DEPARTMENT OF
ECOLOGY
State of Washington

Draft Cleanup Action Plan

North Marina West End Site
Everett, Washington

Washington State Department of Ecology
Toxics Cleanup Program
Olympia, Washington

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FIGURES

TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

ABW	American Boiler Works
ACC	American Construction Company
AO	Agreed Order
As	Arsenic
AST	Above ground storage tank
bgs	below ground surface
CAP	Cleanup Action Plan
COC	Constituent of Concern
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbons
CSL	Cleanup Screening Level
DCAP	Draft Cleanup Action Plan
DGI	Data Gaps Investigation
Ecology	Washington State Department of Ecology
ESA	Environmental Site Assessment
ft	feet
HBU	Highest Beneficial Use
LLC	Limited Liability Company
mg/kg	milligram per kilogram
MNR	Monitored Natural Recovery
MTCA	Model Toxics Control Act
PCB	Polychlorinated Biphenyls
Port	Port of Everett
PQL	Practical Quantitation Limit
PRB	Permeable Reactive Barrier
PSTL	Puget Sound Truck Lines
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
SMS	Sediment Management Standards
SQS	Sediment Quality Standards
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compounds
TBT	Tributyl tin
TOC	Total Organic Carbon
TVS	Total Volatile Solids
µg/L	micrograms per liter
U.S.	United States
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compounds
WAC	Washington Administrative Code

1.0 INTRODUCTION

This draft cleanup action plan (DCAP) describes the selected cleanup action for the North Marina West End Site (Site) in Everett, Washington. The Site cleanup action will be conducted under a consent decree between the Port of Everett (Port) and the Washington State Department of Ecology (Ecology). As specified in Washington Administrative Code (WAC) 173-340-380, this DCAP:

- Describes the selected cleanup action
- Summarizes the rationale for selecting the selected alternative
- Briefly summarizes other cleanup action alternatives evaluated in the remedial investigation/feasibility study (RI/FS)
- Identifies Site cleanup standards
- Provides the schedule for implementation of the DCAP
- Identifies institutional controls required as part of the cleanup action, if applicable
- Identifies applicable state and federal laws
- Specifies the types, levels, and amounts of hazardous substances remaining on-site, and the measures that will be used to prevent migration and contact with those substances.

Sections of this DCAP provide information on Site background (Section 2.0), cleanup standards for the Site (Section 3.0), the selected cleanup action (Section 4.0), other cleanup action alternatives evaluated for the Site (Section 5.0), a schedule for implementation of the DCAP (Section 6.0), and references (Section 7.0).

2.0 SITE BACKGROUND

This section provides a description of the Site and its historical uses, describes investigations conducted to characterize environmental conditions, and summarizes interim actions previously implemented for Site cleanup.

2.1 SITE DESCRIPTION AND HISTORY

The Site is located in Everett, Washington 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, as shown on Figure 1. 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. The Site is bounded on the north by the 12th Street Marina, on the south by the North Marina, on the west by Port Gardner Bay/Snohomish River, and on the east by Port upland property, as shown on Figures 2 and 3. The legal description of the Site is SW ¼ and NW ¼ of Section 18, Township 29 North, Range 5 East, Snohomish County, Washington. The approximate center of the Site is located at North 48.00029º and West -122.22211º.

Between April 2004 and November 2007, the Site was formerly part of the North Marina Redevelopment site managed under Ecology's Voluntary Cleanup Program (VCP No. 1249). Numerous investigations were conducted at the Site prior to and while under the VCP, culminating in interim actions that were conducted for the Site (see Section 2.5 for more detail) between June 2006 and March 2008 while under the VCP.

An agreed order (Order) between the Port and Ecology was implemented in June 2008. The Order required the Port to develop an Interim Action Cleanup Report, a remedial/investigation/feasibility study (RI/FS) work plan to evaluate the nature and extent of Site contamination, an RI/FS Report, and a DCAP.

The rest of this section describes the Site development history, historical operations and Site uses, current conditions, the Site's environmental setting, and Site interim actions. Historical and/or current Site features are shown on Figure 4.

2.2 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.

The Port initiated redevelopment of the North Marina Area in 2000, including entry into a development agreement with a private developer, Maritime Trust (doing business as Everett Maritime LLC). Extensive building demolition was conducted at the Site in preparation for the planned redevelopment, resulting in the removal of all Site buildings except for those buildings shown on Figure 4. However, the development agreement was terminated due to nonperformance on the part of Everett Maritime LLC, which went bankrupt in 2010 as a result of the downturn in the real estate market. The Port still plans on redeveloping the North Marina Area, including the Site, into a mixed use development, but is re-evaluating the master plan to determine how to proceed with redevelopment in the current economic environment. It is anticipated that the planning/permitting process for the redefined North Marina Area redevelopment will be completed by 2013, and future Site development is not likely to occur prior to that time.

2.3 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. 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
- Port of Everett Marine View Reception/Conference Center
- Port of Everett Overflow Parking
- Puget Sound Truck Lines (PSTL)
- United States (U.S.) Coast Guard Station
- Jordan Park.

A number of activities were conducted at these leaseholds, and some of these activities resulted in releases of hazardous substances to the environment. 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.

2.3.1 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 former leasehold was historically used for boiler manufacturing and more recently was used for custom steel fabrication. 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.

2.3.2 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. 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. Additionally, two 5,000-gallon aboveground storage tanks (ASTs) used for storage of diesel and gasoline were located north of the former office/shop.

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.

ACC constructed and operated a graving dock in the northern portion of the former leasehold that included a concrete bottom located at approximately 12 to 14 ft below ground surface (BGS). 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 (cPAHs) resulting from the presence of creosoted timbers and piling, and petroleum hydrocarbon releases from the ASTs and heavy equipment.

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.

2.3.3 AMERICAN TUGBOAT COMPANY/MANSON OSBERG CONSTRUCTION

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.

2.3.4 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, came into operation sometime after 1989, and operated until boat maintenance activities were terminated in 2007 in advance of redevelopment activities. 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.

2.3.5 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 work yard was located north of the building and was used for extensive storage of industrial machinery and materials. General environmental concerns at this former leasehold included potential heavy metals soil contamination associated with industrial sandblasting, and potential petroleum hydrocarbons contamination associated with used oil or other fluids.

2.3.6 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-feet (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.

2.3.7 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. No specific conditions of environmental concern were noted for this parcel. However, the Port of Everett maintains a marina fueling system that includes underground storage tanks (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.

2.3.8 PORT OF EVERETT OVERFLOW PARKING

The Port of Everett Overflow Parking is located off of 13th Street, east of the 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.

2.3.9 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. 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 the AST prior to vacating the property in 2002. Releases from the diesel UST locations were encountered during the tank removals performed in 1990, and contaminated soil [approximately 140 cubic yards (yd^3)] was landfarmed on-site prior to being used for surface fill on the property. PSTL removed its heating oil UST in 2002. However, 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 AST 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.

2.3.10 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-ft long by 30-ft wide and was built sometime prior to 1970. No conditions of environmental concern were identified for this former leasehold.

2.3.11 JORDAN PARK

Jordan Park was a small recreational park. A portion of the park was located within the Site boundary, as shown on Figure 3. The park consisted 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. The park, including the embankments, were removed from the Site in 2006 in preparation for redevelopment activities.

2.4 ENVIRONMENTAL INVESTIGATIONS

A number of environmental investigations were conducted at the Site, including the RI/FS and several earlier investigations conducted while the Site was under the VCP. The investigations conducted prior to the RI 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 2004) and a data gaps investigation (DGI) conducted in late 2004 and early 2005 (Landau Associates 2005). The RI field activities were conducted in 2009 and 2010 (Landau Associates 2011).

2.4.1 INVESTIGATION ACTIVITIES

Over 500 soil samples have been collected throughout the Site and submitted for laboratory analysis. 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.

Investigation of groundwater quality at the Site has consisted of laboratory analysis of groundwater samples collected from 35 monitoring wells and 56 soil boring locations (temporary well points). Groundwater samples were analyzed for VOCs, SVOCs including cPAHs, metals, and petroleum hydrocarbons.

A total of 22 surface sediment samples and 11 subsurface (core) samples were collected from the aquatic portion of the Site. Sediment samples were tested for 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 analysis.

As part of the RI, one surface water sample was collected from the 12th Street Yacht Basin. The surface water sample was analyzed for dissolved arsenic.

2.4.2 ENVIRONMENTAL CONDITIONS

This section summarizes Site environmental conditions for affected media based on the results of the RI, and on data from previous investigations that represent current conditions. Environmental

conditions that existed prior to implementation of the interim action are discussed briefly in Section 2.5 and in more detail in the interim action report (Landau Associates 2008). The Site RI/FS (Landau Associates 2011) should be reviewed for a more detailed discussion of current Site conditions. The West End Interim Action and draft RI/FS reports can be viewed by using the web link provided in Section 2.3.

Soil and groundwater analytical data were compared to applicable Model Toxics Control Act (MTCA) criteria for unrestricted site use to evaluate Site environmental conditions in the RI/FS. In general, the Method B approach was used for the evaluation of soil and groundwater. 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 analytical data were compared to the Sediment Management Standards (SMS; WAC 173-204) Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL) to support evaluation of the nature and extent of contamination. The 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.

2.4.2.1 Soil Quality

The evaluation of the nature and extent of Site soil contamination is based on soil samples collected prior to the RI 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 5. Due to the interim action conducted at the Site prior to implementation of the RI/FS (discussed in Section 2.5), the extent of soil contamination at the Site is very limited. Post interim action sampling results show that only arsenic and copper have been detected in soil at concentrations exceeding applicable MTCA soil cleanup levels. The locations of the MTCA soil cleanup level exceedances are shown on Figure 5.

The concentrations associated with the arsenic exceedances, 24 milligram per kilogram (mg/kg) and 29 mg/kg, are only slightly greater than the MTCA Method A soil cleanup level of 20 mg/kg. A statistical evaluation of the arsenic results for soil remaining in the area of the two arsenic exceedances indicated that soil met the arsenic cleanup level 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 constituent of concern (COC) for Site soil.

Copper is present in soil remaining at the Site at concentrations exceeding the copper MTCA Method B soil cleanup level based on the protection of groundwater (36 mg/kg)[1], as shown on Figure 5. Soil samples collected during the interim action indicated that some of these exceedances could be associated with naturally occurring copper in the ballast rock for the former crane-rail located in this area, although four exceedances occurred outside of the ballast rock area. In total, less than 10 percent of the final compliance monitoring samples exceeded the copper MTCA Method B soil cleanup level based on protection of groundwater.

The copper MTCA Method B soil cleanup level 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 cleanup level (3.1 micrograms per liter [µg/L]) is slightly exceeded. The copper MTCA Method B soil cleanup level applicable to areas where groundwater copper concentrations do not exceed the cleanup level (the majority of the Site) is 3,000 mg/kg based on direct human contact, and is not exceeded at the Site. 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 MTCA Method B soil cleanup level based on direct contact (3,000 mg/kg).

The copper MTCA Method B soil cleanup level for the protection of groundwater (36 mg/kg) is based on the natural background soil concentration for Washington State (*see* footnote 1). 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 cleanup level based on the protection of marine surface water at numerous locations throughout the Site where the copper groundwater cleanup level is not exceeded (Figure 5; *see* light blue dots). In the northwest portion of the Site where the copper Method B groundwater cleanup level 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 cleanup level, and the copper soil concentrations in this area are similar to concentrations elsewhere on the Site where the copper Method B groundwater cleanup level 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

[1] Because groundwater is not a current or likely future source of drinking water and because it discharges to marine surface water, groundwater cleanup levels were developed based on marine surface water cleanup levels protective of human health and aquatic organisms in accordance with WAC 173-340-730. The soil cleanup level for copper was adjusted to reflect natural background (i.e., 36 mg/kg; Ecology 1994) because the background concentration exceeded the modeled concentration (1.1 mg/kg) protective of groundwater as surface water. Refer to Section 5.3.2 of the Draft RI/FS Report for additional information on the development of soil cleanup levels (Landau Associates2011).

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 the above considerations, it is concluded 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, Ecology has determined that Site soil contamination was fully remediated during the interim action (discussed in Section 2.5) 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 DCAP.

2.4.2.2 Groundwater Quality

The evaluation of the nature and extent of Site groundwater contamination is based on post-interim action (RI) groundwater monitoring at 18 monitoring well locations and 17 soil boring locations (temporary well points) shown on Figure 6. Only dissolved arsenic, dissolved copper, oil-range petroleum hydrocarbons, and vinyl chloride were detected in groundwater at concentrations exceeding the applicable MTCA groundwater cleanup levels during the RI. The analytical results that are the basis for delineating the extent of the dissolved arsenic, dissolved copper, and vinyl chloride groundwater contamination are presented on Figure 7. The extent of oil-range petroleum hydrocarbons is not presented on Figure 7 because only one sample exceeded the oil-range petroleum hydrocarbon groundwater MTCA Method A cleanup level and is, therefore, not considered a groundwater COC (*see* Section 6.4.1.1 of the Draft RI/FS for more discussion on petroleum in groundwater; Landau 2011).

As shown on Figure 7, exceedances of the arsenic groundwater MTCA Method A cleanup level 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). Dissolved copper exceedances are more limited than dissolved arsenic and occur at only two locations (RI-MW-1 and RI-MW-3) near the western shoreline. As shown on Figure 7, exceedances of the vinyl chloride groundwater MTCA Method B cleanup level 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 dissolved copper groundwater exceedances are relatively small. The maximum dissolved copper concentration detected in groundwater at the Site was 5 µg/L compared to the MTCA Method B cleanup level of 3.1 µg/L. The maximum RI groundwater dissolved copper concentration of 5 µg/L 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.

Dissolved arsenic groundwater concentrations in the northwest portion of the Site exhibit similar characteristics to dissolved copper in that the current dissolved arsenic concentrations are only slightly above the groundwater MTCA Method A cleanup level, concentrations of dissolved arsenic in groundwater have decreased significantly since completion of the interim action, and current dissolved arsenic concentrations are anticipated to continue decreasing as groundwater quality continues to adjust to post-interim action equilibrium

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 was evaluated during the RI. Groundwater at the shoreline wells are a significant distance from the actual point of discharge to surface water during 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 an angled well constructed at the shoreline in the north-central portion of the Site (MW-11A) were compared to the concentrations measured at an adjacent vertical well (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 concentration of vinyl chloride in the angled well is significantly below the groundwater MTCA Method B cleanup level, which directly demonstrates through groundwater quality monitoring that the vinyl chloride MTCA Method B cleanup level is achieved at the conditional point of compliance established at the groundwater/surface water interface. The minimum observed concentration reduction factor observed between RI-MW-11 and RI-MW-11A was 4.6 for vinyl chloride, and 5.3 for dissolved arsenic. Based on the lowest concentration reduction factor of 4.6, the groundwater cleanup levels for all constituents, including dissolved arsenic and copper, are being achieved at the point of groundwater discharge to marine surface water near the Site northwest corner vertical shoreline wells that exhibited cleanup level exceedances .

Although the groundwater MTCA Method A cleanup level for dissolved arsenic was not achieved in RI-MW-11A, it approached to within a factor of 2. The point of discharge for groundwater to surface water remains about 12 ft north of the angled well, and both the amount of dispersion and the degree of oxygenation will increase significantly between RI-MW-11A and the shoreline. The impact of increased oxygenation is likely to have at least as significant, if not greater, an impact on dissolved arsenic concentrations at the surface water interface than dispersion due to the geochemical conversion of arsenite to arsenate under aerobic (oxygen-rich) conditions.

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 is achieved between RI-MW-11A and the shoreline, which represents a total concentration reduction factor of 25 between the vertical shoreline wells 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 between the angled well and the shoreline, the estimated maximum arsenic concentration at the surface water interface is 1.8 µg/L, which is well below the groundwater MTCA Method B cleanup level of 5 µg/L. Other considerations that support the conclusion that the dissolved arsenic groundwater MTCA Method A cleanup level 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. Total 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 (93 mg/kg) for 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 overestimates 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 dissolved 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.

2.4.2.3 Sediment Quality

The evaluation of the nature and extent of Site sediment is based on analytical results for surface sediment samples collected at 19 locations during the RI. The sampling locations are shown on Figure 8. Sediment quality data were compared to the SQS and CSL and the dry weight equivalent to these criteria. This comparison of the sediment sample analytical results to the SMS criteria indicated that no concentrations exceeded the CSL and, except for the concentration of fluoranthene in one 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 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 8.

The source of the fluoranthene exceedance is most likely the wooden 14th Street bulkhead formerly located immediately north of the exceedance. This former bulkhead was constructed using creosote-treated pilings and timbers, and fluoranthene is a common chemical associated with creosote. The former wooden bulkhead was replaced in 2006 with a cathodically protected steel sheet-pile bulkhead.

2.5 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. Pre-interim action soil and groundwater sampling locations with interim action cleanup level exceedances are shown on Figures 9 and 10, respectively. 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 were achieved. Interim action areas are shown on Figure 11.

A total of 43,600 tons (about 27,000 yd^3) of contaminated soil was removed from the Site during the interim action. A summary of the interim actions implemented within each area is provided in Table 1. A more detailed description of the interim actions is provided in the *West End Site Interim Action Report* (Landau Associates 2008).

3.0 DISCUSSION OF CLEANUP STANDARDS

This section discusses Site cleanup standards for chemical constituents that were detected in affected Site media at concentrations above screening levels developed for the RI/FS. These affected media include groundwater and sediment. As discussed previously in Section 2.4.2.1, soil is not considered a media of concern for the Site and will not be addressed in the DCAP. 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.

3.1 GROUNDWATER

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.

The 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 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 practical quantitation limit (PQL) or background concentrations, if appropriate, is identified as the Site groundwater cleanup value, shown in Table 2.

At least one sample exceeded the groundwater cleanup levels for arsenic, 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 cleanup levels are carried forward as COCs for Site groundwater, as summarized in Table 2.

Under MTCA, the point of compliance is the point or location on the Site where the cleanup levels must be attained. 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 HBU, MTCA provides for a conditional point of compliance at the point of discharge of groundwater to the surface water receiving body. As a result, the point of entry of groundwater to Port Gardner and the 12th Marina is the conditional point of compliance for Site groundwater.

3.2 SEDIMENT

Sediment cleanup standards were developed according to SMS requirements. 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. Only fluoranthene has been detected in sediment above the SQS; therefore, only fluoranthene is carried forward as a COC for Site sediment. The sediment cleanup level for fluoranthene is provided in Table 2.

The point of compliance for sediment will be the upper 10 centimeters (cm), which is considered the predominantly biologically active zone. The area of fluoranthene-impacted sediment is shown on Figure 12.

4.0 SELECTED CLEANUP ACTION

This section describes and evaluates the selected cleanup action for the Site. The other cleanup alternatives considered for the Site and evaluated in the RI/FS are also summarized

4.1 DESCRIPTION OF THE SELECTED CLEANUP ACTION

As discussed in Section 2.4, the nature and extent of contamination at the Site consists of limited upland areas of groundwater contamination and an isolated location of low level sediment contamination. As a result, the selected cleanup action will consist of long-term groundwater compliance monitoring and institutional controls to address upland contamination and monitored natural recovery (MNR) to address sediment contamination.

An environmental restrictive covenant will be placed on the Site as an institutional control to protect the integrity of the cleanup action following implementation. The restrictive covenant will have the following elements to address activities that could compromise the integrity of the cleanup action:

- Groundwater use for potable water will be prohibited.
- Groundwater extracted for construction dewatering or other nonpotable purposes will be managed, treated, and discharged in conformance with an Ecology-approved groundwater management plan.
- Intrusive activities that involve worker contact with contaminated groundwater will be conducted by individuals that have the appropriate training and certifications for working on hazardous waste sites and in conformance with a Site-specific health and safety plan.

The institutional controls will 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 12 for other purposes (e.g., construction dewatering).

Long-term compliance monitoring will consist of monitoring groundwater quality from eight existing monitoring wells along the shoreline and monitoring sediment at one location in the southeast corner of the Site, as shown on Figure 12. Groundwater quality will be monitored quarterly for 1 year to demonstrate compliance with cleanup standards. Sediment quality will 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 sample RI-SED-18) and no additional sediment 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 will be conducted concurrent with the fourth quarter groundwater monitoring event. Table 3 identifies the analytical parameters that will be monitored at each compliance monitoring location.

As described in Section 2.4.2.2, 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 will 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. If quarterly groundwater monitoring results associated with RI-MW-11 and RI-MW-11A show a concentration reduction factor less than that required to demonstrate that the groundwater cleanup standards are being achieved based on available data, additional groundwater and/or surface water quality monitoring may be required.

4.2 EVALUATION OF SELECTED CLEANUP ACTION

The selected cleanup action was evaluated to determine whether it meets the minimum requirements to be considered compliant with the MTCA regulations, as specified in WAC 173-340-360(2). The MTCA minimum requirements include threshold requirements and other requirements. The threshold requirements are:

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

In addition to the threshold requirements, the selected cleanup action must also meet the following requirements:

- Use of permanent solutions to the maximum extent practicable
- A reasonable restoration timeframe
- Consideration of public concerns.

The selected cleanup action is evaluated against these criteria in the following sections.

4.2.1 THRESHOLD REQUIREMENTS

In order for a cleanup action 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 selected cleanup action meets these requirements. Almost all contaminant mass was removed from the Site during the interim actions, 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 for Site groundwater, which is the groundwater/surface water interface at the shoreline, and at the point of compliance for Site sediment, which is throughout the predominantly biologically active zone (upper 10 centimeters of sediment). The selected cleanup action will comply with MTCA, all other applicable state laws, and all applicable federal laws.

4.2.2 PERMANENCE

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 selected cleanup action against the permanence criteria.

4.2.2.1 Overall Protectiveness

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

4.2.2.2 Long-Term Effectiveness

The selected cleanup action 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 selected cleanup action to not be successful is negligible. Because the selected cleanup action does not require active remediation to achieve cleanup standards, its long-term reliability is assured, and the lack of significant residual contaminant mass results in a very low residual risk.

4.2.2.3 Management of Short-Term Risks

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

4.2.2.4 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 actions and groundwater quality monitoring demonstrates that the residual groundwater contamination is not migrating beyond the shoreline. As a result, the selected cleanup action substantially reduces the volume of hazardous substances at the Site when considered in conjunction with the interim action.

4.2.2.5 Implementability

The selected cleanup action 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 DCAP.

4.2.2.6 Cleanup Costs

The estimated cost for implementing the institutional controls and conducting long-term groundwater compliance monitoring, including reporting, is $41,000.

4.2.3 RESTORATION TIMEFRAME

The MTCA [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.

The selected cleanup action will achieve upland cleanup standards immediately following implementation, which will address potential risks to human health and the environment. Sediment cleanup standards will 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 will be achieved immediately following implementation, or shortly thereafter, achieving a shorter restoration timeframe is not practicable.

The selected cleanup action will be compatible with current and potential future use of the Site; the primary consideration for future land use will 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 will be largely limited to requirements for management of extracted groundwater, which can be easily and reliably implemented. The control and monitoring of hazardous substances will be easily achieved by the selected cleanup action 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 actions, natural processes are anticipated to further reduce concentrations of hazardous substances in groundwater and sediment.

4.2.4 PUBLIC PARTICIPATION AND COMMUNITY ACCEPTANCE

A public comment period will be held to allow the public and parties affected by the cleanup action an opportunity to provide comment on this document. Ecology will review all public comments submitted during public comment period, and will incorporate them, as appropriate, in the final cleanup action plan (CAP). You will receive notice by regular mail or e-mail that Ecology has received your comments, along with an explanation about how the comments were addressed.

5.0 SUMMARY OF OTHER CLEANUP ACTION ALTERNATIVES

Because of the thoroughness of the interim action, residual soil contamination that could potentially be targeted for removal, treatment, or containment as part of a final cleanup action is not present at the Site. As such, potential cleanup alternatives for the Site are limited, and cleanup action alternatives were not developed to address Site soil.

Actively remediating Site groundwater contamination through containment or treatment was considered, but was determined to be impracticable. A shoreline barrier wall in conjunction with a long-term groundwater extraction and treatment system was one alternative considered to address Site groundwater contamination. Other potential technologies that provide containment without groundwater extraction and treatment, such as permeable reactive barrier (PRB) walls, were considered, but determined to 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 and the high cost of constructing and operating an effective groundwater 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 was determined to 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 at the Site, 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 were determined to be impracticable for the Site.

Based on the limited area of sediment contamination, 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, MNR was determined to be the only practicable alternative for sediment cleanup. As discussed in Section 2.4.2.3, 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 were determined to be impracticable for cleanup of contaminated Site sediment.

6.0 CAP IMPLEMENTATION SCHEDULE

Implementation of the CAP will commence immediately following entry of the consent decree containing the final CAP. Groundwater compliance monitoring will be initiated within 3 months of entry of the consent decree. Sediment compliance monitoring will be conducted concurrent with the fourth round of quarterly groundwater compliance monitoring. The restrictive covenant to address the management of groundwater extracted from the Site will be filed with the County Assessor's office within 6 months of entry of the consent decree. Based on this schedule, it is anticipated that all CAP requirements will be completed within one year following entry of the consent decree with the court, contingent upon the outcome of groundwater and sediment compliance monitoring.

7.0 REFERENCES

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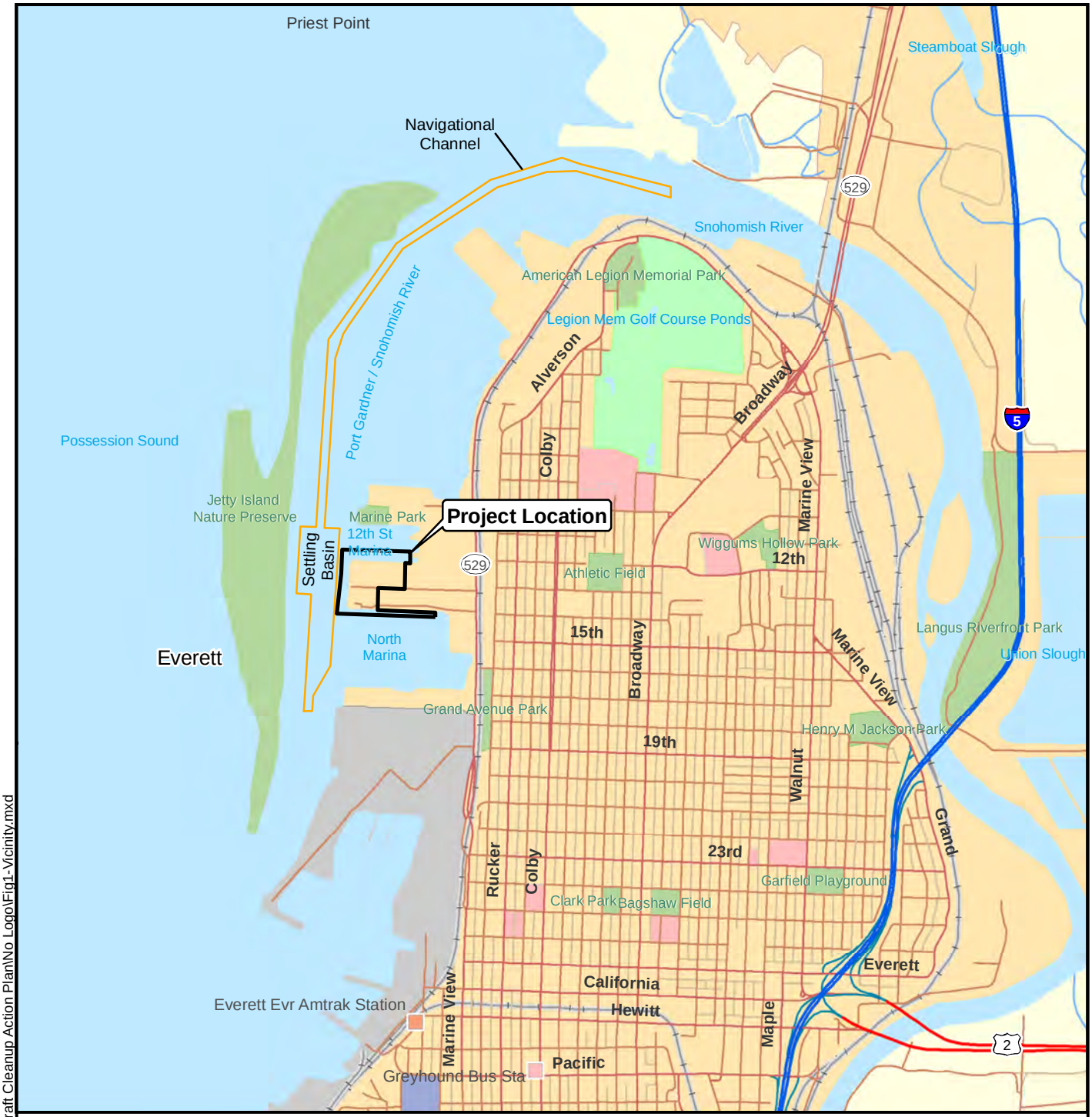

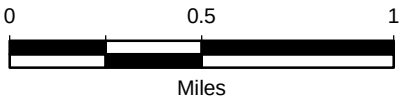

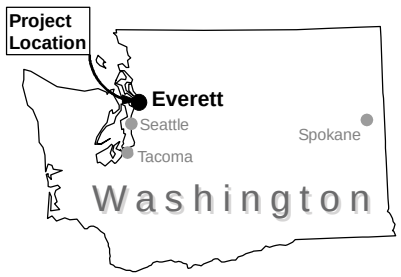

Data Source: ESRI 2008

North Marina West End Site Cleanup Action plan Everett, Washington	**Vicinity Map**	Figure 1

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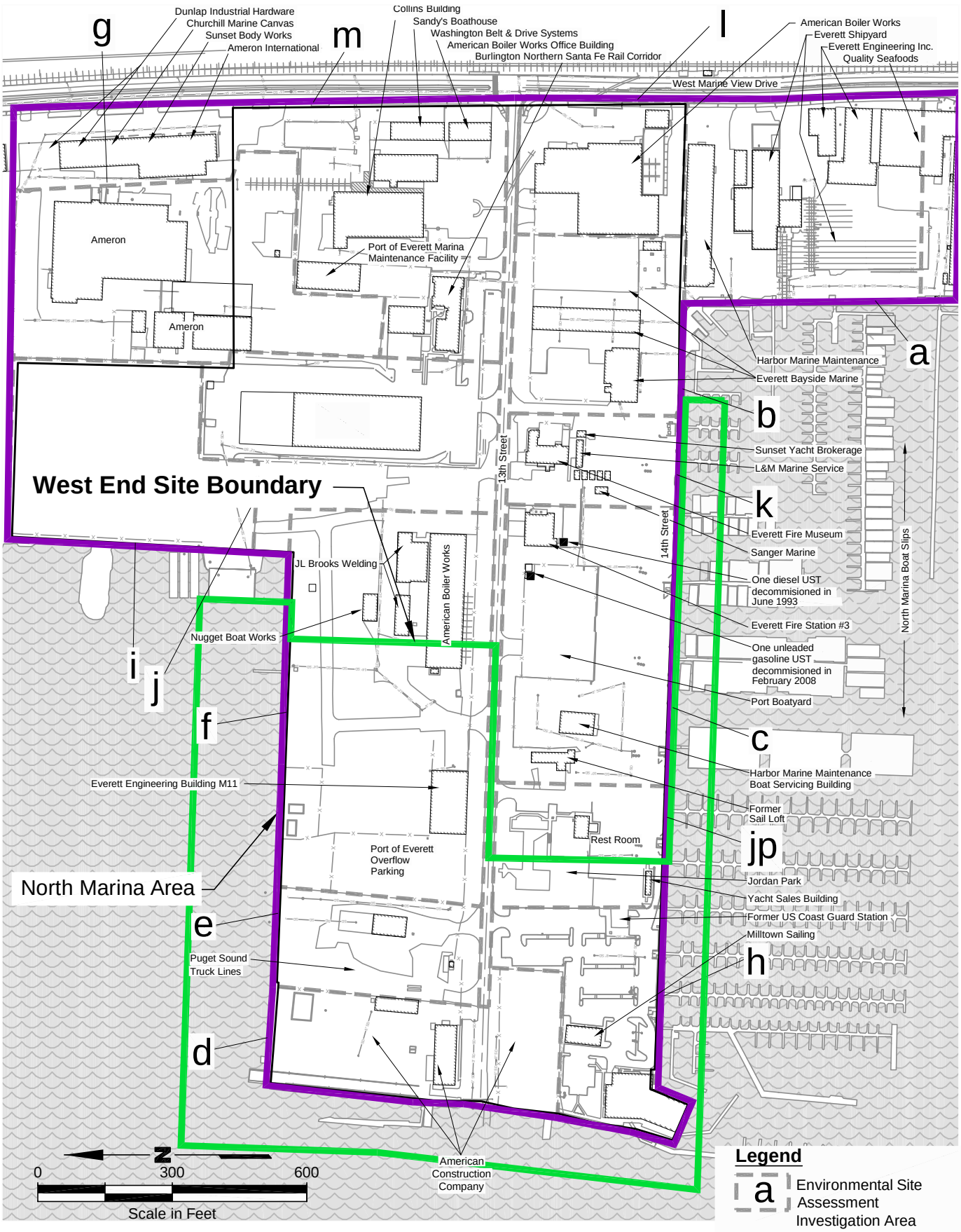


Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\110.111\Final West End RIFS Report\Figure 2.dwg (A) "Figure 2" 3/17/2011

North Marina West End Site
Cleanup Action Plan
Port of Everett, Washington

Location Plan

Figure
2

N

12th Street Marina

In-Water Area

Port Gardner Bay/Snohomish River

In-Water Area

Top of Bank

American Construction North Yard

E

SWALE

Puget Sound Truck Lines

Concrete Pad

D

Building

Concrete Pad

Building

Port of Everett Overflow Parking

Fence

Everett Engineering Work Yard

Co-Op Boat Yard

F

Fence

Everett Engineering Building 10

West End Site

JL Brooks Welding

ABW Plant II Building

Approximate Limits of Pink Material

Fence

Upland Area

American Construction South Yard

Jordan Park

JP

Milltown Sailing

H

Yacht Sales Building

Former Sail Loft

Fence

Harbor Marine Maintenance Boat Services Building

Rest Room

Port Boatyard

13th Street

Everett Fire Station #3

Everett Fire Museum

Everett Bayside Marina Office/Shop Building

L&M Marine Service

Sunset Yacht Brokerage

14th Street

In-Water Area

North Marina

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

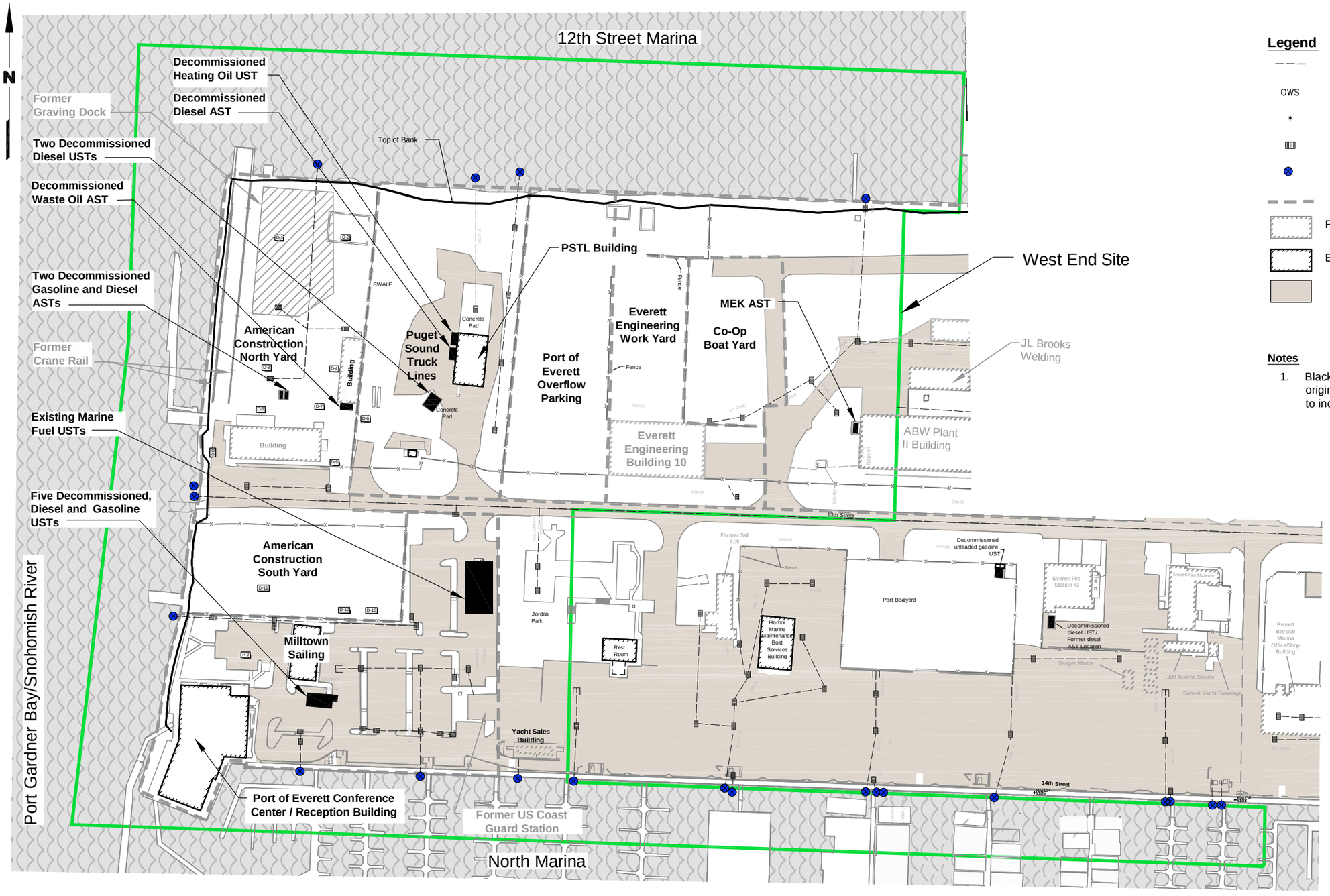
Scale in Feet

North Marina West End Site
Cleanup Action Plan
Port of Everett, Washington

Site Plan

Figure
3

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\110.111\Final West End RIFS Report\Figure 3.dwg (A) "Figure 3" 3/21/2011



Legend

- Storm Drain Line
- OWS — Oil/Water Separator
- Downspout
- Catch Basin
- Approximate Former or Existing Outfall Location
- Approximate Boundary of Former Leasehold
- Former Building
- Existing Building
- Existing Asphalt

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

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\110.111\Final West End RIFS Report\Figure 4.dwg (A) "Figure 4" 3/21/2011

N

Top of Bank

West End Site

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 other than Area D with Copper Soil Concentration Below the Preliminary Cleanup Level Based on Direct Contact (3,000mg/kg) but Above the Groundwater Protection Level (36mg/kg).
- 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.

0 100 200

Scale in Feet

North Marina West End Site Cleanup Action Plan Port of Everett, Washington	**Sampling Locations Representing Soil Remaining and MTCA Soil Cleanup Level Exceedances**	Figure **5**

Port of Everett/North Marina/Cleanup Action Plan | V:\1470\029\110.111\Final West End RIFS Report\Figure 5.dwg (A) "Figure 5" 3/21/2011

Legend

- 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.

North Marina West End Site
Cleanup Action Plan
Port of Everett, Washington

RI Groundwater Monitoring Locations

Figure 6

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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

GW-7	6/18/2009
VC	<0.02

GW-10	6/17/2009
VC	<0.02

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

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

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

12th Street Marina
Puget Sound Truck Lines
American Construction North Yard
RI-MW-2
Everett Engineering Work Yard
Co-Op Boat Yard
American Construction South Yard
Port of Everett Conference Center/ Reception Building
North Marina
Centerline Snohomish River
Port Gardner Bay/Snohomish River
N

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)

North Marina West End Site Cleanup Action Plan
Port of Everett, Washington

MTCA Groundwater Cleanup Level Exceedances

Figure 7

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12th Street Marina

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
RI-SED-11
RI-SED-12
RI-SED-13
RI-SED-14
RI-SED-15
RI-SED-16
RI-SED-17
RI-SED-19
SG-28

Puget Sound Truck Lines

American Construction North Yard

American Construction South Yard

Port of Everett Overflow Parking

Everett Engineering Work Yard

Co-Op Boat Yard

Port of Everett Conference Center Reception Building

North Marina

Centerline Snohomish River

Port Gardner Bay/Snohomish River

Harbor Line

N

RI-SED-18

Fluoranthene	221

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

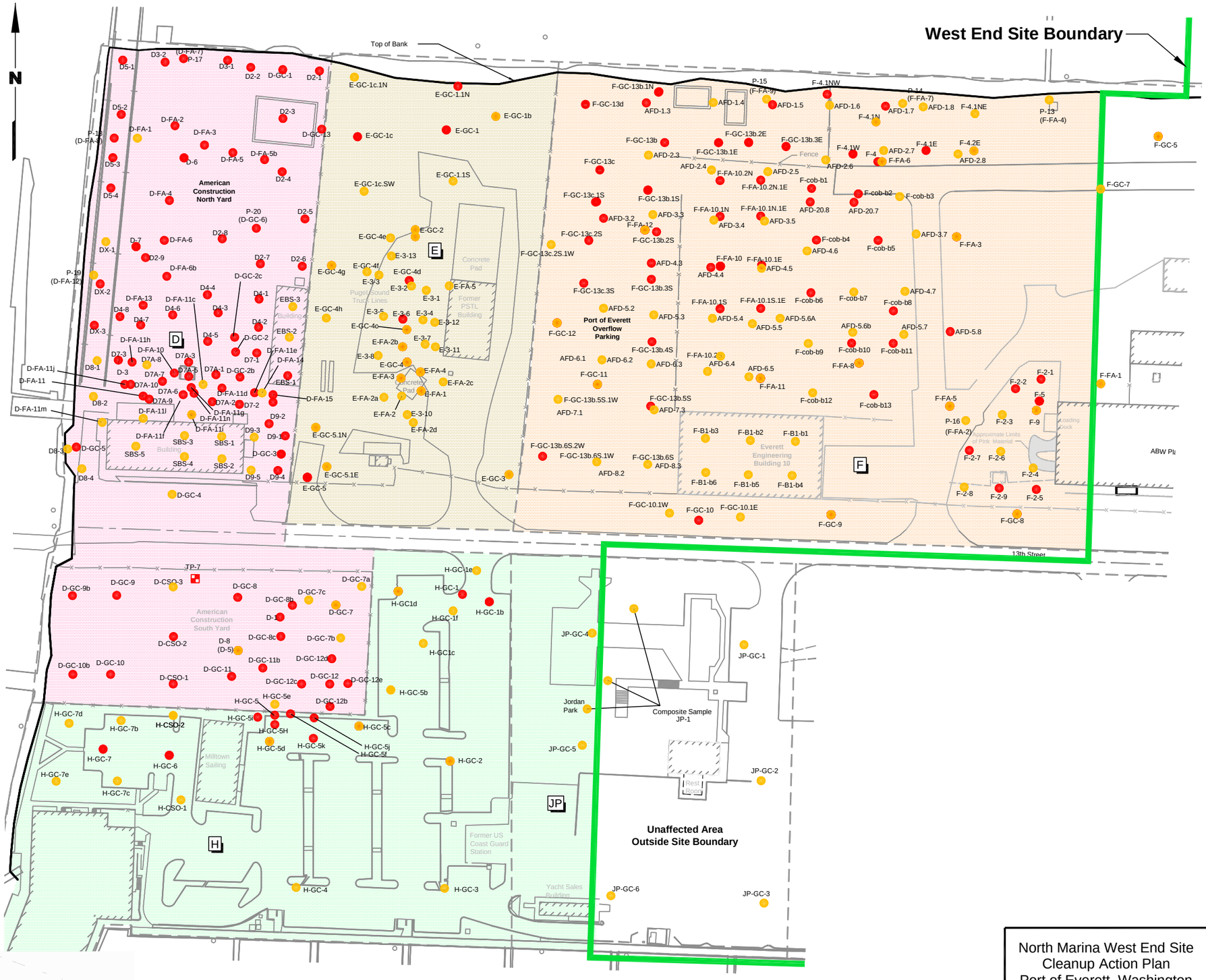
Data Source: Google Earth (2008 Image); Elevation Contours, Harbor Line, and Centerline of Snohomish River: Port of Everett Hydrographic Survey of Tall Ship Moorage; Post Dredge Elevation Contours (2005, PND Engineers)

North Marina West End Site
Cleanup Action Plan
Port of Everett, Washington

RI Sediment Sampling Locations and SQS Cleanup Level Exceedance

Figure 8

Y:\Projects\147029\Mapdocs\West End Site\Draft Cleanup Action Plan\No Logo\Fig8-SedimentSamples&Results.mxd 3/17/2011



North Marina West End Site Cleanup Action Plan Port of Everett, Washington	**Pre-Interim Action Soil Sample Locations with Interim Action Soil Cleanup Level Exceedances**	Figure 9

Port of Everett\North Marina\Cleanup Action Plan | V:\147\029\110.111\Final West End RIFS Report\Figure 9.dwg (A) "Figure 9" 3/17/2011

West End Site Boundary

Top of Bank

N

(D-FA-7)
P-17
P-18
(D-FA-8)
D-4
P-9
American Construction North Yard
P-20
(D-GC-6)
D
P-19
(D-FA-12)
D-FA-11c
D-FA-11k
D-FA-10
D7A-8
D-3
D7A-7
D-FA-11
D7A-10
D7A-6
P-25
D7A-9
D7A-2
P-21
D7-4
D-FA-11b
D-FA-11e
D-FA-14
D-FA-14b
Building
Building
Puget Sound Truck Lines
P-23
P-6
(E-2)
E
P-24
E-3-3
E-3-2
E-3 (See Note 2)
E-3-6
P-22
E-FA-5
Concrete Pad
Former PSTL Building
E-3
E-1
E-4
Concrete Pad
E-FA-2a
E-FA-2
E-3-10
E-4
AFD-5.2
Port of Everett Overflow Parking
P-5
P-15
(F-FA-9)
P-14
(F-FA-7)
P-13
(F-FA-4)
Fence
F-2
F-8
F-1
P-3
F
Everett Engineering Building 10
P-16
(F-FA-2)
Approximate Limits of Prin. Material
Marina Dock
JL Brooks Welding
F-FA-1
ABW Plant II Build
13th Street
D-2
American Construction South Yard
D-1
P-7
Jordan Park
H-1
H-5
H-3
H-4
H-2
H
JP
Former US Coast Guard Station
Yacht Sales Building
Former Sail Loft
Fence
D unleade
Port Boatyard
P-4
Harbor Marine Maintenance Boat Services Building
Rest Room

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 Cleanup Action Plan Port of Everett, Washington	**Pre-Interim Action Groundwater Sampling Locations with Interim Action Groundwater Cleanup Level Exceedances**	Figure 10

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\110.111\Final West End RIFS Report\Figure 10.dwg (A) 'Figure 10' 3/17/2011

N

Top of Bank

D-1 D-2a D-2b D-2c D-2d D-2e D-2f D-3a D-3b D-3c D-4a D-4b D-4c D-5 D-6 D-7 D-7a D-7b D-7c D-7d D-8 D-9a D-9b D-9c D-10 D-11

E-1a E-1b E-2 E-3 E-4

F-1a F-1b F-1c F-1d F-2 F-3 F-4a F-4b F-5 F-8a F-8b F-8c F-8d F-8e F-8f

H-1 H-2 H-3

American Construction North Yard

American Construction South Yard

Puget Sound Truck Lines

Building

Concrete Pad

Former PSTL Building

Concrete Pad

Port of Everett Overflow Parking

BLDG 10 Port of Everett Engineering Building 10

Building

Milltown Sailing

Jordan Park

Former US Coast Guard Station

Yacht Sales Building

13th Street

Former Sail Loft

Fence

Decommissioned unleaded gasoline UST

Port Boatyard

Everett Fire Station #3

Harbor Marine Maintenance Boat Services Building

Rest Room

Decommissioned diesel UST / Former diesel AST Location

Legend

- Approximate Boundary of Former Leasehold
- Building
- Previous Investigation Area D
- Previous Investigation Area E
- Previous Investigation Area F
- Previous Investigation Areas H & JP
- D-1 Soil Interim Action Area

Notes:

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

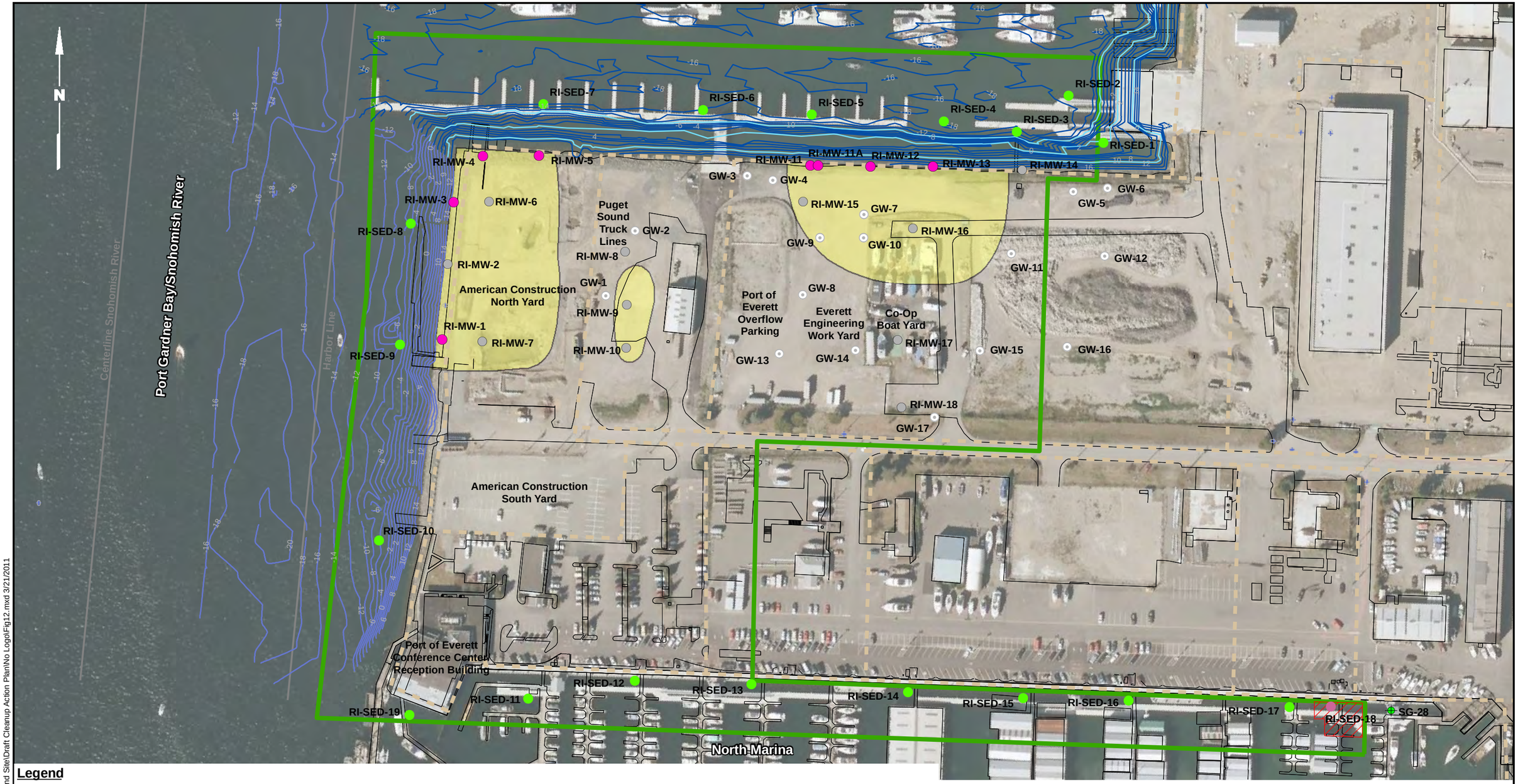
West End Site

0 100 200

Scale in Feet

North Marina West End Site Cleanup Action Plan Port of Everett, Washington	**Interim Action Areas**	Figure 11

Port of Everett/North Marina/Cleanup Action Plan | V:\147\029\110.111\Final West End RIFS Report\Figure 11.dwg (A) "Figure 11" 3/17/2011



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
- Residual Groundwater Contamination Area

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

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)

North Marina West End Site Cleanup Action Plan
Port of Everett, Washington

Residual Groundwater and Sediment Contamination Areas and Compliance Monitoring Locations

Figure 12

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TABLE 1
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 Removed (tons)**	**Groundwater**	**Soil**	**Groundwater**
Investigation Area D						
D-1	Arsenic, Copper, cPAHs	Arsenic	10,554	Source Removal	Yes	No
D-2a	Arsenic, Copper, cPAHs	--	647	--	Yes	--
D-2b	Arsenic, Copper, cPAHs	--	161	--	Yes	--
D-2c	Arsenic, Copper, cPAHs	--	323	--	Yes	--
D-2d	Arsenic, Copper, cPAHs	--	99	--	Yes	--
D-2e	Arsenic, Copper, cPAHs	--	2,244	--	Yes	--
D-2f	Arsenic, Copper, cPAHs	--	297	--	Yes	--
D-3	Arsenic, Copper, cPAHs	Arsenic, Copper	137	Source Removal	Yes	--
D-4a	Arsenic, Copper, cPAHs	--	664	--	Yes	--
D-4b	Arsenic, Copper, cPAHs	--	632	--	Yes	--
D-4c	Arsenic, Copper, cPAHs	--	130		Yes	--
D-5	Arsenic, Copper, cPAHs	Copper	229	Source Removal	Yes	No
D-6	Arsenic, Diesel, Oil	Diesel, Oil	76	Source Removal	Yes	No
D-7	Arsenic, cPAHs, Gasoline, Diesel, Oil	--	1,540	--	Yes	--
D-7d	Arsenic, cPAHs, Gasoline, Diesel, Oil	Gasoline, Diesel, Oil; Arsenic and Copper immediately downgradient	1,834	Source Removal, *In Situ* Soil Agitation, Groundwater Extraction	Yes	Yes; 4 rounds
D-8	Arsenic, cPAHs	Arsenic, Copper	22	--	Yes	--
D-9a	Arsenic, cPAHs	--	159	--	Yes	--
D-9b	Arsenic, cPAHs	--	97	--	Yes	--
D-9c	Arsenic	--	99		Yes	--
D-10	Arsenic, cPAHs	--	2,582	--	Yes	--
D-11	cPAHs	--	2,550	--	Yes	--
Investigation Area E						
E-1a	Arsenic	--	763	--	Yes	--
E-1b	Arsenic	--	1,032	--	Yes	--
E-2	Arsenic	--	141	--	Yes	--
E-3	Diesel	Diesel, Arsenic	657	Source Removal, *In Situ* Soil Agitation, Groundwater Extraction	Yes	Yes; 4 rounds
E-4	Diesel	Diesel	99	Source Removal, *In Situ* Soil Agitation, Groundwater Extraction	Yes	Yes; 5 rounds

TABLE 1
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 Removed (tons)**	**Groundwater**	**Soil**	**Groundwater**
Investigation Area F						
F-1a	Arsenic, cPAHs	Arsenic, Vinyl Chloride	603	Source Removal	Yes	--
F-1b	Arsenic	Arsenic	2,662	Source Removal	Yes	--
F-1c	Arsenic	Arsenic	419	Source Removal	Yes	--
F-1d	Arsenic	Arsenic	1,107	Source Removal	Yes	--
F-2	Arsenic, Lead	--	1,154	--	Yes	--
F-3	Arsenic	--	200	--	Yes	--
F-4a	Arsenic, cPAHs	--	2,868	--	Yes	--
F-4b	Arsenic	Arsenic	734	Source Removal	Yes	--
F-5	cPAHs	--	69	--	Yes	--
F-8a	cPAHs	Arsenic	255	Source Removal	Yes	--
F-8b	cPAHs	Arsenic	594	Source Removal	Yes	--
F-8c	cPAHs	Arsenic	277	Source Removal	Yes	--
F-8d	cPAHs	Arsenic	1,803	Source Removal	Yes	--
F-8e	cPAHs	Arsenic	1,109	Source Removal	Yes	--
F-8f	cPAHs	Arsenic	238	Source Removal	Yes	--
F-8g	cPAHs	Arsenic	632	Source Removal	Yes	--
Investigation Area H						
Area H-1	Arsenic	--	119	--	Yes	--
Area H-2	cPAHs	--	645	--	Yes	--
Area H-3	Arsenic, Mercury	--	362	--	Yes	--

TABLE 2
GROUNDWATER AND SEDIMENT CLEANUP LEVELS FOR CONSTITUENTS OF CONCERN
WEST END SITE, PORT OF EVERETT, WASHINGTON

Constituent of Concern	Groundwater Cleanup Level (µg/L)	Sediment Cleanup Level (mg/kg-OC)
Vinyl Chloride	2.4	NA
Arsenic	5	NA
Copper	3.1	NA
Fluoranthene	NA	160

NA = Not Applicable; analyte is not a constituent of concern for that medium (groundwater or sediment).

TABLE 3
COMPLIANCE MONITORING ANALYTICAL PARAMETERS
WEST END SITE
EVERETT, WASHINGTON

Location	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
RI-SED-18	Fluoranthene