110		1.4 U	1.4 U	1.6 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
1,2,4-Trichlorobenzene	31	51		6.9 U	7.0 U	7.8 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
Hexachlorobenzene	22	70		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U

TABLE 4
SUMMARY OF PREVIOUS SEDIMENT SAMPLES DRY WEIGHT ANALYTICAL RESULTS
WEST END SITE
EVERETT, WASHINGTON

				CM-1	CM-2	CM-3					Dup of NMA-grab-5		Dup of NMA-core-5		
			Sample ID:	21090064	21090058	21090051	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
			Depth:	-1.4 to -5.4	-1.7 to -5.7	0.1 to -3.9	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
	Dry Weight Equivalent to SMS Criteria (a)		Lab ID:	Surface	Surface	Surface	GU78B/HD32A	GU97E	GU97F	GU78C	GU78I	GU97G	GU97J	GU97H	GU97I
	SQS (b)	CSL (c)	Sample Date:	11/9/2000	11/8/2000	11/7/2000	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
Phthalate Esters (µg/kg)															
Dimethylphthalate	71	160		19 U	20 U	20 U	19 U	40 U	20 U	230 J	20 UJ	39 U	19 U	40 U	20 U
Diethylphthalate	200	1200		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
Di-n-Butylphthalate	1400	5100		24 UJ	34 UJ	27 UJ	27 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
Butylbenzylphthalate	63	900		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
bis(2-Ethylhexyl)phthalate	1300	3100		22	34	34	53 U	94 U	42 U	72 U	61 U	140 U	68 U	70 U	32 U
Di-n-octyl phthalate	6200	6200		19 U	20 U	20 U	19 U	40 U	20 U	38	20 U	39 U	19 U	40 U	20 U
Phenols (µg/kg)															
Phenol	420	1200		54	24	36	53	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
2-Methylphenol	63	63		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
4-Methylphenol	670	670		41	31	39	19 U	40 U	20 U	19 U	20 U	39 U	53	40 U	20 U
2,4-Dimethylphenol	29	29		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
Pentachlorophenol	360	690		93 U	98 U	99 U	97 U	200 U	98 U	97 U	98 U	200 U	97 U	200 U	100 U
Misc. Extractables (µg/kg)															
Dibenzofuran	540	540		19 U	20 U	20 U	19 U	40 U	42	19 U	22	39 U	28	40 U	20 U
Hexachlorobutadiene	11	120		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
Hexachloroethane	--	--													
N-Nitrosodiphenylamine	28	40		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
Benzyl Alcohol	57	73		19 U	20 U	20 U	19 U	40 U	20 U	19 U	20 U	39 U	19 U	40 U	20 U
Benzoic Acid	650	650		190 U	200 U	200 U	190 U	400 U	200 U	190 U	200 U	390 U	190 U	400 U	200 U
Conventionals															
Total Organic Carbon (percent)	--			1.4	1.7	1.7	1.65	1.76	5.23	1.08	1.30	1.68	1.62	1.25	0.564
Total Solids (percent wet wt)	--			71.9	72.6	67.6	56.60	67.10	59.20	68.20	65.90	68.60	68.60	73.70	79.10
Total Volatile Solids (percent)	--			4.6	4.6	6.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds (VOCs) (µg/kg-dry weight)															
Trichloroethene	160			1.4 U	1.4 U	1.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	57			1.4 U	1.4 U	1.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	10			1.4 U	1.4 U	1.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total xylene	40			1.4 U	1.4 U	1.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides and PCBs (µg/kg- dry weight)															
4,4'-DDE	--			1.7 U	2.0 U	1.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	--			1.7 U	2.0 U	1.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	--			1.7 U	2.0 U	1.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total DDT	6.9			1.7 U	2.0 U	1.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	10			1 U	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane (alpha)	10			1 U	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	10			2 U	2 U	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	10			1 U	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lindane	10			1 U	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1016	--			17 U	20 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	--			17 U	20 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	--			17 U	20 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	--			17 U	20 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	--			17 U	20 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	--			35 U	39 U	37 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	--			17 U	20 U	19 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	130			35 U	39 U	37 U	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 4
SUMMARY OF PREVIOUS SEDIMENT SAMPLES DRY WEIGHT ANALYTICAL RESULTS
WEST END SITE
EVERETT, WASHINGTON

		NMA-grab-6	NMA-core-6	NMA-core-6	NMA-core-6
		0-10cm	0.5-2.0	2.0-3.5	4.0-6.0
	Dry Weight Equivaler	GU78D	GU97K	GU97L	GU97M
	SQS (b)	7/1/2004	7/2/2004	7/2/2004	7/2/2004
Metals (mg/kg)					
Antimony	--	NA	NA	NA	NA
Arsenic	57	7 U	8	7	6 U
Cadmium	5.1	0.3 U	0.3 U	0.3 U	0.2 U
Chromium	260	35.9	35.1	25.2	37.9
Copper	390	35.1	33.4	19.3	28.7
Lead	450	7	8	5	5
Mercury	0.41	0.14	0.06	0.07 U	0.06 U
Nickel	--	NA	NA	NA	NA
Silver	6.1	0.4 U	0.4 U	0.4 U	0.4 U
Zinc	410	61.7	59.6	42.4	45.9
Organotin (Pore Water) (µg/L)					
Tributyl Tin Chloride	--	0.025 U	NA	NA	NA
Dibutyl Tin Dichloride	--	0.050 U	NA	NA	NA
Butyl Tin Trichloride	--	0.050 U	NA	NA	NA
TBT as TBT	0.15	0.022 U	NA	NA	NA
Organotin (Bulk) (µg/kg)					
Tributyl Tin Chloride	--	NA	5.9 U	5.9 U	5.9 U
Dibutyl Tin Dichloride	--	NA	5.9 U	5.9 U	5.9 U
Butyl Tin Trichloride	--	NA	5.9 U	5.9 U	5.9 U
TBT as TBT	--	NA	5.3 U	5.3 U	5.3 U
PAHs (µg/kg)					
Total LPAHs	5200	1077	1131	ND	ND
Naphthalene	2100	120	110	20 U	20 U
Acenaphthylene	560	20 U	73	20 U	20 U
Acenaphthene	500	160	70	20 U	20 U
Fluorene	540	120	20 U	20 U	20 U
Phenanthrene	1500	580	670	20 U	20 U
Anthracene	960	58	160	20 U	20 U
2-Methylnaphthalene	670	39	48	20 U	20 U
Total HPAHs	12000	1550	2420	ND	ND
Fluoranthene	1700	600	750	20 U	20 U
Pyrene	2600	610	990	20 U	20 U
Benzo(a)anthracene	1300	160	310	20 U	20 U
Chrysene	1400	180	370	20 U	20 U
Benzofluoranthenes	3200				
Benzo(b)fluoranthene	3200 (a)	130	370	20 U	20 U
Benzo(k)fluoranthene	3200 (a)	100	280	20 U	20 U
Benzo(a)pyrene	1600	78	300	20 U	20 U
Indeno(1,2,3-cd)pyrene	600	36	100	20 U	20 U
Dibenz(a,h)anthracene	230	20 U	20 U	20 U	20 U
Benzo(g,h,i)perylene	670	30	86	20 U	20 U
Chlorinated Benzenes (µg/kg)					
1,2-Dichlorobenzene	35	20 U	20 U	20 U	20 U
1,3-Dichlorobenzene	--	20 U	20 U	20 U	20 U
1,4-Dichlorobenzene	110	20 U	20 U	20 U	20 U
1,2,4-Trichlorobenzene	31	20 U	20 U	20 U	20 U
Hexachlorobenzene	22	20 U	20 U	20 U	20 U

TABLE 4
SUMMARY OF PREVIOUS SEDIMENT SAMPLES DRY WEIGHT ANALYTICAL RESULTS
WEST END SITE
EVERETT, WASHINGTON

		NMA-grab-6		NMA-core-6		NMA-core-6		NMA-core-6	
		0-10cm		0.5-2.0		2.0-3.5		4.0-6.0	
	Dry Weight Equivale	GU78D		GU97K		GU97L		GU97M	
	SQS (b)	7/1/2004		7/2/2004		7/2/2004		7/2/2004	
Phthalate Esters (µg/kg)									
Dimethylphthalate	71	20	U	20	U	20	U	20	U
Diethylphthalate	200	20	U	20	U	20	U	20	U
Di-n-Butylphthalate	1400	26	U	20	U	20	U	20	U
Butylbenzylphthalate	63	20	U	20	U	20	U	20	U
bis(2-Ethylhexyl)phthalate	1300	62	U	23	U	20	U	20	U
Di-n-octyl phthalate	6200	20	U	20	U	20	U	20	U
Phenols (µg/kg)									
Phenol	420	20	U	20	U	20	U	20	U
2-Methylphenol	63	20	U	20	U	20	U	20	U
4-Methylphenol	670	20	U	58		20	U	20	U
2,4-Dimethylphenol	29	20	U	20	U	20	U	20	U
Pentachlorophenol	360	98	U	98	U	98	U	98	U
Misc. Extractables (µg/kg)									
Dibenzofuran	540	78		54		20	U	20	U
Hexachlorobutadiene	11	20	U	20	U	20	U	20	U
Hexachloroethane	--								
N-Nitrosodiphenylamine	28	20	U	20	U	20	U	20	U
Benzyl Alcohol	57	20	U	20	U	20	U	20	U
Benzoic Acid	650	200	U	200	U	200	U	200	U
Conventionals									
Total Organic Carbon (percent)	--	0.940		1.32		5.61		0.567	
Total Solids (percent wet wt)	--	67.80		69.40		73.40		76.90	
Total Volatile Solids (percent)	--	NA		NA		NA		NA	
Volatile Organic Compounds (VOCs) (µg/kg-dry weight)									
Trichloroethene	160	NA		NA		NA		NA	
Tetrachloroethene	57	NA		NA		NA		NA	
Ethylbenzene	10	NA		NA		NA		NA	
Total xylene	40	NA		NA		NA		NA	
Pesticides and PCBs (µg/kg- dry weight)									
4,4'-DDE	--	NA		NA		NA		NA	
4,4'-DDD	--	NA		NA		NA		NA	
4,4'-DDT	--	NA		NA		NA		NA	
Total DDT	6.9	NA		NA		NA		NA	
Aldrin	10	NA		NA		NA		NA	
Chlordane (alpha)	10	NA		NA		NA		NA	
Dieldrin	10	NA		NA		NA		NA	
Heptachlor	10	NA		NA		NA		NA	
Lindane	10	NA		NA		NA		NA	
Aroclor 1016	--	NA		NA		NA		NA	
Aroclor 1242	--	NA		NA		NA		NA	
Aroclor 1248	--	NA		NA		NA		NA	
Aroclor 1254	--	NA		NA		NA		NA	
Aroclor 1260	--	NA		NA		NA		NA	
Aroclor 1221	--	NA		NA		NA		NA	
Aroclor 1232	--	NA		NA		NA		NA	
Total PCBs	130	NA		NA		NA		NA	

AET = Apparent Effects Threshhold
NA = Not Analyzed.
U = The analyte was not detected in the sample at the given reporting limit.
J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate.

(a) Cleanup level is for total benzo(k)fluoranthene and benzo(b)fluoranthene.

TABLE 5
SUMMARY OF PREVIOUS INTERIM ACTIONS
WEST END SITE
EVERETT, WASHINGTON

	Indicator Hazardous Substances (IHS)		Interim Cleanup Action Conducted			Compliance Monitoring Conducted Following Interim Cleanup Action?	
Interim Action Area	**Soil**	**Groundwater**	**Soil (a)**		**Groundwater**	**Soil**	**Groundwater**
Investigation Area D							
D-1	Arsenic, Copper, cPAHs	Arsenic	Soil Removal	10,554	Source Removal	Yes	No
D-2a	Arsenic, Copper, cPAHs	--	Soil Removal	647	--	Yes	--
D-2b	Arsenic, Copper, cPAHs	--	Soil Removal	161	--	Yes	--
D-2c	Arsenic, Copper, cPAHs	--	Soil Removal	323	--	Yes	--
D-2d	Arsenic, Copper, cPAHs	--	Soil Removal	99	--	Yes	--
D-2e	Arsenic, Copper, cPAHs	--	Soil Removal	2,244	--	Yes	--
D-2f	Arsenic, Copper, cPAHs	--	Soil Removal	297	--	Yes	--
D-3	Arsenic, Copper, cPAHs	Arsenic, Copper	Soil Removal	137	Source Removal	Yes	--
D-4a	Arsenic, Copper, cPAHs	--	Soil Removal	664	--	Yes	--
D-4b	Arsenic, Copper, cPAHs	--	Soil Removal	632	--	Yes	--
D-4c	Arsenic, Copper, cPAHs	--	Soil Removal	130		Yes	--
D-5	Arsenic, Copper, cPAHs	Copper	Soil Removal	229	Source Removal	Yes	No
D-6	Arsenic, Diesel, Oil	Diesel, Oil	Soil Removal	76	Source Removal	Yes	No
D-7	Arsenic, cPAHs, Gasoline, Diesel, Oil	--	Soil Removal	1,540	--	Yes	--
D-7d	Arsenic, cPAHs, Gasoline, Diesel, Oil	Gasoline, Diesel, Oil; Arsenic and Copper immediately downgradient	Soil removal	1,834	Source Removal, In-Situ Soil Agitation, Groundwater Extraction	Yes	Yes; 4 rounds
D-8	Arsenic, cPAHs	Arsenic, Copper	Soil Removal	22	--	Yes	--
D-9a	Arsenic, cPAHs	--	Soil Removal	159	--	Yes	--
D-9b	Arsenic, cPAHs	--	Soil Removal	97	--	Yes	--
D-9c	Arsenic	--	Soil Removal	99		Yes	--
D-10	Arsenic, cPAHs	--	Soil Removal	2,582	--	Yes	--
D-11	cPAHs	--	Soil Removal	2,550	--	Yes	--
Investigation Area E							
E-1a	Arsenic	--	Soil Removal	763	--	Yes	--
E-1b	Arsenic	--	Soil Removal	1,032	--	Yes	--
E-2	Arsenic	--	Soil Removal	141	--	Yes	--
E-3	Diesel	Diesel, Arsenic	Soil Removal	657	Source Removal, In-Situ Soil Agitation, Groundwater Extraction	Yes	Yes; 4 rounds
E-4	Diesel	Diesel	Soil Removal	99	Source Removal, In-Situ Soil Agitation, Groundwater Extraction	Yes	Yes; 5 rounds
Investigation Area F							
F-1a	Arsenic, cPAHs	Arsenic, Vinyl Chloride	Soil Removal	603	Source Removal	Yes	--
F-1b	Arsenic	Arsenic	Soil Removal	2,662	Source Removal	Yes	--
F-1c	Arsenic	Arsenic	Soil Removal	419	Source Removal	Yes	--
F-1d	Arsenic	Arsenic	Soil Removal	1,107	Source Removal	Yes	--
F-2	Arsenic, Lead	--	Soil Removal	1,154	--	Yes	--
F-3	Arsenic	--	Soil Removal	200	--	Yes	--
F-4a	Arsenic, cPAHs	--	Soil Removal	2,868	--	Yes	--
F-4b	Arsenic	Arsenic	Soil Removal	734	Source Removal	Yes	--
F-5	cPAHs	--	Soil Removal	69	--	Yes	--
F-8a	cPAHs	Arsenic	Soil Removal	255	Source Removal	Yes	--
F-8b	cPAHs	Arsenic	Soil Removal	594	Source Removal	Yes	--
F-8c	cPAHs	Arsenic	Soil Removal	277	Source Removal	Yes	--
F-8d	cPAHs	Arsenic	Soil Removal	1,803	Source Removal	Yes	--
F-8e	cPAHs	Arsenic	Soil Removal	1,109	Source Removal	Yes	--
F-8f	cPAHs	Arsenic	Soil Removal	238	Source Removal	Yes	--
F-8g	cPAHs	Arsenic	Soil Removal	632	Source Removal	Yes	--
Investigation Area H							
Area H-1	Arsenic	--	Soil Removal	119	--	Yes	--
Area H-2	cPAHs	--	Soil Removal	645	--	Yes	--
Area H-3	Arsenic, Mercury	--	Soil Removal	362	--	Yes	--

(a) Value presented is tons of soil removed.

TABLE 6
GROUNDWATER PRELIMINARY CLEANUP LEVELS FOR DETECTED CONSTITUENTS (1)
WEST END SITE, PORT OF EVERETT, WASHINGTON

		State and Federal ARARs (3)					MTCA B Equation (3)		
Analyte	Potable Groundwater Levels (2, 3)	Federal Marine Chronic Aquatic Life Clean Water Act Section 304	Federal Marine Chronic Aquatic Life NTR 40 CFR 131	State Marine Chronic Aquatic Life Washington WQS Ch. 173-201A	Federal Human Health Consumption of Organisms Clean Water Act Section 304	Federal Human Health Consumption of Organisms NTR 40 CFR 131	Human Health MTCA Method B Surface Water Equation 173-340-730	Practical Quantitation Limit (4)	Preliminary Cleanup Level (5)
VOLATILES (µg/L)									
1,1,1-Trichloroethane	---	NA	NA	NA	NA	NA	420,000 nc	1	420,000
Benzene	---	NA	NA	NA	51	71	23 c	1	51 (a)
Ethylbenzene	---	NA	NA	NA	2,100	29000	6,900 nc	1	2,100
m,p-Xylene	1600	NA	NA	NA	NA	NA	NA	1	1600
o-Xylene	16000	NA	NA	NA	NA	NA	NA	1	16000
Toluene	---	NA	NA	NA	15,000	200000	19,000 nc	1	15,000
Total Xylenes	1600	NA	NA	NA	NA	NA	NA	1	1600
Trichloroethene	---	NA	NA	NA	30	81	6.7 c, (b)	1	30 (a)
Vinyl Chloride	---	NA	NA	NA	2.4	530	3.7 c	1	2.4
1,1-Dichloroethane	800	NA	NA	NA	NA	NA	NA	1	800
1,2,4-Trimethylbenzene	400	NA	NA	NA	NA	NA	NA	1	400
1,3,5-Trimethylbenzene	400	NA	NA	NA	NA	NA	NA	1	400
Acetone	800	NA	NA	NA	NA	NA	NA	1	800
Carbon Disulfide	800	NA	NA	NA	NA	NA	NA	1	800
cis-1,2-Dichloroethene	70	NA	NA	NA	NA	NA	NA	1	70
trans-1,2-Dichloroethene	---	NA	NA	NA	10,000	NA	33,000 nc		10,000
Chloroethane	15	NA	NA	NA	NA	NA	NA		15
TOTAL PETROLEUM HYDROCARBONS (mg/L)									
Gasoline range	0.8 (c)	NA	NA	NA	NA	NA	NA	0.1	0.8
Diesel range	0.5 (c)	NA	NA	NA	NA	NA	NA	0.1	0.5
Oil range	0.5 (c)	NA	NA	NA	NA	NA	NA	0.25	0.5
METALS (µg/L)									
Arsenic	5 (d)	36 (e)	36 (e)	36 (e)	0.14	0.14	0.098 c	0.2	5 (d)
Cadmium	---	8.8 (e)	9.3 (e)	9.3 (e)	NA	NA	20 nc	0.2	8.8
Total Chromium (f)	--	NA	NA	NA	NA	NA	240,000 nc	1	240,000
Copper	---	3.1 (e)	2.4	3.1 (e)	NA	NA	2,700 nc	1	3.1 (g)
Lead	---	8.1 (e)	8.1 (e)	8.1 (e)	NA	NA	NA	1	8.1
Mercury	---	0.94 (e)	0.025	0.025	0.3	0.15	NA	0.1	0.1 (h)
Zinc	---	81 (e)	81 (e)	81 (e)	26,000	NA	17,000 nc	1	81
PAHs (µg/L)									
Benzo(a)anthracene	---	NA	NA	NA	0.018	0.031	NA	0.1	0.1 (h)
Benzo(a)pyrene	---	NA	NA	NA	0.018	0.031	0.03 c	0.1	0.1 (h)
Benzo(b)fluoranthene	---	NA	NA	NA	0.018	0.031	NA	0.1	0.1 (h)
Benzo(k)fluoranthene	---	NA	NA	NA	0.018	0.031	NA	0.1	0.1 (h)
Chrysene	---	NA	NA	NA	0.018	0.031	NA	0.1	0.1 (h)
Dibenz(a,h)anthracene	---	NA	NA	NA	0.018	0.031	NA	0.1	0.1 (h)
Indeno(1,2,3-cd)pyrene	---	NA	NA	NA	0.018	0.031	NA	0.1	0.1 (h)
Naphthalene	---	NA	NA	NA	NA	NA	4,900 nc	0.1	4,900
cPAH TEQ	---	NA	NA	NA	NA	NA	NA	--	0.1 (h)

"c" = Cleanup level based on a 1E-06 cancer risk level.
"nc" = Cleanup level based on a hazard quotient of 1.
Shaded value = Basis for proposed cleanup level.
"---" = A potable groundwater cleanup level was not provided because an applicable surface water cleanup level was identified.

ARAR = Applicable or Relevant and Appropriate Requirements
CLARC = Cleanup Levels and Risk Calculation
MTCA = Model Toxics Control Act

NA = Cleanup level not available.
NTR = National Toxics Rule
WQS = Water Quality Standard

(a) Cleanup level deferred to federal ARAR because it is considered sufficiently protective of human health for carcinogens as described in WAC 173-340-730(3) and in Figure 3 of Ecology's Focus on Developing Surface Water Cleanup Standards Under MTCA (rev. April 2005).
(b) The Method B Surface Water cleanup level for trichloroethene is based on Ecology's new recommended slope factor of 0.089 mg/kg-day^{-1}
(c) Due to the absence of published ARARs or a MTCA B cleanup level, the MTCA A potable groundwater cleanup level was selected.
(d) Ecology's potable groundwater Method A cleanup level for arsenic is based on background concentrations of this metal in groundwater (WAC 173-340-900; Table 720-1).
As such, the proposed cleanup level for arsenic of 5 ug/L is based on the MTCA Method A level for potable groundwater.
(e) The surface water cleanup level is based on the dissolved fraction.
(f) Cleanup level for total chromium is defered to chromium (III) cleanup levels because no metal plating or other activities associated with chromium (VI) occurred at the Site.
(g) Selected preliminary cleanup level (Ecology 2009).
(h) The proposed cleanup levels is based on the PQL.

NOTES:
(1) Where available, groundwater cleanup levels are based on protection of marine surface water. Groundwater at the site discharges into Port Gardner and is non-potable.
(2) Potable groundwater levels were used for screening purposes in absence of applicaple surface water levels. Unless other wise noted, the minimum level between state and federal ARARs and MTCA Method B was selected.
(3) Unless otherwise noted, all federal and state ARARs and MTCA B cleanup levels for surface water were identified from Ecology's online CLARC database (https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx).
(4) Practical quantitation limits (PQLs) based on analytical method reporting limits.
(5) Cleanup level based on lowest water quality standard or PQL or background, indicated by shading, except as noted otherwise.

TABLE 7
SOIL PRELIMINARY CLEANUP LEVELS FOR DETECTED CONSTITUENTS
WEST END SITE, PORT OF EVERETT, WASHINGTON

Analyte	Selected Surface Water ARAR (ug/l) (n)	MTCA Protection of Groundwater as Surface Water (b)	MTCA Method B Direct Contact (a)	Background (c)	Practical Quantitation Limit (d)	Preliminary Cleanup Level (e)
TOTAL PETROLEUM HYDROCARBONS (mg/kg)						
Gasoline range	--	--	30/100 (f,g)	--	5.00	30/100 (g)
Diesel range	--	--	2,000 (f)	--	10.00	2,000
Oil range	--	--	2,000 (f)	--	10.00	2,000
Mineral oil	--	--	4,000 (f)	--	10.00	4,000
BTEX (mg/kg)						
Benzene	51 (o)	0.29	18.0 (h)	--	0.05	0.29
Toluene	15,000 (q)	110	6,400 (i)	--	0.03	110
Ethyl Benzene	2,100 (q)	18.0	8,000 (i)	--	0.05	18.0
m,p-Xylene	1,600	15	16,000 (i)	--	0.06	15
o-Xylene	16,000	150	160,000 (i)	--	0.04	150
METALS (mg/kg)						
Arsenic	0.14 (q,r)	0.06	20 (j)	7	5.00	20 (j)
Barium	2,000	1,650	16,000 (i)	--	0.30	1,650
Cadmium	8.8 (q)	1.2	80 (i)	1	0.20	80 (k)
Chromium	240,000 (s)	$1x10^{6}$ (t)	120,000	48	0.60	120,000
Copper	2.4 (r)	1.1	3,000 (i)	36	1.00	3,000/36 (k,v)
Lead	8.1 (q,r)	1,620	250 (l)	17	2.00	250 (l)
Mercury	0.03 (q,r)	0.03	24 (i)	0.07	0.05	24 (k)
Zinc	81 (q,r)	101	24,000 (i)	85	0.60	24,000 (k)
SVOCs (mg/kg)						
Dibenzo furan	32	--	160 (i)	--	0.20	160
Fluorene	3,500 (q)	553	3,200 (i)	--	0.20	553
Phenanthrene	--	--	--	--	0.20	--
Carbazole	4.40	0.32	50 (h)	--	0.08	50 (k)
Anthracene	26,000 (s)	12,000	24,000 (i)	--	0.14	12,000
Fluoranthene	90 (s)	89	3,200 (i)	--	0.06	89
Pyrene	2,600 (s)	3,600	2,400 (i)	--	0.15	2,400
bis(2-Ethylhexyl)phthalate	2.20 (q)	4.9	71 (h)	--	0.27	4.9
PAHs						
Naphthalene	4,900 (s)	140	1,600 (i)	--	0.02	140
2-Methylnaphthalene	32	--	320	--	0.02	320
1-Methylnaphthalene	2	--	24	--	0.02	24
Total Naphthalene	--	--	--	--	--	--
Benzo(a)anthracene	0.018 (q)	0.13	TEQ (m)	--	0.02	TEQ (m)
Chrysene	0.018 (q)	0.14	TEQ (m)	--	0.02	TEQ (m)
Benzo(b)fluoranthene	0.018 (q)	0.43	TEQ (m)	--	0.02	TEQ (m)
Benzo(k)fluoranthene	0.018 (q)	0.43	TEQ (m)	--	0.02	TEQ (m)
Benzo(a)pyrene	0.018 (q)	0.35	0.14 (h)	--	0.02	0.14
Indeno(1,2,3-cd)pyrene	0.018 (q)	1.3	TEQ (m)	--	0.02	TEQ (m)
Dibenz(a,h)anthracene	0.018 (q)	0.65	TEQ (m)	--	0.02	TEQ (m)
cPAH TEQ		--	0.14		--	0.14
TBT (ug/kg)						
TBT as TBT Ion	0.01	7,400	23,400	--	4	7,400
VOCs (mg/kg)						
Acetone	800	3.2	8,000 (i)	--	0.005	3.2
1,1-Dichloroethane	800	4.3	8,000 (i)	--	0.001	4.3
Methyl Ethyl Ketone	4,800	--	48,000 (i)	--	0.003	48,000
1,1,1-Trichloroethane	420,000 (s)	3,400	72,000 (i)	--	0.005	3,400
Trichloroethene	30 (u)	0.20	11 (h)	--	0.003	0.20
Tetrachloroethene	3.30 (q,o)	0.04	1.9 (h)	--	0.004	0.04
1,2,4-Trimethylbenzene	400		4,000		0.002	4,000
1,3,5-Trimethylbenzene	400	--	4,000 (i)	--	0.004	4,000
Isopropylbenzene	800	--	8,000 (i)	--	0.002	8,000
VOCs (mg/kg)						
n-Propylbenzene	--	--	--	--	0.002	--
sec-Butylbenzene	--	--	--	--	0.003	--
4-Isopropyltoluene	--	--	--	--	0.002	--
n-Butylbenzene	--	--	--	--	0.002	--

-- = Soil criteria not established.

Shaded value = selected as proposed cleanup level.

TEQ = Toxicity Equivalency Quotient. TEQ is based on individual Toxicity Equivalency Factors (TEFs) of benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, ideno(1,2,3-cd)pyrene, and dibenz(a,h)anthracene.

(a) MTCA Method B standard formula values based on direct contact (Ecology's CLARC, accessed) unless otherwise noted.
(b) MTCA Method B values based on protection of marine surface water using MTCA equation 747-1 (February 2001), unless otherwise noted.
(c) From Ecology's Natural Background Soil Metals Concentrations in Puget Sound (1994). Used 90th percentile for Puget Sound unless noted otherwise.
(d) Practical quantitation limits (PQLs) based on 10 times the analytical method detection limits.
(e) Preliminary cleanup level based on lowest soil criteria corrected for PQL and background, as indicated by shading.
(f) MTCA Method A soil cleanup levels for unrestricted land uses (February 2007). MTCA Method B criteria do not exist for this constituent.
(g) MTCA Method A cleanup level is 30 mg/kg when benzene is present and 100 mg/kg when benzene is not present.
(h) MTCA Method B soil standard formula value based on criteria as a carcinogen.
(i) MTCA Method B soil standard formula value based on criteria as a non-carcinogen.
(j) The MTCA Method A soil cleanup level for unrestricted land use was used for arsenic because it was established based on adjustments for background. From Responsiveness Summary for the Amendments to the Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC. 1991.
(k) Proposed cleanup level is the Method B direct human contact cleanup level. Empirical evidence, based on groundwater analytical results, indicate that current concentrations of constituent in soil are protective of groundwater and, therefore, need only be compared to cleanup levels protective of direct human contact.
(l) MTCA Method A soil cleanup level based on preventing unacceptable blood lead levels.
(m) As requested by Ecology a TEQ will be computed for each sample containing carcinogenic PAHs above reporting limits and compared to the benzo(a)pyrene cleanup level in accordance with WAC 173-340-708(8)(e).
(n) Selected surfacewater ARARs as noted; the minimum ARAR was selected for use in 3-phase model calculation, unless otherwise noted.
(o) Selected surface water ARAR used for calculation of soil cleanup level protective of groundwater is based on the federal criteria because it is considered sufficiently protective of human health for carcinogens as described in WAC 173-340-740(3).
(p) Water Quality Standards For Surface Waters of the State of Washington - Chapter 173-201A WAC
(q) EPA National Recommended Water Quality Criteria - Section 304 Clean Water Act
(r) EPA Water Quality Standards (National Toxics Rule) - 40 CFR 131
(o)(s) MTCA Method B Surface Water Equation (Standard Fomula Values)
(t) Calculated cleanup level is greater than 100% of constituent.
(u) MTCA Method B surface water criteria (1.5 ug/l adjusted upward to 1.0E-5 (15 ug/L)
(v) Copper proposed cleanup level is 36 mg/kg for the ACC North Yard based on its presence in groundwater in that portion of the site.

TABLE 8
SEDIMENT REGULATORY LEVELS
WEST END SITE
EVERETT, WASHINGTON

		SMS Cleanup Screening Level Criteria (a)	SMS Marine Sediment Quality Standards (b)	SQS Dry Weight Equivalent (c)	CSL Dry Weight Equivalent (c)	Dredged Material Management Program 1998 Screening Level
Conventionals (%)						
	Total organic carbon	10 (d)	10 (d)	10 (d)	10 (d)	---
	Total volatile solids (%)	25 (e)	25 (e)	25 (e)	25 (e)	---
Metals		**(mg/kg - dry weight)**	**(mg/kg - dry weight)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**	**(mg/kg - dry weight)**
	Antimony	---	---	---	---	150
	Arsenic	93	57	57	93	57
	Cadmium	6.7	5.1	5.1	6.7	5.1
	Chromium	270	260	260	270	---
	Copper	390	390	390	390	390
	Lead	530	450	450	530	450
	Mercury	0.59	0.41	0.41	0.59	0.41
	Nickel	---	---	---	---	140
	Silver	6.1	6.1	6.1	6.1	6.1
	Zinc	960	410	410	960	410
Organotins (Bulk)		**(µg/kg dry weight)**				
	TBT as TBT ion	73 (e)	--	---	---	--
	TBT as Tin ion	30 (e)	--	---	---	--
Organotins (Pore Water)		**(µg/L)**	**(µg/L)**	**(µg/L)**	**(µg/L)**	
	TBT as TBT ion	0.05	0.15	0.05 (f)	0.05 (f)	--
	TBT as Tin ion	0.02	0.06	---	---	--
PCBs		**(mg/kg -OC)**	**(mg/kg -OC)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**
	Total PCBs	65	12	130	1000	130
Pesticides						**(µg/kg dry weight)**
	Total DDT	---	---	---	---	6.9
	Aldrin	---	---	---	---	10
	Chlordane	---	---	---	---	10
	Dieldrin	---	---	---	---	10
	Heptachlor	---	---	---	---	10
	Lindane	---	---	---	---	10
VOCs (mg/kg)						
	Ethylbenzene	---	---	---	---	10
	Tetrachloroethene	---	---	---	---	57
	Total xylenes	---	---	---	---	40
	Trichloroethene	---	---	---	---	160
LPAHs		**(mg/kg -OC)**	**(mg/kg -OC)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**
	Naphthalene	170	99	2100	2100	2100
	Acenaphthylene	66	66	1300	1300	560
	Acenaphthene	57	16	500	500	500
	Fluorene	79	23	540	540	540
	Phenanthrene	480	100	1500	1500	1500
	Anthracene	1200	220	960	960	960
	2-Methylnaphthalene	64	38	670	670	670
	Total LPAH	780	370	5200	5200	5200
HPAHs		**(mg/kg -OC)**	**(mg/kg -OC)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**
	Fluoranthene	1200	160	1700	2500	1700
	Pyrene	1400	1000	2600	3300	2600
	Benzo(a)anthracene	270	110	1300	1600	1300
	Chrysene	460	110	1400	2800	1400
	Total benzofluoranthenes	450	230	3200	3600	3200
	Benzo(a)pyrene	210	99	1600	1600	1600
	Indeno(1,2,3-cd)pyrene	88	34	600	690	600
	Dibenzo(a,h)anthracene	33	12	230	230	230
	Benzo(g,h,i)perylene	78	31	670	720	670
	Total HPAH	5300	960	12000	17000	12000
Misc. SVOCs		**(mg/kg -OC)**	**(mg/kg -OC)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**
	1,2-Dichlorobenzene	2.3	2.3	35	50	35
	1,3-Dichlorobenzene	---	---	---	---	170
	1,4-Dichlorobenzene	9	3.1	110	110	110
	1,2,4-Trichlorobenzene	1.8	0.81	31	51	31
	Hexachlorobenzene	2.3	0.38	22	70	22
	Dimethylphthalate	53	53	71	160	1400
	Diethylphthalate	110	61	200	1200	1200
	Di-n-butylphthalate	1700	220	1400	5100	5100
	Butylbenzylphthalate	64	4.9	63	900	970
	bis(2-ethylhexyl)phthalate	78	47	1300	3100	8300
	Di-n-octylphthalate	4500	58	6200	6200	6200
	Dibenzofuran	58	15	540	540	540
	Hexachlorobutadiene	6.2	3.9	11	120	29
	Hexachloroethane	---	---	---	---	1400
	n-Nitroso-di-phenylamine	11	11	28	40	28
Misc. SVOCs		**(µg/kg dry weight)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**	**(µg/kg dry weight)**
	Phenol	1200	420	420	1200	420
	2-Methylphenol	63	63	63	63	63
	4-Methylphenol	670	670	670	670	670
	2,4-Dimethylphenol	29	29	29	29	29
	Pentachlorophenol	690	360	360	690	400
	Benzyl alcohol	73	57	57	73	57
	Benzoic acid	650	650	650	650	650

(a) Marine sediment cleanup screening criteria set forth in WAC 173-204-520, unless otherwise indicated.
(b) Marine sediment quality standards set forth in WAC 173-204-320, unless otherwise indicated.
(c) Dry weight equivalent criteria are based on the Puget Sound Apparent Effect Threshold Values (Barrick et al. 1988)
(d) Total Organic Carbon screening levels based on SMS Clarification Paper published by Ecology (Kendall and Michelsen 1997).
(e) Total Volatile Solids screening level based SMS Clarification Paper published by Ecology and PSDDA.
(f) Ecology, 1996, SMS technical information memorandum: testing reporting, and evaluation of tributyltin data in PSDAA and SMS programs.

TABLE 9
MONITORING WELL GROUNDWATER ELEVATIONS
WEST END SITE
PORT OF EVERETT

		4/29/2009 (1410-1540)		6/12/2009 (0825-1345) (a)		9/16/2009 (0915-1024) (b)	
Well ID	**TOC Elevation**	**Measured DTW (ft)**	**GW Elevation (ft)**	**Measured DTW (ft)**	**GW Elevation (ft)**	**Measured DTW (ft)**	**GW Elevation (ft)**
RI-MW-1	14.301	5.55	8.75	5.26	9.041	5.55 (c)	8.751
RI-MW-2	14.389	6.50	7.89	6.39	7.999	6.02	8.369
RI-MW-3	14.523	6.00	8.52	5.52	9.003	4.70	9.823
RI-MW-4	14.459	5.00	9.46	4.81	9.649	5.35	9.109
RI-MW-5	13.676	3.80	9.88	3.86	9.816	4.43	9.246
RI-MW-6	14.739	5.50	9.24	5.33	9.409	5.54	9.199
RI-MW-7	14.737	6.00	8.74	5.35	9.387	5.90	8.837
RI-MW-8	15.122	3.80	11.32	4.31	10.812	5.48	9.642
RI-MW-9	14.639	3.40	11.24	3.73	10.909	4.53	10.109
RI-MW-10	15.39	3.95	11.44	4.34	11.05	5.44	9.95
RI-MW-11	15.864	3.80	12.06	5.06	10.804	5.93	9.934
RI-MW-12	15.933	4.80	11.13	4.98	10.953	5.51	10.423
RI-MW-13	16.522	5.75	10.77	5.64	10.882	6.51	10.012
RI-MW-14	16.084	6.00	10.08	5.58	10.504	5.31	10.774
RI-MW-15	16.791	6.50	10.29	5.57	11.221	6.67	10.121
RI-MW-16	17.98	5.50	12.48	5.79	12.19	7.33	10.65
RI-MW-17	16.767	2.90	13.87	4.19	12.577	5.47	11.297
RI-MW-18	16.244	3.15	13.09	4.47	11.774	5.17	11.074

TOC = Top of Casing (2" diameter PVC well casing)
DTW = Depth to Water

(a) Low tide on June 12: -0.2 at 1430 (http://www.dairiki.org/tides/monthly.php/ert/)
(b) Low tide on September 16: -0.6 ft at 0921 (http://www.dairiki.org/tides/monthly.php/ert/)
(c) The water level measured at well RI-MW-1 on September 16 was found to be erroneous, so the the water level measured at this well on September 17 is presented.

TABLE 10
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - DRY WEIGHT
WEST END SITE
PORT OF EVERETT

	Dry Weight Equivalent to SMS Criteria (a)		RI-SED-1 OY89B/OZ22A/PA01M 5/12/2009	RI-SED-2 OY89D/OZ22C/PA01O 5/12/2009	RI-SED-3 OY89C/OZ22B/PA01N 5/12/2009	RI-SED-4 OY67L/OY96L/PA01L 5/11/2009	RI-SED-5 OY67K/OY96K/PA01K 5/11/2009	RI-SED-6 OY67J/OY96J/PA01J 5/11/2009	RI-SED-7 OY67I/OY96I/PA01I 5/11/2009	RI-SED-8 OY89E/OZ22D/PA01P 5/12/2009	RI-SED-9 OY67H/OY96H/PA01H 5/11/2009	RI-SED-10 OY67G/OY96G/PA01G 5/11/2009
	SQS (b)	CSL (c)										
TOTAL METALS (mg/kg-dry wt)												
Methods SW6010B/SW7471A												
Arsenic	57	93	**20**	**20**	**20**	**30**	**26**	**30**	**30**	**14**	**21**	**20**
Cadmium	5.1	6.7	**0.4**	**0.4**	**0.5**	0.4 U	0.4 U	0.4 U	0.4 U	0.3 U	0.3 U	0.3 U
Chromium	260	270	**61**	**56**	**63**	**69**	**70.1**	**66**	**64**	**51.1**	**54.0**	**49.9**
Copper	390	390	**68.7**	**62.2**	**70.4**	**68.6**	**68.1**	**65.5**	**63.2**	**52.9**	**48.8**	**42.8**
Lead	450	530	**12**	**11**	**12**	**12**	**12**	**12**	**12**	**9**	**8**	**10**
Mercury	0.41	0.59	**0.10**	**0.10**	**0.10**	**0.10**	**0.11**	**0.11**	**0.11**	**0.07**	**0.07**	**0.06**
Silver	6.1	6.1	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.7 U	0.5 U	0.5 U	0.5 U
Zinc	410	960	**109**	**101**	**111**	**109**	**112**	**102**	**100**	**83**	**81**	**74**
POREWATER ORGANOTIN (µg/L)												
Method Krone 1988 SIM												
Butyltin Ion	--	--	**0.011**	**0.017**	**0.026**	**0.014**	**0.008**	0.008 U	**0.010**	**0.012**	**0.015**	**0.010**
Dibutyltin Ion	--	--	0.012 U	0.012 U	**0.013**	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Tributyltin Ion	0.05 (d)	0.15 (d)	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
PAHs (µg/kg-dry wt)												
Method SW8270D												
Naphthalene	2100	2100	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Acenaphthylene	1300	1300	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Acenaphthene	500	500	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Fluorene	540	540	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Phenanthrene	1500	1500	**15** J	20 U	**14** J	20 U	20 U	20 U	**12** J	**18** J	19 U	**14** J
Anthracene	960	960	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
2-Methylnaphthalene	670	670	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
LPAH (e, f)	5200	5200	**15**	20 U	**14** J	20 U	20 U	20 U	**12** J	**18** J	19 U	**14** J
Fluoranthene	1700	2500	**28**	**17** J	**24**	20 U	**10** J	20 U	**15** J	**20**	19 U	**22**
Pyrene	2600	3300	**25**	**18** J	**21**	20 U	**10** J	20 U	**14** J	**18** J	19 U	**21**
Benzo(a)anthracene	1300	1600	**15** J	20 U	**10** J	20 U	20 U	20 U	20 U	**10** J	19 U	19 U
Chrysene	1400	2800	**24**	**22**	**17** J	20 U	20 U	20 U	20 U	**16** J	19 U	**16** J
Benzo(b)fluoranthene	--	--	**11** J	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	**11** J
Benzo(k)fluoranthene	--	--	**11** J	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Total Benzofluoranthenes (e, g)	3200	3600	**22** J	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	**11** J
Benzo(a)pyrene	1600	1600	**10** J	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Indeno(1,2,3-c,d)pyrene	600	690	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Dibenz(a,h)anthracene	230	230	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Benzo(g,h,i)perylene	670	720	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
HPAH (e, h)	12000	17000	**124** J	**57** J	**72** J	20 U	**20** J	20 U	**29** J	**64** J	19 U	**70** J

TABLE 10
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - DRY WEIGHT
WEST END SITE
PORT OF EVERETT

	Dry Weight Equivalent to SMS Criteria (a)		RI-SED-1	RI-SED-2	RI-SED-3	RI-SED-4	RI-SED-5	RI-SED-6	RI-SED-7	RI-SED-8	RI-SED-9	RI-SED-10
			OY89B/OZ22A/PA01M	OY89D/OZ22C/PA01O	OY89C/OZ22B/PA01N	OY67L/OY96L/PA01L	OY67K/OY96K/PA01K	OY67J/OY96J/PA01J	OY67I/OY96I/PA01I	OY89E/OZ22D/PA01P	OY67H/OY96H/PA01H	OY67G/OY96G/PA01G
	SQS (b)	CSL (c)	5/12/2009	5/12/2009	5/12/2009	5/11/2009	5/11/2009	5/11/2009	5/11/2009	5/12/2009	5/11/2009	5/11/2009
SEMIVOLATILES (µg/kg-dry wt)												
Method SW8270D												
1,2-Dichlorobenzene	35	50	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
1,3-Dichlorobenzene	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
1,4-Dichlorobenzene	110	110	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
1,2,4-Trichlorobenzene	31	51	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Hexachlorobenzene	22	70	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Dimethylphthalate	71	160	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Diethylphthalate	200	1200	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Di-n-Butylphthalate	1400	5100	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Butylbenzylphthalate	63	900	650 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
bis(2-Ethylhexyl)phthalate	1300	3100	**36**	**23**	**17** J	**14** J	**22**	**12** J	**29**	**12** J	19 U	**13** J
Di-n-Octyl phthalate	6200	6200	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Dibenzofuran	540	540	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Hexachlorobutadiene	11	120	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Hexachloroethane	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
N-Nitrosodiphenylamine	28	40	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
SEMIVOLATILES (µg/kg-dry wt)												
Method SW8270D												
Phenol	420	1200	20 U	20 U	20 U	20 U	20 U	**17** J	20 U	**19** J	19 U	19 U
2-Methylphenol	63	63	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
4-Methylphenol	670	670	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
2,4-Dimethylphenol	29	29	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Pentachlorophenol	360	690	100 U	99 U	98 U	100 U	98 U	100 U	98 U	97 U	97 U	97 U
Benzyl Alcohol	57	73	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Benzoic Acid	650	650	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	190 U	190 U
1-Methylnaphthalene	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
PCBs (µg/kg-dry wt)												
PSDDA Method SW8082												
Aroclor 1016	--	--	4.0 U	4.0 U	3.9 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U
Aroclor 1242	--	--	4.0 U	4.0 U	3.9 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U
Aroclor 1248	--	--	4.0 U	4.0 U	3.9 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U
Aroclor 1254	--	--	4.0 U	4.0 U	3.9 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U
Aroclor 1260	--	--	4.0 U	4.0 U	3.9 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U
Aroclor 1221	--	--	4.0 U	4.0 U	3.9 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U
Aroclor 1232	--	--	4.0 U	4.0 U	4.3 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U
Aroclor 1262	--	--	4.0 U	4.0 U	3.9 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U
Aroclor 1268	--	--	4.0 U	4.0 U	3.9 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U
Total PCBs (e)	130	1000	4.0 U	4.0 U	3.9 U	4.0 U	3.9 U	4.0 U	4.0 U	3.9 U	3.9 U	4.0 U

TABLE 10
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - DRY WEIGHT
WEST END SITE
PORT OF EVERETT

	Dry Weight Equivalent to SMS Criteria (a)		RI-SED-1	RI-SED-2	RI-SED-3	RI-SED-4	RI-SED-5	RI-SED-6	RI-SED-7	RI-SED-8	RI-SED-9	RI-SED-10
	SQS (b)	CSL (c)	OY89B/OZ22A/PA01M 5/12/2009	OY89D/OZ22C/PA01O 5/12/2009	OY89C/OZ22B/PA01N 5/12/2009	OY67L/OY96L/PA01L 5/11/2009	OY67K/OY96K/PA01K 5/11/2009	OY67J/OY96J/PA01J 5/11/2009	OY67I/OY96I/PA01I 5/11/2009	OY89E/OZ22D/PA01P 5/12/2009	OY67H/OY96H/PA01H 5/11/2009	OY67G/OY96G/PA01G 5/11/2009
CONVENTIONALS												
Total Organic Carbon (PLUMB81TC) (%)	10 (i)	10 (i)	1.97	1.48	2.17	2.05	2.35	2.14	2.25	1.65	1.06	0.808
Total Solids (EPA160.3) (%)	--	--	47.40	48.60	48.90	47.70 J1	50.80 J1	48.50 J1	46.90 J1	55.50	60.40 J1	60.30 J1
Total Volatile Solids (EPA160.4) (%)	25 (i)	25 (i)	6.75 J1	7.14 J1	7.31 J1	7.41 J1	7.10 J1	7.57 J1	7.50 J1	5.86 J1	4.91 J1	4.34 J1
Ammonia as N (EPA350.1M) (mg/kg)	--	--	**50.0** J1	**13.9** J1	**20.4** J1	**16.0** J1	**18.4** J1	**17.2** J1	**18.7** J1	**14.7** J1	**9.24** J1	**12.8** J1
Sulfide (EPA376.2) (mg/kg)	--	--	**251** J1	**276** J1	**385** J1	**306** J1	**219** J1	**268** J1	**156** J1	**68.0** J1	**86.0** J1	**79.5** J1
GRAIN SIZE												
Method PSEP												
Particle/Grain Size, Phi Scale <-1	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.1	0.1
Particle/Grain Size, Phi Scale -1 to 0	--	--	0.2	0.1	0.2	0.1	0.6	0.9	2.1	0.3	0.4	0.4
Particle/Grain Size, Phi Scale 0 to 1	--	--	0.3	0.2	0.2	0.2	0.5	0.6	1.9	0.6	0.6	0.5
Particle/Grain Size, Phi Scale 1 to 2	--	--	0.5	0.2	0.1	0.1	0.2	0.4	2.0	0.9	1.3	1.6
Particle/Grain Size, Phi Scale 2 to 3	--	--	1.0	0.3	0.1	0.1	0.4	0.6	3.2	9.4	10.0	18.5
Particle/Grain Size, Phi Scale 3 to 4	--	--	4.1	2.2	1.7	1.8	3.4	4.9	8.9	22.4	27.5	25.2
Particle/Grain Size, Phi Scale 4 to 5	--	--	17.2	14.3	13.8	15.8	19.0	14.7	13.7	17.0	18.1	17.8
Particle/Grain Size, Phi Scale 5 to 6	--	--	20.2	24.7	21.0	20.5	18.5	19.0	20.8	14.8	14.9	11.6
Particle/Grain Size, Phi Scale 6 to 7	--	--	21.7	21.0	22.2	23.1	19.3	22.2	16.2	11.6	9.6	7.9
Particle/Grain Size, Phi Scale 7 to 8	--	--	12.0	12.8	12.7	13.1	12.4	12.6	9.5	7.3	5.2	4.9
Particle/Grain Size, Phi Scale 8 to 9	--	--	7.4	7.4	8.2	7.3	7.8	7.0	5.8	4.3	3.3	3.2
Particle/Grain Size, Phi Scale 9 to 10	--	--	4.9	6.0	7.0	5.8	5.9	5.7	4.9	3.6	2.9	2.6
Particle/Grain Size, Phi Scale >10	--	--	10.5	10.8	12.8	12.0	11.9	11.3	10.1	7.8	6.0	5.5
Particle/Grain Size, Fines (Silt/Clay)	--	--	93.9	97.0	97.7	97.6	94.9	92.6	81.0	66.4	60.1	53.6

TABLE 10
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - DRY WEIGHT
WEST END SITE
PORT OF EVERETT

	Dry Weight Equivalent to SMS Criteria (a)						Dup of RI-SED-14					
	SQS (b)	CSL (c)	RI-SED-11 OY89I/OZ22H/PA01T 5/12/2009	RI-SED-12 OY89G/OZ22F/PA01R 5/12/2009	RI-SED-13 OY89F/OZ22E/PA01Q 5/12/2009	RI-SED-14 OY67F/OY96F/PA01F 5/11/2009	RI-SED-20 OY67A/OY96A/PA01A 5/11/2009	RI-SED-15 OY67E/OY96E/PA01E 5/11/2009	RI-SED-16 OY67D/OY96D/PA01D 5/11/2009	RI-SED-17 OY67C/OY96C/PA01C 5/11/2009	RI-SED-18 OY67B/OY96B/PA01B 5/11/2009	RI-SED-19 OY89H/OZ22G/PA01S 5/12/2009
TOTAL METALS (mg/kg-dry wt)												
Methods SW6010B/SW7471A												
Arsenic	57	93	**10**	6 U	**10**	**19**	**20**	**20**	**19**	**20**	**17**	**11**
Cadmium	5.1	6.7	**0.4**	0.2 U	**0.4**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.3 U	0.3 U
Chromium	260	270	**50**	**5.6**	**50**	**53.8**	**55**	**62**	**55.8**	**57**	**63.6**	**40.2**
Copper	390	390	**56.9**	**3.8**	**57.1**	**60.0**	**62.9**	**69.0**	**60.8**	**69.8**	**48.2**	**41.7**
Lead	450	530	**10**	2 U	**9**	**12**	**11**	**13**	**10**	**13**	**11**	**7**
Mercury	0.41	0.59	**0.09**	0.03 U	**0.09**	**0.09**	**0.09**	**0.10**	**0.08**	**0.10**	**0.06**	**0.06**
Silver	6.1	6.1	0.6 U	0.3 U	0.6 U	0.6 U	0.6 U	0.6 U	0.5 U	0.6 U	0.5 U	0.4 U
Zinc	410	960	**99**	**11**	**99**	**95**	**102**	**110**	**98**	**106**	**82**	**78**
POREWATER ORGANOTIN (µg/L)												
Method Krone 1988 SIM												
Butyltin Ion	--	--	**0.011**	**0.030**	**0.010**	**0.012**	**0.014**	0.008 U	**0.010**	0.008 U	0.008 U	**0.014**
Dibutyltin Ion	--	--	0.012 U	0.021 U	0.012 U	0.012 UJ	**0.031** J1	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Tributyltin Ion	0.05 (d)	0.15 (d)	0.008 U	0.014 U	0.008 U	0.008 UJ	**0.037** J1	0.008 U	0.008 U	**0.025**	0.008 U	0.008 U
PAHs (µg/kg-dry wt)												
Method SW8270D												
Naphthalene	2100	2100	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Acenaphthylene	1300	1300	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	**17** J	20 U
Acenaphthene	500	500	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	**15** J	20 U
Fluorene	540	540	20 U	**18** J	20 U	20 U	20 U	19 U	20 U	**11** J	**98**	20 U
Phenanthrene	1500	1500	**22**	**91**	**13** J	**20**	**37**	19 U	**22**	**57**	**600** J1	**12** J
Anthracene	960	960	**10** J	**37**	20 U	20 U	**15** J	19 U	**12** J	**26**	**140** J	**12** J
2-Methylnaphthalene	670	670	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	**14** J	20 U
LPAH (e, f)	5200	5200	**32** J	**146** J	**13** J	**20**	**52** J	19 U	**34** J	**94** J	**870**	**24** J
Fluoranthene	1700	2500	**30**	**35**	**49**	**49** J1	**110** J1	**43**	**69**	**120**	**2300**	**67**
Pyrene	2600	3300	**37**	**59**	**46**	**66** J1	**120** J1	**46**	**82**	**130**	**1200** J1	**57**
Benzo(a)anthracene	1300	1600	**14** J	**71**	**17** J	**45**	**48**	**19** J	**71**	**83**	**300** J1	**21**
Chrysene	1400	2800	**41**	**220**	**44**	**81**	**110**	**35**	**130**	**210**	**670** J1	**30**
Benzo(b)fluoranthene	--	--	**14** J	**34**	**18** J	**80**	**86**	**34**	**84**	**92**	**360** J1	**14** J
Benzo(k)fluoranthene	--	--	**14** J	**34**	**18** J	**41**	**64**	**23**	**64**	**74**	**260**	**14** J
Total Benzofluoranthenes (e, g)	3200	3600	**28** J	**68**	**36** J	**121**	**150**	**57**	**148**	**166**	**620**	**28** J
Benzo(a)pyrene	1600	1600	**10** J	**22**	**11** J	**30**	**40**	**13** J	**39**	**44**	**150**	**11** J
Indeno(1,2,3-c,d)pyrene	600	690	20 U	20 U	20 U	**13** J	**19** J	19 U	**17** J	**20**	**70**	20 U
Dibenz(a,h)anthracene	230	230	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	**19** J	20 U
Benzo(g,h,i)perylene	670	720	20 U	20 U	20 U	**10** J	**17** J	19 U	**13** J	**19** J	**66**	20 U
HPAH (e, h)	12000	17000	**160** J	**475**	**203** J	**415** J	**614** J	**213** J	**569** J	**792** J	**5395** J	**214** J

TABLE 10
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - DRY WEIGHT
WEST END SITE
PORT OF EVERETT

	Dry Weight Equivalent to SMS Criteria (a)						Dup of RI-SED-14					
			RI-SED-11	RI-SED-12	RI-SED-13	RI-SED-14	RI-SED-20	RI-SED-15	RI-SED-16	RI-SED-17	RI-SED-18	RI-SED-19
			OY89I/OZ22H/PA01T	OY89G/OZ22F/PA01R	OY89F/OZ22E/PA01Q	OY67F/OY96F/PA01F	OY67A/OY96A/PA01A	OY67E/OY96E/PA01E	OY67D/OY96D/PA01D	OY67C/OY96C/PA01C	OY67B/OY96B/PA01B	OY89H/OZ22G/PA01S
	SQS (b)	CSL (c)	5/12/2009	5/12/2009	5/12/2009	5/11/2009	5/11/2009	5/11/2009	5/11/2009	5/11/2009	5/11/2009	5/12/2009
SEMIVOLATILES (µg/kg-dry wt)												
Method SW8270D												
1,2-Dichlorobenzene	35	50	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
1,3-Dichlorobenzene	--	--	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
1,4-Dichlorobenzene	110	110	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
1,2,4-Trichlorobenzene	31	51	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Hexachlorobenzene	22	70	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Dimethylphthalate	71	160	20 U	20 U	20 U	20 U	**22**	19 U	20 U	20 U	**38**	20 U
Diethylphthalate	200	1200	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Di-n-Butylphthalate	1400	5100	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Butylbenzylphthalate	63	900	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
bis(2-Ethylhexyl)phthalate	1300	3100	**31**	**15** J	**82**	**32**	**52**	**28**	**33**	**64**	**78**	**16** J
Di-n-Octyl phthalate	6200	6200	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Dibenzofuran	540	540	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	**31**	20 U
Hexachlorobutadiene	11	120	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Hexachloroethane	--	--	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
N-Nitrosodiphenylamine	28	40	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
SEMIVOLATILES (µg/kg-dry wt)												
Method SW8270D												
Phenol	420	1200	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
2-Methylphenol	63	63	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
4-Methylphenol	670	670	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
2,4-Dimethylphenol	29	29	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Pentachlorophenol	360	690	98 U	98 U	99 U	99 U	100 U	97 U	98 U	98 U	97 U	98 U
Benzyl Alcohol	57	73	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Benzoic Acid	650	650	200 U	200 U	200 U	200 U	200 U	190 U	200 U	200 U	190 U	200 U
1-Methylnaphthalene	--	--	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
PCBs (µg/kg-dry wt)												
PSDDA Method SW8082												
Aroclor 1016	--	--	3.9 U	4.0 U	4.0 U	4.0 U	3.6 U	3.9 U	3.6 U	3.5 U	3.5 U	4.0 U
Aroclor 1242	--	--	3.9 U	4.0 U	4.0 U	4.0 U	3.6 U	3.9 U	3.6 U	3.5 U	3.5 U	4.0 U
Aroclor 1248	--	--	3.9 U	4.0 U	4.0 U	4.0 U	3.6 U	3.9 U	3.6 U	3.5 U	4.7 U	4.0 U
Aroclor 1254	--	--	**5.3**	4.0 U	4.0 U	**6.0**	**7.1**	**4.2**	**7.7**	**11**	**15**	4.0 U
Aroclor 1260	--	--	3.9 U	4.0 U	4.0 U	4.0 U	3.6 U	3.9 U	3.6 U	**4.5**	**5.3**	4.0 U
Aroclor 1221	--	--	3.9 U	4.0 U	4.0 U	4.0 U	3.6 U	3.9 U	3.6 U	3.5 U	3.5 U	4.0 U
Aroclor 1232	--	--	3.9 U	4.0 U	4.0 U	4.0 U	9.5 U	3.9 U	7.7 U	3.5 U	3.5 U	4.0 U
Aroclor 1262	--	--	3.9 U	4.0 U	4.0 U	4.0 U	3.6 U	3.9 U	3.6 U	3.5 U	3.5 U	4.0 U
Aroclor 1268	--	--	3.9 U	4.0 U	4.0 U	4.0 U	3.6 U	3.9 U	3.6 U	3.5 U	3.5 U	4.0 U
Total PCBs (e)	130	1000	**5.3**	4.0 U	4.0 U	**6.0**	**7.1**	**4.2**	**7.7**	**15.5**	**20.3**	4.0 U

TABLE 10
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - DRY WEIGHT
WEST END SITE
PORT OF EVERETT

	Dry Weight Equivalent to SMS Criteria (a)		RI-SED-11	RI-SED-12	RI-SED-13	RI-SED-14	Dup of RI-SED-14 RI-SED-20	RI-SED-15	RI-SED-16	RI-SED-17	RI-SED-18	RI-SED-19
	SQS (b)	CSL (c)	OY89I/OZ22H/PA01T 5/12/2009	OY89G/OZ22F/PA01R 5/12/2009	OY89F/OZ22E/PA01Q 5/12/2009	OY67F/OY96F/PA01F 5/11/2009	OY67A/OY96A/PA01A 5/11/2009	OY67E/OY96E/PA01E 5/11/2009	OY67D/OY96D/PA01D 5/11/2009	OY67C/OY96C/PA01C 5/11/2009	OY67B/OY96B/PA01B 5/11/2009	OY89H/OZ22G/PA01S 5/12/2009
CONVENTIONALS												
Total Organic Carbon (PLUMB81TC) (%)	10 (i)	10 (i)	1.32	0.489	1.56	1.57	1.76	2.27	1.32	1.71	1.04	1.03
Total Solids (EPA160.3) (%)	--	--	51.10	82.40	48.90	49.20 J1	48.20 J1	47.80 J1	52.60 J1	48.40 J1	58.30 J1	62.00
Total Volatile Solids (EPA160.4) (%)	25 (i)	25 (i)	6.22 J1	1.18 J1	6.75 J1	6.40 J1	6.19 J1	6.50 J1	5.41 J1	5.54 J1	4.15 J1	4.06 J1
Ammonia as N (EPA350.1M) (mg/kg)	--	--	**16.8** J1	**2.97** J1	**17.7** J1	**21.4** J1	**21.3** J1	**20.6** J1	**15.7** J1	**15.4** J1	**8.77** J1	**8.36** J1
Sulfide (EPA376.2) (mg/kg)	--	--	**266** J1	**50.9** J1	**263** J1	**325** J1	**251** J1	**307** J1	**464** J1	**93.5** J1	**78.3** J1	**154** J1
GRAIN SIZE												
Method PSEP												
Particle/Grain Size, Phi Scale <-1	--	--	0.5	23.5	0.1	3.2	0.2	2.7	0.0	0.5	9.3	0.1
Particle/Grain Size, Phi Scale -1 to 0	--	--	0.9	19.2	0.5	0.7	0.6	0.7	0.4	0.6	2.5	0.3
Particle/Grain Size, Phi Scale 0 to 1	--	--	1.1	22.1	0.5	1.6	0.9	0.9	0.7	1.5	3.4	0.8
Particle/Grain Size, Phi Scale 1 to 2	--	--	1.2	17.0	0.5	3.3	1.7	1.3	1.5	2.8	6.1	3.1
Particle/Grain Size, Phi Scale 2 to 3	--	--	6.5	5.6	1.6	5.7	3.9	3.1	6.3	5.6	10.2	21.1
Particle/Grain Size, Phi Scale 3 to 4	--	--	23.8	4.6	15.3	18.7	18.2	11.7	14.5	10.3	17.6	27.9
Particle/Grain Size, Phi Scale 4 to 5	--	--	20.4	3.7	24.3	18.9	21.6	18.5	20.7	15.9	18.6	17.2
Particle/Grain Size, Phi Scale 5 to 6	--	--	8.6	1.0	13.6	16.8	15.7	18.2	17.7	18.3	11.2	8.0
Particle/Grain Size, Phi Scale 6 to 7	--	--	11.4	0.9	12.6	10.8	12.4	13.6	12.4	14.8	7.5	5.9
Particle/Grain Size, Phi Scale 7 to 8	--	--	7.3	0.6	9.7	6.6	7.2	8.9	7.9	10.1	4.1	4.2
Particle/Grain Size, Phi Scale 8 to 9	--	--	5.4	0.6	6.0	3.2	5.4	6.1	5.5	5.7	2.8	3.0
Particle/Grain Size, Phi Scale 9 to 10	--	--	4.6	0.4	5.4	3.4	3.9	4.7	4.1	5.0	2.2	2.8
Particle/Grain Size, Phi Scale >10	--	--	8.4	0.7	10.1	7.1	8.1	9.6	8.4	9.0	4.5	5.5
Particle/Grain Size, Fines (Silt/Clay)	--	--	66.0	8.0	81.7	66.8	74.4	79.5	76.7	78.7	51.0	46.6

TABLE 10
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - DRY WEIGHT
WEST END SITE
PORT OF EVERETT

FOOTNOTES:

U = Indicates the compound was undetected at the reported concentration.
J = Reported detected result is less than the Reporting Limit but greater than the Method Detection Limit.
J1 = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected in the sample; the reported sample reporting limit is an estimate.
NA = Not analyzed.
Bold = Detected compound.
Boxed results exceed the SQS.

(a) Dry weight equivalent criteria are based on the Puget Sound Apparent Effect Threshold Values (Barrick et al. 1988)
(b) SMS Sediment Quality Standard
(c) SMS Cleanup Screening Level
(d) Ecology, 1996, SMS techinical memorandum: testing, reporting, and evaluation of tributyltin data in PSDAA and SMS Programs.
(e) 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 compound/isomers.
  (ii) Where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.
(f) 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.
(g) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.
(h) 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 listed.
(i) DMMP clarification paper and SMS technichal information memorandum: Management of Wood Waste Under Dredged Material Management Program and the SMS Cleanup Program.

TABLE 11
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - CARBON NORMALIZED
WEST END SITE
PORT OF EVERETT

	Sediment Management Standards		RI-SED-1 OY89B/OZ22A/PA01M 5/12/2009	RI-SED-2 OY89D/OZ22C/PA01O 5/12/2009	RI-SED-3 OY89C/OZ22B/PA01N 5/12/2009	RI-SED-4 OY67L/OY96L/PA01L 5/11/2009	RI-SED-5 OY67K/OY96K/PA01K 5/11/2009	RI-SED-6 OY67J/OY96J/PA01J 5/11/2009	RI-SED-7 OY67I/OY96I/PA01I 5/11/2009	RI-SED-8 OY89E/OZ22D/PA01P 5/12/2009	RI-SED-9 OY67H/OY96H/PA01H 5/11/2009	RI-SED-10 OY67G/OY96G/PA01G 5/11/2009
	SQS (a)	CSL (b)										
TOTAL METALS (mg/kg-dry wt)												
Methods SW6010B/SW7471A												
Arsenic	57	93	**20**	**20**	**20**	**30**	**26**	**30**	**30**	**14**	**21**	**20**
Cadmium	5.1	6.7	**0.4**	**0.4**	**0.5**	0.4 U	0.4 U	0.4 U	0.4 U	0.3 U	0.3 U	0.3 U
Chromium	260	270	**61**	**56**	**63**	**69**	**70.1**	**66**	**64**	**51.1**	**54.0**	**49.9**
Copper	390	390	**68.7**	**62.2**	**70.4**	**68.6**	**68.1**	**65.5**	**63.2**	**52.9**	**48.8**	**42.8**
Lead	450	530	**12**	**11**	**12**	**12**	**12**	**12**	**12**	**9**	**8**	**10**
Mercury	0.41	0.59	**0.10**	**0.10**	**0.10**	**0.10**	**0.11**	**0.11**	**0.11**	**0.07**	**0.07**	**0.06**
Silver	6.1	6.1	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.7 U	0.5 U	0.5 U	0.5 U
Zinc	410	960	**109**	**101**	**111**	**109**	**112**	**102**	**100**	**83**	**81**	**74**
POREWATER ORGANOTIN (ug/L-dry wt)												
Method Krone 1988 SIM												
Butyltin Ion	--	--	**0.011**	**0.017**	**0.026**	**0.014**	**0.008**	0.008 U	**0.010**	**0.012**	**0.015**	**0.010**
Dibutyltin Ion	--	--	0.012 U	0.012 U	**0.013**	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Tributyltin Ion	0.05 (c)	0.15 (c)	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
PAHs (mg/kg OC) (d)												
Method SW8270D												
Naphthalene	99	170	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Acenaphthylene	66	66	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Acenaphthene	16	57	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Fluorene	23	79	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Phenanthrene	100	480	**0.8** J	1.4 U	**0.6** J	1.0 U	0.9 U	0.9 U	**0.5** J	**1.1** J	1.8 U	**1.7** J
Anthracene	220	1200	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
2-Methylnaphthalene	38	64	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
LPAH (e, f)	370	780	**0.8**	1.4 U	**0.6** J	1.0 U	0.9 U	0.9 U	**0.5** J	**1.1** J	1.8 U	**1.7** J
Fluoranthene	160	1200	**1.4**	**1.1** J	**1.1**	1.0 U	**0.4** J	0.9 U	**0.7** J	**1.2**	1.8 U	**2.7**
Pyrene	1000	1400	**1.3**	**1.2** J	**1.0**	1.0 U	**0.4** J	0.9 U	**0.6** J	**1.1** J	1.8 U	**2.6**
Benzo(a)anthracene	110	270	**0.8** J	1.4 U	**0.5** J	1.0 U	0.9 U	0.9 U	0.9 U	**0.6** J	1.8 U	2.4 U
Chrysene	110	460	**1.2**	**1.5**	**0.8** J	1.0 U	0.9 U	0.9 U	0.9 U	**1.0** J	1.8 U	**2.0** J
Benzo(b)fluoranthene	--	--	**0.6** J	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	**1.4** J
Benzo(k)fluoranthene	--	--	**0.6** J	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Total Benzofluoranthenes (e, g)	230	450	**1.1** J	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	**1.4** J
Benzo(a)pyrene	99	210	**0.5** J	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Indeno(1,2,3-c,d)pyrene	34	88	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Dibenz(a,h)anthracene	12	33	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Benzo(g,h,i)perylene	31	78	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
HPAH (e, h)	960	5300	**6.3** J	**3.9** J	**3.3** J	1.0 U	**0.9** J	0.9 U	**1.3** J	**3.9** J	1.8 U	**8.7** J
SEMIVOLATILES (mg/kg OC) (d)												
Method SW8270D												
1,2-Dichlorobenzene	2.3	2.3	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U (j)
1,3-Dichlorobenzene	--	--	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
1,4-Dichlorobenzene	3.1	9	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
1,2,4-Trichlorobenzene	0.81	1.8	1.0 U (j)	1.4 U (i)	0.9 U (i)	1.0 U (i)	0.9 U (i)	0.9 U (i)	0.9 U (i)	1.2 U (i)	1.8 U (i)	2.4 U (j)
Hexachlorobenzene	0.38	2.3	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Dimethylphthalate	53	53	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Diethylphthalate	61	110	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Di-n-Butylphthalate	220	1700	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Butylbenzylphthalate	4.9	64	33.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
bis(2-Ethylhexyl)phthalate	47	78	**1.8**	**1.6**	**0.8** J	**0.7** J	**0.9**	**0.6** J	**1.3**	**0.7** J	1.8 U	**1.6** J
Di-n-Octyl phthalate	58	4500	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Dibenzofuran	15	58	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Hexachlorobutadiene	3.9	6.2	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
Hexachloroethane	--	--	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U
N-Nitrosodiphenylamine	11	11	1.0 U	1.4 U	0.9 U	1.0 U	0.9 U	0.9 U	0.9 U	1.2 U	1.8 U	2.4 U

TABLE 11
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - CARBON NORMALIZED
WEST END SITE
PORT OF EVERETT

	Sediment Management Standards		RI-SED-1 OY89B/OZ22A/PA01M 5/12/2009	RI-SED-2 OY89D/OZ22C/PA01O 5/12/2009	RI-SED-3 OY89C/OZ22B/PA01N 5/12/2009	RI-SED-4 OY67L/OY96L/PA01L 5/11/2009	RI-SED-5 OY67K/OY96K/PA01K 5/11/2009	RI-SED-6 OY67J/OY96J/PA01J 5/11/2009	RI-SED-7 OY67I/OY96I/PA01I 5/11/2009	RI-SED-8 OY89E/OZ22D/PA01P 5/12/2009	RI-SED-9 OY67H/OY96H/PA01H 5/11/2009	RI-SED-10 OY67G/OY96G/PA01G 5/11/2009
	SQS (a)	CSL (b)										
SEMIVOLATILES (µg/kg-dry wt)												
Method SW8270D												
Phenol	420	1200	20 U	20 U	20 U	20 U	20 U	**17** J	20 U	**19** J	19 U	19 U
2-Methylphenol	63	63	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
4-Methylphenol	670	670	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
2,4-Dimethylphenol	29	29	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Pentachlorophenol	360	690	100 U	99 U	98 U	100 U	98 U	100 U	98 U	97 U	97 U	97 U
Benzyl Alcohol	57	73	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
Benzoic Acid	650	650	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	190 U	190 U
1-Methylnaphthalene	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	19 U	19 U
PCBs (mg/kg OC) (d)												
PSDDA Method SW8082												
Aroclor 1016	--	--	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
Aroclor 1242	--	--	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
Aroclor 1248	--	--	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
Aroclor 1254	--	--	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
Aroclor 1260	--	--	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
Aroclor 1221	--	--	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
Aroclor 1232	--	--	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
Aroclor 1262	--	--	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
Aroclor 1268	--	--	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
Total PCBs	12	65	0.2 U	0.3 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4 U	0.5 U
CONVENTIONALS												
Total Organic Carbon (PLUMB81TC) (%)	10 (k)	10 (k)	1.97	1.48	2.17	2.05	2.35	2.14	2.25	1.65	1.06	0.808
Total Solids (EPA160.3) (%)	--	--	47.40	48.60	48.90	47.70 J1	50.80 J1	48.50 J1	46.90 J1	55.50	60.40 J1	60.30 J1
Total Volatile Solids (EPA160.4) (%)	25 (k)	25 (k)	6.75 J1	7.14 J1	7.31 J1	7.41 J1	7.10 J1	7.57 J1	7.50 J1	5.86 J1	4.91 J1	4.34 J1
Ammonia as N (EPA350.1M) (mg/kg)	--	--	**50.0** J1	**13.9** J1	**20.4** J1	**16.0** J1	**18.4** J1	**17.2** J1	**18.7** J1	**14.7** J1	**9.24** J1	**12.8** J1
Sulfide (EPA376.2) (mg/kg)	--	--	**251** J1	**276** J1	**385** J1	**306** J1	**219** J1	**268** J1	**156** J1	**68.0** J1	**86.0** J1	**79.5** J1
GRAIN SIZE												
Method PSEP												
Particle/Grain Size, Phi Scale <-1	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.1	0.1
Particle/Grain Size, Phi Scale -1 to 0	--	--	0.2	0.1	0.2	0.1	0.6	0.9	2.1	0.3	0.4	0.4
Particle/Grain Size, Phi Scale 0 to 1	--	--	0.3	0.2	0.2	0.2	0.5	0.6	1.9	0.6	0.6	0.5
Particle/Grain Size, Phi Scale 1 to 2	--	--	0.5	0.2	0.1	0.1	0.2	0.4	2.0	0.9	1.3	1.6
Particle/Grain Size, Phi Scale 2 to 3	--	--	1.0	0.3	0.1	0.1	0.4	0.6	3.2	9.4	10.0	18.5
Particle/Grain Size, Phi Scale 3 to 4	--	--	4.1	2.2	1.7	1.8	3.4	4.9	8.9	22.4	27.5	25.2
Particle/Grain Size, Phi Scale 4 to 5	--	--	17.2	14.3	13.8	15.8	19.0	14.7	13.7	17.0	18.1	17.8
Particle/Grain Size, Phi Scale 5 to 6	--	--	20.2	24.7	21.0	20.5	18.5	19.0	20.8	14.8	14.9	11.6
Particle/Grain Size, Phi Scale 6 to 7	--	--	21.7	21.0	22.2	23.1	19.3	22.2	16.2	11.6	9.6	7.9
Particle/Grain Size, Phi Scale 7 to 8	--	--	12.0	12.8	12.7	13.1	12.4	12.6	9.5	7.3	5.2	4.9
Particle/Grain Size, Phi Scale 8 to 9	--	--	7.4	7.4	8.2	7.3	7.8	7.0	5.8	4.3	3.3	3.2
Particle/Grain Size, Phi Scale 9 to 10	--	--	4.9	6.0	7.0	5.8	5.9	5.7	4.9	3.6	2.9	2.6
Particle/Grain Size, Phi Scale >10	--	--	10.5	10.8	12.8	12.0	11.9	11.3	10.1	7.8	6.0	5.5
Particle/Grain Size, Fines (Silt/Clay)	--	--	93.9	97.0	97.7	97.6	94.9	92.6	81.0	66.4	60.1	53.6

TABLE 11
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - CARBON NORMALIZED
WEST END SITE
PORT OF EVERETT

	Sediment Management Standards		RI-SED-11 OY89I/OZ22H/PA01T 5/12/2009	RI-SED-12 OY89G/OZ22F/PA01R 5/12/2009	RI-SED-13 OY89F/OZ22E/PA01Q 5/12/2009	RI-SED-14 OY67F/OY96F/PA01F 5/11/2009	Dup of RI-SED-14 RI-SED-20 OY67A/OY96A/PA01A 5/11/2009	RI-SED-15 OY67E/OY96E/PA01E 5/11/2009	RI-SED-16 OY67D/OY96D/PA01D 5/11/2009	RI-SED-17 OY67C/OY96C/PA01C 5/11/2009	RI-SED-18 OY67B/OY96B/PA01B 5/11/2009	RI-SED-19 OY89H/OZ22G/PA01S 5/12/2009
	SQS (a)	CSL (b)										
TOTAL METALS (mg/kg-dry wt)												
Methods SW6010B/SW7471A												
Arsenic	57	93	**10**	6 U	**10**	**19**	**20**	**20**	**19**	**20**	**17**	**11**
Cadmium	5.1	6.7	**0.4**	0.2 U	**0.4**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.3 U	0.3 U
Chromium	260	270	**50**	**5.6**	**50**	**53.8**	**55**	**62**	**55.8**	**57**	**63.6**	**40.2**
Copper	390	390	**56.9**	**3.8**	**57.1**	**60.0**	**62.9**	**69.0**	**60.8**	**69.8**	**48.2**	**41.7**
Lead	450	530	**10**	2 U	**9**	**12**	**11**	**13**	**10**	**13**	**11**	**7**
Mercury	0.41	0.59	**0.09**	0.03 U	**0.09**	**0.09**	**0.09**	**0.10**	**0.08**	**0.10**	**0.06**	**0.06**
Silver	6.1	6.1	0.6 U	0.3 U	0.6 U	0.6 U	0.6 U	0.6 U	0.5 U	0.6 U	0.5 U	0.4 U
Zinc	410	960	**99**	**11**	**99**	**95**	**102**	**110**	**98**	**106**	**82**	**78**
POREWATER ORGANOTIN (ug/L-dry wt)												
Method Krone 1988 SIM												
Butyltin Ion	--	--	**0.011**	**0.030**	**0.010**	**0.012**	**0.014**	0.008 U	**0.010**	0.008 U	0.008 U	**0.014**
Dibutyltin Ion	--	--	0.012 U	0.021 U	0.012 U	0.012 UJ	**0.031** J1	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Tributyltin Ion	0.05 (c)	0.15 (c)	0.008 U	0.014 U	0.008 U	0.008 UJ	**0.037** J1	0.008 U	0.008 U	**0.025**	0.008 U	0.008 U
PAHs (mg/kg OC) (d)												
Method SW8270D												
Naphthalene	99	170	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
Acenaphthylene	66	66	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	**1.6** J	1.9 U
Acenaphthene	16	57	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	**1.4** J	1.9 U
Fluorene	23	79	1.5 U	**3.7** J	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	**0.6** J	**9.4**	1.9 U
Phenanthrene	100	480	**1.7**	**18.6**	**0.8** J	**1.3**	**2.1**	0.8 U	**1.7**	**3.3**	**57.7** J1	**1.2** J
Anthracene	220	1200	**0.8** J	**7.6**	1.3 U	1.3 U	**0.9** J	0.8 U	**0.9** J	**1.5**	**13.5** J	**1.2** J
2-Methylnaphthalene	38	64	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	**1.3** J	1.9 U
LPAH (e, f)	370	780	**2.4** J	**29.9** J	**0.8** J	**1.3**	**3.0** J	0.8 U	**2.6** J	**5.5** J	**83.7**	**2.3** J
Fluoranthene	160	1200	**2.3**	**7.2**	**3.1**	**3.1** J1	**6.3** J1	**1.9**	**5.2**	**7.0**	**221.2**	**6.5**
Pyrene	1000	1400	**2.8**	**12.1**	**2.9**	**4.2** J1	**6.8** J1	**2.0**	**6.2**	**7.6**	**115.4** J1	**5.5**
Benzo(a)anthracene	110	270	**1.1** J	**14.5**	**1.1** J	**2.9**	**2.7**	**0.8** J	**5.4**	**4.9**	**28.8** J1	**2.0**
Chrysene	110	460	**3.1**	**45.0**	**2.8**	**5.2**	**6.3**	**1.5**	**9.8**	**12.3**	**64.4** J1	**2.9**
Benzo(b)fluoranthene	--	--	**1.1** J	**7.0**	**1.2** J	**5.1**	**4.9**	**1.5**	**6.4**	**5.4**	**34.6** J1	**1.4** J
Benzo(k)fluoranthene	--	--	**1.1** J	**7.0**	**1.2** J	**2.6**	**3.6**	**1.0**	**4.8**	**4.3**	**25.0**	**1.4** J
Total Benzofluoranthenes (e, g)	230	450	**2.1** J	**13.9**	**2.3** J	**7.7**	**8.5**	**2.5**	**11.2**	**9.7**	**59.6**	**2.7** J
Benzo(a)pyrene	99	210	**0.8** J	**4.5**	**0.7** J	**1.9**	**2.3**	**0.6** J	**3.0**	**2.6**	**14.4**	**1.1** J
Indeno(1,2,3-c,d)pyrene	34	88	1.5 U	4.1 U	1.3 U	**0.8** J	**1.1** J	0.8 U	**1.3** J	**1.2**	**6.7**	1.9 U
Dibenz(a,h)anthracene	12	33	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	**1.8** J	1.9 U
Benzo(g,h,i)perylene	31	78	1.5 U	4.1 U	1.3 U	**0.6** J	**1.0** J	0.8 U	**1.0** J	**1.1** J	**6.3**	1.9 U
HPAH (e, h)	960	5300	**12.1** J	**97.1**	**13.0** J	**26.4** J	**34.9** J	**9.4** J	**43.1** J	**46.3** J	**518.8** J	**20.8** J
SEMIVOLATILES (mg/kg OC) (d)												
Method SW8270D												
1,2-Dichlorobenzene	2.3	2.3	1.5 U	4.1 U (j)	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
1,3-Dichlorobenzene	--	--	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
1,4-Dichlorobenzene	3.1	9	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
1,2,4-Trichlorobenzene	0.81	1.8	1.5 U (i)	4.1 U (j)	1.3 U (i)	1.3 U (i)	1.1 U (i)	0.8 U	1.5 U (i)	1.2 U (i)	1.8 U (i)	1.9 U (i)
Hexachlorobenzene	0.38	2.3	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
Dimethylphthalate	53	53	1.5 U	4.1 U	1.3 U	1.3 U	**1.3**	0.8 U	1.5 U	1.2 U	**3.7**	1.9 U
Diethylphthalate	61	110	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
Di-n-Butylphthalate	220	1700	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
Butylbenzylphthalate	4.9	64	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
bis(2-Ethylhexyl)phthalate	47	78	**2.3**	**3.1** J	**5.3**	**2.0**	**3.0**	**1.2**	**2.5**	**3.7**	**7.5**	**1.6** J
Di-n-Octyl phthalate	58	4500	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
Dibenzofuran	15	58	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	**3.0**	1.9 U
Hexachlorobutadiene	3.9	6.2	1.5 U	4.1 U (j)	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
Hexachloroethane	--	--	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U
N-Nitrosodiphenylamine	11	11	1.5 U	4.1 U	1.3 U	1.3 U	1.1 U	0.8 U	1.5 U	1.2 U	1.8 U	1.9 U

TABLE 11
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - CARBON NORMALIZED
WEST END SITE
PORT OF EVERETT

	Sediment Management Standards		RI-SED-11 OY89I/OZ22H/PA01T 5/12/2009	RI-SED-12 OY89G/OZ22F/PA01R 5/12/2009	RI-SED-13 OY89F/OZ22E/PA01Q 5/12/2009	RI-SED-14 OY67F/OY96F/PA01F 5/11/2009	Dup of RI-SED-14 RI-SED-20 OY67A/OY96A/PA01A 5/11/2009	RI-SED-15 OY67E/OY96E/PA01E 5/11/2009	RI-SED-16 OY67D/OY96D/PA01D 5/11/2009	RI-SED-17 OY67C/OY96C/PA01C 5/11/2009	RI-SED-18 OY67B/OY96B/PA01B 5/11/2009	RI-SED-19 OY89H/OZ22G/PA01S 5/12/2009
	SQS (a)	CSL (b)										
SEMIVOLATILES (µg/kg-dry wt)												
Method SW8270D												
Phenol	420	1200	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
2-Methylphenol	63	63	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
4-Methylphenol	670	670	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
2,4-Dimethylphenol	29	29	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Pentachlorophenol	360	690	98 U	98 U	99 U	99 U	100 U	97 U	98 U	98 U	97 U	98 U
Benzyl Alcohol	57	73	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
Benzoic Acid	650	650	200 U	200 U	200 U	200 U	200 U	190 U	200 U	200 U	190 U	200 U
1-Methylnaphthalene	--	--	20 U	20 U	20 U	20 U	20 U	19 U	20 U	20 U	19 U	20 U
PCBs (mg/kg OC) (d)												
PSDDA Method SW8082												
Aroclor 1016	--	--	0.3 U	0.8 U	0.3 U	0.3 U	0.2 U	0.2 U	0.3 U	0.2 U	0.3 U	0.4 U
Aroclor 1242	--	--	0.3 U	0.8 U	0.3 U	0.3 U	0.2 U	0.2 U	0.3 U	0.2 U	0.3 U	0.4 U
Aroclor 1248	--	--	0.3 U	0.8 U	0.3 U	0.3 U	0.2 U	0.2 U	0.3 U	0.2 U	0.5 U	0.4 U
Aroclor 1254	--	--	**0.4**	0.8 U	0.3 U	**0.4**	**0.4**	**0.2**	**0.6**	**0.6**	**1.4**	0.4 U
Aroclor 1260	--	--	0.3 U	0.8 U	0.3 U	0.3 U	0.2 U	0.2 U	0.3 U	**0.3**	**0.5**	0.4 U
Aroclor 1221	--	--	0.3 U	0.8 U	0.3 U	0.3 U	0.2 U	0.2 U	0.3 U	0.2 U	0.3 U	0.4 U
Aroclor 1232	--	--	0.3 U	0.8 U	0.3 U	0.3 U	0.5 U	0.2 U	0.6 U	0.2 U	0.3 U	0.4 U
Aroclor 1262	--	--	0.3 U	0.8 U	0.3 U	0.3 U	0.2 U	0.2 U	0.3 U	0.2 U	0.3 U	0.4 U
Aroclor 1268	--	--	0.3 U	0.8 U	0.3 U	0.3 U	0.2 U	0.2 U	0.3 U	0.2 U	0.3 U	0.4 U
Total PCBs	12	65	**0.4**	0.8 U	0.3 U	**0.4**	**0.4**	**0.2**	**0.6**	**0.9**	**2.0**	0.4 U
CONVENTIONALS												
Total Organic Carbon (PLUMB81TC) (%)	10 (k)	10 (k)	1.32	0.489	1.56	1.57	1.76	2.27	1.32	1.71	1.04	1.03
Total Solids (EPA160.3) (%)	--	--	51.10	82.40	48.90	49.20 J1	48.20 J1	47.80 J1	52.60 J1	48.40 J1	58.30 J1	62.00
Total Volatile Solids (EPA160.4) (%)	25 (k)	25 (k)	6.22 J1	1.18 J1	6.75 J1	6.40 J1	6.19 J1	6.50 J1	5.41 J1	5.54 J1	4.15 J1	4.06 J1
Ammonia as N (EPA350.1M) (mg/kg)	--	--	**16.8** J1	**2.97** J1	**17.7** J1	**21.4** J1	**21.3** J1	**20.6** J1	**15.7** J1	**15.4** J1	**8.77** J1	**8.36** J1
Sulfide (EPA376.2) (mg/kg)	--	--	**266** J1	**50.9** J1	**263** J1	**325** J1	**251** J1	**307** J1	**464** J1	**93.5** J1	**78.3** J1	**154** J1
GRAIN SIZE												
Method PSEP												
Particle/Grain Size, Phi Scale <-1	--	--	0.5	23.5	0.1	3.2	0.2	2.7	0.0	0.5	9.3	0.1
Particle/Grain Size, Phi Scale -1 to 0	--	--	0.9	19.2	0.5	0.7	0.6	0.7	0.4	0.6	2.5	0.3
Particle/Grain Size, Phi Scale 0 to 1	--	--	1.1	22.1	0.5	1.6	0.9	0.9	0.7	1.5	3.4	0.8
Particle/Grain Size, Phi Scale 1 to 2	--	--	1.2	17.0	0.5	3.3	1.7	1.3	1.5	2.8	6.1	3.1
Particle/Grain Size, Phi Scale 2 to 3	--	--	6.5	5.6	1.6	5.7	3.9	3.1	6.3	5.6	10.2	21.1
Particle/Grain Size, Phi Scale 3 to 4	--	--	23.8	4.6	15.3	18.7	18.2	11.7	14.5	10.3	17.6	27.9
Particle/Grain Size, Phi Scale 4 to 5	--	--	20.4	3.7	24.3	18.9	21.6	18.5	20.7	15.9	18.6	17.2
Particle/Grain Size, Phi Scale 5 to 6	--	--	8.6	1.0	13.6	16.8	15.7	18.2	17.7	18.3	11.2	8.0
Particle/Grain Size, Phi Scale 6 to 7	--	--	11.4	0.9	12.6	10.8	12.4	13.6	12.4	14.8	7.5	5.9
Particle/Grain Size, Phi Scale 7 to 8	--	--	7.3	0.6	9.7	6.6	7.2	8.9	7.9	10.1	4.1	4.2
Particle/Grain Size, Phi Scale 8 to 9	--	--	5.4	0.6	6.0	3.2	5.4	6.1	5.5	5.7	2.8	3.0
Particle/Grain Size, Phi Scale 9 to 10	--	--	4.6	0.4	5.4	3.4	3.9	4.7	4.1	5.0	2.2	2.8
Particle/Grain Size, Phi Scale >10	--	--	8.4	0.7	10.1	7.1	8.1	9.6	8.4	9.0	4.5	5.5
Particle/Grain Size, Fines (Silt/Clay)	--	--	66.0	8.0	81.7	66.8	74.4	79.5	76.7	78.7	51.0	46.6

TABLE 11
RI SEDIMENT SAMPLE ANALYTICAL RESULTS - CARBON NORMALIZED
WEST END SITE
PORT OF EVERETT

FOOTNOTES:

U = Indicates the compound was undetected at the reported concentration.
J = Reported detected result is less than the Reporting Limit but greater than the Method Detection Limit.
J1 = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected in the sample; the reported sample reporting limit is an estimate.
Bold = Detected compound.
Boxed results exceed the SQS.

(a) SMS Sediment Quality Standard (Chapter 173-204 WAC).
(b) SMS Cleanup Screening Level (Chapter 173-204 WAC).
(c) Ecology, 1996, SMS techinical memeroandum: testing, reporting, and evaluation of tributyltin data in PSDAA and SMS Programs.
(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) 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.
(f) 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.
(g) The total benzofluoranthenes criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.
(h) 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.
(i) The reporting limit is above the SQS but below the CSL criteria.
(j) The reporting limit is above the SQS and the CSL criteria as a result of low TOC concentrations.
(k) DMMP clarification paper and SMS technichal information memorandum: Management of Wood Waste Under Dredged Material Management Program and the SMS Cleanup Program.

TABLE 12
2009 GROUNDWATER MONITORING RESULTS
WEST END SITE
PORT OF EVERETT

	Screening Level	RI-MW-1 PC60E 6/12/2009	Duplicate of RI-MW-1 RI-MW-19 PC60G 6/12/2009	RI-MW-1 PP11A 9/17/2009	Duplicate of RI-MW-1 RI-MW-101 PP11S 9/17/2009	RI-MW-1 QR08D 4/1/2010	RI-MW-2 PC60F 6/12/2009	RI-MW-2 PP11B 9/17/2009	RI-MW-3 PD51A 6/16/2009	RI-MW-3 PP11C 9/18/2009	RI-MW-3 QR08E 4/1/2010	RI-MW-4 PD51B 6/17/2009	RI-MW-4 PP11D 9/17/2009	RI-MW-4 QR08F 4/1/2010	RI-MW-5 PD51C 6/17/2009	RI-MW-5 PP11E 9/17/2009	RI-MW-6 PD51D 6/16/2009	RI-MW-6 PP11F 9/17/2009	RI-MW-7 PD51E 6/18/2009	RI-MW-7 PP11G 9/17/2009	RI-MW-7 QR08C 4/1/2010	RI-MW-7 QW56A 5/14/2010
DISSOLVED METALS (µg/L)																						
Method EPA 200.8																						
Arsenic	5	**6**	**6**	**6**	**6**	**5**	**1**	0.5 U	**0.9**	**2**	NA	**7.3**	**22.4**	**8.6**	**5.2**	**2.8**	**9.7**	**13.2**	**10.8**	**10.8**	**7.8**	NA
Copper	3.1	**3**	**2.6**	**5**	**5**	**3**	**2.2**	**2.1**	**3**	**5**	**2.2**	**1.7**	**1.5**	NA	**0.5**	**0.8**	**2.2**	**2.9**	NA	NA	NA	NA
NWTPH-HCID (µg/L)																						
Diesel-Range Organics	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Organics	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-Dx (µg/L)																						
Diesel-Range Organics	500	250 U	250 U	250 U	NA	NA	250 U	250 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	250 U	250 U	250 U
Lube Oil	500	500 U	500 U	500 U	NA	NA	500 U	500 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1500**	500 U	500 U	500 U
NWTPH-G (µg/L)																						
Gasoline-Range Organics	800	250 U	250 U	250 U	250 U	NA	250 U	250 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	250 U	NA	NA
VOLATILES (µg/L)																						
Method SW8260CSIM																						
Vinyl Chloride	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FIELD PARAMETERS																						
pH		7.14	7.14	6.64	6.64	7.37	8.51	7.16	9.55	7.10	8.32	7.80	6.30	7.8	8.13	7.60	8.43	8.34	8.23	6.76	NA (a)	7.54
Conductivity (uS/cm)		1,229	1,229	11,142	11,142	12605	1465	2609	2113	-299.9	14254	225	1082	1540	142	844	160	774	392	900	NA (a)	4200
Turbidity (NTU)		1.21	1.21	3.52	3.52	7.16	2.11	4.46	5.58	4.12	NA	12.75	66.92	417.2	6.35	1.61	NA	325.3	NA (a)	97.57	NA (a)	NA (a)
Dissolved oxygen (mg/L)		2.59	2.59	6.50	6.50	0.7	2.2	0.78	2.43	8.24	0.39	2.82	1.31	0.32	2.26	6.44	2.10	13.68	7.00	NA (a)	NA (a)	0.54
Temperature (°C)		13.97	13.97	16.67	16.67	9.75	12.0	15.59	11.48	15.45	10.27	12.32	15.69	9.81	13.21	16.32	20.07	18.69	16.59	18.54	NA (a)	13.96
ORP (mv)		36.9	36.9	-49.2	-49.2	-33.8	-284.7	-300.4	-288.3	-300.2	-223.2	-45.2	-151.4	-154.8	-68.2	-163.1	49.9	NA	-15.8	NA (a)	NA (a)	-73.9
Ferrous iron (mg/L)		2.2	2.2	1.3	1.3	NA	0.8	0.0	1.0	0.8	NA	2.0	3.0	NA	1.5	1.1	0.1	0.0	0.3	NA (a)	NA (a)	NA (a)

TABLE 12
2009 GROUNDWATER MONITORING RESULTS
WEST END SITE
PORT OF EVERETT

	Screening Level	RI-MW-8 PD51F 6/16/2009	RI-MW-8 PP11H 9/18/2009	Duplicate of RI-MW-8 RI-MW-88 PP11T 9/18/2009	RI-MW-9 PC60B 6/12/2009	RI-MW-9 PP11I 9/18/2009	RI-MW-10 PC60A 6/12/2009	RI-MW-10 PP11J 9/18/2009	RI-MW-11 PD51I 6/18/2009	Duplicate of RI-MW-11 RI-MW-111 PD51J 6/18/2009	RI-MW-11 PP11K 9/18/2009	Duplicate of RI-MW-11 RI-MW-111 PP11U 9/18/2009	RI-MW-11 QR08I 4/1/2010	Duplicate of RI-MW-11 RI-MW-111 QR08A 4/1/2010	RI-MW-11 QW56C 5/14/2010	Duplicate of RI-MW-11 RI-MW-111 QW56B 5/14/2010	RI-MW-11A QR07A 4/1/2010	RI-MW-11A QW56D 5/14/2010	RI-MW-11A(mid) QR07B 4/1/2010	RI-MW-12 PD51K 6/18/2009	RI-MW-12 PP11L 9/18/2009	RI-MW-12 QR08H 4/1/2010
DISSOLVED METALS (µg/L)																						
Method EPA 200.8																						
Arsenic	5	**1.2**	**0.9**	NA	**7.9**	**9.9**	**2.5**	**10.9**	**61.8**	**58.7**	**51.2**	NA	**50.3**	**49.8**	**48**	**51**	**6.1**	**9**	**5.5**	**6**	**3.2**	**9.8**
Copper	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-HCID (µg/L)																						
Diesel-Range Organics	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Organics	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-Dx (µg/L)																						
Diesel-Range Organics	500	250 U	250 U	250 U	250 U	250 U	250 U	250 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	500	500 U	200 U	500 U	500 U	500 U	500 U	500 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-G (µg/L)																						
Gasoline-Range Organics	800	250 U	250 U	NA	250 U	250 U	250 U	250 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILES (µg/L)																						
Method SW8260CSIM																						
Vinyl Chloride	2.4	NA	NA	NA	NA	NA	NA	NA	**5**	**4.5**	**0.81**	**0.91**	**2.3**	**2.6**	**2.6**	**2.4**	**0.41**	**0.4**	**0.56**	NA	0.020 U	NA
FIELD PARAMETERS																						
pH		7.65	17.28	17.28	7.56	7.43	7.22	7.28	8.19	8.19	6.68	6.68	7.5	NA	8.25	NA	7.13	7.39	7.06	8.32	6.93	7.62
Conductivity (uS/cm)		104	566	566	300	1373	272	1175	346	346	1980	1980	1612	NA	3220	NA	3614	2593	3155	258	3078	363
Turbidity (NTU)		28.14	58.56	58.56	7.44	9.04	2.16	NA	18.06	18.06	70.77	70.77	4.41	NA	NA	NA	NA	NA	NA	2.69	14.25	NA
Dissolved oxygen (mg/L)		1.95	2.02	2.02	0.55	9.53	9.03	7.76	2.95	2.95	3.55	3.55	0.33	NA	0.02	NA	0.97	0.25	7.06	2.21	1.98	0.31
Temperature (°C)		14.59	17.28	17.28	14.93	16.47	14.21	17.31	13.65	13.65	17.73	17.73	10.32	NA	12.31	NA	11.34	12.25	10.46	13.01	15.72	10.12
ORP (mv)		-35.8	-102.5	-102.5	84.1	-71.2	73.5	-55.7	-90.8	-90.8	-123.3	-123.3	-123.3	NA	-142.8	NA	-49.4	-64	-61.8	-78.1	-113.4	-107.8
Ferrous iron (mg/L)		1.5	2.0	2.0	1.1	0.8	1.4	0.6	2.2	2.2	5.0	5.0	NA	NA	NA	NA	NA	NA	NA	1.8	7.0	NA

TABLE 12
2009 GROUNDWATER MONITORING RESULTS
WEST END SITE
PORT OF EVERETT

	Screening Level	RI-MW-13 PD51L 6/17/2009	RI-MW-13 PP11M 9/18/2009	RI-MW-13 QR08G 4/1/2010	RI-MW-14 PD51M 6/17/2009	RI-MW-14 PP11N 9/18/2009	RI-MW-15 PD51N 6/17/2009	RI-MW-15 PP11O 9/17/2009	RI-MW-16 PD51O/PF00A 6/17/2009	RI-MW-16 PP11P 9/17/2009	RI-MW-17 PC60D 6/12/2009	RI-MW-17 PP11Q 9/18/2009	RI-MW-18 PC60C 6/12/2009	RI-MW-18 PP11R 9/18/2009	SW-1 QR08B 4/1/2010	GW-1 PD51G 6/18/2009	GW-2 PD51H 6/18/2009	GW-3 PD51P 6/18/2009	GW-4 PD51Q 6/18/2009	GW-5 PD51R 6/17/2009	GW-6 PD46A 6/17/2009	GW-7 PD46B 6/18/2009
DISSOLVED METALS (µg/L)																						
Method EPA 200.8																						
Arsenic	5	**41.9**	**36.7**	**23.2**	**3.5**	**1.3**	**69.3**	**67.9**	**69**	**27.1**	**2.7**	**1.3**	**0.9**	**2.4**	2 U	**0.6**	**1.0**	**1.5**	**1.1**	**1.8**	**1.1**	NA
Copper	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-HCID (µg/L)																						
Diesel-Range Organics	500	NA	NA	NA	NA	NA	NA	NA	**>630** (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Organics	800	NA	NA	NA	NA	NA	NA	NA	250 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	500	NA	NA	NA	NA	NA	NA	NA	**>630** (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-Dx (µg/L)																						
Diesel-Range Organics	500	NA	NA	NA	NA	NA	NA	NA	250 U	250 U	NA	NA	NA	NA	NA	250 U	250 U	NA	NA	NA	NA	NA
Lube Oil	500	NA	NA	NA	NA	NA	NA	NA	500 U	500 U	NA	NA	NA	NA	NA	500 U	500 U	NA	NA	NA	NA	NA
NWTPH-G (µg/L)																						
Gasoline-Range Organics	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	250 U	NA	NA	NA	NA	NA
VOLATILES (µg/L)																						
Method SW8260CSIM																						
Vinyl Chloride	2.4	NA	NA	NA	NA	NA	**12**	**1.9**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.16**	NA	NA	0.02 U
FIELD PARAMETERS																						
pH		7.86	6.45	7.56	7.40	6.45	7.84	6.26	7.88	6.94	7.44	6.43	7.72	7.14	7.4	NA	NA	NA	NA	NA	NA	NA
Conductivity (uS/cm)		331	2520	786	215	4946	314	1373	734	2138	111	630	77	389	13987	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)		4.67	16.86	NA	12.6	8.43	24.83	22.11	34.52	25.94	9.41	46.5	3.37	NA	5.93	NA	NA	NA	NA	NA	NA	NA
Dissolved oxygen (mg/L)		3.09	1.26	0.55	2.60	2.22	5.87	NA	3.82	NA	2.92	6.11	8.88	11.37	11.48	NA	NA	NA	NA	NA	NA	NA
Temperature (°C)		13.40	17.69	10.3	12.89	16.01	13.97	18.15	13.49	19.32	15.85	18.85	13.51	17.65	8.16	NA	NA	NA	NA	NA	NA	NA
ORP (mv)		-99.7	-90.2	-120.2	-2.6	-79.8	-72.7	NA	-94.5	NA	-69.5	-70.8	-11.2	-27.0	97.8	NA	NA	NA	NA	NA	NA	NA
Ferrous iron (mg/L)		1.4	2.0	NA	1.3	4.0	2.2	3.2	3.0	4.8	2.2	4.5	1.7	0.8	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 12
2009 GROUNDWATER MONITORING RESULTS
WEST END SITE
PORT OF EVERETT

		GW-8	GW-9	GW-10	GW-11	GW-12	GW-13	GW-14	GW-15	GW-16	GW-17
	Screening	PD46C	PD46D	PD46E	PD46F	PD46G	PD46H	PD46I	PD46J	PD46K	PD46L
	Level	6/17/2009	6/17/2009	6/17/2009	6/18/2009	6/18/2009	6/17/2009	6/17/2009	6/17/2009	6/17/2009	6/18/2009
DISSOLVED METALS (µg/L)											
Method EPA 200.8											
Arsenic	5	**1.3**	**1.4**	NA	**0.6**	**0.5**	**1.0**	**0.3**	**0.4**	**0.2**	**0.3**
Copper	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-HCID (µg/L)											
Diesel-Range Organics	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline-Range Organics	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-Dx (µg/L)											
Diesel-Range Organics	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-G (µg/L)											
Gasoline-Range Organics	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILES (µg/L)											
Method SW8260CSIM											
Vinyl Chloride	2.4	**0.86**	**1.1**	0.02 U	NA	NA	NA	NA	NA	NA	NA
FIELD PARAMETERS											
pH		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conductivity (uS/cm)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved oxygen (mg/L)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Temperature (°C)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mv)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron (mg/L)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

U = Indicates the compound was undetected at the reported concentration.
Bold = Detected compound.
Boxed Value = Concentration exceeds screening level.
NA = Not analyzed.
ORP = Oxidation Reduction Potential

(a) Water yield from well RI-MW-7 was insufficient to collect all field parameters

(b) Diesel-range organics and/or lube oil-range organics were detected in sample RI-MW-16 using Ecology's HCID method. However, the HCID method is a qualitatve analyses and does not include the acid silca-gel cleanup procedure and, therefore, may result in a false positive for diesel and lube oil. In accordance with Ecology's Analytical Methods for Petroleum Hydrocarbons (publication no. ECY 97-602), the sample was analyzed by Ecology's Method NWTPH-Dx. Additionally, an acid silica-gel cleanup procudure was used to remove naturally occuring organics.

TABLE 13
GROUNDWATER PROPOSED CLEANUP LEVELS FOR DETECTED CONSTITUENTS (1)
WEST END SITE, PORT OF EVERETT, WASHINGTON

		State and Federal ARARs (3)					MTCA B Equation (3)		
Analyte	Potable Groundwater Levels (2, 3)	Federal Marine Chronic Aquatic Life Clean Water Act Section 304	Federal Marine Chronic Aquatic Life NTR 40 CFR 131	State Marine Chronic Aquatic Life Washington WQS Ch. 173-201A	Federal Human Health Consumption of Organisms Clean Water Act Section 304	Federal Human Health Consumption of Organisms NTR 40 CFR 131	Human Health MTCA Method B Surface Water Equation 173-340-730	Practical Quantitation Limit (4)	Preliminary Cleanup Level (5)
Vinyl Chloride (µg/L)	---	NA	NA	NA	2.4	530	3.7 c	1	2.4
Arsenic	5 (a)	36 (b)	36 (b)	36 (b)	0.14	0.14	0.098 c	0.2	5 (a)
Copper	---	3.1 (b)	2.4	3.1 (b)	NA	NA	2,700 nc	1	3.1 (c)

"c" = Cleanup level based on a 1E-06 cancer risk level.
"nc" = Cleanup level based on a hazard quotient of 1.
Shaded value = Basis for proposed cleanup level.
"---" = A potable groundwater cleanup level was not provided because an applicable surface water cleanup level was identified.

ARAR = Applicable or Relevant and Appropriate Requirements
CLARC = Cleanup Levels and Risk Calculation
MTCA = Model Toxics Control Act

NA = Cleanup level not available.
NTR = National Toxics Rule
WQS = Water Quality Standard

(a) Ecology's potable groundwater Method A cleanup level for arsenic is based on background concentrations of this metal in groundwater (WAC 173-340-900; Table 720-1).
As such, the proposed cleanup level for arsenic of 5 ug/L is based on the MTCA Method A level for potable groundwater.
(b) The surface water cleanup level is based on the dissolved fraction.
(c) Selected preliminary cleanup level (Ecology 2009).

NOTES:
(1) Where available, groundwater cleanup levels are based on protection of marine surface water. Groundwater at the site discharges into Port Gardner and is non-potable.
(2) Potable groundwater levels were used for screening purposes in absence of applicaple surface water levels. Unless other wise noted, the minimum level between state and federal ARARs and MTCA Method B was selected.
(3) Unless otherwise noted, all federal and state ARARs and MTCA B cleanup levels for surface water were identified from Ecology's online CLARC database (https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx).
(4) Practical quantitation limits (PQLs) based on analytical method reporting limits.
(5) Cleanup level based on lowest water quality standard or PQL or background, indicated by shading, except as noted otherwise.

TABLE 14
SEDIMENT CLEANUP LEVEL
WEST END SITE
EVERETT, WASHINGTON

	SMS Cleanup Screening Level Criteria (a) (mg/kg -OC)	SMS Marine Sediment Quality Standards (b) (mg/kg -OC)	SQS Dry Weight Equivalent (c) (µg/kg dry weight)	CSL Dry Weight Equivalent (c) (µg/kg dry weight)	Dredged Material Management Program 1998 Screening Level (µg/kg dry weight)	Site Sediment Cleanup Level (mg/kg -OC)
Fluoranthene	1200	160	1700	2500	1700	160

(a) Marine sediment cleanup screening criteria set forth in WAC 173-204-520, unless otherwise indicated.
(b) Marine sediment quality standards set forth in WAC 173-204-320, unless otherwise indicated.
(c) Dry weight equivalent criteria are based on the Puget Sound Apparent Effect Threshold Values (Barrick et al. 1988)

TABLE 15
COMPLIANCE MONITORING ANALYTES
WEST END SITE
EVERETT, WASHINGTON

Well Number	Analyte
MW-1	Copper, Arsenic
MW-3	Arsenic, Copper
MW-4	Arsenic
MW-5	Arsenic
MW-11	Arsenic, Vinyl Chloride
MW-11A	Arsenic, Vinyl Chloride
MW-12	Arsenic
MW-13	Arsenic

TABLE 16
CLEANUP ALTERNATIVE COST ESTIMATE
NORTH MARINA WEST END SITE

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL
Institutional controls development	1	LS	$ 5,000	$ 5,000
Groundwater sampling/analysis (quarterly)	4	qtr	$ 4,000	$ 16,000
Sediment sampling/analysis (1 round)	1	rd	$ 3,000	$ 3,000
Reporting	1	yrs	$ 7,500	$ 7,500
Contingency (30 %)	1	LS	$ 9,500	$ 9,500
Total				**$ 41,000**
Approximate Cost Range (-30% - +50%)			$ 29,000 to	$ 62,000

APPENDIX A

Summary of Previous Environmental Investigations and Documents

SUMMARY OF PREVIOUS ENVIRONMENTAL INVESTIGATIONS AND DOCUMENTS

This following is a list of documents previously prepared for the North Marina Area and submitted to Ecology.

- Landau Associates. 2001. *Phase I Environmental Site Assessment Report, North Marina Redevelopment Project, Port of Everett, Everett, Washington*. November 28.

- Pentec. 2004. *12th Street and North Marina Improvements, Biological Evaluation, Everett, Washington.* Draft (with Addendum 1). Prepared for the Port of Everett. Pentec Environmental. January 7.

- Pentec. 2001. *Puget Sound Dredged Disposal Analysis, Full Characterization for the 12th Street Marina*. Prepared for the Port of Everett. Pentec Environmental. February 1.

- Landau Associates. 2004. *Phase II Environmental Site Assessment Report, North Marina Area, Port of Everett, Everett, Washington*. April 13.

- Landau Associates. 2004. *Data Report, Sediment Quality Investigation, Port of Everett North Marina Area, Everett, Washington*. Prepared for the Port of Everett. November 3

- Landau Associates. 2005. *Final Work Plan, Data Gaps Investigation, North Marina Redevelopment Area, Port of Everett, Washington*. Prepared for Port of Everett. January 5

- Landau Associates. 2005. *Ecology Review Draft, Data Gaps Investigation, North Marina Redevelopment Site, Everett, Washington*. Prepared for the Port of Everett. May 13.

- Landau Associates. 2006. *Ecology Review Draft Report, Supplemental Data Gaps Investigation, North Marina Redevelopment Site, Everett, Washington*. February 28.

- Landau Associates. 2006. *Cleanup Action Plan, North Marina Redevelopment Site, Everett, Washington*. Prepared for the Port of Everett. September 25.

- Landau Associates. 2006. Technical Memorandum to Poli Luis, Port of Everett, re: *Area F Supplemental Soil Investigation, North Marina Redevelopment Site, Port of Everett, Washington*. October 30.

- Landau Associates. 2006. Technical Memorandum to Poli Luis, Port of Everett, re: *Former Puget Sound Truck Lines Leasehold, Additional Soil and Groundwater Investigation, Port of Everett, Washington*. November

- Landau Associates. 2007. *West End Cleanup Action Plan, North Marina Redevelopment Site, Everett, Washington*. Prepared for the Port of Everett. July 6.

- Landau Associates. 2008. Ecology Review Draft, *West End Interim Action Report, North Marina Redevelopment Site, Everett, Washington.* Prepared for the Port of Everett. September 3.

APPENDIX B

Brief Descriptions of Previous Investigations

BRIEF DESCRIPTIONS OF PREVIOUS INVESTIGATIONS

ENVIRONMENTAL INVESTIGATIONS

This Appendix provides brief descriptions of the previous environmental investigations conducted at the North Marina Area, which includes the West End Site and areas east of the site.

PHASE II ESA

The Phase II ESA was conducted in early 2003 and 2004 to provide initial characterization of the environmental conditions across the North Marina Area. The intent of the investigation was to evaluate locations where hazardous substances may have been released based on the understanding of present and historical potential sources of contamination. Sample locations and testing parameters were selected to determine whether soil or groundwater contamination had resulted from potential sources and activities identified as “high risk issues” in the Phase I ESA. A total of 30 soil and 45 groundwater samples were collected and tested during the Phase II ESA. Of these samples, 21 soil and 21 groundwater samples were obtained from the North Marina Area. Depending on the location of the sample, with respect to current and former site uses and features, samples were tested for the following parameters:

- **Soil samples**: diesel- and gasoline-range total petroleum hydrocarbons (TPH-D and TPH-G); metals [As, cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), silver (Ag), and zinc (Zn)]; polychlorinated biphenyls (PCBs); cPAHs; semivolatile organic compounds (SVOCs); and/or benzene, toluene, ethylbenzene, and xylenes (BTEX).

- **Groundwater Samples**: TPH; dissolved metals (As, Cd, Cr, Cu, Pb, Hg, Ag, Zn); BTEX; cPAHs; and/or SVOCs.

Based on the results of the Phase II ESA, several constituents of concern (COCs) were identified for the North Marina Area, including cPAHs and selected metals (As, Cu, Pb, and Zn) that were detected in soil and/or groundwater. The COCs identified during the Phase II ESA served as the basis for establishing the testing parameters used during subsequent North Marina Area investigations.

DATA GAPS INVESTIGATION

The data gaps investigation (DGI) scope of work was developed to fill the data gaps in North Marina Area characterization data that remained following the Phase II ESA. The DGI scope was subdivided into two broad elements: 1) general characterization to provide sufficient data to delineate the extent of contamination throughout Site areas that were not evaluated during the Phase II ESA and did not have identified environmental concerns, and 2) focused investigation to better delineate contamination in affected areas identified during the Phase II ESA.

A total of 102 direct-push borings were completed, and 193 soil samples and 34 groundwater samples were collected for analysis from the North Marina Area during the DGI. The soil samples were collected using direct-push drilling techniques. Groundwater samples were collected from direct-push borings and monitoring wells using low-flow groundwater sampling techniques. The following subsections present summaries of the general characterization and focused investigation activities conducted during the DGI.

General Characterization

An area-wide (i.e., general characterization) sampling approach was used to characterize soil quality in areas with no specific environmental concern within the North Marina Area, including the North Marina Area, by obtaining samples that were distributed across the North Marina Area on about a 100 to 150 feet (ft) spacing, and testing the samples for COCs identified for the North Marina Area during the Phase II ESA. A total of 41 general characterization sample locations were tested within the North Marina Area boundary. At each general characterization sample location, the total depth of the borings ranged from 4 and 12 ft BGS and the top 3 ft of recovered soil below the pavement and base course section were separated into three sample intervals (0 to 0.5, 1 to 2, and 2 to 3 ft).

The uppermost sample interval from each general characterization location was tested for COCs detected above the preliminary cleanup levels during the Phase II ESA, including selected metals (As, Cu, Pb, and Zn); cPAHs; and petroleum hydrocarbons. Petroleum hydrocarbon testing was conducted by initially analyzing the sample for hydrocarbon identification (HCID); follow-up testing was conducted for specific hydrocarbon ranges detected by the HCID analysis. The vertical extent of soil contamination was evaluated at each location by testing the deeper samples if the uppermost sample exceeded the preliminary cleanup screening level established for each COC.

Focused Investigation

Focused investigation methods were used in areas where preliminary cleanup screening level exceedances were detected during the Phase II ESA, and locations identified as historical operational work areas where contamination was considered likely. These areas were identified based on knowledge of current and past site uses and a review of historical aerial photographs. The following subsections present descriptions of the focused investigation areas.

Investigation Area d - American Construction Company North Yard

During the DGI, a total of 32 borings were installed throughout the ACC North Yard related to focus area investigations. These focus areas addressed:

- Delineation of arsenic and cPAH soil contamination located within the footprint of the former graving dock identified during the Phase II ESA
- Delineation of heavy-end petroleum hydrocarbons encountered during the Phases II ESA
- Investigation of two ASTs (diesel and gas) located north of the main office building
- Investigation of one AST (used oil) located northeast of the main office building.

Four borings (D-FA-1 through D-FA-4) were installed to further delineate the extent of arsenic soil contamination and heavy-end hydrocarbon contamination within the estimated footprint of the former graving dock identified during the Phase II ESA.

Four soil borings (D-FA-5 through D-FA-8) and four monitoring wells (P-17 through P-20) were advanced outside the estimated graving dock boundary to bound the extent of arsenic soil and groundwater contamination associated with fill contained in the former graving dock. Two additional borings (D-FA-5b and D-FA-6b) were installed because planned boring locations D-FA-5 and D-FA-6 did not fully bound deep arsenic contamination to the south and east.

Two borings (D-FA-10 and D-FA-11) and one downgradient monitoring well (P-19) were installed in the vicinity of the gasoline and diesel ASTs and associated fuel line.

Diesel-range petroleum hydrocarbon contamination associated with releases from the diesel AST was observed in the planned borings. Eleven additional borings (D-FA-11c through D-FA-11m) and two additional monitoring wells (P-21 and P-25) were installed to delineate the observed diesel contamination. The additional borings were generally advanced to 8 ft BGS and selected samples were tested for diesel-range hydrocarbons at the capillary fringe, or where field screening indicated the highest level of contamination. Delineation of the diesel release was largely conducted based on field screening, with the presence or absence of diesel odor and sheen being the primary screening tools.

Three soil samples collected from additional borings in the diesel-affected area were tested for extractable petroleum hydrocarbons (EPH) and naphthalenes to evaluate human health direct contact risks associated with the observed diesel contamination. Additionally, two groundwater samples were collected and tested for VOCs to allow evaluation of potential human health risks associated with the vapor pathway. These samples were collected at the supplemental boring locations where field screening indicated the highest amount of hydrocarbon impact.

A boring downgradient from the used oil AST (D-FA-14) and a shallow hand-auger boring (D-FA-15) immediately adjacent to the AST were installed to evaluate the extent of impact from AST releases, as described in the DGI work plan. Evidence of waste oil contamination was observed in soil collected from location D-FA-15. A groundwater sample was also collected from Boring D-FA-14. Because of anomalously high metals concentrations detected in the groundwater sample, possibly the result of a failed water filter used during sample collection, a second boring (D-FA-14b) was advanced during a subsequent field effort to resample groundwater at this location for metals.

Investigation Area e – Puget Sound Truck Lines

Five focus area borings (E-FA-1 through E-FA-5) were planned for the DGI to investigate potential impacts to soil and groundwater by two former UST locations, including the former fuel USTs and the former heating oil UST. No petroleum hydrocarbon contamination at the UST-5b location was indicated by observations or field screening in soil samples collected from Boring E-FA-5. However, petroleum hydrocarbon impacts associated with the former fueling USTs location were observed during advancement of the four planned explorations for this location (E-FA-1 through E-FA-4), and additional characterization was conducted to better delineate the release associated with this location.

Additional investigation included installation of 12 borings and 3 monitoring wells to delineate petroleum hydrocarbon impacts to soil and groundwater related to releases from UST-5. Delineation was accomplished using field screening methods and limited analytical testing for NWTPH-Dx. Based on field screening, soil samples collected from the borings within the plume area (E-FA-4c, E-FA-4d, and E-FA-4g) were also tested for EPH, naphthalenes, and BTEX to evaluate the risk to human health based on direct contact using Ecology’s petroleum mixtures approach.

Investigation Area f – Multiple Tenants

During the DGI, 12 focus area borings (F-FA-1 through F-FA-12) and four monitoring wells (P-13 through P-16) were installed in Investigation Area f to better delineate shallow soil cPAH and arsenic contamination and arsenic contamination in groundwater identified during the Phase II ESA. In general, the focused investigation was conducted in the central portion of Investigation Area f, with general characterization occurring toward the east and west ends.

Five borings (F-FA-6b through F-FA-6f) were completed to delineate the horizontal and vertical limits of a dark soil layer at F-FA-6 that appeared to be impacted by heavy-end petroleum hydrocarbons, based on field screening. A composite sample of this impacted soil layer was collected at F-FA-6 and tested for TPH-HCID and EPH and naphthalenes.

Additional soil and groundwater testing was conducted to further evaluate the cause of elevated groundwater concentrations of arsenic detected in all Investigation Area f monitoring wells sampled during the originally planned round of DGI groundwater sampling. The additional characterization was conducted to evaluate whether the elevated arsenic groundwater concentrations were the result of elevated arsenic concentrations present in subsurface soil in contact with groundwater, or if it was the result of background arsenic soil concentrations mobilized by reducing (anoxic) groundwater conditions associated with the presence of organic material in subsurface soil.

A total of 43 subsurface soil samples archived from 13 boring locations (F-FA-2 through F-FA-11, and F-GC-8 through F-GC-10) were tested to characterize arsenic soil concentrations in the area affected by elevated arsenic groundwater concentrations. Additionally, groundwater samples were collected from all seven Investigation Area f monitoring wells. All groundwater samples were tested for arsenic and conventional parameters (dissolved oxygen, oxidation-reduction potential, ferrous iron, alkalinity, total organic carbon, nitrate, and sulfate) to confirm the previous arsenic results and evaluate the oxidation-reduction state of groundwater in this area.

SUPPLEMENTAL DATA GAPS INVESTIGATION

The supplemental DGI was conducted to better delineate the extent of contamination identified during the DGI. Three specific areas within the North Marina Area boundary were investigated as part of the supplemental DGI:

- **Area e, former PSTL leasehold:** groundwater samples were collected from two wells (P-23 and P-24) and tested for dissolved metals to evaluate whether arsenic concentrations are elevated in groundwater in this area due to reducing conditions associated with the presence of diesel-range petroleum hydrocarbon contamination from previous UST releases at the North Marina Area.

- **Area h, immediately south of ACC South Yard:** soil samples were collected from two borings locations (H-GC-6 and H-GC-7), to evaluate an area that was not previously characterized. Samples were collected and tested using the same sampling and analysis scheme and techniques used for the general characterization samples collected during the DGI.

- **Area h, arsenic soil contamination:** soil samples were collected from three borings (H-GC-1b through H-GC-1d) in the vicinity of DGI boring location H-GC-1 to better delineate the extent of arsenic soil contamination. Samples were collected at each boring location from the depth interval that corresponded to the depth of contamination and were tested for the constituents that exceeded the preliminary cleanup levels at the original sample locations.

The results of these are reported in the West End Site Interim Action Report.

2006 ADDITIONAL SOIL DELINEATION

Multiple areas throughout the North Marina Area were investigated following the supplemental DGI to provide additional delineation of identified contamination areas for design of the interim cleanup action. A total of 59 soil samples were collected within the North Marina Area from contaminated areas encountered during previous investigations. The additional delineation samples were tested only for the constituent(s) that exceeded their respective preliminary cleanup levels within the identified cleanup area. Samples were collected from the following areas:

- **Investigation Area e, PSTL (2 locations):** Four surface soil samples (E-GC-1.1N, E-GC-1c.1N, E-GC-1.1S, and E-GC-1.1SW) were collected in the vicinity of sample locations E-GC-1c and E-GC-1, which exhibited shallow soil arsenic contamination during the DGI; and two surface soil samples (E-GC-5.1N and E-GC-5.1S) were collected in the vicinity of sample location E-GC-5, which exhibited shallow soil arsenic contamination during the DGI.

- **Area f, ABW Plant II:** Shallow soil samples were collected from nine boring location (F-2-1 through F-2-9) in the vicinity of the western loading dock of the ABW Plant II building to delineate metals contamination identified during the Phase II ESA. Surface soil sample F-5 was collected in this area during the Phase II ESA and exhibited elevated concentrations of arsenic. Pink sandblast grit, known to contain elevated levels of arsenic and lead, was observed on the ground surface in this area adjacent to and extending out from the loading dock.

- **Area f, Multiple Tennant Leaseholds:** 34 shallow soil samples (primarily surface soil samples) were collected throughout Area f to delineate the lateral extent of contamination encountered at previous soil sample locations throughout Area f. The additional samples numbers contain the designation of the original sample with which they are associated; for example soil sample F-GC-13b.5S was collected to delineate the arsenic contamination at F-GC-13b.

The results of these are reported in the West End Site Interim Action Report.

PUGET SOUND TRUCK LINES INVESTIGATION

An additional soil and groundwater investigation was conducted in May of 2006 at the former PSTL leasehold to better delineate diesel-range petroleum hydrocarbon contamination in soil and groundwater associated with the former diesel USTs. Investigation activities consisted of exploring subsurface soil conditions at 13 boring locations (E-3-1 through E-3-13), and collecting soil and groundwater samples for laboratory analysis using direct-push drilling technology. Seven of the direct-push borings were located inside the estimated area of contamination, and six of the borings were installed outside the estimated area of contamination. Continuous soil samples were collected for field soil type classification and field screening for evidence of potential contamination. Individual soil samples were collected from each boring from the depth interval where evidence of contamination was observed during field-screening. Groundwater samples were collected from the following four boring locations: E-3-2, E-3-3, E-3-6, and E-3-10. All soil and groundwater samples submitted for laboratory analysis were analyzed for diesel- and motor oil-range total petroleum hydrocarbons.

The results of these are reported in the West End Site Interim Action Report.

AREA F SUPPLEMENTAL SOIL INVESTIGATION

This investigation was conducted to delineate and evaluate an area of affected soil encountered during cleanup of Cleanup Action Areas F-1 and F-4. The affected soil directly underlies the shallow soil contamination of these cleanup action areas, is dark in appearance, and in some places exhibits a petroleum-like odor.

A total of 61 direct-push borings were completed throughout the western portion of Area f to delineate the vertical and lateral extent of discolored soil within Area f and to determine the areas within the discolored soil that exceed the soil preliminary cleanup levels. Soil borings were generally completed on an approximate 50-ft grid throughout the potentially affected area.

Direct-push borings were advanced to depths of 4 to 8 ft BGS to extend through the entire thickness of the discolored soil, where present. The affected soil layer was encountered at 45 of the 61 boring locations. The affected soil was composed of silt, sand, and wood debris; and exhibited a dark color and a light to strong petroleum-like odor. The top of the affected soil layer was encountered between 0 to 2.9 ft BGS, and the base of the layer between 1 to 5.2 ft BGS. Thickness of the layer varied from 0.5 to 3.8 ft, with an average thickness of about 1.5 ft.

A total of 45 soil samples were tested during this investigation. One sample from each boring location was a composite sample collected across the full depth of the discolored soil layer, where present. Samples were not collected from boring locations where the discolored soil layer was not present. All 45 soil samples were tested for cPAHs. Additionally, the 5 samples that exhibited the greatest visual or olfactory indication of contamination (AFD-3.4, AFD-3.5, AFD-4.3, AFD-4.4, and AFD-7.3) were also tested for TPH in diesel and oil ranges.

The results of these are reported in the West End Site Interim Action Report.

2007 ADDITIONAL DELINEATION

Additional characterization was required during design of the cleanup action to better delineate the vertical and aerial extent of contamination in Investigation Areas e, d and h. A majority of the investigation was focused in Area d (the ACC North and South Yards). Additional delineation was conducted by advancing direct-push borings to target depths identified based on currently available data and testing samples using a similar method to that employed for previous North Marina Area investigation activities. Soil samples were collected from ground surface to 0.5 ft BGS, and in subsequent 1-ft intervals, until the target depth was reached. Samples were then tested incrementally downward until the analytical result was below the preliminary cleanup level to determine the vertical extent of contamination. Groundwater samples were also collected from borings in areas affected by petroleum hydrocarbons, where additional data was needed to complete groundwater characterization.

A total of 93 direct-push explorations were completed, and a total of 216 soil samples and 11 groundwater samples were collected and analyzed during this investigation. At the time of the investigation, preliminary cleanup action areas were defined based on previously collected data that were presented in the West End CAP. Many sample names used for the investigation incorporate the name of the planned cleanup action area with which the new sample is associated (primarily used in the ACC North Yard); for example, sample D5-2 was collected from planned cleanup action area D-5 located in the ACC North Yard. Other sample names used for this investigation incorporate the names of previous sample locations with which the additional delineation samples are associated; for example, D-GC-9b was collected to better delineate the contamination associated with previous sample location D-GC-9.

As presented in the West End CAP, the additional delineation samples were only tested for the indicator hazardous substances that were driving the cleanup action for a given area or for the constituents that exceeded preliminary cleanup levels at the previous sample location with which the additional sampling was associated. These investigation activities, completed for the various portions of the North Marina Area, are described in the following subsections.

The results of these are reported in the West End Site Interim Action Report.

Investigation Area h

Soil samples were collected from 19 direct-push borings locations in Area h to fill data gaps in the characterization of this portion of the North Marina Area. The data gaps consisted of the vertical and aerial extent of soil contamination associated with three preliminary cleanup action areas, H-1 through H-3. The following conditions were investigated in each area:

- Area H-1 is located in an entrance road for the public parking area west of Jordan Park and encompasses an area of shallow soil arsenic contamination. Samples were collected from four direct-push boring locations (H-GC-1b, H-GC-1c, H-GC-1d, and H-GC-1e), and were tested for arsenic to better delineate the soil contamination associated with sample location H-GC-1.

- Area H-2 is located in the parking lot north of the Port of Everett convention center and encompasses an area of shallow soil cPAH soil contamination. Samples were collected from six direct-push boring locations (H-GC-7b, H-GC-7c, H-GC-7d, H-GC-7e, H-CSO-1, and H-CSO-2), and were tested for cPAHs to better delineate the soil contamination associated with sample locations H-GC-6 and H-GC-7. Locations containing “CSO” in their name were sampled adjacent to the planned combined sewer outfall line to determine the health and safety requirements during construction of the CSO line.

- Area H-3 is located immediately south of the ACC South Yard and encompasses an area of shallow soil arsenic and mercury contamination. Samples were collected from nine direct-push boring locations (H-GC-5b through H-GC-5f and H-GC-5h through H-GC-5k), and were tested for total metals (As, Cd, Cr, Cu, Pb, and Hg) to better delineate the soil contamination associated with H-GC-5.

ACC North Yard

A total of 166 samples were collected throughout the ACC north yard to fill data gaps in the characterization of this portion of the North Marina Area. The data gaps consisted of the vertical and aerial extent of one or more of the following soil contaminants: arsenic, cPAHs, and petroleum hydrocarbon. Additional characterization was also conducted to better delineate petroleum hydrocarbons in groundwater. Based on previous North Marina Area investigations, shallow soil contamination is widespread in the ACC North Yard and primarily consists of arsenic and cPAH contamination. Therefore, a majority of the investigation was focused on these constituents. Localized areas of diesel-range petroleum hydrocarbon contamination were present in the soil and groundwater in the vicinity of the former fuel ASTs and were addressed by this investigation as well.

In the northern portion of the ACC North Yard, a total of 23 additional locations were sampled in association with planned Cleanup Action Areas D-2, D-3, D-4, and D-5. These areas exhibited elevated soil concentrations of arsenic and/or cPAHs. Soil contamination in these areas extended from the ground surface to up to 3 ft BGS. The limits of the preliminary cleanup action areas were defined based on locations of North Marina Area features such as the former graving dock and an insufficient number of sample locations. Samples from these areas were tested for arsenic and cPAHs.

In the southern portion of the North Yard, a total of 9 additional locations were sampled in association with planned soil cleanup action areas D-8 and D-9. Area D-8 exhibited elevated concentrations of cPAHs and arsenic in the shallow soil, extending to 1 ft BGS. Area D-9 exhibited soil elevated concentrations of cPAHs in the shallow surface soil, extending to 1 ft BGS. Because of the widespread presence of arsenic throughout the North Yard, the additional samples in both areas were tested for both arsenic and cPAHs.

In the vicinity of the former fuel ASTs, and north of the ACC main office building and maintenance shop, a total of 14 additional locations were sampled in association with preliminary cleanup action areas D-7 and D-7A. Area D-7 encompasses an area where arsenic, cPAHs, and diesel-range and/or motor-oil petroleum hydrocarbons were detected at concentrations exceeding the preliminary cleanup levels in the approximate upper 1 ft of soil. Area D-7A is a sub-area of Area D-7 where diesel-range petroleum hydrocarbon contamination extended from 2 ft BGS down to 8 ft BGS in the soil and also affected the groundwater. Shallow soil samples collected to better delineate the contamination in Area D-7 were tested for arsenic, cPAHs, and diesel- and oil-range petroleum hydrocarbons. Groundwater and deeper soil samples collected to better delineate the contamination of Area D-7A were tested for diesel- and oil-range petroleum hydrocarbons. Based on field observations made during the investigation and results of HCID testing, which indicated that gasoline-range petroleum hydrocarbons were present in the soil and groundwater, several soil and groundwater samples were also tested for gasoline-range petroleum hydrocarbons and BTEX.

ACC South Yard

A total of 26 samples were collected from direct-push borings throughout the ACC South Yard to fill data gaps in the characterization of this portion of the North Marina Area. The data gaps consisted of the vertical and aerial extent of arsenic and/or cPAHs contamination in soil. Samples were collected from 17 direct-push boring locations. The surface sample at each location was tested for cPAHs and arsenic; deeper samples were tested for constituents that exceeded the preliminary cleanup level criteria in the shallower sample.

During investigation of the South Yard, an area of concrete-like material was encountered in the eastern portion of the South Yard at four boring locations (D-GC-12b through D-GC-12e). The material ranged from 1 to 1.5 ft thick, and was dense and grayish white. Samples were collected and tested from each boring location where the material was encountered. Samples were collected across the entire thickness of the material to determine whether the material was contaminated, and from below the material to determine if the surrounding material was also affected. The samples were tested for arsenic because other areas of concrete waste found in the North Marina Area had exhibited only elevated arsenic concentrations.

Puget Sound Truck Lines

One groundwater sample was collected from planned cleanup area E-4, which was located in the southern portion of the former PSTL leasehold. Area E-4 was a localized area where no exceedance of the soil preliminary cleanup levels was encountered, but a single exceedance of the groundwater preliminary cleanup level for diesel-range petroleum hydrocarbons occurred at sample location E-FA-2 during the DGI. An additional groundwater sample, E-4, was collected from a direct-push boring that was co-located to E-FA-2 and tested for diesel-range petroleum hydrocarbons to determine whether the previous sample results were representative of groundwater conditions.

SUB-SLAB SOIL SAMPLING

Soil characterization samples were collected throughout the North Marina Area beneath the floor slabs of large buildings, or buildings that hosted activities that could have resulted in releases of contamination to the subsurface. These samples were collected once the buildings were demolished as part of North Marina Area redevelopment activities. The samples were collected from the former footprints of three buildings within the North Marina Area boundary: 1) the ACC office/shop building, 2) the ACC storage building, and 3) the Everett Engineering Shop Building (i.e., Building 10). No other buildings located within the North Marina Area have been demolished in advance of redevelopment activities.

Based on the building size, between four and six equally spaced samples were collected from each building footprint. The samples were collected from the upper 6 inches of soil located directly beneath the sub-slab gravel layer and were analyzed for cPAHs, TPH-D, and metals (consistent with the general characterization analytical list from the DGI).

The results of these are reported in the West End Site Interim Action Report.

APPENDIX C

Monitoring Well 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

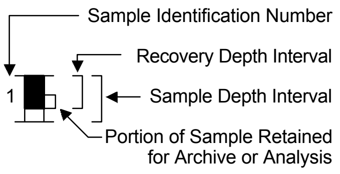
Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil 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% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

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	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Rotosonic
5	Air Rotary (Rock)
6	Wash Rotary (Rock)
7	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

∇ ATD	Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

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Port of Everett West End RI/FS
Implementation
Everett, Washington

Soil Classification System and Key

Figure
C-1

9/24/10 N:\PROJECTS\147029.220.131-132.GPJ SOIL CLASS SHEET

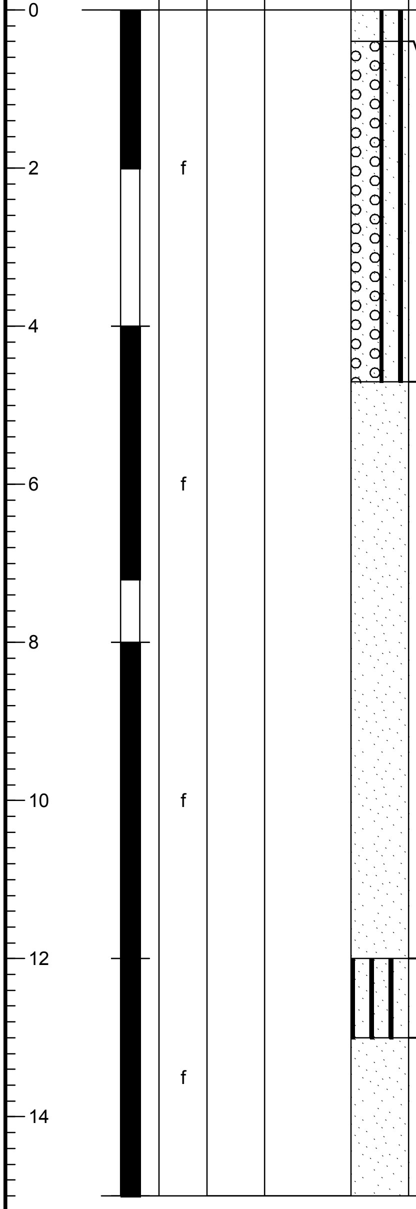
RI-MW-1

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Depth (ft) | Sample Number & Interval | Sampler Type | Blows/Foot | Test Data | Graphic Symbol | USCS Symbol

Drilling Method: Strataprobe™

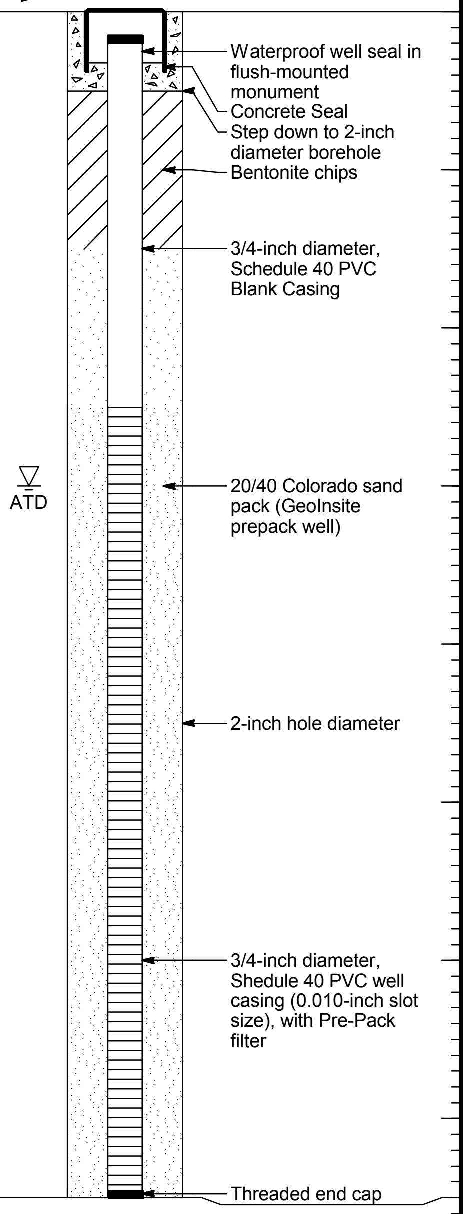
Ground Elevation (ft): 14.301



USCS Symbol	Description
SP/SM	Brown, gravely, fine to medium SAND, with silt and grass
GP/SM	Rust orange, crushed ROCK, with fine sand and silt (railroad ballast)
SP	Light brown, fine to medium SAND, with trace silt
SM	Gray, very silty, fine SAND
SP	Gray, fine to medium SAND, with trace silt and shell fragments

Water Level

Detail



Boring Completed 04/23/09
Total Depth of Boring = 15.0 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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Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-1

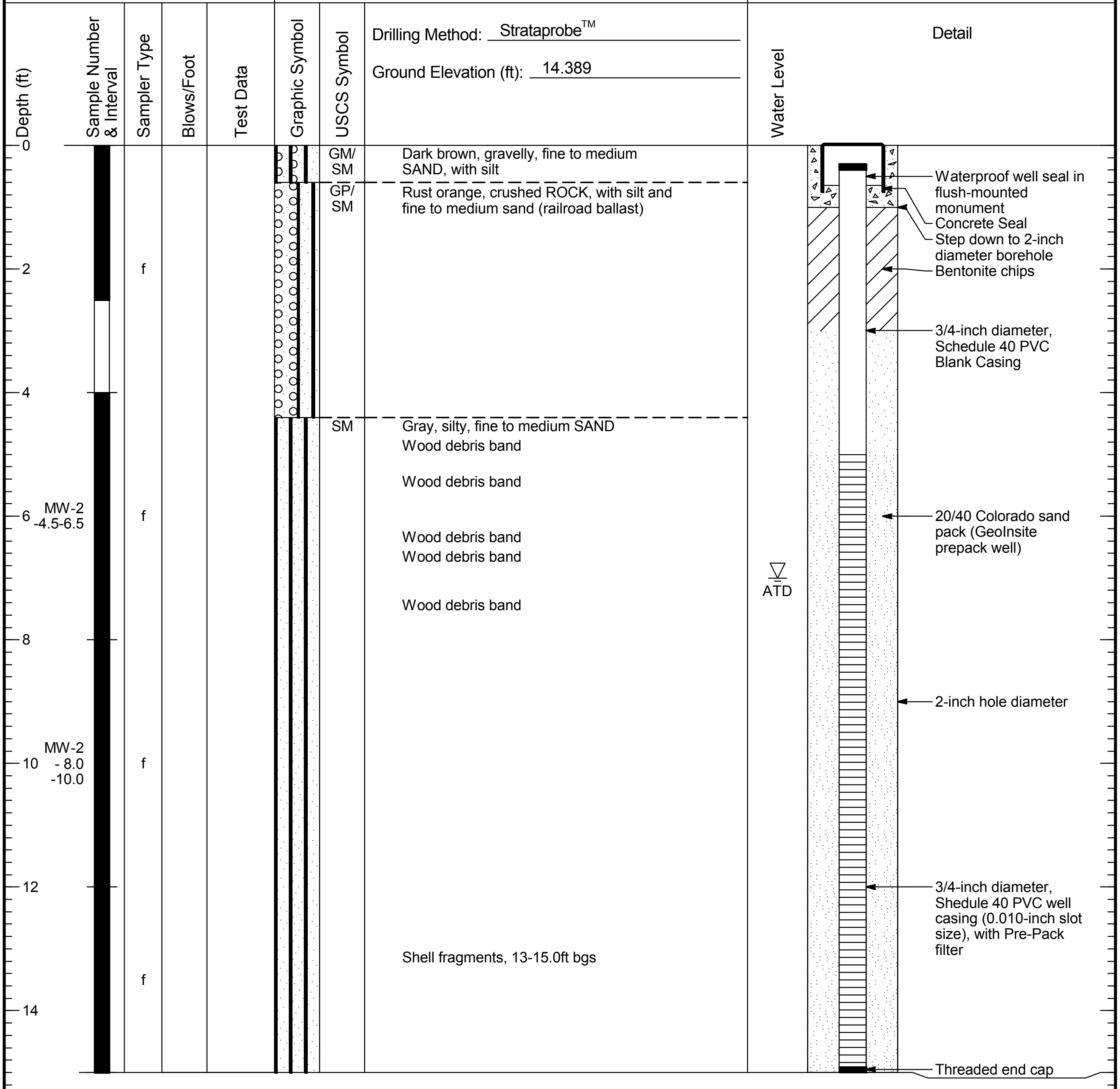
Figure
C-2

RI-MW-2

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Drilling Method: Strataprobe™

Ground Elevation (ft): 14.389



Depth (ft)	USCS Symbol	Description
0	GM/SM	Dark brown, gravelly, fine to medium SAND, with silt
~0.6	GP/SM	Rust orange, crushed ROCK, with silt and fine to medium sand (railroad ballast)
~4.4	SM	Gray, silty, fine to medium SAND
		Wood debris band
		Wood debris band
		Wood debris band
		Wood debris band
		Wood debris band
		Shell fragments, 13-15.0ft bgs

Boring Completed 04/23/09
Total Depth of Boring = 15.0 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.

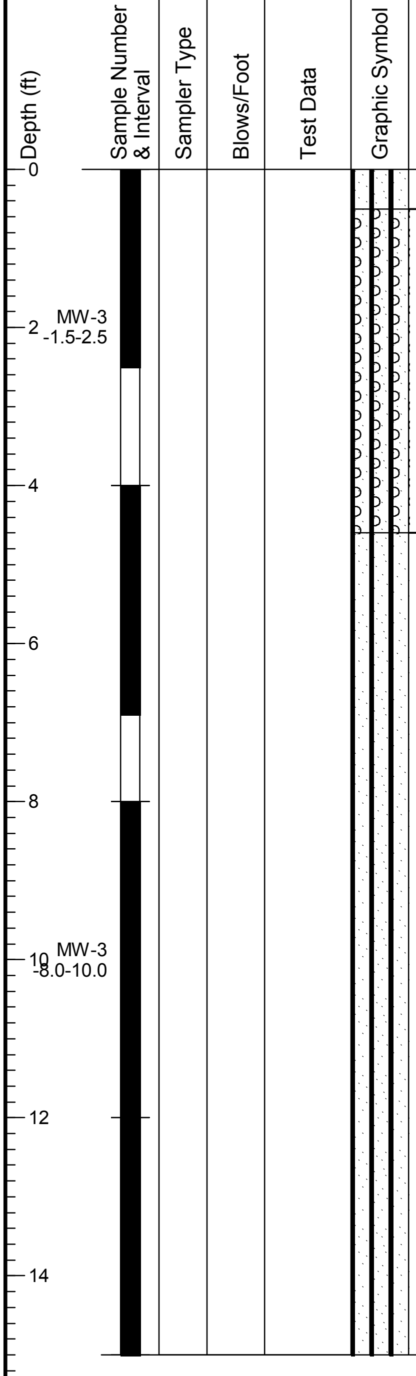
LANDAU ASSOCIATES	Port of Everett West End RI/FS Implementation Everett, Washington	Log of RI-MW-2	Figure C-3

RI-MW-3

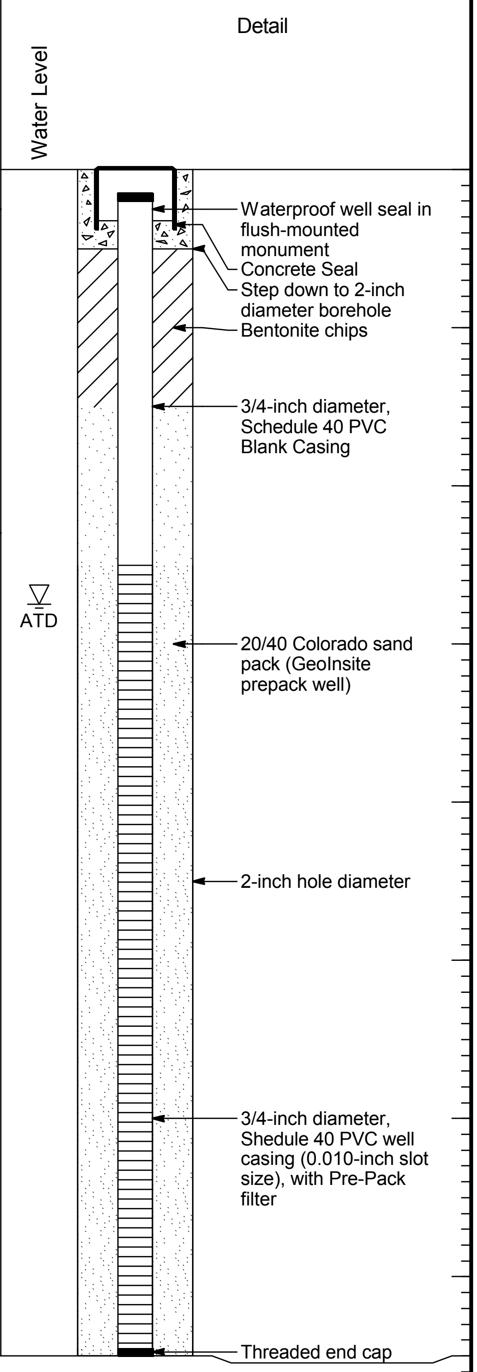
SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Drilling Method: Strataprobe™

Ground Elevation (ft): 14.523



USCS Symbol	
SM	Brown, silty, fine to medium SAND, with gravel
GM	Rust orange, crushed ROCK, with fine sand and silt (railroad ballast)
SM	Dark grey to black, silty, fine to medium SAND, with wood debris Brick fragments present at 5ft bgs Abundant wood debris 12ft bgs Shell fragments 12-13ft bgs



Boring Completed 04/22/09
Total Depth of Boring = 15.0 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.

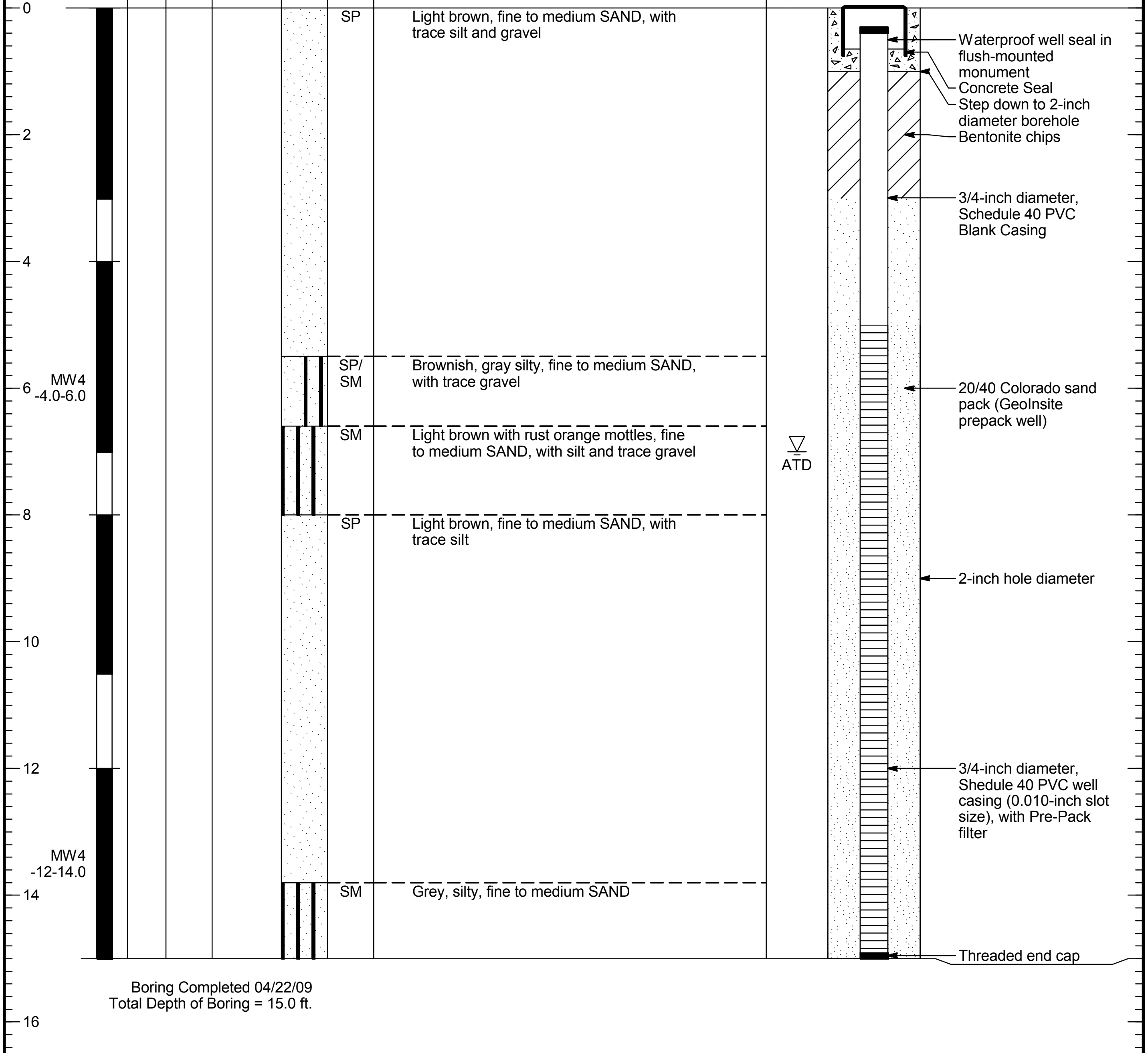
RI-MW-4

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Depth (ft) | Sample Number & Interval | Sampler Type | Blows/Foot | Test Data | Graphic Symbol | USCS Symbol | Water Level | Detail

Drilling Method: Strataprobe™

Ground Elevation (ft): 14.459



SP	Light brown, fine to medium SAND, with trace silt and gravel
SP/ SM	Brownish, gray silty, fine to medium SAND, with trace gravel
SM	Light brown with rust orange mottles, fine to medium SAND, with silt and trace gravel
SP	Light brown, fine to medium SAND, with trace silt
SM	Grey, silty, fine to medium SAND

Boring Completed 04/22/09
Total Depth of Boring = 15.0 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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Port of Everett West End RI/FS
Implementation
Everett, Washington

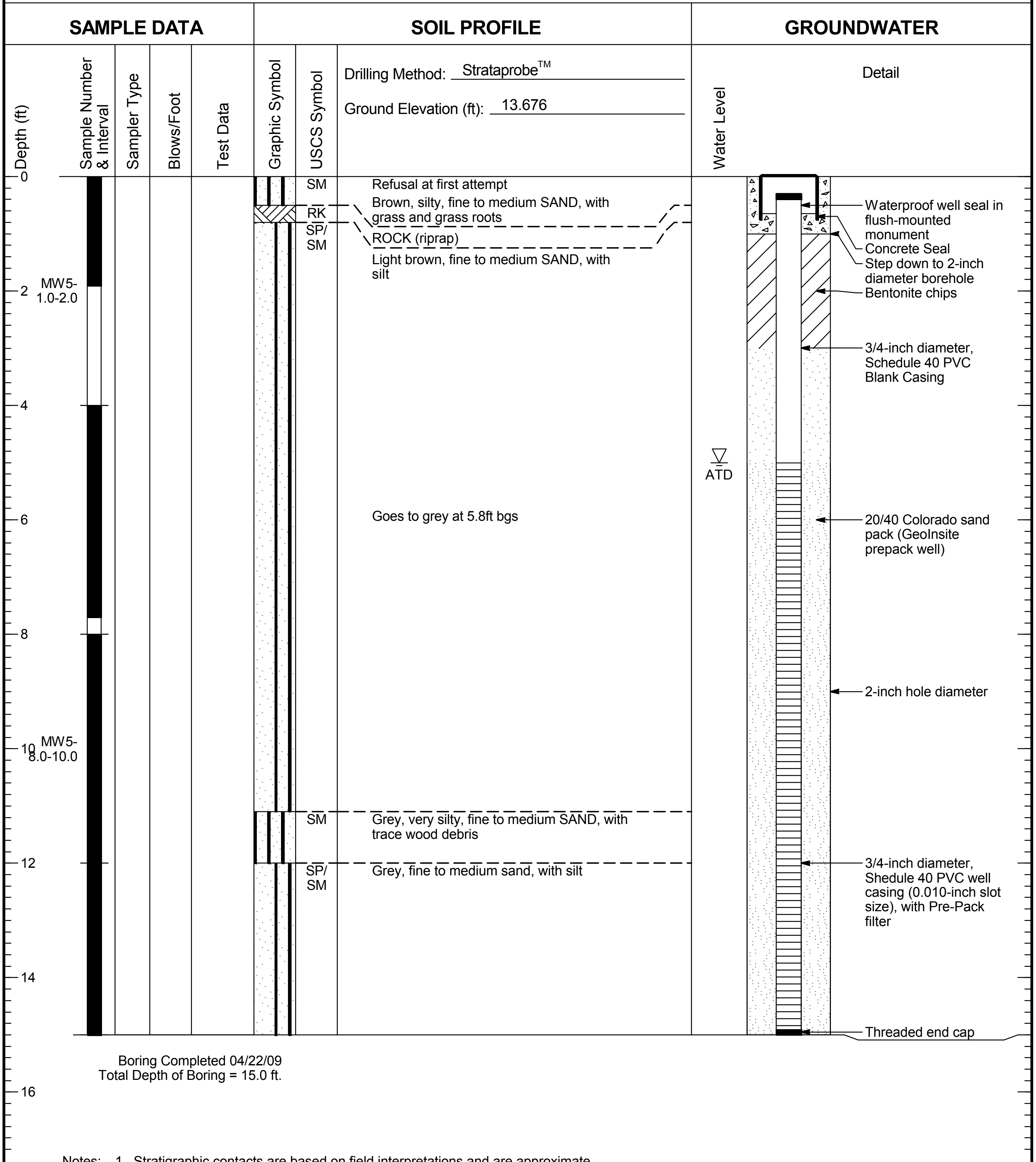
Log of RI-MW-4

Figure
C-5

RI-MW-5

Drilling Method: Strataprobe™

Ground Elevation (ft): 13.676



Refusal at first attempt

Brown, silty, fine to medium SAND, with grass and grass roots

ROCK (riprap)

Light brown, fine to medium SAND, with silt

Goes to grey at 5.8ft bgs

Grey, very silty, fine to medium SAND, with trace wood debris

Grey, fine to medium sand, with silt

Waterproof well seal in flush-mounted monument

Concrete Seal

Step down to 2-inch diameter borehole

Bentonite chips

3/4-inch diameter, Schedule 40 PVC Blank Casing

20/40 Colorado sand pack (GeoInsite prepack well)

2-inch hole diameter

3/4-inch diameter, Shedule 40 PVC well casing (0.010-inch slot size), with Pre-Pack filter

Threaded end cap

Boring Completed 04/22/09
Total Depth of Boring = 15.0 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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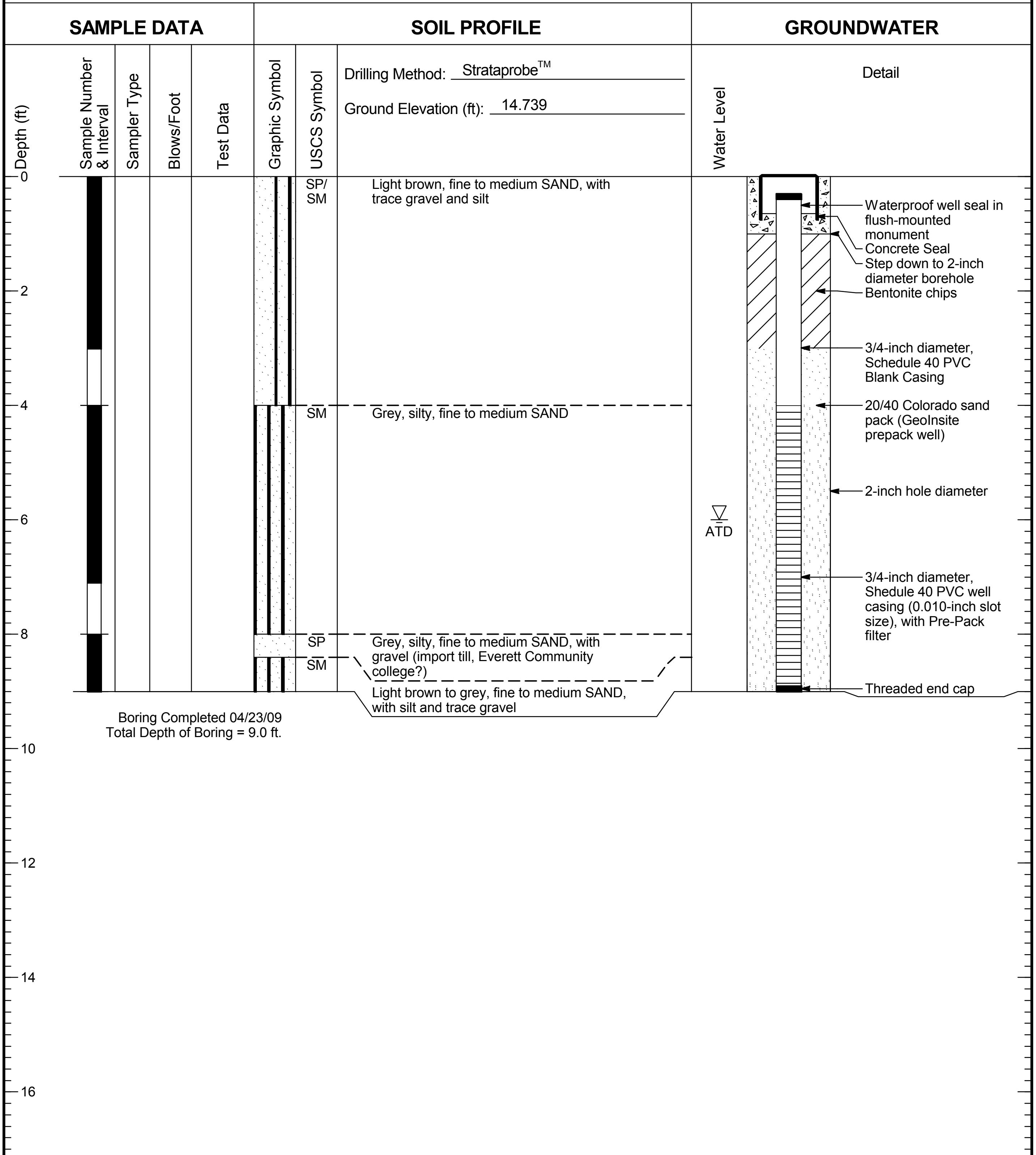
Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-5

Figure
C-6

RI-MW-6



Drilling Method: Strataprobe™

Ground Elevation (ft): 14.739

0	SP/ SM	Light brown, fine to medium SAND, with trace gravel and silt
4	SM	Grey, silty, fine to medium SAND
8	SP	Grey, silty, fine to medium SAND, with gravel (import till, Everett Community college?)
	SM	Light brown to grey, fine to medium SAND, with silt and trace gravel

Boring Completed 04/23/09
Total Depth of Boring = 9.0 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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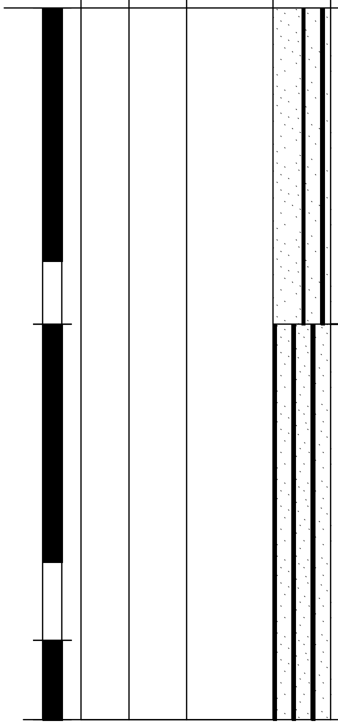
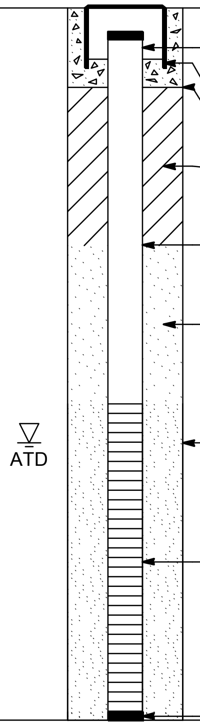
Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-6

RI-MW-7

SAMPLE DATA					SOIL PROFILE			GROUNDWATER	
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: Strataprobe™ Ground Elevation (ft): 14.737	Water Level	Detail
0						SP/ SM	Grey, fine to medium SAND, with gravel and silt Goes to brown, silty at 2.4ft bgs (ECC fill gravel?)		
4						SM	Light brown, silty, fine to medium SAND, with gravel	ATD	





Waterproof well seal in flush-mounted monument

Concrete Seal

Step down to 2-inch diameter borehole

Bentonite chips

3/4-inch diameter, Schedule 40 PVC Blank Casing

20/40 Colorado sand pack (GeoInsite prepack well)

2-inch hole diameter

3/4-inch diameter, Shedule 40 PVC well casing (0.010-inch slot size), with Pre-Pack filter

Threaded end cap

Depth (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16

Boring Completed 04/23/09
Total Depth of Boring = 9.0 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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Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-7

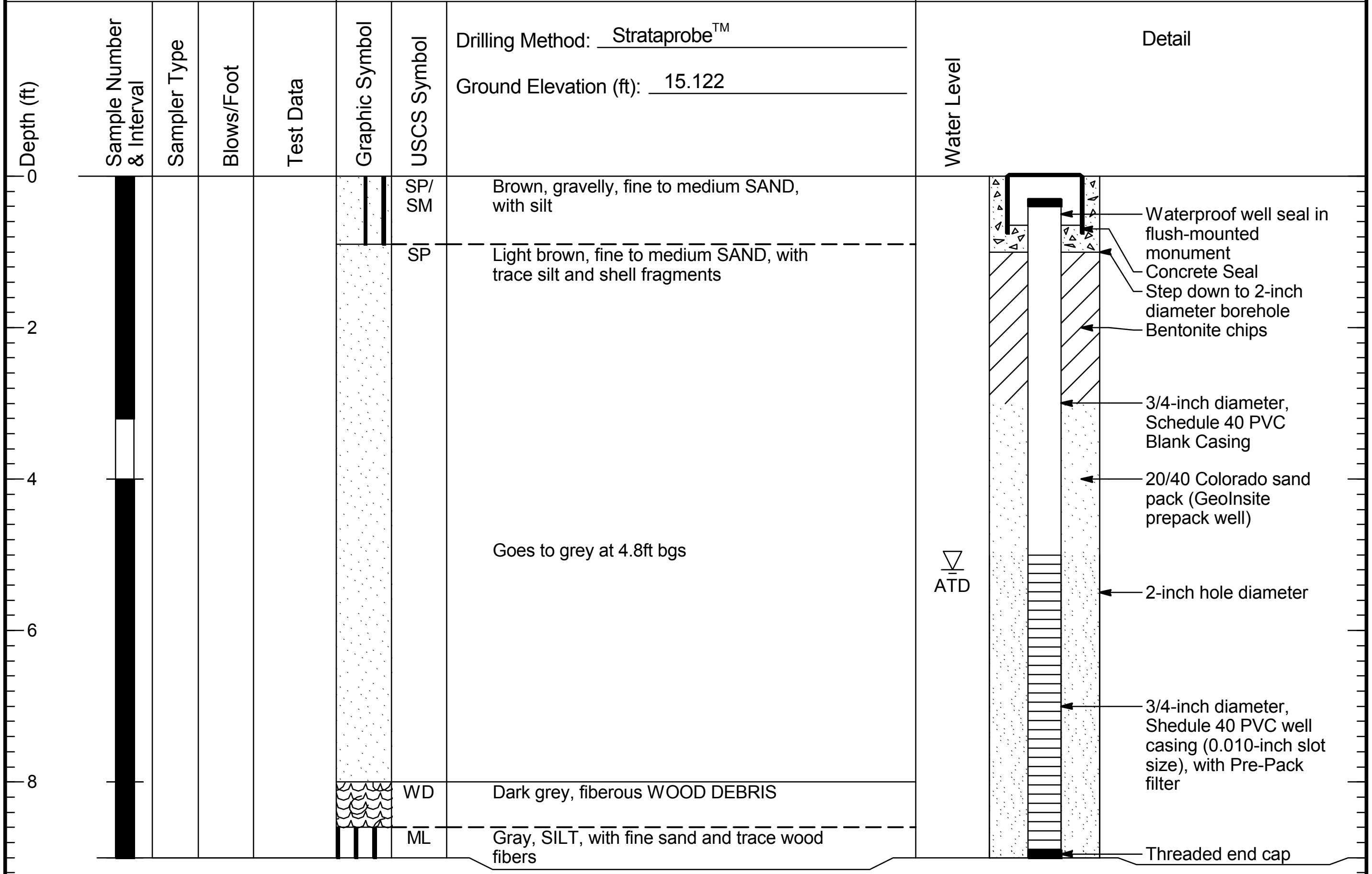
Figure
C-8

RI-MW-8

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Drilling Method: Strataprobe™

Ground Elevation (ft): 15.122



USCS Symbol	Description
SP/ SM	Brown, gravelly, fine to medium SAND, with silt
SP	Light brown, fine to medium SAND, with trace silt and shell fragments Goes to grey at 4.8ft bgs
WD	Dark grey, fiberous WOOD DEBRIS
ML	Gray, SILT, with fine sand and trace wood fibers

Boring Completed 04/22/09
Total Depth of Boring = 9.0 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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Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-8

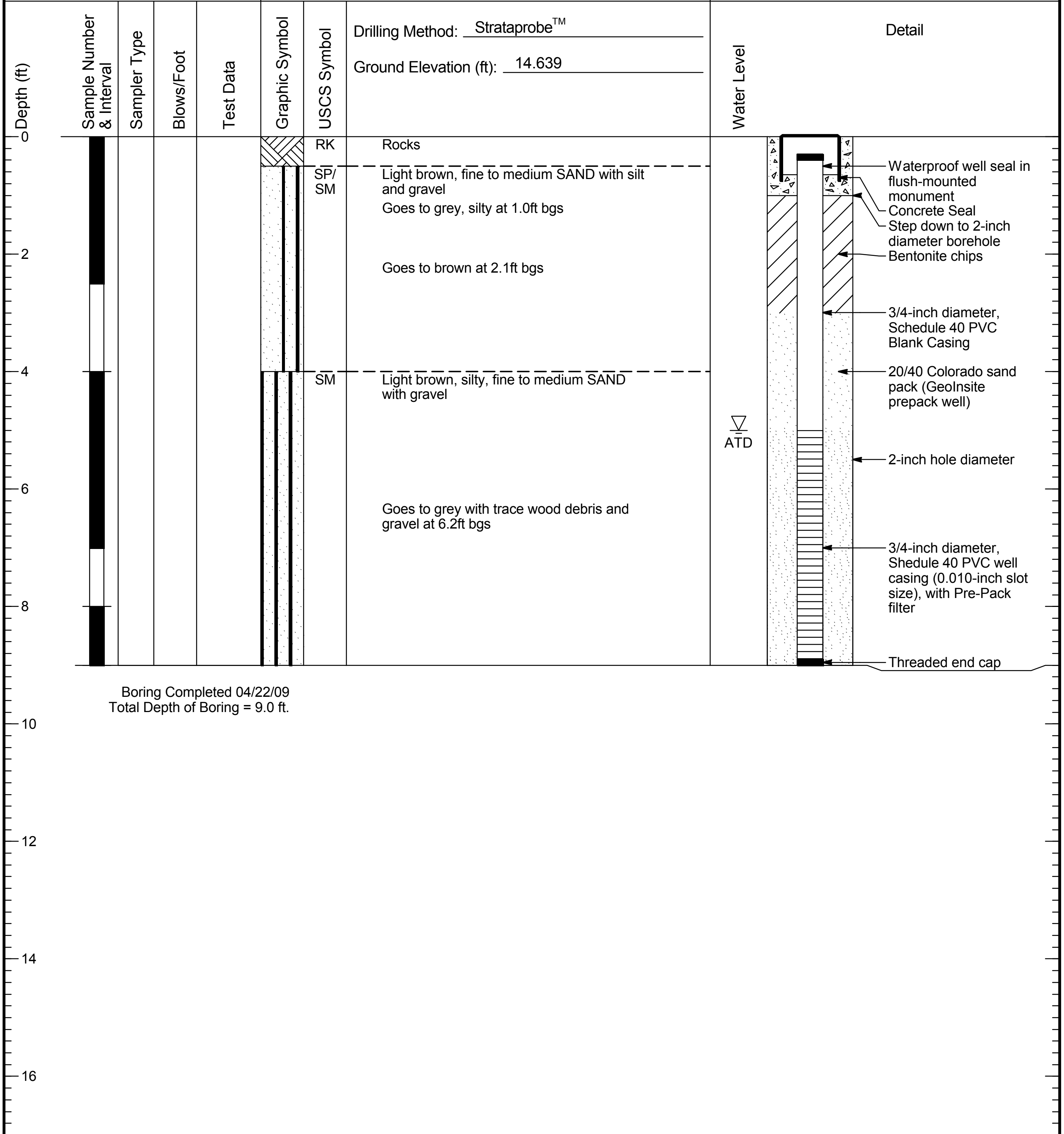
Figure
C-9

RI-MW-9

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Drilling Method: Strataprobe™

Ground Elevation (ft): 14.639



USCS Symbol	Description
RK	Rocks
SP/SM	Light brown, fine to medium SAND with silt and gravel Goes to grey, silty at 1.0ft bgs Goes to brown at 2.1ft bgs
SM	Light brown, silty, fine to medium SAND with gravel Goes to grey with trace wood debris and gravel at 6.2ft bgs

Boring Completed 04/22/09
Total Depth of Boring = 9.0 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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Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-9

Figure
C-10

RI-MW-10

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

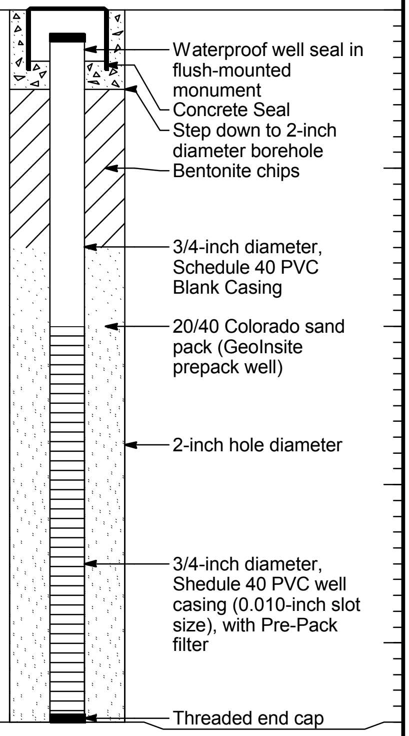
Drilling Method: Strataprobe™

Ground Elevation (ft): 15.39

Depth (ft)	USCS Symbol		Water Level
0	SP	Light brown, fine to medium SAND, with trace silt and shell fragments	
	SP/ SM	Light brown and grey, silty, gravelly, fine to medium SAND	
4	SM	Brown, silty, fine to coarse SAND, with gravel	▽ ATD
6		Goes to grey, fine to medium SAND at 5.7ft bgs	
	SM/ WD	Gray, silty, fine sand, with abundant wood debris	
	SM	Gray, silty, fine sand	

Boring Completed 04/23/09
Total Depth of Boring = 9.0 ft.

Detail



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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Port of Everett West End RI/FS Implementation
Everett, Washington

Log of RI-MW-10

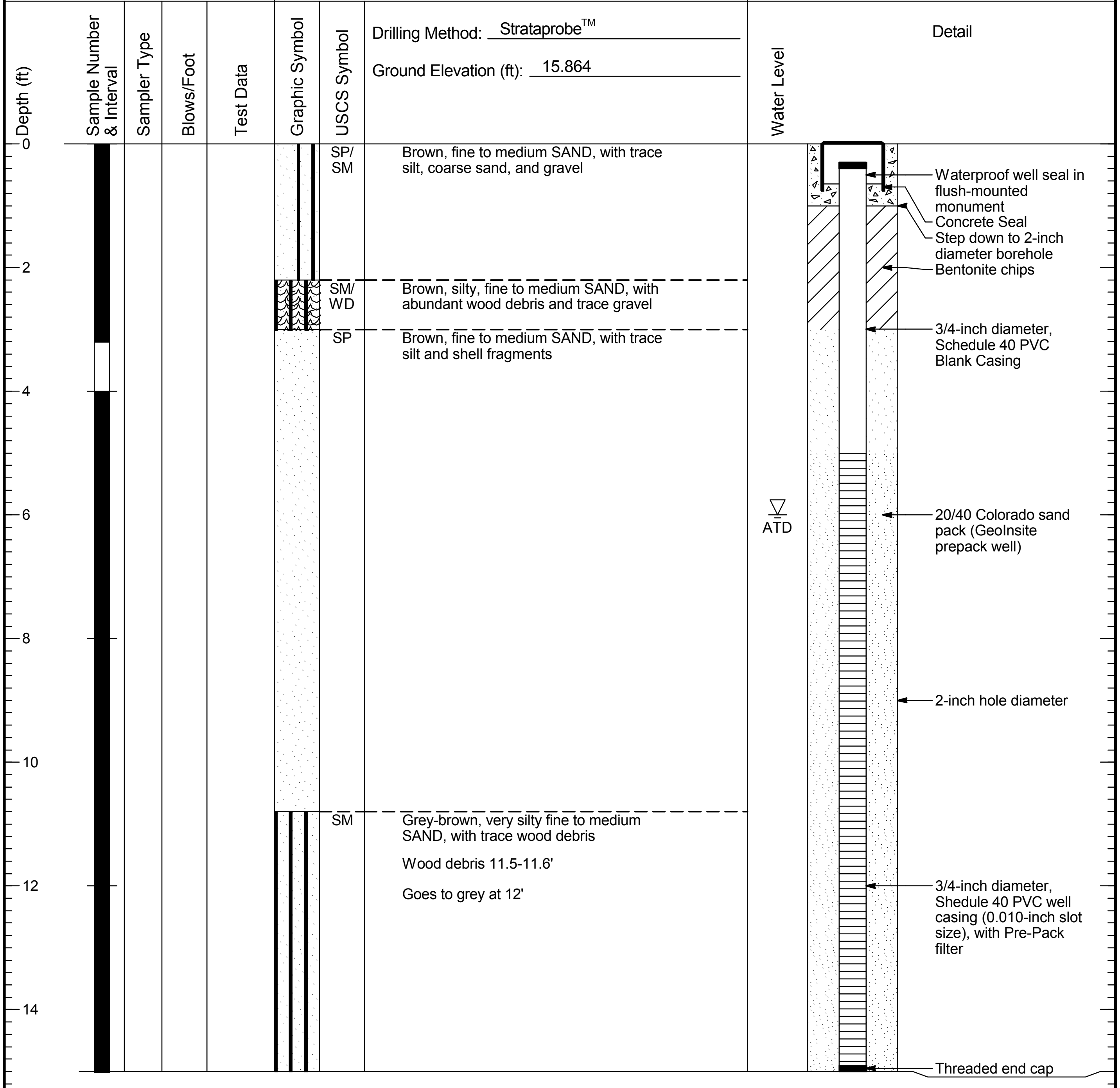
Figure C-11

RI-MW-11

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Drilling Method: Strataprobe™

Ground Elevation (ft): 15.864



USCS Symbol	Description
SP/SM	Brown, fine to medium SAND, with trace silt, coarse sand, and gravel
SM/WD	Brown, silty, fine to medium SAND, with abundant wood debris and trace gravel
SP	Brown, fine to medium SAND, with trace silt and shell fragments
SM	Grey-brown, very silty fine to medium SAND, with trace wood debris Wood debris 11.5-11.6' Goes to grey at 12'

Boring Completed 04/21/09
Total Depth of Boring = 15.0 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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Port of Everett West End RI/FS
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Everett, Washington

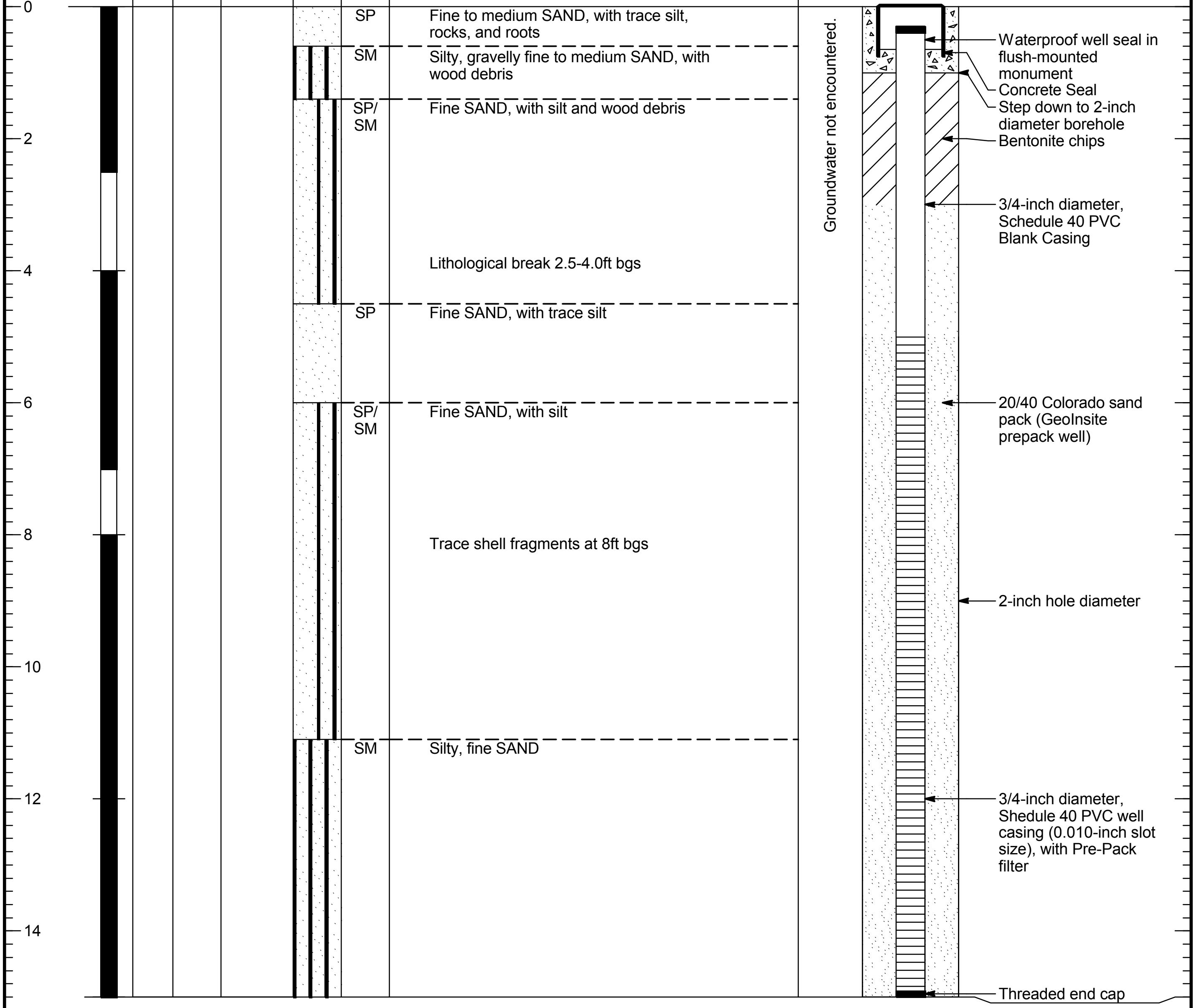
Log of RI-MW-11

Figure
C-12

RI-MW-12

SAMPLE DATA	SOIL PROFILE	GROUNDWATER
Depth (ft) Sample Number & Interval Sampler Type Blows/Foot Test Data	Graphic Symbol USCS Symbol Drilling Method: Strataprobe™ Ground Elevation (ft): 15.933	Water Level Detail

USCS Symbol	
SP	Fine to medium SAND, with trace silt, rocks, and roots
SM	Silty, gravelly fine to medium SAND, with wood debris
SP/ SM	Fine SAND, with silt and wood debris Lithological break 2.5-4.0ft bgs
SP	Fine SAND, with trace silt
SP/ SM	Fine SAND, with silt Trace shell fragments at 8ft bgs
SM	Silty, fine SAND



Boring Completed 04/21/09
Total Depth of Boring = 15.0 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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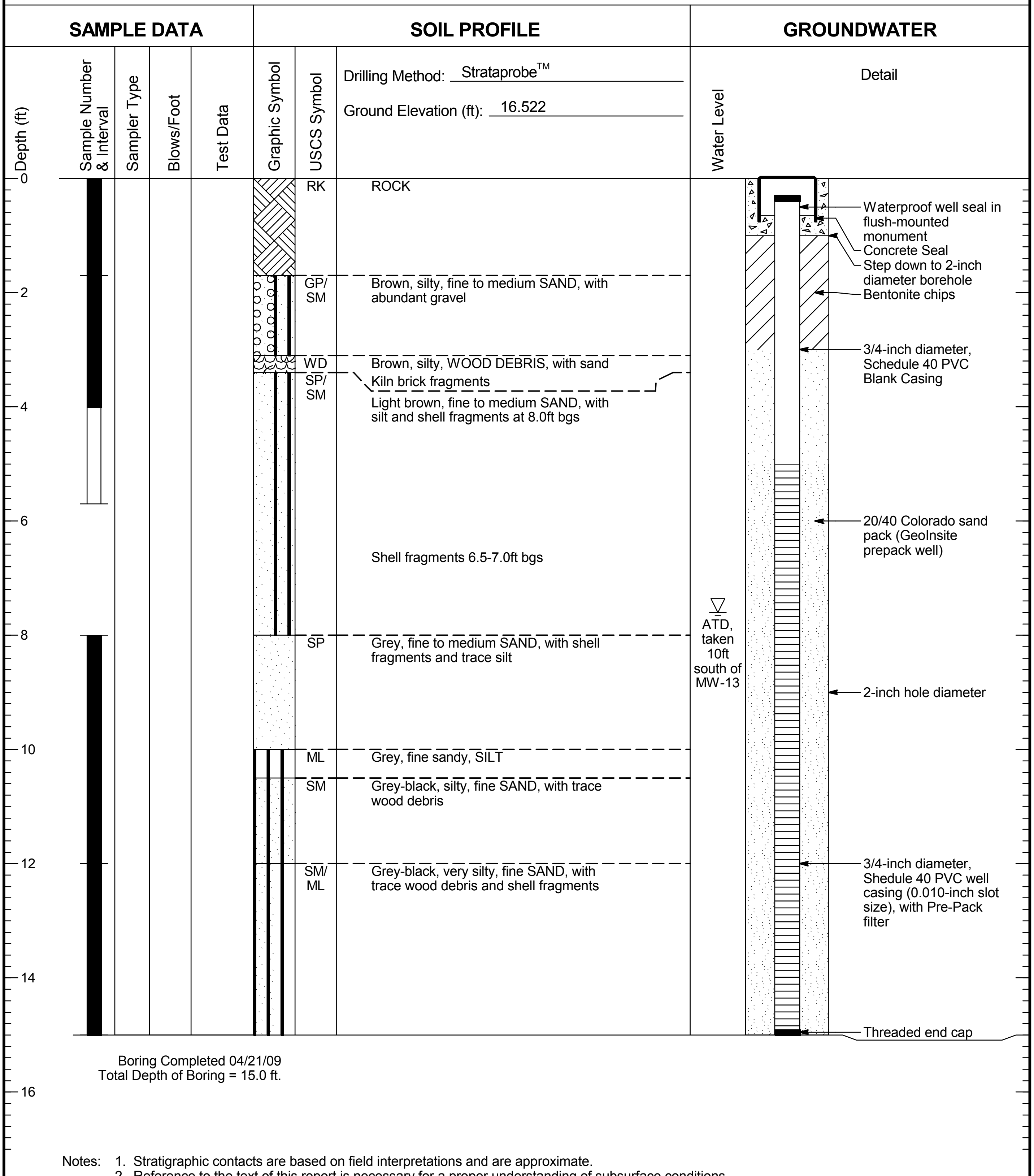
Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-12

Figure
C-13

RI-MW-13



Drilling Method: Strataprobe™

Ground Elevation (ft): 16.522

ROCK

Brown, silty, fine to medium SAND, with abundant gravel

Brown, silty, WOOD DEBRIS, with sand

Kiln brick fragments

Light brown, fine to medium SAND, with silt and shell fragments at 8.0ft bgs

Shell fragments 6.5-7.0ft bgs

Grey, fine to medium SAND, with shell fragments and trace silt

Grey, fine sandy, SILT

Grey-black, silty, fine SAND, with trace wood debris

Grey-black, very silty, fine SAND, with trace wood debris and shell fragments

Boring Completed 04/21/09
Total Depth of Boring = 15.0 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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Port of Everett West End RI/FS
Implementation
Everett, Washington

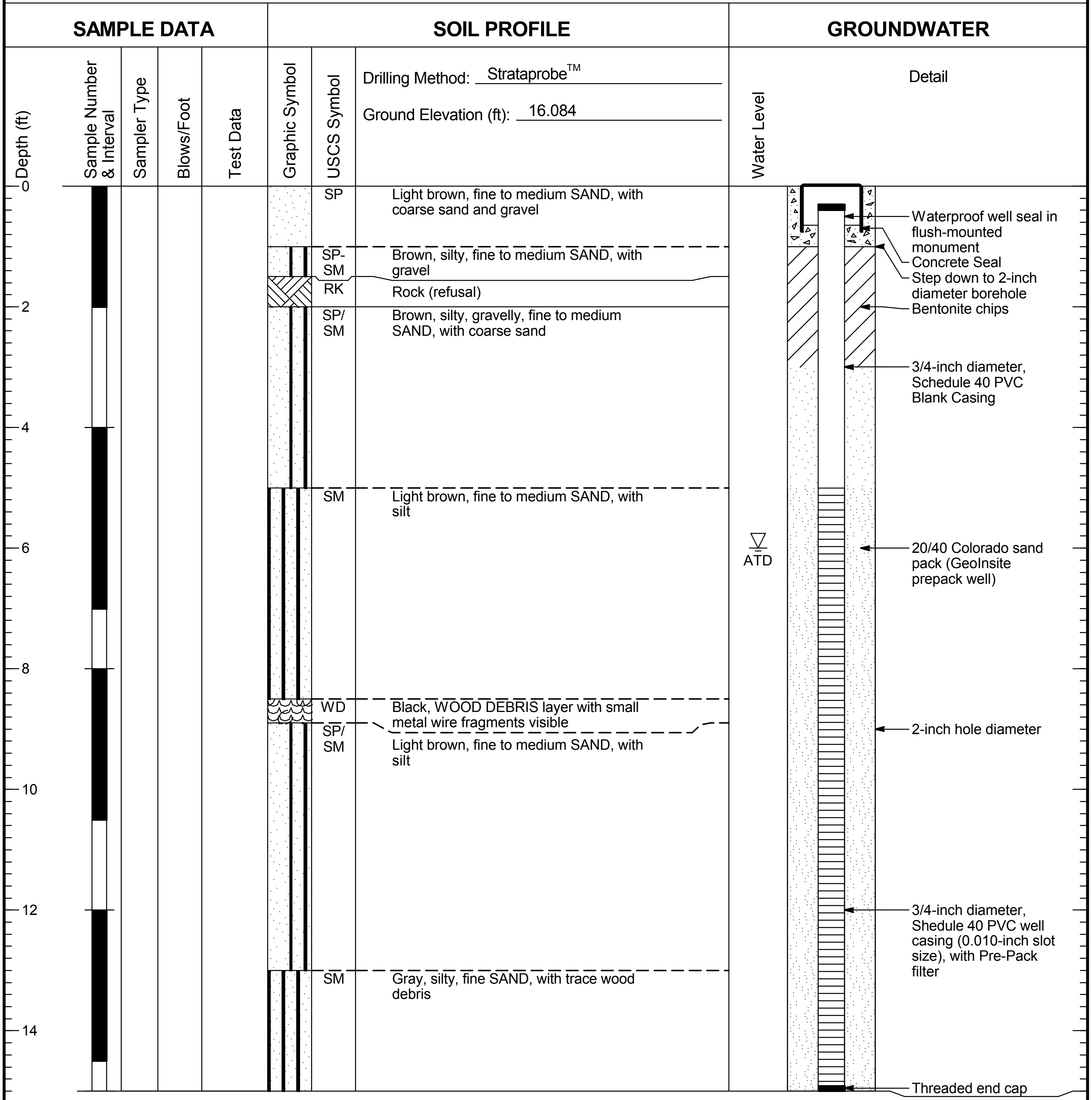
Log of RI-MW-13

Figure
C-14

RI-MW-14

Drilling Method: Strataprobe™

Ground Elevation (ft): 16.084



USCS Symbol	Description
SP	Light brown, fine to medium SAND, with coarse sand and gravel
SP-SM	Brown, silty, fine to medium SAND, with gravel
RK	Rock (refusal)
SP/SM	Brown, silty, gravelly, fine to medium SAND, with coarse sand
SM	Light brown, fine to medium SAND, with silt
WD	Black, WOOD DEBRIS layer with small metal wire fragments visible
SP/SM	Light brown, fine to medium SAND, with silt
SM	Gray, silty, fine SAND, with trace wood debris

Boring Completed 04/21/09
Total Depth of Boring = 15.0 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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Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-14

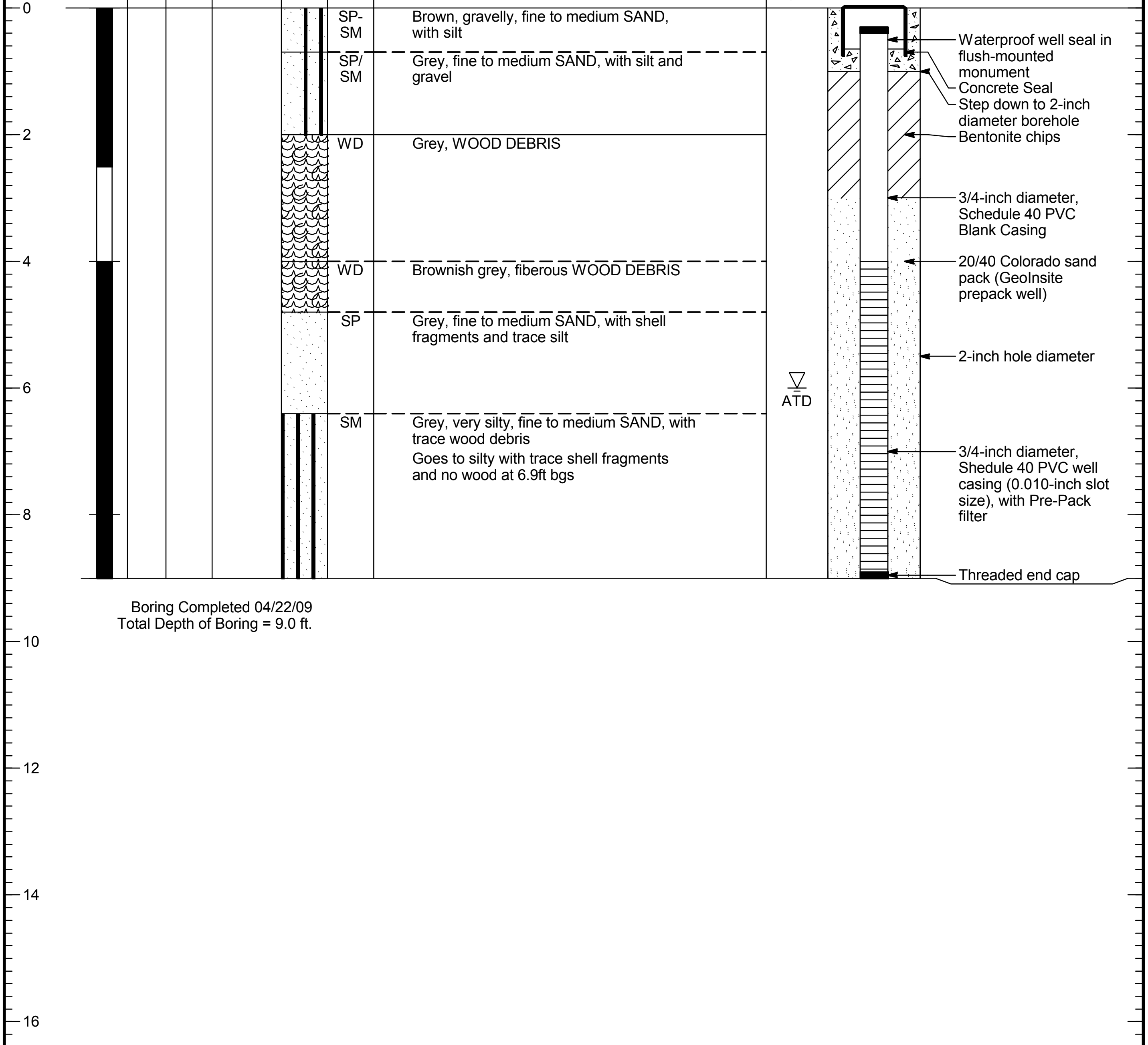
Figure
C-15

RI-MW-15

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Drilling Method: Strataprobe™

Ground Elevation (ft): 16.791



USCS Symbol	Description
SP-SM	Brown, gravelly, fine to medium SAND, with silt
SP/SM	Grey, fine to medium SAND, with silt and gravel
WD	Grey, WOOD DEBRIS
WD	Brownish grey, fiberous WOOD DEBRIS
SP	Grey, fine to medium SAND, with shell fragments and trace silt
SM	Grey, very silty, fine to medium SAND, with trace wood debris Goes to silty with trace shell fragments and no wood at 6.9ft bgs

Boring Completed 04/22/09
Total Depth of Boring = 9.0 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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Port of Everett West End RI/FS
Implementation
Everett, Washington

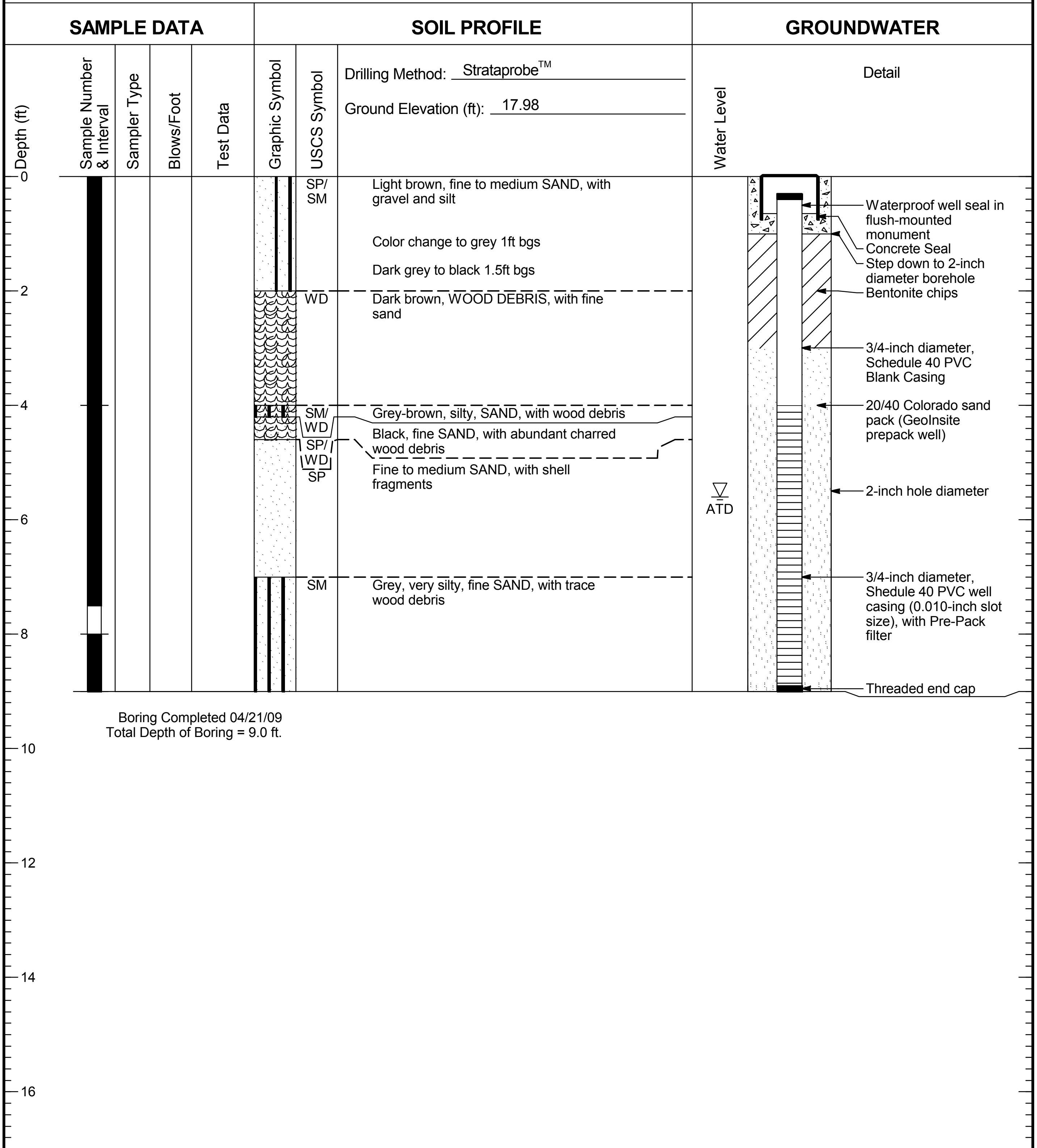
Log of RI-MW-15

Figure
C-16

RI-MW-16

Drilling Method: Strataprobe™

Ground Elevation (ft): 17.98



USCS Symbol	
SP/ SM	Light brown, fine to medium SAND, with gravel and silt Color change to grey 1ft bgs Dark grey to black 1.5ft bgs
WD	Dark brown, WOOD DEBRIS, with fine sand
SM/ WD	Grey-brown, silty, SAND, with wood debris
SP/ WD	Black, fine SAND, with abundant charred wood debris
SP	Fine to medium SAND, with shell fragments
SM	Grey, very silty, fine SAND, with trace wood debris

Boring Completed 04/21/09
Total Depth of Boring = 9.0 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.

Landau Associates

Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-16

Figure
C-17

RI-MW-17

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

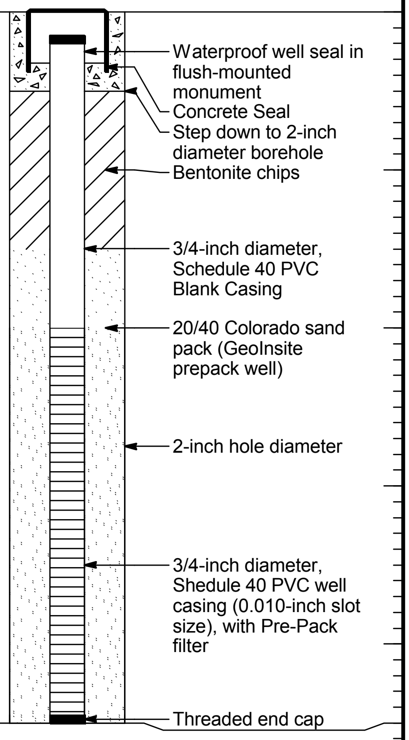
Drilling Method: Strataprobe™

Ground Elevation (ft): 16.767

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Description	Water Level
0					SM	Light brown, silty SAND	
					SP/SM	Dark brown, silty SAND, with gravel and wood debris	
					SP-SM	Grey, gravelly, fine to medium SAND, with silt and shell fragments	
					SM	Grey, fine to medium SAND, with silt and shell fragments	∇ ATD
					CL	Dark grey, fine, sandy, SILT, with wood debris	
					SP	Dark grey, fine SAND, with trace silt	

Boring Completed 04/21/09
Total Depth of Boring = 9.0 ft.

Detail



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.

LANDAU ASSOCIATES

Port of Everett West End RI/FS
Implementation
Everett, Washington

Log of RI-MW-17

Figure
C-18

RI-MW-18

SAMPLE DATA

SOIL PROFILE

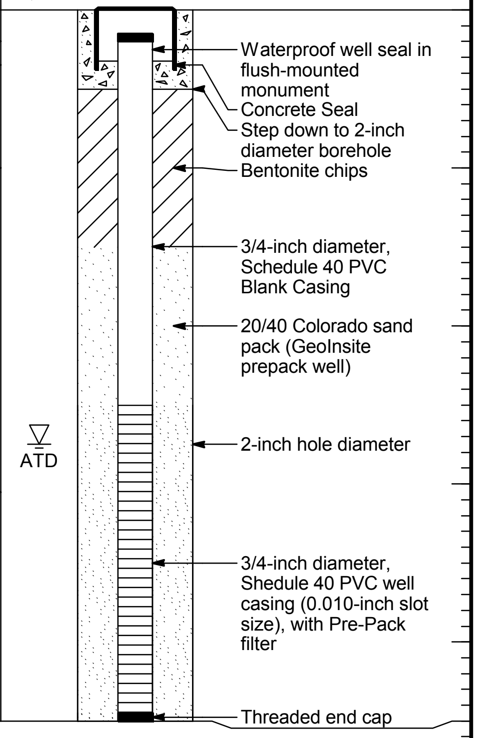
Drilling Method: Strataprobe™

Ground Elevation (ft): 16.244

Depth (ft)	USCS Symbol	Description
0	PT	Brown, SOD
	SP	Brownish-gray, fine to medium SAND
	SP-SM	Grey, silty, fine to medium SAND, with gravel Color change to brown 1.4ft bgs
2	SM	Light brown and grey, fine to medium SAND, with trace silt Loose, wet at 4.0ft bgs
6	SM/WD	Grey, silty, fine SAND, with wood debris

Boring Completed 04/22/09
Total Depth of Boring = 9.0 ft.

GROUNDWATER



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.

LANDAU ASSOCIATES

Port of Everett West End RI/FS Implementation
Everett, Washington

Log of RI-MW-18

Figure C-19

APPENDIX D

Terrestrial Ecological Exclusion Form

Washington State Department of Ecology
Toxics Cleanup Program

Terrestrial Ecological Evaluation Process - Primary Exclusions

Documentation Form

Exclusion #	Exclusion Detail	Yes or No?	Are Institutional Controls Required If The Exclusion Applies?
1	Will soil contamination be located at least 6 feet beneath the ground surface and less than 15 feet?	Yes ☐ / No ☐	Yes ☐
	Will soil contamination be located at least 15 feet beneath the ground surface?	Yes ☐ / No ☐	No ☐
	Will soil contamination be located below the conditional point of compliance?	Yes ☐ / No ☐	Yes ☐
2	Will soil contamination be covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from being exposed?	Yes ☐ / No ☐	Yes ☐
3[1]	Is there less than 1.5 acres of contiguous undeveloped land on the site, or within 500 feet of any area of the site affected by hazardous substances **other than** those listed in the table of Hazardous Substances of Concern? And Is there less than 0.25 acres of contiguous undeveloped land on or within 500 feet of any area of the site affected by hazardous substances **listed in** the table of Hazardous Substances of Concern?	**Yes** ☒ / No ☐ **Yes** ☒ / No ☐	Other factors determine
4	Are concentrations of hazardous substances in the soil less than or equal to natural background concentrations of those substances at the point of compliance	Yes ☐ / No ☐	No ☐

---

[1] **A terrestrial ecological evaluation is not required for the Site based on Exclusion Criteria 3.**

APPENDIX E

Johnson & Ettinger Model Calculations

Groundwater Model Type: Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings: GW-ADV Versions 3.1; 02/04.

Site:	West End Site, Port of Everett		
Calculate Incremental Risks from Actual Groundwater Concentration:	Yes		
Calculate Hazard Quotient:	Yes		
Calculate Target GW Conentrationt at 1E-06 risk.	Yes	Units:	Notes:
Groundwater Vinyl Chloride Concentration:	12	(ug/L)	a
Building ID:	NA	---	---
Building Type Assumption:	Industrial	---	b

ASSUMPTIONS:

Average soil/groundwater temperature:	12	C	c
Depth below grade to bottom of enclosed space floor:	15	cm	d
Depth below grade to water table (ft):	6	ft	a
Depth below grade to water table (cm):	183	cm	a
Soil stratum A Thickness:	183	cm	a
Soil stratum B Thickness:	---	---	---
Soil stratum C Thickness:	---	---	---
Soil stratum A:	SL	---	a
Soil stratum B:	---	---	---
Soil stratum C:	---	---	---
Soil stratum directly above water table:	SL	---	a
Soil stratum soil vapor permeability basis:	soil type calculation	cm^2	e
Enclosed space floor thickness:	10	cm	f
Soil-building pressure differential:	40	$g/cm\text{-}s^2$	f
Enclosed space floor length:	1000	cm	f
Enclosed space floor width:	1000	cm	f
Enclosed space height:	244	cm	f
Floor-wall seam crack width:	0.1	cm	f
Indoor air exchange rate:	0.5	1/h	g
Average vapor flow rate into buildings:	5	L/m	h

Reasonable Maximum Exposure Assumptions:			i
ATc = Averaging time (carcinogen):	75	yr	j
ED = Exposure duration:	20	yr	j
EF = Exposure frequency:	250	days	k
IR = Inhalation rate:	20	m^3/day	l
Target risk for unrestricted use:	1.0E-06	unitless	m

RESULTS:

Vinyl Chloride (µg/m^3) [CAS = 75014]

Carcinogen risk =	2.6E-07	unitless	o
Target Concentration =	46	(ug/L)	p

Notes:

--- = Not applicable

a Site specific data from soil borings and analytical esults.

b Assumptions based on potential future building use.

c Based on JE Model Guidance Figure 8.

d JE model default value for slab-on-grade scenario.

e Soil stratum soil vapor permeability calculated from soil type.

f JE Model recommended default values were used.

g *Draft Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action* (Ecology 2009). M.C. Baechler et al (Author), 1992 (p. 58), an indoor exchange rate of 1.5 /hr was used for the industrial scenario.

h Conservative default value for residential buildings used as per discussions with Ecology.

i Assumes property to be used for residential or industrial use above ground level (no basement).

j Based on Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC (November 2007). MTCA WAC 173-340-750 Equation 750-2 noncarcinogen input Equation 750-2 carcinogen input parameters: risk = 1.0E-06; ATc = averaging time (75 years); ED = exposure duration (30 years);

k Assumes an exposure frequency of 8 hours per day for 250 days per year for commercial or industrial land use. Source: *RISK ASSESSMENT GUIDANCE FOR SUPERFUND VOLUME I: HUMAN HEALTH EVALUATION MANUAL SUPPLEMENTAL GUIDANCE "STANDARD DEFAULT* EXPOSURE FACTORS" INTERIM FINAL U.S. Environmental Protection Agency (EPA) Office of Emergency and Remedial Response Toxics Integration Branch, March 25, 1991.

l *Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation* Risk Assessment) (EPA 2009).

m Acceptable carcinogen risk = 1.0E-06 (for unrestricted site use) per Model Toxic Control Act Cleanup Regulation Chapter 173-340 WAC (November 2007).

o Calculated from JE Model's indoor air concentration using RAGS Part F methodology.

p Target concentration limit that provides an acceptable carcinogen risk of 1.0E-06.

APPENDIX F

Empirical Demonstration of Protection of Groundwater

APPENDIX F
EMPIRICAL DEMONSTRATION OF PROTECTION OF GROUNDWATER

For some constituents present in soil [cadmium, copper (all areas except for Area D), lead, mercury, zinc], the soil criteria protective of human health (i.e., Method B direct human contact) was selected as the soil PCL regardless if it was higher than the PCL based on groundwater protection, In accordance with WAC 173-340-747(9), if an empirical demonstration can be made that concentrations present in soil are not causing exceedances of the groundwater cleanup levels, then development of a soil criterion protective of groundwater is not necessary. The MTCA regulations [WAC 173-340-747(9)(b)] identify requirements for demonstrating that soil concentrations will not cause an exceedance of groundwater cleanup levels:

- Measured groundwater concentrations must be less than or equal to the groundwater cleanup level
- Sufficient time must have elapsed for migration of the hazardous substance from soil to groundwater to have occurred
- Characteristics of the site that would impact migration of contaminants to groundwater must be representative of future site conditions.

Analytical results for dissolved metals collected during the RI are shown in Table 12 of this report. Dissolved cadmium, copper (all areas except for Area D), lead, mercury, and zinc were not detected in groundwater above the PCL during the RI or previous investigations. Based on these results, the first MTCA requirement above is met.

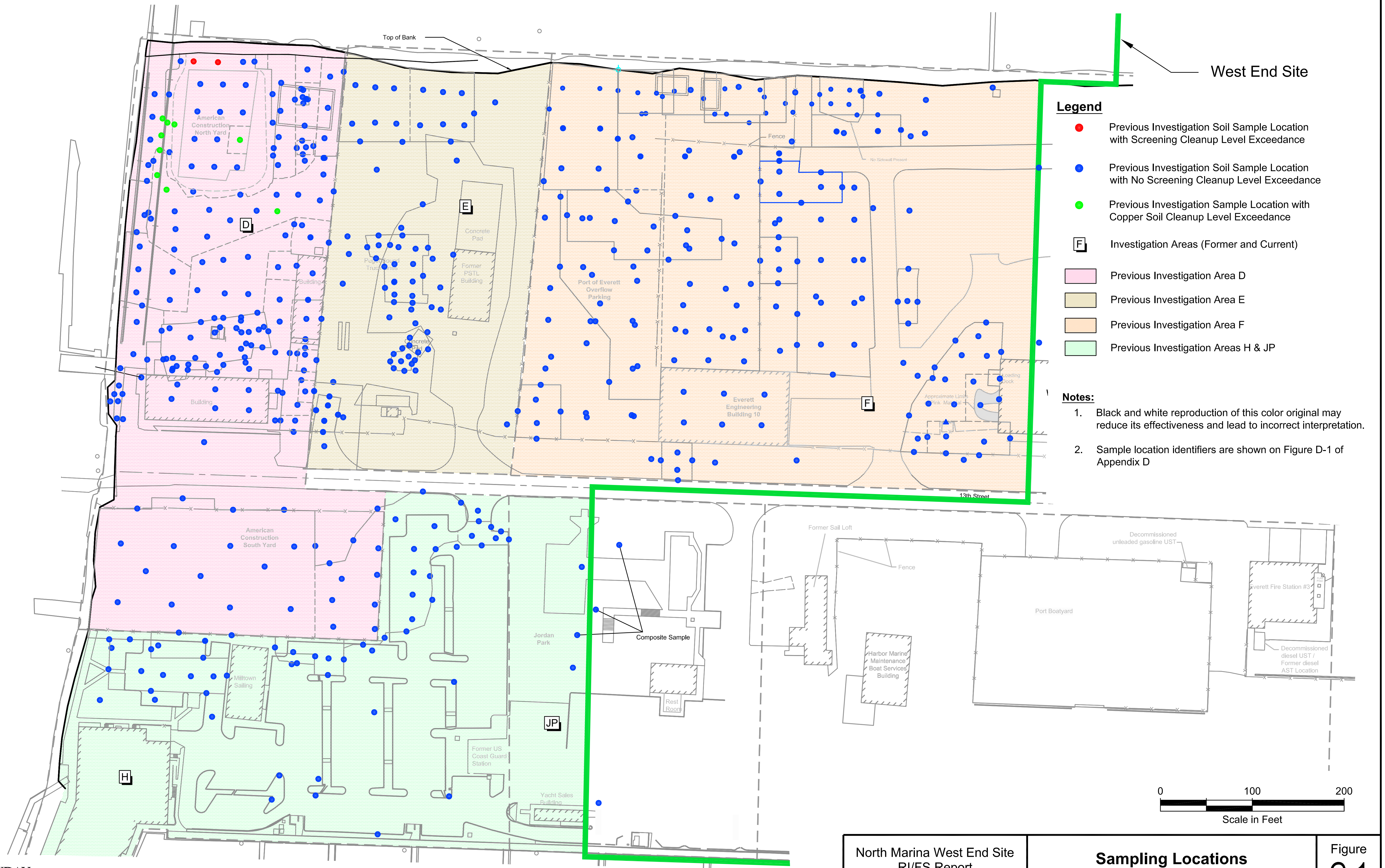
The North Marina Area, which includes the Site, has been used for a variety of commercial, industrial, and marine-related activities since the late 1800s and the occurrence of metals in soil at the Site is presumed to be attributable to activities related to these various uses. Furthermore, the depth to groundwater at the Site is shallow, ranging from 3.0 to 7.5 ft below ground surface (BGS). Because the property has been used for over a hundred years and depth to groundwater is shallow, it is expected that adequate time has elapsed for metals to have reached groundwater, therefore, the second MTCA requirement above is met.

The Port is planning to redevelop the North Marina Area, which includes the Site. Redevelopment will likely include a mix of marina support, retail, restaurant, hotel, office, residential, and public recreational uses. Any changes to the Site uses are expected to decrease rather than increase the potential for migration of contaminants from soil to groundwater, therefore, current conditions are considered to be adequately representative of future conditions, meeting the third MTCA requirement.

Based on an empirical demonstration, the existing soil concentrations at the site are protective of groundwater.

APPENDIX G

Sample Locations Representing Soil Remaining



Legend

- ● Previous Investigation Soil Sample Location with Screening Cleanup Level Exceedance
- ● Previous Investigation Soil Sample Location with No Screening Cleanup Level Exceedance
- ● Previous Investigation Sample Location with Copper Soil Cleanup Level Exceedance
- F Investigation Areas (Former and Current)
- ▨ Previous Investigation Area D
- ▨ Previous Investigation Area E
- ▨ Previous Investigation Area F
- ▨ Previous Investigation Areas H & JP

Notes:

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
2. Sample location identifiers are shown on Figure D-1 of Appendix D

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\120\D\Final West End RIFS Report\FigureG-1.dwg (A) "Figure G-1" 9/24/2010

LANDAU ASSOCIATES

North Marina West End Site
RI/FS Report
Port of Everett, Washington

Sampling Locations Representing Soil Remaining

Figure
G-1

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D-GC-4 (1-1.5) 0411208-01 11/9/2004	D1-B1 LT09A 10/8/2007	D1-B2 LT09B 10/8/2007	D1-B3 LT09C 10/8/2007	D1-B4 LT09D 10/8/2007	D1-B5 LT09E 10/8/2007	D1-B6 LT09F 10/8/2007	D1-B7 LT09G 10/8/2007	D1-B8 LT09H 10/8/2007	D1-B9a LU36A 10/18/2007	D1-B10 LT09J 10/8/2007	D1-B11 LT09K 10/8/2007	D1-B12 LT09L 10/8/2007	D1-S1-A4 LV31A 10/25/2007	D1-S1b2 LT59B 10/12/2007	D1-S1-C3 LU36C 10/18/2007	D1-S1c-AC-1 LT38B 10/10/2007
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel-Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	TEQ	7.0 U	65 U	64 U	66 U	64 U	65 U	66 U	66 U	66 U	NA	64 U	66 U	66 U	64 U	66 U	66 U	110
Chrysene	TEQ	17	65 U	64 U	66 U	64 U	65 U	66 U	66 U	66 U	NA	79	66 U	66 U	64 U	66 U	66 U	140
Benzo(b)fluoranthene	TEQ	7.0 U	65 U	64 U	66 U	64 U	65 U	66 U	66 U	66 U	NA	72	66 U	66 U	64 U	66 U	66 U	66
Benzo(k)fluoranthene	TEQ	7.0 U	65 U	64 U	66 U	64 U	65 U	66 U	66 U	66 U	NA	64 U	66 U	66 U	64 U	66 U	66 U	66 U
Benzo(a)pyrene	0.14	7.0 U	65 U	64 U	66 U	64 U	65 U	66 U	66 U	66 U	NA	64 U	66 U	66 U	64 U	66 U	66 U	110
Indeno(1,2,3-cd)pyrene	TEQ	7.0 U	65 U	64 U	66 U	64 U	65 U	66 U	66 U	66 U	NA	64 U	66 U	66 U	64 U	66 U	66 U	66 U
Dibenz(a,h)anthracene	TEQ	7.0 U	65 U	64 U	66 U	64 U	65 U	66 U	66 U	66 U	NA	64 U	66 U	66 U	64 U	66 U	66 U	66 U
TEQ	140	0.2	ND	ND	ND	ND	ND	ND	ND	ND	NA	8.0	ND	ND	ND	ND	ND	129
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	4.7	10	8	11	7	8	9	10	8	11	16	11	14	NA	7	7	13
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3000/36 (c)	14.0	20.5	15.0	31.8	18.3	25.7	31.5	21.9	27.7	37.9	31.4	12	14.9	NA	13.4	20.0	40.9
Lead	250	3.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	33.7 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D1-S2-A4	D1-S2b2	D1-S2c2	D1-S3-A5	D1-S3a5a	D1-S3b2	D1-S3c2	D1-S4-B4	D1-S4-C4	D1-S5a2	D1-S5b2	D1-S5c2	D1-S6a2	D1-S6-b2	D1-S6c2	D1-S7-A3	D1-S7b2
		LV31B	LT59D	LT59E	LW39A	MF31A	LT59G	LT59H	LV31D	LV31E	LT59L	LT59M	LT59N	LT59O	LT59P	LT59Q	LU36H	LT60A
		10/25/2007	10/12/2007	10/12/2007	11/1/2007	1/15/2008	10/12/2007	10/12/2007	10/25/2007	10/25/2007	10/12/2007	10/12/2007	10/12/2007	10/12/2007	10/12/2007	10/12/2007	10/18/2007	10/12/2007
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel-Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	TEQ	63 U	64 U	66 U	NA	64 U	64 U	64 U	NA	NA	67	65 U	65 U	64 U	66 U	65 U	NA	73
Chrysene	TEQ	63 U	64 U	66 U	NA	64 U	64 U	64 U	NA	NA	160	65 U	65 U	64 U	66 U	65 U	NA	94
Benzo(b)fluoranthene	TEQ	65	64 U	66 U	NA	64 U	64 U	64 U	NA	NA	210	65 U	65 U	64 U	66 U	65 U	NA	65 U
Benzo(k)fluoranthene	TEQ	65	64 U	66 U	NA	64 U	64 U	64 U	NA	NA	78	65 U	65 U	64 U	66 U	65 U	NA	65 U
Benzo(a)pyrene	0.14	63 U	64 U	66 U	NA	64 U	64 U	64 U	NA	NA	85	65 U	65 U	64 U	66 U	65 U	NA	91
Indeno(1,2,3-cd)pyrene	TEQ	63 U	64 U	66 U	NA	64 U	64 U	64 U	NA	NA	67	65 U	65 U	64 U	66 U	65 U	NA	65 U
Dibenz(a,h)anthracene	TEQ	63 U	64 U	66 U	NA	64 U	64 U	64 U	NA	NA	66 U	65 U	65 U	64 U	66 U	65 U	NA	65 U
TEQ	140	13.0	ND	ND	NA	ND	ND	ND	NA	NA	129	ND	ND	ND	ND	ND	NA	99.2
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	6	11	5	NA	7	9	7	10	20	9	11	5 U	13	14	NA	14
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3000/36 (c)	NA	15.2	36.0	15.1	NA	16.7	20.8	19.3	20.4	34.4	21.8	33.2	18.2	36	22.6	38.6	39.6
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 8

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

		D1-S7c2	D1-S8-A3	D1-S8b2	D1-S8c2	D2a-B1b	D2a-B2a	D2a-B3a	D2a-S1	D2a-S2	D2b-B1	D2c-AC-5	D2C-AC-5a	D2C-AC-5b	D2c-AC-5W	D2C-AC-5Wa	D2c-AC-5N	D2C-AC-5Na	D2c-AC-5S
	Preliminary Cleanup Levels (a)	LT60B	LU36I	LT60D	LT60E	LT13A	LR83C	LR83D	LN83D	LT13B	LN83E	L070904-11	LQ44E	LQ44A	L070904-13	LQ44D	L070904-14	LQ44C	L070904-15
		10/12/2007	10/18/2007	10/12/2007	10/12/2007	10/8/2007	10/1/2007	10/1/2007	8/31/2007	10/8/2007	8/31/2007	9/4/2007	9/20/2007	9/20/2007	9/4/2007	9/20/2007	9/4/2007	9/20/2007	9/4/2007
PETROLEUM HYDROCARBONS																			
NWTPH-HCID (mg/kg)																			
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																			
Diesel-Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50 U	NA	6.1 U	50 U	NA	50 U	NA	50 U
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100 U	NA	12 U	100 U	NA	100 U	NA	100 U
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 U	NA	NA	20 U	NA	20 U	NA	20 U
Gasoline (mg/kg)																			
Method 8021/NWTPH-G																			
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 U	NA	NA	20 U	NA	20 U	NA	20 U
BTEX (µg/kg)																			
EPA Method 8021																			
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	30 U	NA	NA	30 U	NA	30 U	NA	30 U
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100 U	NA	NA	100 U	NA	100 U	NA	100 U
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50 U	NA	NA	50 U	NA	50 U	NA	50 U
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	150 U	NA	NA	150 U	NA	150 U	NA	150 U
cPAHs (µg/kg)																			
SW8270D																			
Benzo(a)anthracene	TEQ	66 U	NA	64 U	64 U	64 U	64 U	63 U	64 U	64 U	66 U	NA	63 U	65 U	NA	64 U	NA	66 U	NA
Chrysene	TEQ	66 U	NA	64 U	64 U	64 U	64 U	63 U	65	64 U	66 U	NA	63 U	65 U	NA	64 U	NA	66 U	NA
Benzo(b)fluoranthene	TEQ	66 U	NA	64 U	64 U	64 U	64 U	63 U	64 U	64 U	66 U	NA	63 U	65 U	NA	64 U	NA	66 U	NA
Benzo(k)fluoranthene	TEQ	66 U	NA	64 U	64 U	64 U	64 U	63 U	76	64 U	66 U	NA	63 U	65 U	NA	64 U	NA	66 U	NA
Benzo(a)pyrene	0.14	66 U	NA	64 U	64 U	64 U	64 U	63 U	64 U	64 U	66 U	NA	63 U	65 U	NA	64 U	NA	66 U	NA
Indeno(1,2,3-cd)pyrene	TEQ	66 U	NA	64 U	64 U	64 U	64 U	63 U	64 U	64 U	66 U	NA	63 U	65 U	NA	64 U	NA	66 U	NA
Dibenz(a,h)anthracene	TEQ	66 U	NA	64 U	64 U	64 U	64 U	63 U	64 U	64 U	66 U	NA	63 U	65 U	NA	64 U	NA	66 U	NA
TEQ	140	ND	NA	ND	ND	ND	ND	ND	8.2	ND	ND	NA	ND	ND	NA	ND	NA	ND	NA
TOTAL METALS (mg/kg)																			
SW6000-7000 Series																			
Arsenic	20	10	NA	7	12	7	8	7	13	7	6	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3000/36 (c)	25.2	24.4	16.0	29.6	15.8	13.6	12.1	29.8	19.3	19.1	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D2C-AC-5Sa	D2c-AC-7	D2c-AC-7N	D2c-AC-7W	D2c-AC-7S	D2c-AC-7E	D2c-B1	D2c-B2	D2c-B3	D2d-B1	D2d-S1	D2d-Petrol-B1a	D2d-Petrol-S1	D2E-B1	D2E-B2	D2E-B3	D2E-B4	D2E-B5
		LQ44B	LO63A	LO63C	LO63D	LO63E	LO63F	LR78J	LQ44F	LN83F	LD76L	LD76M	LE43F	LE43G	MB03B	MB03D	MB03E	MB03F	MB03G
		9/20/2007	9/7/2007	9/7/2007	9/7/2007	9/7/2007	9/7/2007	9/28/2007	9/20/2007	8/31/2007	6/15/2007	6/15/2007	6/21/2007	6/21/2007	12/6/2007	12/6/2007	12/6/2007	12/6/2007	12/6/2007
PETROLEUM HYDROCARBONS																			
NWTPH-HCID (mg/kg)																			
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																			
Diesel-Range Hydrocarbons	2000	NA	6.2 U	15	14	6.4 U	6.3 U	NA	NA	NA	NA	NA	5.8 U	25	NA	NA	NA	NA	NA
Motor Oil	2000	NA	12 U	13 U	14 U	13 U	12 U	NA	NA	NA	NA	NA	12 U	86	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																			
Method 8021/NWTPH-G																			
Gasoline	30/100 (b)	NA	8.8 U	9.3 U	9.0 U	8.6 U	8.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																			
EPA Method 8021																			
Benzene	290	NA	22 U	23 U	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	22 U	23 U	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	22 U	23 U	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	24 U	47 U	45 U	43 U	42 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	22 U	23 U	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																			
SW8270D																			
Benzo(a)anthracene	TEQ	66 U	NA	NA	NA	NA	NA	65 U	64 U	65 U	66 U	61 U	NA	NA	64 U	65 U	66 U	64 U	64 U
Chrysene	TEQ	66 U	NA	NA	NA	NA	NA	65 U	64 U	65 U	66 U	61 U	NA	NA	64 U	65 U	66 U	64 U	64 U
Benzo(b)fluoranthene	TEQ	66 U	NA	NA	NA	NA	NA	65 U	64 U	65 U	66 U	61 U	NA	NA	64 U	65 U	66 U	64 U	64 U
Benzo(k)fluoranthene	TEQ	66 U	NA	NA	NA	NA	NA	65 U	64 U	65 U	66 U	61 U	NA	NA	64 U	65 U	66 U	64 U	64 U
Benzo(a)pyrene	0.14	66 U	NA	NA	NA	NA	NA	65 U	64 U	65 U	66 U	61 U	NA	NA	64 U	65 U	66 U	64 U	64 U
Indeno(1,2,3-cd)pyrene	TEQ	66 U	NA	NA	NA	NA	NA	65 U	64 U	65 U	66 U	61 U	NA	NA	64 U	65 U	66 U	64 U	64 U
Dibenz(a,h)anthracene	TEQ	66 U	NA	NA	NA	NA	NA	65 U	64 U	65 U	66 U	61 U	NA	NA	64 U	65 U	66 U	64 U	64 U
TEQ	140	ND	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND
TOTAL METALS (mg/kg)																			
SW6000-7000 Series																			
Arsenic	20	NA	7	6	20	6	6 U	6	7	6	6 U	7	NA	NA	7	15	6	8	12
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3000/36 (c)	NA	NA	NA	NA	NA	NA	19.1	22.7	17.9	20.9	15.5	NA	NA	20.1	32.2	22.5	23.6	41.3
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 8

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D2E-B6 MB03H 12/6/2007	D2E-B7 MB38A 12/7/2007	D2E-B8 MB38B 12/7/2007	D2E-B9 MB38C 12/7/2007	D2E-B10 MB38D 12/7/2007	D2E-B11 MB38E 12/7/2007	D2E-B12 MD34C 12/20/2007	D2e-B13a ME14G 1/2/2008	D2e-B14 MF65B 1/17/2008
PETROLEUM HYDROCARBONS										
NWTPH-HCID (mg/kg)										
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)										
Diesel-Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	41	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	11 U	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)										
Method 8021/NWTPH-G										
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)										
EPA Method 8021										
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)										
SW8270D										
Benzo(a)anthracene	TEQ	66 U	64 U	66	64 U	65 U	66 U	64 U	NA	64 U
Chrysene	TEQ	99	64 U	120	64 U	65 U	66 U	64 U	NA	64 U
Benzo(b)fluoranthene	TEQ	100	64 U	110	64 U	65 U	66 U	64 U	NA	64 U
Benzo(k)fluoranthene	TEQ	66 U	64 U	64 U	64 U	65 U	66 U	64 U	NA	64 U
Benzo(a)pyrene	0.14	66 U	64 U	64 U	64 U	65 U	66 U	64 U	NA	64 U
Indeno(1,2,3-cd)pyrene	TEQ	66 U	64 U	64 U	64 U	65 U	66 U	64 U	NA	64 U
Dibenz(a,h)anthracene	TEQ	66 U	64 U	64 U	64 U	65 U	66 U	64 U	NA	64 U
TEQ	140	11	ND	18.8	ND	ND	ND	ND	NA	ND
TOTAL METALS (mg/kg)										
SW6000-7000 Series										
Arsenic	20	13	12	6	12	8	5 U	7	NA	15
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3000/36 (c)	34.9	35.2	18.9	28.1	26.5	17.4	12.9	24.9	44.0
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D2e-B15	D2e-B15a	D2E-S1	D2e-S3A	D2e-S4d	D2e-S5	D2e-S5	D2e-TP-1	D2e-TP-2	D2f-B1	D2f-B2	D2f-B3a	D2f-B4	D3-B1	D3-B2	D3-B3	D3-S1A
		MK63A	MM01A	MB03C	MD34B	MM01B	MF65A	MK63C	MN60A	MO32A	LQ13D	LQ13C	LR78I	LQ13A	LZ67A	LZ67G	LZ67D	LZ67B
		2/27/2008	3/7/2008	12/6/2007	12/20/2007	3/7/2008	1/17/2008	2/27/2008	3/7/2008	3/7/2008	9/18/2007	9/18/2007	9/28/2007	9/18/2007	########	########	11/26/2007	11/26/2007
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	TEQ	NA	64 U	63 U	66 U	64 U	79	NA	NA	NA	65 U	64 U	66 U	63 U	65 U	87 U	65 U	65 U
Chrysene	TEQ	NA	64 U	63 U	66 U	64 U	140	NA	NA	NA	65 U	64 U	66 U	63 U	190	190 U	65 U	65 U
Benzo(b)fluoranthene	TEQ	NA	64 U	63 U	66 U	64 U	110	NA	NA	NA	65 U	64 U	66 U	63 U	130	170 U	65 U	65 U
Benzo(k)fluoranthene	TEQ	NA	64 U	63 U	66 U	64 U	67	NA	NA	NA	65 U	64 U	66 U	63 U	84	84 U	65 U	65 U
Benzo(a)pyrene	0.14	NA	64 U	63 U	66 U	64 U	70	NA	NA	NA	65 U	64 U	66 U	63 U	65 U	75 U	65 U	65 U
Indeno(1,2,3-cd)pyrene	TEQ	NA	64 U	63 U	66 U	64 U	65 U	NA	NA	NA	65 U	64 U	66 U	63 U	65 U	66 U	65 U	65 U
Dibenz(a,h)anthracene	TEQ	NA	64 U	63 U	66 U	64 U	65 U	NA	NA	NA	65 U	64 U	66 U	63 U	65 U	66 U	65 U	65 U
TEQ	140	NA	ND	ND	ND	ND	97.0	NA	NA	NA	ND	ND	ND	ND	23.3	111	ND	ND
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	20 U	6	5 U	10 U	5 U	NA	NA	NA	7	6	NA	7	24	29	12	7
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	64.1	53.4	15.9	18.1	87.7	19.8	16.2	179	100	15.0	11.4	NA	13.4	34.5	45.7	36.3	13.8
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D3-S1B	D3-S2a	D3-S2B	D4a-B1	D4a-B2	D4a-b3a	D4a-B4	D4a-b5a	D4a-b6a	D4a-B7	D4b-b1a	D4-B2	D4b-b3	D4b-B4a	D4b-B5a	D4b-S1	D4b-S2
		LZ67C	LZ67E	LZ67F	LR83A	LQ13G	LU83A	LQ13H	LU83B	LU83C	LQ13K	MD48A	LN07B	MD48C	ME14C	ME14D	MD48B	ME14A
		11/26/2007	11/26/2007	11/26/2007	10/1/2007	9/18/2007	10/23/2007	9/18/2007	10/23/2007	10/23/2007	9/18/2007	12/21/2007	8/27/2007	12/21/2007	1/2/2008	1/2/2008	12/21/2007	1/2/2008
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	TEQ	65 U	65 U	64 U	63 U	64 U	NA	63 U	65 U	64 U	64 U	63 U	66 U	66 U	NA	63 U	63 U	63 U
Chrysene	TEQ	65 U	65 U	64 U	63 U	64 U	NA	63 U	65 U	64 U	64 U	63 U	66 U	66 U	NA	63 U	63 U	63 U
Benzo(b)fluoranthene	TEQ	65 U	65 U	64 U	63 U	64 U	NA	63 U	65 U	64 U	64 U	63 U	66 U	66 U	NA	63 U	63 U	63 U
Benzo(k)fluoranthene	TEQ	65 U	65 U	64 U	63 U	64 U	NA	63 U	65 U	64 U	64 U	63 U	66 U	66 U	NA	63 U	63 U	63 U
Benzo(a)pyrene	0.14	65 U	65 U	64 U	63 U	64 U	NA	63 U	65 U	64 U	64 U	63 U	66 U	66 U	NA	63 U	63 U	63 U
Indeno(1,2,3-cd)pyrene	TEQ	65 U	65 U	64 U	63 U	64 U	NA	63 U	65 U	64 U	64 U	63 U	66 U	66 U	NA	63 U	63 U	63 U
Dibenz(a,h)anthracene	TEQ	65 U	65 U	64 U	63 U	64 U	NA	63 U	65 U	64 U	64 U	63 U	66 U	66 U	NA	63 U	63 U	63 U
TEQ	140	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	7	7	11	7	9	10	7	11	6	10	8	5	5 U	7	7	7	5 U
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	15.1	14.7	32.5	23.9	30.0	32.8	18.1	36	16.8	13.2	19.0	18.5	18.9	13.4	14.4	21.4	19.3
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D4c-B1 LQ13E 9/18/2007	D4c-S1 LT11A 10/9/2007	D5-B1 LN83G 8/31/2007	D5-B2 LN83H 8/31/2007	D5-B3 LN83I 8/31/2007	D5-B4 LN83J 8/31/2007	D5-S1 MB03A 12/6/2007	D6-B1 LC72A/L070606-23 6/7/2007	D6-S1 L070606-26 6/7/2007	D6-S2 LC72C/L070606-25 6/7/2007	D6-S3 L070606-24 6/7/2007	D6-S5 L070606-28 6/7/2007	D6-S4 L070606-29 6/7/2007	D6-S5 LC72F/L070606-28 6/7/2007	D6-S6 LC72E/L070606-27 6/7/2007	D6-2-2.5 L070606-22 6/7/2007
PETROLEUM HYDROCARBONS																	
NWTPH-HCID (mg/kg)																	
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	180
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	220
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	140
NWTPH-DxSG (mg/kg)																	
Diesel Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																	
Method 8021/NWTPH-G																	
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																	
EPA Method 8021																	
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																	
SW8270D																	
Benzo(a)anthracene	TEQ	64 U	64 U	65 U	66 U	64 U	63 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	TEQ	64 U	64 U	65 U	66 U	64 U	63 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	TEQ	64 U	64 U	65 U	66 U	64 U	63 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	TEQ	64 U	64 U	65 U	66 U	64 U	63 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.14	64 U	64 U	65 U	66 U	64 U	63 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	TEQ	64 U	64 U	65 U	66 U	64 U	63 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	TEQ	64 U	64 U	65 U	66 U	64 U	63 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	140	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL METALS (mg/kg)																	
SW6000-7000 Series																	
Arsenic	20	6 U	6 U	5 U	5 U	5 U	5 U	5 U	7	NA	7	NA	NA	NA	8	8	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	18.2	26.4	16.7	16.1	19	14.2	18.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D7-AC-4 L070904-28 9/6/2007	D7-B1 LM19A 8/17/2007	D7-B2a LR78A 9/28/2007	D7-B3a LR78B 9/28/2007	D7-B4 LM19D 8/17/2007	D7-S6 LM19N 8/17/2007	D7d1-AC-1 (6.0-6.5) L070904-02/LO36A 9/4/2007	D7d1-AC-2 L070904-17/LO63H 9/5/2007	D7d1-AC-3 L070904-23 9/6/2007	D7d1-AC-4 L070904-24 9/6/2007	D7d2-AC-2 (6.0-6.5) L070904-04/LO36C 9/4/2007	D7d2-AC-3 L070904-08/LO36D 9/4/2007	D7d2-S1 L070904-25 9/6/2007	D7d2-S1a LR78H 9/28/2007	D7d3-AC-1 (6.0-6.5) L070904-03/LO36B 9/4/2007
PETROLEUM HYDROCARBONS																
NWTPH-HCID (mg/kg)																
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																
Diesel Range Hydrocarbons	2000	50 U	35	76	57	8.9	31	130	50 U	180	50 U	50 U	50 U	50 U	NA	50 U
Motor Oil	2000	100 U	300	390	350	14 U	450	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	100 U
Mineral Spirits	4000	20 U	NA	NA	NA	NA	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	NA	20 U
Gasoline (mg/kg)																
Method 8021/NWTPH-G																
Gasoline	30/100 (b)	20 U	NA	NA	NA	NA	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	NA	20 U
BTEX (µg/kg)																
EPA Method 8021																
Benzene	290	30 U	NA	NA	NA	NA	NA	30 U	30 U	30 U	30 U	30 U	30 U	30 U	NA	30 U
Toluene	110,000	100 U	NA	NA	NA	NA	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	100 U
Ethylbenzene	18,000	50 U	NA	NA	NA	NA	NA	50 U	50 U	50 U	50 U	50 U	50 U	50 U	NA	50 U
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		150 U	NA	NA	NA	NA	NA	150 U	150 U	150 U	150 U	150 U	150 U	150 U	NA	150 U
cPAHs (µg/kg)																
SW8270D																
Benzo(a)anthracene	TEQ	NA	64 U	65 U	94	64 U	65 U	65 U	560 U	NA	NA	66 U	62 U	NA	64 U	64 U
Chrysene	TEQ	NA	64 U	65 U	140	64 U	65 U	65 U	560 U	NA	NA	66 U	62 U	NA	64 U	64 U
Benzo(b)fluoranthene	TEQ	NA	64 U	65 U	110	64 U	65 U	65 U	560 U	NA	NA	66 U	62 U	NA	64 U	64 U
Benzo(k)fluoranthene	TEQ	NA	64 U	65 U	110	64 U	65 U	65 U	560 U	NA	NA	66 U	62 U	NA	64 U	64 U
Benzo(a)pyrene	0.14	NA	64 U	65 U	86	64 U	65 U	65 U	560 U	NA	NA	66 U	62 U	NA	64 U	64 U
Indeno(1,2,3-cd)pyrene	TEQ	NA	64 U	65 U	64 U	64 U	65 U	65 U	560 U	NA	NA	66 U	62 U	NA	64 U	64 U
Dibenz(a,h)anthracene	TEQ	NA	64 U	65 U	64 U	64 U	65 U	65 U	560 U	NA	NA	66 U	62 U	NA	64 U	64 U
TEQ	140	NA	ND	ND	119	ND	ND	ND	ND	NA	NA	ND	ND	NA	ND	ND
TOTAL METALS (mg/kg)																
SW6000-7000 Series																
Arsenic	20	NA	5	13	14	8	7	NA	NA	NA	NA	NA	NA	NA	6 U	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 8

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D7d3-AC-4 L070904-18/LO63G 9/5/2007	D7d3-AC-5 L070904-19 9/5/2007	D7d3-AC-5a LR78G 9/28/2007	D7d3-AC-7 L070904-21 9/5/2007	D7d3/D7d4-OVB1 L070904-05/LO11A 9/4/2007	D7d3/D7d4-OVB2 L070904-06/LO11B 9/4/2007	D7d3/D7d4-OVB3 L070904-07/LO11C 9/4/2007	D7d3-S1 LP24D 9/12/2007	D7d3-S1 LR78D 9/28/2007	D7d3-S2 LR78C 9/28/2007	D7d3-S3 LR78E 9/28/2007	D7d4-AC-2 LO63L 9/6/2007	D7d4-AC-4 L070904-29 9/7/2007	D7d4-AC-4b L070904-30 9/7/2007	D7d4-AC-5 L070904-31 9/7/2007	D7d4-AC-5b L070904-32 9/7/2007
PETROLEUM HYDROCARBONS																	
NWTPH-HCID (mg/kg)																	
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																	
Diesel Range Hydrocarbons	2000	50 U	50 U	NA	200	50 U	50 U	980	6.6 U	37	6.3 U	6.8 U	53	50 U	750	50 U	50 U
Motor Oil	2000	100 U	100 U	NA	100 U	100 U	100 U	100 U	13 U	14	13 U	14 U	22	100 U	100 U	100 U	100 U
Mineral Spirits	4000	20 U	20 U	NA	20 U	20 U	20 U	20 U	NA	NA	NA	NA	NA	20 U	20 U	20 U	20 U
Gasoline (mg/kg)																	
Method 8021/NWTPH-G																	
Gasoline	30/100 (b)	20 U	20 U	NA	20 U	20 U	20 U	20 U	5.8 U	NA	NA	NA	21	20 U	20 U	20 U	20 U
BTEX (µg/kg)																	
EPA Method 8021																	
Benzene	290	30 U	30 U	NA	30 U	30 U	30 U	30 U	29 U	NA	NA	NA	30 U	30 U	30 U	30 U	30 U
Toluene	110,000	100 U	100 U	NA	100 U	100 U	100 U	100 U	29 U	NA	NA	NA	30 U	100 U	100 U	100 U	100 U
Ethylbenzene	18,000	50 U	50 U	NA	50 U	50 U	50 U	50 U	29 U	NA	NA	NA	30 U	50 U	50 U	50 U	50 U
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	58 U	NA	NA	NA	60 U	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	29 U	NA	NA	NA	30 U	NA	NA	NA	NA
Xylenes (total)		150 U	150 U	NA	150 U	150 U	150 U	150 U	NA	NA	NA	NA	NA	150 U	150 U	150 U	150 U
cPAHs (µg/kg)																	
SW8270D																	
Benzo(a)anthracene	TEQ	64 U	NA	66 U	NA	66 U	63 U	64 U	66 U	66 U	67 U	64 U	NA	NA	NA	NA	NA
Chrysene	TEQ	64 U	NA	66 U	NA	66 U	63 U	64 U	66 U	66 U	67 U	64 U	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	TEQ	64 U	NA	66 U	NA	66 U	63 U	64 U	66 U	66 U	67 U	64 U	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	TEQ	64 U	NA	66 U	NA	66 U	63 U	64 U	66 U	66 U	67 U	64 U	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.14	64 U	NA	66 U	NA	66 U	63 U	64 U	66 U	66 U	67 U	64 U	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	TEQ	64 U	NA	66 U	NA	66 U	63 U	64 U	66 U	66 U	67 U	64 U	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	TEQ	64 U	NA	66 U	NA	66 U	63 U	64 U	66 U	66 U	67 U	64 U	NA	NA	NA	NA	NA
TEQ	140	ND	NA	ND	NA	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
TOTAL METALS (mg/kg)																	
SW6000-7000 Series																	
Arsenic	20	NA	NA	7	NA	7	7	7	7	6	6 U	6 U	NA	NA	NA	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	NA	NA	NA	NA	16.8	18.7	14.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D7d4-S3	D7d5-B1	D7d5-s1a	D7x-B1	D7x-B2	D7x-B3	D7x-B4	D7x-B5	D7x-B6	D7x-B7	D7x-B8	D7x-S1	D7x-s2	D7x-s3	D7x-s4	D8-BN	D8-BS
		LR78F	LS45A	LU83D	LS46A	LS46B	LS46C	LS46D	LS46E	LS46F	LS46G	LS46H	LT38C	LR79B	LR79C	LR79D	MD33A	MD33B
		9/28/2007	10/2/2007	10/23/2007	10/3/2007	10/3/2007	10/3/2007	10/3/2007	10/3/2007	10/3/2007	10/3/2007	10/3/2007	10/10/2007	10/1/2007	10/1/2007	10/1/2007	12/20/2007	12/20/2007
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2000	5.8 U	6.5 U	NA	140	110	22	35	47	60	110	170	640	9.3	6.1 U	6.6 U	NA	NA
Motor Oil	2000	12 U	13 U	NA	370	35	23	15 U	15 U	13 U	29	13	440	18	12 U	13 U	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	30/100 (b)	NA	NA	NA	14	27	13 U	18	20	18	20	42	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	23 U	25 U	32 U	30 U	30 U	23 U	41 U	22 U	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	23 U	25 U	32 U	30 U	30 U	23 U	41 U	22 U	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	23 U	25 U	32 U	30 U	30 U	23 U	41 U	22 U	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	46 U	51 U	64 U	60 U	60 U	45 U	82 U	44 U	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	23 U	25 U	32 U	30 U	30 U	23 U	41 U	22 U	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	TEQ	65 U	65 U	62 U	NA	NA	NA	NA	NA	NA	NA	NA	65 U	66 U	65 U	66 U	66 U	66 U
Chrysene	TEQ	65 U	65 U	62 U	NA	NA	NA	NA	NA	NA	NA	NA	65 U	66 U	65 U	66 U	66 U	66 U
Benzo(b)fluoranthene	TEQ	65 U	65 U	62 U	NA	NA	NA	NA	NA	NA	NA	NA	65 U	66 U	65 U	66 U	66 U	66 U
Benzo(k)fluoranthene	TEQ	65 U	65 U	62 U	NA	NA	NA	NA	NA	NA	NA	NA	65 U	66 U	65 U	66 U	66 U	66 U
Benzo(a)pyrene	0.14	65 U	65 U	62 U	NA	NA	NA	NA	NA	NA	NA	NA	65 U	66 U	65 U	66 U	66 U	66 U
Indeno(1,2,3-cd)pyrene	TEQ	65 U	65 U	62 U	NA	NA	NA	NA	NA	NA	NA	NA	65 U	66 U	65 U	66 U	66 U	66 U
Dibenz(a,h)anthracene	TEQ	65 U	65 U	62 U	NA	NA	NA	NA	NA	NA	NA	NA	65 U	66 U	65 U	66 U	66 U	66 U
TEQ	140	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	7	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	7	6	6	6 U	6 U	6
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D8-SW MD33C 12/20/2007	D8-SE MD33D 12/20/2007	D8-SS MD33E 12/20/2007	D8-SNa ME14E 1/2/2008	D8-SSa ME14F 1/2/2008	D-8-1 (1-2) KW35F 4/25/2007	D-8-2 (0-0.5) KW35C/KX38Q 4/25/2007	D-8-2 (1-2) KW35D 4/25/2007	D-8-3 (0-0.5) KW35A/KX38P 4/25/2007	D-8-3 (1-2) KW35B 4/25/2007	D-8-4 (0-0.5) KW30S/KX38J 4/25/2007	D-8-4 (1-2) KW30T 4/25/2007	D-9-3 (0-0.5) KW48AI/KX96M 4/26/2007	D-9-5 (0-0.5) KW48AK/KX96O 4/26/2007	D9a-B1 LD76G 6/15/2007	D9a-B2 LD76H 6/15/2007	D9a-B3 LK17A 8/6/2007	D9a-S1 LD76E 6/15/2007
PETROLEUM HYDROCARBONS																			
NWTPH-HCID (mg/kg)																			
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																			
Diesel Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																			
Method 8021/NWTPH-G																			
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																			
EPA Method 8021																			
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																			
SW8270D																			
Benzo(a)anthracene	TEQ	64 U	66 U	64 U	63 U	NA	64 U	NA	66 U	NA	64 U	NA	64 U	65 U	NA	61 U	62 U	63 U	62 U
Chrysene	TEQ	64 U	66 U	64 U	63 U	NA	64 U	NA	88	NA	64 U	NA	64 U	65 U	NA	61 U	62 U	63 U	130
Benzo(b)fluoranthene	TEQ	64 U	66 U	64 U	63 U	NA	64 U	NA	96	NA	64 U	NA	64 U	65 U	NA	61 U	62 U	63 U	140
Benzo(k)fluoranthene	TEQ	64 U	66 U	64 U	63 U	NA	64 U	NA	82	NA	64 U	NA	64 U	65 U	NA	61 U	62 U	63 U	130
Benzo(a)pyrene	0.14	64 U	66 U	64 U	63 U	NA	64 U	NA	66 U	NA	64 U	NA	64 U	65 U	NA	61 U	62 U	63 U	62 U
Indeno(1,2,3-cd)pyrene	TEQ	64 U	66 U	64 U	63 U	NA	64 U	NA	66 U	NA	64 U	NA	64 U	65 U	NA	61 U	62 U	63 U	62 U
Dibenz(a,h)anthracene	TEQ	64 U	66 U	64 U	63 U	NA	64 U	NA	66 U	NA	64 U	NA	64 U	65 U	NA	61 U	62 U	63 U	62 U
TEQ	140	ND	ND	ND	ND	NA	ND	NA	19	NA	ND	NA	ND	ND	NA	ND	ND	ND	28.3
TOTAL METALS (mg/kg)																			
SW6000-7000 Series																			
Arsenic	20	6 U	6	55	NA	5 U	5 U	8	5 U	6	6	6	5	7	12	5 U	11	5 U	20
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D9a-S2 LD76F 6/15/2007	D9b-B1 LD76D 6/15/2007	D9b-S2 LD76B 6/15/2007	D9b-S3 LD76C 6/15/2007	D9c-B1 LD76K 6/15/2007	D9c-S1a LG47A 7/3/2007	D9c-S2 LD76J 6/15/2007	D10-B1 (3-3.5) LC16A 6/5/2007	D10-B2 (3-3.5) LC16B 6/5/2007	D10-B3 LD62A 6/14/2007	D10-B4 LD62B 6/14/2007	D10-B5 LD62M 6/14/2007	D10-B6 LD62L 6/14/2007	D10-B7 LD62K 6/14/2007	D10-B8 LD62N 6/14/2007
PETROLEUM HYDROCARBONS																
NWTPH-HCID (mg/kg)																
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																
Diesel Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																
Method 8021/NWTPH-G																
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																
EPA Method 8021																
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																
SW8270D																
Benzo(a)anthracene	TEQ	60 U	64 U	66 U	62 U	NA	NA	NA	66 U	65 U	65 U	63 U	NA	NA	NA	NA
Chrysene	TEQ	60 U	64 U	66 U	62 U	NA	NA	NA	66 U	65 U	65 U	63 U	NA	NA	NA	NA
Benzo(b)fluoranthene	TEQ	60 U	64 U	66 U	62 U	NA	NA	NA	66 U	65 U	65 U	63 U	NA	NA	NA	NA
Benzo(k)fluoranthene	TEQ	60 U	64 U	66 U	62 U	NA	NA	NA	66 U	65 U	65 U	63 U	NA	NA	NA	NA
Benzo(a)pyrene	0.14	60 U	64 U	66 U	62 U	NA	NA	NA	66 U	65 U	65 U	63 U	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	TEQ	60 U	64 U	66 U	62 U	NA	NA	NA	66 U	65 U	65 U	63 U	NA	NA	NA	NA
Dibenz(a,h)anthracene	TEQ	60 U	64 U	66 U	62 U	NA	NA	NA	66 U	65 U	65 U	63 U	NA	NA	NA	NA
TEQ	140	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA	NA
TOTAL METALS (mg/kg)																
SW6000-7000 Series																
Arsenic	20	8	8	14	6	13	6 U	11	13	6	9	5 U	5	6	6	5 U
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	0.2 U	0.2 U	NA	NA	NA	NA	NA	NA
Copper	36 (c)	NA	NA	NA	NA	NA	NA	NA	19.6	12.9	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	3	2 U	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.04 U	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 8

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D10-B9 LD62J 6/14/2007	D10-B10 LD62I 6/14/2007	D10-B11 LD62E 6/14/2007	D10-B12 LE77A 6/22/2007	D10-B13 LE77B 6/22/2007	D10-S1 (0.5-3) LC16C 6/5/2007	D10-S3 (0.5-3) LC16E 6/5/2007	D10-S4 LD76N 6/15/2007	D10-S5 LD76O 6/14/2007	D10-S6 LD62F 6/14/2007	D10-S7A LF29A 6/28/2007	D10-S8 LD62C 6/14/2007	D10-S9A LF29B 6/28/2007	D10-S10 LD62H 6/14/2007	D10-S11 LE77C 6/22/2007	D10-S12 LE77D 6/22/2007
PETROLEUM HYDROCARBONS																	
NWTPH-HCID (mg/kg)																	
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																	
Diesel Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																	
Method 8021/NWTPH-G																	
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																	
EPA Method 8021																	
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																	
SW8270D																	
Benzo(a)anthracene	TEQ	NA	NA	NA	NA	NA	66 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	TEQ	NA	NA	NA	NA	NA	66 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	TEQ	NA	NA	NA	NA	NA	66 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	TEQ	NA	NA	NA	NA	NA	77	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.14	NA	NA	NA	NA	NA	66 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	TEQ	NA	NA	NA	NA	NA	66 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	TEQ	NA	NA	NA	NA	NA	66 U	65 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	140	NA	NA	NA	NA	NA	7.7	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL METALS (mg/kg)																	
SW6000-7000 Series																	
Arsenic	20	7	5 U	7	6 U	6 U	18	20	19	15	12	6	11	6	7	10 U	9
Cadmium	80	NA	NA	NA	NA	NA	0.2 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	NA	NA	NA	NA	NA	31.9	23.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	11	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	0.05 U	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D10-S13	D10-S14	D11-B1	D11-B2	D11-B3a	D11-B4	D11-B5	D11-B6	D11-B7a	D11-B8a	D11-B9	D11-B10a	D11-B11	D11-CB1	D11-S1	D11-S2a
		LE77E	LE77F	LH86G	LH86H	LJ71C	LD66B	LH86J	LH86K	LJ71E	LF28A	LH86M	LJ71D	LD66D	LH84E	LH86A	LJ71A
		6/22/2007	6/22/2007	7/17/2007	7/16/2007	8/1/2007	6/14/2007	7/16/2007	7/16/2007	8/1/2007	6/28/2007	7/16/2007	8/1/2007	6/14/2007	7/17/2007	7/17/2007	8/1/2007
PETROLEUM HYDROCARBONS																	
NWTPH-HCID (mg/kg)																	
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																	
Diesel Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																	
Method 8021/NWTPH-G																	
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																	
EPA Method 8021																	
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																	
SW8270D																	
Benzo(a)anthracene	TEQ	NA	NA	65 U	62 U	65 U	66 U	60 U	64 U	65 U	65 U	63 U	63 U	64 U	NA	63 U	65 U
Chrysene	TEQ	NA	NA	65 U	62 U	65 U	66 U	60 U	64 U	65 U	65 U	63 U	63 U	64 U	NA	63 U	65 U
Benzo(b)fluoranthene	TEQ	NA	NA	65 U	62 U	65 U	66 U	60 U	64 U	65 U	65 U	63 U	63 U	64 U	NA	63 U	65 U
Benzo(k)fluoranthene	TEQ	NA	NA	65 U	62 U	65 U	66 U	60 U	64 U	65 U	65 U	63 U	63 U	64 U	NA	63 U	65 U
Benzo(a)pyrene	0.14	NA	NA	65 U	62 U	65 U	66 U	60 U	64 U	65 U	65 U	63 U	63 U	64 U	NA	63 U	65 U
Indeno(1,2,3-cd)pyrene	TEQ	NA	NA	65 U	62 U	65 U	66 U	60 U	64 U	65 U	65 U	63 U	63 U	64 U	NA	63 U	65 U
Dibenz(a,h)anthracene	TEQ	NA	NA	65 U	62 U	65 U	66 U	60 U	64 U	65 U	65 U	63 U	63 U	64 U	NA	63 U	65 U
TEQ	140	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
TOTAL METALS (mg/kg)																	
SW6000-7000 Series																	
Arsenic	20	6	7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 U	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 8

TABLE G-1
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA D
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	D11-S3 LH86C 7/16/2007	D11-S4 LD66A 6/14/2007	D11-S5 LD66E 6/14/2007	D11-S6 LH86D 7/16/2007	D11-S7 LH86E 7/16/2007	D11-S8a LJ71B 8/1/2007	DX-1 (0-0.5) KX54A/KY42J 4/25/2007	EBS-3 (0.9-1.4) KX36J 5/1/2007	SBS-1 (1.3-2.0) KW48AL 4/26/2007	SBS-2 (0.8-1.3) KW48AM 4/26/2007	SBS-3 (0.8-1.3) KW48AO 4/26/2007	SBS-4 (0.8-1.3) KW48AN 4/26/2007	SBS-5 (1-1.6) KX36N 5/1/2007
PETROLEUM HYDROCARBONS														
NWTPH-HCID (mg/kg)														
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)														
Diesel Range Hydrocarbons	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)														
Method 8021/NWTPH-G														
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)														
EPA Method 8021														
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	110,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	150,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)														
SW8270D														
Benzo(a)anthracene	TEQ	63 U	65 U	64 U	61 U	86	64 U	65 UJ	63 U	65 U	62 U	64 U	64 U	65 U
Chrysene	TEQ	63 U	65 U	72	61 U	100	64 U	76 J	63 U	65 U	62 U	64 U	64 U	65 U
Benzo(b)fluoranthene	TEQ	63 U	65 U	64 U	61 U	130	64 U	65 UJ	63 U	65 U	62 U	64 U	64 U	65 U
Benzo(k)fluoranthene	TEQ	63 U	65 U	68	61 U	92	64 U	91 J	63 U	65 U	62 U	64 U	64 U	65 U
Benzo(a)pyrene	0.14	63 U	65 U	64 U	61 U	100	64 U	65 UJ	63 U	65 U	62 U	64 U	64 U	65 U
Indeno(1,2,3-cd)pyrene	TEQ	63 U	65 U	64 U	61 U	60 U	64 U	65 UJ	63 U	65 U	62 U	64 U	64 U	65 U
Dibenz(a,h)anthracene	TEQ	63 U	65 U	64 U	61 U	60 U	64 U	65 UJ	63 U	65 U	62 U	64 U	64 U	65 U
TEQ	140	ND	ND	7.5	ND	132	ND	9.9 J	ND	ND	ND	ND	ND	ND
TOTAL METALS (mg/kg)														
SW6000-7000 Series														
Arsenic	20	NA	NA	NA	NA	NA	NA	6	5 U	6	6	7	7	5 U
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	36 (c)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ND = Not Detected.
NA = Not Analyzed
U = Indicates the analyte was not detected in the sample at the given reporting limit.
J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected in the sample; the reported sample reporting limit is an estimate.
Boxed cells indicate an exceedance of the preliminary cleanup level.

(a) Development of soil cleanup levels is prepsented in Table 6 of this work plan.
(b) MTCA Method A cleanup level is 30 mg/kg when benzene is present and 100 mg/kg when benzene is not present.
(c) In Area D, the soil preliminary cleanup levels protective of groundwater as marine surface water is used for copper because copper has previously been detected in groundwater; Copper proposed cleanup level is 36 mg/kg for the ACC North Yard based on its presence in groundwater in that portion of the site. in this area at concentrations above the cleanup screening level.

TABLE G-2
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA E
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	E1a-B1	E1a-B2	E1a-B3	E1a-B4	E1a-B5	E1a-B6	E1a-S1	E1a-S2	E1b-B1	E1b-B2	E1b-B3	E1b-B4	E1b-B5	E1b-B6	E1b-S1	E1b-S2	E2-B1
		JQ34A	JQ34B	JQ34C	JQ34D	JQ34E	JQ34F	JQ34M	JQ34N	JQ34G	JQ34H	JQ34I	JQ34J	JQ34K	JQ34L	JQ34O	JQ34P	JS41L
		7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	7/21/2006	8/9/2006
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	140	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	7	13	11	9	9	6	9	6	15	5 U	5 U	13	8	7	9	11	9
Cadmium	80	0.2 U	0.3	0.3	0.3	0.2 U	0.2 U	0.2 U	0.2 U	0.5	0.2 U	0.2 U	0.7	0.2 U	0.3	0.2 U	0.3	0.2 U
Copper	3,000	16.5	23.9	24.2	22.4	18.7	13.9	29.1	15.9	33.1	2.2	2.6	26.2	22.7	19.8	15.7	27.8	41.3
Lead	250	6	21	24	11	10	3	8	6	18	2 U	2 U	20	10	31	5	13	3
Mercury	24	0.04 U	0.04	0.04	0.05 U	0.04 U	0.04 U	0.04 U	0.04 U	0.05 U	0.04 U	0.04 U	0.05 U	0.04 U	0.04 U	0.04 U	0.04	0.05 U
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 10 (Soil E)

TABLE G-2
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA E
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	E2-B2	E2-S1	E2-S2	E2-S3	E2-S4	E-3-1	E-3-3	E-3-5	E-3-7	E-3-8	E-3-10	E-3-11	E-3-12	E3-B1	E3-B2	E3-B3	E3-B4
							(4.5-5.5)	(3.5-4.5)	(5-6)	(5-7)	(3.5-4.5)	(4-5)	(4-5)	(5-6)				
		JS41M	JS41H	JS41I	JS41J	JS41K	JJ12N	JJ12P	JJ12M	JJ12I	JJ12G	JJ12E	JJ12H	JJ12K	L070606-51	L070606-52	L070606-53	L070606-54
		8/9/2006	8/9/2006	8/9/2006	8/9/2006	8/9/2006	5/10/2006	5/10/2006	5/10/2006	5/10/2006	5/10/2006	5/10/2006	5/10/2006	5/10/2006	6/8/2007	6/8/2007	6/8/2007	6/8/2007
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 U	20 U	20 U	20 U
Diesel	2,000	NA	NA	NA	NA	NA	NA	400	7.0 U	1000	36	21	6.1 U	11	50 U	50 U	50 U	50 U
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	120	14 U	73 U	260	210	12	26	100 U	100 U	100 U	100 U
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	140	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	8	10	5 U	13	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,000	22.9	23.2	24.3	23	30.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	3	7	5	4	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	0.05 U	0.05 U	0.04 U	0.05 U	0.04 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 10 (Soil E)

TABLE G-2
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA E
WEST END SITE
EVERETT, WASHINGTON

		E3-B5	E3-B6	E3-B7	E3-B8	E3-B9	E3-S1	E3-S2	E3-S3	E3-S4	E3-S5A	E3-S6	E3-S7	E3-S8	E3-S9	E3-S10A	E3-S11	E3-S12
	Preliminary Cleanup Levels (a)	L070606-55 6/8/2007	L070606-56 6/8/2007	LH82A 7/6/2007	LH82B 7/6/2007	LE77G 6/25/2007	L070606-44 6/8/2007	L070606-45 6/8/2007	L070606-46 6/8/2007	L070606-47 6/8/2007	L070606-60 6/8/2007	L070606-49 6/8/2007	L070606-50 6/8/2007	L070606-57 6/8/2007	L070606-58 6/8/2007	LC96A 6/12/2007	LE77I 6/25/2007	LE77J 6/25/2007
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	20 U	20 U	NA	NA	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	NA	NA	NA
Diesel	2,000	50 U	50 U	NA	NA	NA	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	NA	NA	NA
Motor Oil	2,000	100 U	100 U	NA	NA	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	27	6.5 U	6.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	29	5.8 U	6.1 U
Motor Oil	2,000	NA	NA	76	14	13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	14 U	12 U	12 U
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	140	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-2
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA E
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	E3-S13	E3-NW Corner	E3-TP1-7	E3-TP2-4	E3-TP3-4.5	E3-TP4-3.5	E3-TP4-5	E3-TP6-4.5	E3-EW-6	E3-WW-5	E4-B1	E4-B2	E4-B8	E4-S1	E4-S2	E4-S3	E4-S4
		LE77H	LE77K	L070606-8	L070606-13	L070606-12	L070606-11	L070606-10	L070606-20	L070606-17	L070606-18	L070606-42	L070606-43	L070606-3	L070606-33	L070606-34	L070606-35	L070606-36
		6/25/2007	6/25/2007	6/6/2007	6/6/2007	6/6/2007	6/6/2007	6/6/2007	6/6/2007	6/6/2007	6/6/2007	6/8/2007	6/8/2007	6/6/2007	6/8/2007	6/8/2007	6/8/2007	6/8/2007
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Diesel	2,000	NA	NA	50 U	50 U	50 U	50 U	50 U	180	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Motor Oil	2,000	NA	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	5.6 U	900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	11 U	18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	140	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 10 (Soil E)

TABLE G-2
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA E
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	E4-S5 L070606-37 6/8/2007	E4-S6 L070606-38 6/8/2007	E4-S7 L070606-39 6/8/2007	E4-S8 L070606-40 6/8/2007	E4-S9 L070606-41 6/8/2007	E4-EW-6 L070606-4 6/6/2007	E4-NW-5 L070606-2 6/6/2007	E4-SB-7 L070606-32 6/7/2007	E4-SP-1 L070606-7 6/6/2007	E4-SP-2 L070606-6 6/6/2007	E4-SW-4.5 L070606-15 6/6/2007	E4-SW-5.5 L070606-14 6/6/2007	E4-SW-5.5 L070606-31 6/7/2007	E4-SW-6 L070606-5 6/6/2007	E4-SW-7 L070606-1 6/6/2007	E4-WW-5.5 L070606-30 6/7/2007	E-FA-1 (5-5.5) HQ96C 1/27/2005
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	NA
Diesel	2,000	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	410	50 U	850	50 U	50 U	50 U	80	50 U	NA
Motor Oil	2,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.0 U
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	140	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-2
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA E
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	E-FA-2b (3.8-4.2) HQ96F 1/27/2005	E-FA-4 (7-7.5) HQ96B 1/27/2005	E-FA-5 (4.5-4.9) HP78C 1/18/2005	E-GC-1b (0-0.5) HU67F 3/3/2005	E-GC-1.1S (0.5-1.0) JD05T 3/2/2006	E-GC-1c.1SW (0-0.5) JD05U 3/2/2006	E-GC-2 (0-0.5) HP08M 1/12/2005	E-GC-3 (0-0.5) HP08R 1/12/2005	E-GC-4 (0.5-1.0) HP08O 1/12/2005	E-GC-4 (1.5-2.5) HP08P 1/12/2005	E-GC-4g (3.5-4.0) HP10P 1/12/2005	E-GC-5.1S (1.5-2.0) JJ13L 5/9/2006	E-GC-5.1E (1.0-1.5) JD05AA 3/2/2006	E-GC-5.1N (1.0-1.5) JD05Z 3/2/2006
PETROLEUM HYDROCARBONS **NWTPH-HCID (mg/kg)**															
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	22 U	22 U	21 U	23 U	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	>54	54 U	53 U	59 U	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	>120	110 U	>100	120 U	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)															
Diesel Range Hydrocarbons	2,000	610	330 J	210	NA	NA	NA	110	NA	35	NA	5.0 U	NA	NA	NA
Motor Oil	2,000	180	18 J	630	NA	NA	NA	1300	NA	360	NA	10 U	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg) **Method 8021/NWTPH-G**															
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg) **EPA Method 8021**															
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22 U	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22 U	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	44 U	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22 U	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg) **SW8270D**															
Benzo(a)anthracene	--	NA	NA	NA	NA	NA	NA	63 U	64 U	66 U	65 U	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	63 U	64 U	66 U	65 U	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	63 U	64 U	66 U	65 U	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	63 U	64 U	66 U	65 U	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	63 U	64 U	66 U	65 U	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	63 U	64 U	66 U	65 U	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	63 U	64 U	66 U	65 U	NA	NA	NA	NA
TEQ	140	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	NA	NA	NA	NA
TOTAL METALS (mg/kg) **SW6000-7000 Series**															
Arsenic	20	NA	NA	NA	8	9	20	6	5 U	5	NA	NA	8	15	12
Cadmium	80	NA	NA	NA	0.7	NA	NA	0.2 U	0.2 U	0.2 U	NA	NA	NA	NA	NA
Copper	3,000	NA	NA	NA	16.8	NA	NA	15.7	9.0	20.5	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	26	NA	NA	43	5	4	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	0.05 U	NA	NA	0.05 U	0.04 U	0.05 U	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	74.2	NA	NA	46.9	30.2	35.6	NA	NA	NA	NA	NA

NA = Not Analyzed.
ND = Not Detected.
U = Indicates the analyte was not detected in the sample at the given reporting limit.
J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
Boxed cells indicate an exceedance of the preliminary cleanup level.

(a) Development of soil cleanup screening levels is presented in Table 6 of this work plan.
(b) MTCA Method A cleanup level is 30 mg/kg when benzene is present and 100 mg/kg when benzene is not present.

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Screening Levels (a)	AFD-1.4 (0.7-2.0) JY47I 9/26/2006	AFD-1.6 (0-0.9) JY47O 9/26/2006	AFD-1.8 (0.6-1.1) JY47Q 9/26/2006	AFD-2.3 (1.6-2.6) JY47G 9/26/2006	AFD-2.4 (0.4-1.4) JY47F 9/26/2006	AFD-2.5 (1.3-2.8) JY47E 9/26/2006	AFD-2.6 (0-1.6) JY47K 9/26/2006	AFD-2.7 (2.4-3.2) JY47L 9/26/2006	AFD-2.8 (2.9-3.4) JY47M 9/26/2006	AFD-2.9 (2-2.8) JY47N 9/26/2006	AFD-3.3 (2.4-5.2) JY47B 9/26/2006	AFD-3.4 (1.2-5.0) JY47C 9/26/2006	AFD-3.5 (2.0-5.2) JY47D 9/26/2006	AFD-3.7 (1.1-1.9) JY48C 9/27/2006	AFD-4.5 (2.1-3.1) JY46Q 9/26/2006	AFD-4.6 (2.0-4.6) JY47A 9/26/2006	AFD-4.7 (0.7-1.3) JY48D 9/27/2006
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	170	89	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	360	180	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	180	120	130	140	130	150	180	64 U	65 U	65 U	130	150	140	110	63 U	100	120
Chrysene	--	230	160	170	190	170	220	140	64 U	65 U	65 U	130	210	160	160	65	130	180
Benzo(b)fluoranthene	--	97	68	83	77	64 U	95	71	64 U	65 U	65 U	69	93	78	68	63 U	65 U	63 U
Benzo(k)fluoranthene	--	130	67	81	67	81	89	110	64 U	65 U	65 U	69	100	67	69	63 U	69	98
Benzo(a)pyrene	--	93	64 U	66 U	66	64 U	64	76	64 U	65 U	65 U	66 U	71	64 U	65 U	63 U	65 U	63 U
Indeno(1,2,3-cd)pyrene	--	63 U	64 U	66 U	65 U	64 U	64 U	65 U	64 U	65 U	65 U	66 U	66 U	64 U	65 U	63 U	65 U	63 U
Dibenz(a,h)anthracene	--	63 U	64 U	66 U	65 U	64 U	64 U	65 U	64 U	65 U	65 U	66 U	66 U	64 U	65 U	63 U	65 U	63 U
TEQ	140	136	27.1	31.1	96.3	22.8	100	114	ND	ND	ND	28.1	107	30.3	26.3	0.65	18.2	23.6
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Screening Levels (a)	AFD-5.2 (0-1.4) JY46F 9/26/2006	AFD-5.3 (0-1.5) JY46E 9/26/2006	AFD-5.4 (0-1.0) JY46N 9/26/2006	AFD-5.5 (0.9-2.2) JY46O 9/26/2006	AFD-5.6a (1.0-2.8) JY46P 9/26/2006	AFD-5.6b (0.8-1.9) JY48E 9/27/2006	AFD-5.7 (0.9-1.8) JY48F 9/27/2006	AFD-6.0 (1.5-2.0) JY46D 9/26/2006	AFD-6.1 (1.3-2.0) JY46C 9/26/2006	AFD-6.2 (0.9-1.9) JY46B 9/26/2006	AFD-6.3 (0.5-2.5) JY46A 9/26/2006	AFD-6.4 (0.8-4) JY46L 9/26/2006	AFD-6.5 (1.8-3) JY46M 9/26/2006	AFD-7.1 (0.5-1.5) JY46I 9/26/2006	AFD-7.3 (0.4-4) JY46H 9/26/2006	AFD-8.2 (0.6-2.4) JY46J 9/26/2006	AFD-8.3 (1.1-1.8) JY46K 9/26/2006
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	170	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	300	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	110	66 U	120	160	120	190	200	63 U	66 U	65 U	120	63 U	250	66 U	66	120 M	100
Chrysene	--	180	98	180	170	200	250	250	63 U	66 U	270	160	89	240	66 U	84	560 M	150
Benzo(b)fluoranthene	--	75	66 U	66	86	70	87	110	63 U	66 U	65 U	72	63 U	100	66 U	64 U	65 U	70
Benzo(k)fluoranthene	--	74	66 U	70	74	110	86	110	63 U	66 U	65 U	100	63 U	87	66 U	64 U	65 U	79
Benzo(a)pyrene	--	64 U	66 U	64 U	72	86	69	88	63 U	66 U	65 U	77	63 U	76	66 U	64 U	65 U	65 U
Indeno(1,2,3-cd)pyrene	--	64 U	66 U	64 U	63 U	66 U	66 U	64 U	63 U	66 U	65 U	66 U	63 U	66 U	66 U	64 U	65 U	65 U
Dibenz(a,h)anthracene	--	64 U	66 U	64 U	63 U	66 U	66 U	64 U	63 U	66 U	65 U	66 U	63 U	66 U	66 U	64 U	65 U	65 U
TEQ	140	27.7	0.98	27.4	106	118	108	132	ND	ND	2.7	108	0.89	122	ND	7.4	17.6	26.4
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Screening Levels (a)	F1a-B1	F1a-B2	F1a-B4	F1a-S1	F1a-S3	F1a-S4	F8F-S1a	F1b-ADD-B1	F1b-ADD-B2a	F1b-ADD-B3	F1b-ADD-B4	F1b-ADD-B5	F1b-ADD-B6	F1b-B1	F1b-B2a	F1b-B3	F1b-B4
		JR91A	KC63A	JR91C	JR91B	JR91D	JR91E	MO65A	LB64A	LC97A	LB64C	LB64D	LB64E	LB64F	KB28A (b)	LE43H	KB28C (b)	KB28D (b)
		8/4/2006	10/26/2006	8/4/2006	8/4/2006	8/4/2006	8/4/2006	3/24/2008	5/31/2007	6/11/2007	5/31/2007	5/31/2007	5/31/2007	5/31/2007	10/16/2006	6/21/2007	10/16/2006	10/16/2006
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2,000																	
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)																		
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene		110	NA	110	64 U	100	84	77	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	130	NA	120	64	140	99	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	64 U	NA	66 U	64 U	66 U	64 U	66 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	93	NA	66 U	64 U	66 U	64 U	66 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	64 U	NA	66 U	64 U	66 U	64 U	66 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	64 U	NA	66 U	64 U	66 U	64 U	66 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	64 U	NA	66 U	64 U	66 U	64 U	66 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	--	21.6	NA	12.2	0.6	11.4	9.4	8.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	140																	
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	6	4.0	5 U	10	5 U	5 U	NA	5 U	7	5 U	5 U	5 U	7	3.7	6	5.1	4.7
Cadmium	80	0.3	0.2	0.2	0.3	0.2 U	0.2 U	NA	0.3	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.3	NA	0.3	0.5
Copper	3,000	49.1	31.6	31.4	61.7	33.3	32.1	NA	35.7	14.0	18.0	25.6	12.8	13.6	21.3	NA	39.3	33.9
Lead	250	36	31	27	73	26	21	NA	30	2 U	8	7	2 U	2 U	4	NA	38	31
Mercury	24	0.18	0.18	0.19	0.12	0.20	0.14	NA	0.17	0.05 U	0.08	0.05	0.05 U	0.04 U	0.04 U	NA	0.15	0.14
Zinc	24,000	81.1	56	52.8	150	59.5	51.9	NA	61	38	73	46	38	35	59	NA	69	67

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Screening Levels (a)	F1b-B5 KU16A 4/4/2007	F1b-B6 KU16B 4/4/2007	F1b-B7 KU16C 4/4/2007	F1b-S1b KU16D 4/4/2007	F1b-S2 KB28F (b) 10/16/2006	F1b-UST North LB91A 6/4/2007	F1b-UST South LB91B 6/4/2007	F1b-UST East LB91C 6/4/2007	F1b-UST West LB91D 6/4/2007	F1b-UST Bottom LB91E 6/4/2007	F1C-B1 MK65D 2/27/2008	F1C-B2 MK65E 2/27/2008	F1C-S4 MK65A 2/27/2008	F1C-S5 MK65B 2/27/2008	F1C-S6 MK65C 2/27/2008	F1d.1-B1 MM95A 3/12/2008	F1d.1-B2 MM95B 3/12/2008
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline		NA	NA	NA	NA	NA	22 U	20 U	20 U	20 U	27 U	NA	NA	NA	NA	NA	NA	NA
Diesel	30/100 (b)	NA	NA	NA	NA	NA	56 U	50 U	50 U	50 U	67 U	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000 2,000	NA	NA	NA	NA	NA	110 U	100 U	100 U	100 U	140 U	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)																		
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	140																	
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	5 U	10	6 U	7	2.8	NA	NA	NA	NA	NA	6	5 U	5 U	5 U	7	5 U	8
Cadmium	80	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.3	0.2	0.5	0.4
Copper	3,000	16.4	17.8	23.7	31.5	18.2	NA	NA	NA	NA	NA	33.2	28.1	21.5	33.9	38.8	33.0	42.2
Lead	250	2	6	7	7	4	NA	NA	NA	NA	NA	11	12	3	30	26	28	19
Mercury	24	0.04 U	0.05	0.05 U	0.05 U	0.04 U	NA	NA	NA	NA	NA	0.05 U	0.11	0.05 U	0.17	0.07	0.20	0.09
Zinc	24,000	33	58	51	69	47	NA	NA	NA	NA	NA	98	47	53	83	98	57	100

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Screening Levels (a)	F1d.1-B3 MM95C 3/12/2008	F1d.1-B4 MM95D 3/12/2008	F1d.1-B5 MM95E 3/12/2008	F1d.1-B6 MM95F 3/12/2008	F1d.1-B7 MM95G 3/12/2008	F1d.1-B8 MM95H 3/12/2008	F1d.1-B9 MM95I 3/12/2008	F1d.1-B10 MM95J 3/12/2008	F1d.1-B11 MM95K 3/12/2008	Fld.1-S1 MK65Y 2/27/2008	Fld.1-S2 MK65Z 2/27/2008	Fld.1-S3 MK65AA 2/27/2008	F2-1-B1 JN24N 6/21/2006	F2-1-B2 JN24O 6/21/2006	F2-1-B3 JN24P 6/21/2006	F2-1-B4 JN24Q 6/21/2006	F2-1-B6 JN24S 6/21/2006
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000 2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)																		
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	140																	
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	6 U	6 U	8	6 U	10	6 U	6 U	6 U	6 U	11	19	20	7	5 U	5 U	5	5 U
Cadmium	80	0.2	0.3	0.3	0.4	0.5	0.5	0.7	0.4	0.4	0.6	0.6	0.8	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Copper	3,000	21.1	28.3	70.3	30.2	92.9	33.8	30.0	34.3	29.2	388	266	388	29.7	12.1	16.9	15.1	18.0
Lead	250	15	11	13	45	36	28	25	27	25	144	65	84	21	3	4	3	3
Mercury	24	0.09	0.06 U	0.06	0.20	0.12	0.17	0.16	0.12	0.14	0.06	0.32	0.31	0.08	0.05 U	0.05 U	0.04 U	0.04 U
Zinc	24,000	37	66	78	54	116	64	58	63	52	248	297	334	96.2	32.5	39.6	33.9	38.8

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Screening Levels (a)	F2-1-B7	F2-1-B8	F2-1-B9a	F2-1-S1	F2-1-S2	F2-1-S3a	F2-1-S3a(1.0-2.0)	F2-1-S4a	F2-1-S4a(1.0-2.0)	F2-1-S5	F2-1-S6	F2-1-S7	F2-1-S8	F2-2-B1	F2-2-B2	F2-2-B3	F2-2-S1
		JN24T	JN24V	JO55B	JN24B	JN24A	JO55C	JO55D	JO55F	JO55G	JN24F	JN24G	JN24H	JN24I	JN24W	JR93A	JR93B	JN24E
		6/21/2006	6/21/2006	6/30/2006	6/22/2006	6/22/2006	6/30/2006	6/30/2006	6/30/2006	6/30/2006	6/22/2006	6/22/2006	6/22/2006	6/22/2006	6/21/2006	8/4/2006	8/4/2006	6/22/2006
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2,000																	
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)																		
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	140																	
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	8	6	5	16	5 U	9	7	8	5	8	14	6	10	5 U	6 U	6 U	6
Cadmium	80	0.2 U	0.2 U	0.2 U	0.3	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Copper	3,000	20.0	22.3	21.6	85.3	16.2	27.0	18.0	28.1	14.4	28.6	49.6	19.6	40.7	23.9	17.2	16.5	17.9
Lead	250	4	3	3	35	3	14	2 U	4	2 U	7	71	5	17	4	5	4	14
Mercury	24	0.05 U	0.04 U	0.05 U	0.10	0.04 U	0.05 U	0.04 U	0.04 U	0.04 U	0.05 U	0.05 U	0.04 U	0.04	0.04 U	0.04 U	0.04 U	0.04 U
Zinc	24,000	48.9	48.2	104	231	51.9	189	40.2	57.4	38.6	69.8	203	49.5	105	42.0	47.2	50.0	70.5

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Screening Levels (a)	F2-2-S2	F2-2-S3	F2-3-B1	F2-3-B2	F2-3-S1	F3-S1	F3-S2	F3-S4	F3-B1	F3-B2	F3-S3	F-4.1NE (0-0.5)
		JN24J	JN24K	JN24U	JN24R	JN24C	KD27A	KD27B	KD27C	KD27D	KD27E	KD27F	JE81H
		6/22/2006	6/22/2006	6/21/2006	6/21/2006	6/22/2006	10/27/2006	10/27/2006	10/27/2006	10/27/2006	10/27/2006	10/27/2006	3/27/2006
PETROLEUM HYDROCARBONS													
NWTPH-HCID (mg/kg)													
Gasoline		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2,000												
NWTPH-DxSG (mg/kg)													
Diesel Range Hydrocarbons		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)													
Method 8021/NWTPH-G													
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)													
EPA Method 8021													
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)													
cPAHs (µg/kg)													
SW8270D													
Benzo(a)anthracene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TEQ	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	140												
TOTAL METALS (mg/kg)													
SW6000-7000 Series													
Arsenic	20	6	6	7	5	11	9.2	5.5	3.3	1.5	2.1	5.1	6
Cadmium	80	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4	0.3	0.3	0.2	0.2 U	0.4	NA
Copper	3,000	15.1	14.1	20.1	15.3	21.3	28.8	25.9	15.5	14.9	10.0	25.0	NA
Lead	250	10	6	5	4	25	15	15	17	2	13	15	NA
Mercury	24	0.04 U	0.05 U	0.05 U	0.04 U	0.05 U	0.04 U	0.08	0.04 U	0.05 U	0.03 U	0.04	NA
Zinc	24,000	80.0	46.4	47.6	47.4	155	78	82	83	34	31	99	NA

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 12

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	F-4.2E	F4a-B1	F4a-B2	F4a-B3	F4a-B4a	F4a-B5	F4a-B6	F4a-S1	F4a-S2	F4a-S3	F4a-S4	F4b-B1	F4b-B3	F4b-B4	F4b-B5	F4b-B6	F4b-B7
		(0-0.5)																
		JD55A	JQ13A	JQ13B	JQ13C	JQ67A	JQ13E	JQ13F	JQ13G	JQ13H	JQ13I	JQ13J	KC63B	KC63C	KC63D	KC63E	KC63F	KC63G
		3/2/2006	7/20/2006	7/20/2006	7/20/2006	7/26/2006	7/20/2006	7/20/2006	7/20/2006	7/20/2006	7/20/2006	7/20/2006	10/26/2006	10/26/2006	10/26/2006	10/26/2006	10/26/2006	10/26/2006
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	NA	61 U	66 U	64 U	64 U	66 U	120	110	110	64 U	63 U	NA	NA	NA	NA	NA	NA
Chrysene	--	NA	61 U	66 U	64 U	64 U	66 U	150	140	150	72	63 U	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	--	NA	61 U	66 U	64 U	64 U	66 U	72	85	96	64 U	63 U	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	--	NA	61 U	66 U	64 U	64 U	66 U	65 U	92	62	64 U	63 U	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	--	NA	61 U	66 U	64 U	64 U	66 U	65 U	62	62 U	64 U	63 U	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	61 U	66 U	64 U	64 U	66 U	65 U	61 U	62 U	64 U	63 U	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	NA	61 U	66 U	64 U	64 U	66 U	65 U	61 U	62 U	64 U	63 U	NA	NA	NA	NA	NA	NA
TEQ	140	NA	ND	ND	ND	ND	ND	20.7	92.1	28.3	0.7	ND	NA	NA	NA	NA	NA	NA
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	6 U	6	6 U	9	NA	7 U	6 U	6	5 U	5 U	7	3.5	5.2	3.6	4.2	4.7	1.6
Cadmium	80	NA	0.2	0.2 U	0.3 U	NA											29.2	27.1
Copper	3,000	NA	18.4	19.8	29.7	NA	24.2	33.1	41.5	31.0	29.3	22.2	25.9	35.6	32.0	34.1	29	2
Lead	250	NA	7	7	43	NA	12	31	29	28	17	9	20	35	52	28	0.14	0.04 U
Mercury	24	NA	0.04 U	0.05 U	0.05 U	NA	0.06 U	0.28	0.16	0.17	0.11	0.04	0.11	0.20	0.17	0.13	NA	NA
Zinc	24,000	NA	816	52.4	819	NA	102	63.0	100	69.5	54.7	70.7	55	63	63	79	80	34

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 12

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	F4b-S5	F4b-S7	F4b-S8	F4b-S9	F5-B1	F5-B2	F5-S2	F5-S3	F5-S4	F8a-B1	F8a-B2	F8a-S1	F8a-S2	F8a-S3	F8b-B1	F8b-B2	F8b-B3
		KC63H	KC63I	JT96J	JT96I	JR75Q	JR75P	JR75R	JR75O	JR75S	LE43A	LE43B	LE43C	LE43D	LE43E	LE14A	LE14B	LE14C
		10/26/2006	10/26/2006	8/16/2006	8/16/2006	8/2/2006	8/2/2006	8/2/2006	8/2/2006	8/2/2006	6/20/2007	6/20/2007	6/20/2007	6/20/2007	6/20/2007	6/19/2007	6/19/2007	6/19/2007
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	NA	NA	110	63 U	65 U	65 U	64 U	64 U	63 U	66 U	64 U	82	95	110	120	64 U	67 U
Chrysene	--	NA	NA	130	63 U	65 U	65 U	64 U	64 U	88	66 U	64 U	130	130	160	220	64 U	69
Benzo(b)fluoranthene	--	NA	NA	81	63 U	65 U	65 U	64 U	64 U	63 U	66 U	64 U	74	75	64 U	91	64 U	67 U
Benzo(k)fluoranthene	--	NA	NA	64 U	63 U	65 U	65 U	64 U	64 U	79	66 U	64 U	64 U	63 U	64 U	120	64 U	67 U
Benzo(a)pyrene	--	NA	NA	64 U	63 U	65 U	65 U	64 U	64 U	63 U	66 U	64 U	64 U	63 U	64 U	77	64 U	67 U
Indeno(1,2,3-cd)pyrene	--	NA	NA	64 U	63 U	65 U	65 U	64 U	64 U	63 U	66 U	64 U	64 U	63 U	64 U	65 U	64 U	67 U
Dibenz(a,h)anthracene	--	NA	NA	64 U	63 U	65 U	65 U	64 U	64 U	63 U	66 U	64 U	64 U	63 U	64 U	65 U	64 U	67 U
TEQ	140	NA	NA	20.4	ND	ND	ND	ND	ND	8.8	ND	ND	16.9	18.3	12.6	112	ND	0.7
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	3.8	4.2	5 U	7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	25.2	32.3	30.1	36.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,000	7	28	12	7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	0.05 U	0.15	0.11	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	51	77	57.5	51.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	F8b-B4	F8b-S1a	F8b-S2	F8b-S3a	F8c-B1	F8c-B2	F8c-B3	F8c-B4	F8c-S3	F8d-B1	F8d-B2	F8d-B3	F8d-B4	F8d-B5	F8d-B6	F8d-S1	F8d-S2
		LE14D	LG47C	LE14F	LG47B	LE14H	LE14I	LJ57A	LJ57B	LE14L	KF43A	KF43B	KF43C	KF43D	KF43E	KF43F	KF43G	KF43H
		6/19/2007	7/6/2007	6/19/2007	7/6/2007	6/19/2007	6/19/2007	7/31/2007	7/31/2007	6/19/2007	11/14/2006	11/14/2006	11/14/2006	11/14/2006	11/14/2006	11/14/2006	11/14/2006	11/14/2006
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	160	120	110	150	96	64 U	77	64 U	68	64 U	65 U	64 U	66 U	64 U	65	99	69
Chrysene	--	220	160	130	200	140	64 U	140	64 U	97	64 U	65 U	64 U	66 U	64 U	65 U	130	100
Benzo(b)fluoranthene	--	110	80	65	120	64 U	64 U	81	64 U	63 U	64 U	65 U	64 U	66 U	64 U	65 U	65 U	64 U
Benzo(k)fluoranthene	--	110	93	64 U	75	64 U	64 U	86	64 U	63 U	64 U	65 U	64 U	66 U	64 U	65 U	65 U	64 U
Benzo(a)pyrene	--	84	68	64 U	74	64 U	64 U	66 U	64 U	63 U	64 U	65 U	64 U	66 U	64 U	65 U	65 U	64 U
Indeno(1,2,3-cd)pyrene	--	66 U	66 U	64 U	61 U	64 U	64 U	66 U	64 U	63 U	64 U	65 U	64 U	66 U	64 U	65 U	65 U	64 U
Dibenz(a,h)anthracene	--	66 U	66 U	64 U	61 U	64 U	64 U	66 U	64 U	63 U	64 U	65 U	64 U	66 U	64 U	65 U	65 U	64 U
TEQ	140	124	98.9	18.8	110	11	ND	25.8	ND	7.8	ND	ND	ND	ND	ND	ND	11.2	7.9
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	F8d-S4	F8d-S5	F8d-S6	F8d-S8	F8E-B1	F8E-B2	F8E-B3	F8E-S1	F8E-S2	F8E-S3	F8E-S4	F8E-S5	F8F-B1	F8F-S1	F8F-S2	F8F-S3	F8F-S4
		KF43J	KF42A	KF42B	KF42D	MK65K	MK65L	MK65M	MK65F	MK65G	MK65H	MK65I	MK65J	MK65X	MK65T	MK65U	MK65V	MK65W
		11/14/2006	11/14/2006	11/14/2006	11/14/2006	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	68	63 U	66 U	65	66 U	63 U	63 U	85	83	82	64 U	100	64 U	890	150	65 U	130
Chrysene	--	82	72	66 U	73	66 U	63 U	63 U	120	100	110	64 U	130	64 U	880	140	65 U	160
Benzo(b)fluoranthene	--	66 U	63 U	66 U	63 U	66 U	63 U	63 U	63 U	63 U	62 U	64 U	64 U	64 U	260	66	65 U	93
Benzo(k)fluoranthene	--	66 U	63 U	66 U	63 U	66 U	63 U	63 U	63 U	63 U	62 U	64 U	92	64 U	320	66 U	65 U	65 U
Benzo(a)pyrene	--	66 U	63 U	66 U	63 U	66 U	63 U	63 U	63 U	63 U	62 U	64 U	64 U	64 U	250	66 U	65 U	65 U
Indeno(1,2,3-cd)pyrene	--	66 U	63 U	66 U	63 U	66 U	63 U	63 U	63 U	63 U	62 U	64 U	64 U	64 U	66 U	66 U	65 U	65 U
Dibenz(a,h)anthracene	--	66 U	63 U	66 U	63 U	66 U	63 U	63 U	63 U	63 U	62 U	64 U	64 U	64 U	66 U	66 U	65 U	65 U
TEQ	140	7.6	0.7	ND	7.2	ND	ND	ND	9.7	9.3	9.3	ND	20.5	ND	406	23.0	ND	23.9
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	F8G-B1	F8G-B2	F8G-S1	F8G-S2	F8G-S3	F8G-S4	F-COB-B9	F-COB-B12	F-FA-2	F-FA-2	F-FA-2	F-FA-2	F-FA-3	F-FA-3	F-FA-3	F-FA-3	F-FA-3
								(0-0.75)	(0-0.6)	(0-2)	(2-4)	(4-6)	(6-8)	(0-0.5)	(3.5-4.5)	(4.5-5.5)	(5.5-7.0)	(7.0-8.0)
		MK65R	MK65S	MK65N	MK65O	MK65P	MK65Q	MF21L	MF21M	HR96S	HR96T	HR97A	HR97B	HP32K	HR95P	HR95Q	HR95R	HR95S
		2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	2/27/2008	1/14/2008	1/14/2008	1/18/2005	1/18/2005	1/18/2005	1/18/2005	1/13/2005	1/13/2005	1/13/2005	1/13/2005	1/13/2005
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21 U	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	52 U	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100 U	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	63 U	65 U	63 U	63 U	63 U	70	NA	NA	NA	NA	NA	NA	69 U	NA	NA	NA	NA
Chrysene	--	63 U	65 U	80	63 U	63 U	97	NA	NA	NA	NA	NA	NA	69 U	NA	NA	NA	NA
Benzo(b)fluoranthene	--	63 U	65 U	63 U	63 U	63 U	64 U	NA	NA	NA	NA	NA	NA	69 U	NA	NA	NA	NA
Benzo(k)fluoranthene	--	63 U	65 U	63 U	63 U	63 U	64 U	NA	NA	NA	NA	NA	NA	69 U	NA	NA	NA	NA
Benzo(a)pyrene	--	63 U	65 U	63 U	63 U	63 U	64 U	NA	NA	NA	NA	NA	NA	69 U	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	63 U	65 U	63 U	63 U	63 U	64 U	NA	NA	NA	NA	NA	NA	69 U	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	63 U	65 U	63 U	63 U	63 U	64 U	NA	NA	NA	NA	NA	NA	69 U	NA	NA	NA	NA
TEQ	140	ND	ND	0.8	ND	ND	8.0	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA	NA
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	NA	NA	NA	NA	NA	NA	17	8	13	6	10	10	18	7	7	7	10
Cadmium	80	NA	NA	NA	NA	NA	NA	0.5	0.7	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA
Copper	3,000	NA	NA	NA	NA	NA	NA	664	360	NA	NA	NA	NA	25.7	NA	NA	NA	NA
Lead	250	NA	NA	NA	NA	NA	NA	30	34	NA	NA	NA	NA	11	NA	NA	NA	NA
Mercury	24	NA	NA	NA	NA	NA	NA	0.07	0.29	NA	NA	NA	NA	0.05 U	NA	NA	NA	NA
Zinc	24,000	NA	NA	NA	NA	NA	NA	188	158	NA	NA	NA	NA	73.1	NA	NA	NA	NA

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	F-FA-4 (0-0.5) HP78B 1/18/2005	F-FA-4 (1-2) HR96O 1/18/2005	F-FA-4 (2-3) HR96P 1/18/2005	F-FA-4 (4-6) HR96Q 1/18/2005	F-FA-4 (6-8) HR96R 1/18/2005	F-FA-5 (0.7-1.2) HP32H 1/13/2005	F-FA-5 (1.7-2.7) HR95F 1/13/2005	F-FA-5 (2.7-3.7) HR95G 1/13/2005	F-FA-5 (4-6) HR95H 1/13/2005	F-FA-5 (6-8) HR95I 1/13/2005	F-GC-8 (0.8-1.3) HP32G 1/13/2005	F-GC-8 (1.8-2.8) HR95D 1/13/2005	F-GC-8 (2.8-3.8) HR95E 1/13/2005	F-GC-9 (1.5-2.0) HP32F 1/13/2005	F-GC-9 (2.5-3.5) HR95B 1/13/2005	F-GC-9 (3.5-4.5) HR95C 1/13/2005	F-GC-10.1E (0.5-1.0) JD05R 3/2/2006
PETROLEUM HYDROCARBONS																		
NWTPH-HCID (mg/kg)																		
Gasoline	30/100 (b)	22 U	NA	NA	NA	NA	21 U	NA	NA	NA	NA	25 U	NA	NA	24 U	NA	NA	NA
Diesel	2,000	54 U	NA	NA	NA	NA	52 U	NA	NA	NA	NA	63 U	NA	NA	59 U	NA	NA	NA
Motor Oil	2,000	110 U	NA	NA	NA	NA	100 U	NA	NA	NA	NA	120 U	NA	NA	120 U	NA	NA	NA
NWTPH-DxSG (mg/kg)																		
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																		
Method 8021/NWTPH-G																		
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																		
EPA Method 8021																		
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																		
SW8270D																		
Benzo(a)anthracene	--	63 U	NA	NA	NA	NA	69 U	NA	NA	NA	NA	84 U	NA	NA	79 U	NA	NA	66 U
Chrysene	--	63 U	NA	NA	NA	NA	69 U	NA	NA	NA	NA	84 U	NA	NA	79 U	NA	NA	66 U
Benzo(b)fluoranthene	--	63 U	NA	NA	NA	NA	69 U	NA	NA	NA	NA	84 U	NA	NA	79 U	NA	NA	66 U
Benzo(k)fluoranthene	--	63 U	NA	NA	NA	NA	69 U	NA	NA	NA	NA	84 U	NA	NA	79 U	NA	NA	66 U
Benzo(a)pyrene	--	63 U	NA	NA	NA	NA	69 U	NA	NA	NA	NA	84 U	NA	NA	79 U	NA	NA	66 U
Indeno(1,2,3-cd)pyrene	--	63 U	NA	NA	NA	NA	69 U	NA	NA	NA	NA	84 U	NA	NA	79 U	NA	NA	66 U
Dibenz(a,h)anthracene	--	63 U	NA	NA	NA	NA	69 U	NA	NA	NA	NA	84 U	NA	NA	79 U	NA	NA	66 U
TEQ	140	ND	NA	NA	NA	NA	ND	NA	NA	NA	NA	ND	NA	NA	ND	NA	NA	ND
TOTAL METALS (mg/kg)																		
SW6000-7000 Series																		
Arsenic	20	8	6 U	6 U	9	10	13	8	6 U	8	12	8	10	13	8	7	14	NA
Cadmium	80	0.2	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	0.2 U	NA	NA	0.2 U	NA	NA	NA
Copper	3,000	40.6	NA	NA	NA	NA	32.8	NA	NA	NA	NA	23.1	NA	NA	21.9	NA	NA	NA
Lead	250	12	NA	NA	NA	NA	16	NA	NA	NA	NA	5	NA	NA	5	NA	NA	NA
Mercury	24	0.05 U	NA	NA	NA	NA	0.05 U	NA	NA	NA	NA	0.06	NA	NA	0.05 U	NA	NA	NA
Zinc	24,000	76.9	NA	NA	NA	NA	94.4	NA	NA	NA	NA	37.6	NA	NA	35.2	NA	NA	NA

TABLE G-3
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA F
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	F-GC-10.1W (1.0-1.5) JD05Q 3/2/2006	F-GC-11 (0-0.5) HP32D 1/13/2005	F-GC-12 (0-0.5) HP32E 1/13/2005	F-GC-13b.5S.1W (0-0.5) JF49D 3/27/2006	F-GC-13b.6S (0-0.5) JE81C 3/27/2006	F-GC-13b.6S.1W (0-0.5) JF49C 3/27/2006	F-GC-13c.2S.1W (0-0.5) JF49E 3/27/2006
PETROLEUM HYDROCARBONS								
NWTPH-HCID (mg/kg)								
Gasoline	30/100 (b)	NA	21 U	24 U	NA	NA	NA	NA
Diesel	2,000	NA	52 U	60 U	NA	NA	NA	NA
Motor Oil	2,000	NA	100 U	120 U	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)								
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)								
Method 8021/NWTPH-G								
Gasoline	100	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)								
EPA Method 8021								
Benzene	290	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)								
SW8270D								
Benzo(a)anthracene	--	65 U	70 U	80 U	NA	NA	NA	NA
Chrysene	--	65 U	70 U	80 U	NA	NA	NA	NA
Benzo(b)fluoranthene	--	65 U	70 U	80 U	NA	NA	NA	NA
Benzo(k)fluoranthene	--	65 U	70 U	80 U	NA	NA	NA	NA
Benzo(a)pyrene	--	65 U	70 U	80 U	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	--	65 U	70 U	80 U	NA	NA	NA	NA
Dibenz(a,h)anthracene	--	65 U	70 U	80 U	NA	NA	NA	NA
TEQ	140	ND	ND	ND	NA	NA	NA	NA
TOTAL METALS (mg/kg)								
SW6000-7000 Series								
Arsenic	20	NA	9	6	8	9	14	8
Cadmium	80	NA	0.2 U	0.2 U	NA	NA	NA	NA
Copper	3,000	NA	34.6	38.3	NA	NA	NA	NA
Lead	250	NA	11	8	NA	NA	NA	NA
Mercury	24	NA	0.04 U	0.06 U	NA	NA	NA	NA
Zinc	24,000	NA	77.6	43.1	NA	NA	NA	NA

NA = Not Analyzed.
ND = Not Detected.
U = Indicates the analyte was not detected in the sample at the given reporting limit.
Boxed cells indicate an exceedance of the preliminary cleanup level.

(a) Development of soil cleanup screening levels is presented in Table 6 of this work plan.
(b) MTCA Method A cleanup level is 30 mg/kg when benzene is present and 100 mg/kg when benzene is not present.

TABLE G-4
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA H
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	H1-B1	H1-B2	H1-S1	H1-S2	H1-S3	H1-S4	H1-S5	H2-B1a	H2-B2	H2-B3	H2-B4	H2-S1a	H2-S2	H2-S3	H2-S4	H2-S5	H2-S6a	H2-S7	H3-B1	H3-B2
		LE41A 6/20/2007	LE41B 6/20/2007	LE41C 6/20/2007	LE41D 6/20/2007	LE41E 6/20/2007	LE41F 6/20/2007	LE41G 6/20/2007	LJ47A 7/30/2007	LH08H 7/12/2007	LH08I 7/12/2007	LH08J 7/12/2007	LJ47C 7/30/2007	LH08B 7/12/2007	LH08C 7/12/2007	LH08D 7/12/2007	LH08E 7/12/2007	LJ47B 7/30/2007	LJ47D 7/30/2007	LB76A 6/1/2007	LB76B 6/1/2007
PETROLEUM HYDROCARBONS																					
NWTPH-HCID (mg/kg)																					
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																					
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																					
Method 8021/NWTPH-G																					
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																					
EPA Method 8021																					
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																					
SW8270D																					
Benzo(a)anthracene	--	NA	NA	NA	NA	NA	NA	NA	66 U	65 U	65 U	65 U	64 U	64 U	66 U	65 U	66 U	62 U	200 U	NA	NA
Chrysene	--	NA	NA	NA	NA	NA	NA	NA	66 U	65 U	65 U	65 U	64 U	64 U	66 U	65 U	66 U	62 U	200 U	NA	NA
Benzo(b)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	66 U	65 U	65 U	65 U	64 U	64 U	66 U	65 U	66 U	62 U	200 U	NA	NA
Benzo(k)fluoranthene	--	NA	NA	NA	NA	NA	NA	NA	66 U	65 U	65 U	65 U	64 U	64 U	66 U	65 U	66 U	62 U	210	NA	NA
Benzo(a)pyrene	--	NA	NA	NA	NA	NA	NA	NA	66 U	65 U	65 U	65 U	64 U	64 U	66 U	65 U	66 U	62 U	200 U	NA	NA
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	NA	NA	NA	66 U	65 U	65 U	65 U	64 U	64 U	66 U	65 U	66 U	62 U	200 U	NA	NA
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	NA	NA	NA	66 U	65 U	65 U	65 U	64 U	64 U	66 U	65 U	66 U	62 U	200 U	NA	NA
TEQ	140	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	21	NA	NA
TOTAL METALS (mg/kg)																					
SW6000-7000 Series																					
Arsenic	20	5 U	20	7	12	9	8	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7	7
Cadmium	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	0.2 U
Copper	3,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.7	16.4
Lead	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3	3
Mercury	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.04 U	0.04 U
Zinc	24,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39.1	40

Source: (modified) P:\147\029\100\FileRm\R\Work Plans\West End RIFS Final WP\Tables\W End RIFS Final WP_Tb 14

TABLE G-4
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN AREA H
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Levels (a)	H3-B3 LB76C 6/1/2007	H3-S2 LB78A 6/1/2007	H3-S3 LB78B 6/1/2007	H3-S4 LB76E 6/1/2007	H3-S5 (0.5-3) LC20A 6/5/2007	H-CSO-1 (1.2-1.7) KM95Y 1/30/2007	H-CSO-2 (0.5-1) KM95T 1/30/2007	H-GC-1c (0.9-1.4) 7/15/2005	H-GC-1e (2-2.5) KM95A 1/30/2007	H-GC-1f (1-1.5) KM95B 1/30/2007	H-GC-2 (1-1.5) HP39O 1/14/2005	H-GC-3 (0-0.5) 0409181-09 9/10/2004	H-GC-4 (0-0.5) 0409181-10 9/10/2004	H-GC-5c (2-2.5) HU35B 3/2/2005	H-GC-5c (3-4) HU88G 3/2/2005	H-GC-5d (1.8-2.3) HU34A 3/2/2005	H-GC-5d (2.8-3.8) HU88H 3/2/2005	H-GC-7b (1.5-2) KM95U 1/30/2007	H-GC-7c (1.25-1.5) KM95V 1/30/2007	H-GC-7d (0.7-1.2) KM95W 1/30/2007	H-GC-7e (0.6-1.1) KM95X 1/30/2007
PETROLEUM HYDROCARBONS																						
NWTPH-HCID (mg/kg)																						
Gasoline	30/100 (b)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>53	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-DxSG (mg/kg)																						
Diesel Range Hydrocarbons	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Motor Oil	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	630	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creosote		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline (mg/kg)																						
Method 8021/NWTPH-G																						
Gasoline	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTEX (µg/kg)																						
EPA Method 8021																						
Benzene	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	109,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cPAHs (µg/kg)																						
SW8270D																						
Benzo(a)anthracene	--	NA	NA	NA	NA	64 U	65 U	65 U	NA	NA	NA	71 U	35 U	34	NA	NA	NA	NA	65 U	65 U	64 U	63 U
Chrysene	--	NA	NA	NA	NA	64 U	65 U	78	NA	NA	NA	71 U	74	39	NA	NA	NA	NA	65 U	65 U	64 U	63 U
Benzo(b)fluoranthene	--	NA	NA	NA	NA	64 U	65 U	65 U	NA	NA	NA	71 U	35 U	28	NA	NA	NA	NA	65 U	65 U	64 U	63 U
Benzo(k)fluoranthene	--	NA	NA	NA	NA	64 U	65 U	65 U	NA	NA	NA	71 U	35 U	29	NA	NA	NA	NA	65 U	65 U	64 U	63 U
Benzo(a)pyrene	--	NA	NA	NA	NA	64 U	65 U	65 U	NA	NA	NA	71 U	35 U	38	NA	NA	NA	NA	65 U	65 U	64 U	63 U
Indeno(1,2,3-cd)pyrene	--	NA	NA	NA	NA	64 U	65 U	65 U	NA	NA	NA	71 U	35 U	15 U	NA	NA	NA	NA	65 U	65 U	64 U	63 U
Dibenz(a,h)anthracene	--	NA	NA	NA	NA	64 U	65 U	65 U	NA	NA	NA	71 U	35 U	15 U	NA	NA	NA	NA	65 U	65 U	64 U	63 U
TEQ	140	NA	NA	NA	NA	ND	ND	0.78	NA	NA	NA	ND	0.74	47	NA	NA	NA	NA	ND	ND	ND	ND
TOTAL METALS (mg/kg)																						
SW6000-7000 Series																						
Arsenic	20	7	11.1	13.0	8	19	NA	NA	11	6	5 U	11	5.8	5.0	10	5	17	13	NA	NA	NA	NA
Cadmium	80	0.2 U	0.5 U	0.6 U	0.2 U	0.2 U	NA	NA	0 U	NA	NA	0.2 U	NA	NA	0.2 U	NA	0.2 U	NA	NA	NA	NA	NA
Copper	3,000	16.5	22	24	19.7	24.3	NA	NA	28	NA	NA	21.5	35.0	14.2	18.9	NA	24.7	NA	NA	NA	NA	NA
Lead	250	3	7	14	9	5	NA	NA	9	NA	NA	13	6.8	10.6	6	NA	15	NA	NA	NA	NA	NA
Mercury	24	0.04 U	0.05 U	0.04 U	11.9	0.05	NA	NA	0 U	NA	NA	0.05 U	0.03	0.02 J	0.05 U	0.05 U	0.05 U	0.05 U	NA	NA	NA	NA
Zinc	24,000	39	50	60	69	47	NA	NA	60	NA	NA	85.8	NA	NA	44.5	NA	62.3	NA	NA	NA	NA	NA

NA = Not Analyzed.
ND = Not Detected.
U = Indicates the analyte was not detected in the sample at the given reporting limit.
J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

(a) Development of soil cleanup screening levels is presented in Table 6 of this work plan.
(b) MTCA Method A cleanup level is 30 mg/kg when benzene is present and 100 mg/kg when benzene is not present.

TABLE G-5
SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMAINING IN THE PORTION OF AREA JP WITHIN THE CURRENT SITE BOUNDARY
WEST END SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Screening Levels (a)	J-P-1 (0-0.5) 12/23/2003	JP-GC-4 (0.5-1) 1/12/2005	JP-GC-5 (0.5-1) 1/12/2005
PETROLEUM HYDROCARBONS				
NWTPH-HCID (mg/kg)				
Gasoline	30/100 (b)	NA	NA	NA
Diesel	2,000	NA	NA	NA
Motor Oil	2,000	NA	NA	NA
NWTPH-DxSG (mg/kg)				
Diesel Range Hydrocarbons	2,000	NA	NA	NA
Motor Oil	2,000	NA	NA	NA
Mineral Spirits	4,000	NA	NA	NA
Creosote		NA	NA	NA
Gasoline (mg/kg)				
Method 8021/NWTPH-G				
Gasoline	100	NA	NA	NA
BTEX (µg/kg)				
EPA Method 8021				
Benzene	290	NA	NA	NA
Toluene	109,000	NA	NA	NA
Ethylbenzene	18,000	NA	NA	NA
m,p-Xylene	16,000,000	NA	NA	NA
o-Xylene	160,000,000	NA	NA	NA
Xylenes (total)		NA	NA	NA
cPAHs (µg/kg)				
SW8270D				
Benzo(a)anthracene	--	7.1 U	64 U	63 U
Chrysene	--	7.1 U	64 U	63 U
Benzo(b)fluoranthene	--	7.1 U	64 U	63 U
Benzo(k)fluoranthene	--	7.1 U	64 U	63 U
Benzo(a)pyrene	--	7.1 U	64 U	63 U
Indeno(1,2,3-cd)pyrene	--	7.1 U	64 U	63 U
Dibenz(a,h)anthracene	--	7.1 U	64 U	63 U
TEQ	140	ND	ND	ND
TOTAL METALS (mg/kg)				
SW6000-7000 Series				
Arsenic	20	3	5 U	5 U
Cadmium	80	0.2 U	0.2 U	0.2 U
Copper	3,000	19.9	19.9	23.8
Lead	250	8	3	9
Mercury	24	0.05 U	0.04 U	0.05 U
Zinc	24,000	44.7	27.2	27.7

NA = Not Analyzed.
ND = Not Detected.
U = Indicates the analyte was not detected in the sample at the given reporting limit.

(a) Development of soil cleanup screening levels is presented in Table 6 of this work plan.

(b) MTCA Method A cleanup level is 30 mg/kg when benzene is present and 100 mg/kg when benzene is not present.

APPENDIX H

Statistical Evaluation of Arsenic Concentrations Remaining in Soil in Area D

STATISTICAL EVALUATION OF ARSENIC CONCENTRATIONS REMAINING IN AREA D SOIL

This Appendix summarizes the statistical evaluation conducted as part of the interim action to determine compliance with the preliminary cleanup levels (PCL). Arsenic is present in soil remaining at concentrations exceeding the PCL at two locations in the former American Construction Company (ACC) Yard (D3-b1 and D3-b2).

The Model Toxics Control Act (MTCA) allows for compliance with cleanup levels if the following are true:

- No single sample concentration is greater than two times the cleanup level
- Less than ten percent of the concentrations exceed the soil cleanup level
- The upper one-sided ninety-five percent confidence limit (UCL) on the true mean soil concentration is less than the soil cleanup level.

The data set used for the statistical evaluation consists of 38 soil samples representing soil remaining in the former graving dock excavation. The soil samples were collected from the sidewalls and base of the excavation in interim action areas D-1 and D-3. As described below, all of the above criteria are true for this data set and, therefore, the arsenic concentrations remaining in soil within the former ACC graving dock area comply with the arsenic PCL.

- The concentrations associated with the two arsenic PCL exceedances are 24 mg/kg and 29 mg/kg, which are less than two times the arsenic PCL of 20 mg/kg.
- Only two concentrations in the data set of 38 exceed the PCL; therefore, less than ten percent of the concentrations exceed the arsenic PCL for soil.
- The UCL for the data is 12 mg/kg, which is less than the20 mg/kg arsenic PCL for soil.

The UCL was calculated using MTCAStat software (Ecology 1997). The data set included one nondetect; therefore, in accordance WAC 173-340-740(7)(f)(i), the nondetect was assigned a value equal to one-half the reporting limit. The data set was determined by MTCAStat to be lognormally distributed; therefore, the UCL was calculated in MTCAStat using the Land's method. The data set and statistical results are documented in an attached report generated using MTCAStat. The arsenic concentrations used in the data set and the associated sample identifications are presented in Table 8 of the *Final RI/FS Work Plan, West End Site, Everett, Washington* (Landau Associates 2009).

COMPLIANCE CALCULATIONS

Arsenic Concentrations (mg/kg)
10
8
11
7
8
9
10
8
11
16
11
14
7
7
13
6
11
5
7
9
7
10
20
9
11
2.5
13
14
14
10
7
12
24
29
12
7
7
7

Upper Confidence Limit Calculation for Arsenic in Soil
ACC Former Graving Dock Area
North Marina West End Site

Number of samples		Uncensored values	
Uncensored	38	Mean	10.62
Censored	0	Lognormal mean	10.64
Detection limit or PQL	5	Std. devn.	5.06902919
Method detection limit		Median	10
TOTAL	38	Min.	2.5
		Max.	29

Lognormal distribution?		Normal distribution?	
r-squared is:	0.932	r-squared is:	0.821

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 12.1738862544519