Ecology Review Draft
Data Gaps Investigation
North Marina Redevelopment Site
Everett, Washington

May 13, 2005

Prepared for

Port of Everett
Everett, Washington

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EXECUTIVE SUMMARY

This report presents the results of the Data Gaps Investigation (DGI) for the Port of Everett (Port) North Marina Redevelopment Site located in Everett, Washington (Site). Figure E-1 presents a Site vicinity map and Figure E-2 presents a Site plan showing the investigation areas created for investigation of the Site. Site investigation and cleanup are being accomplished to address the requirements of the Washington State Department of Ecology's (Ecology) Model Toxics Control Act (MTCA; WAC 173-340) under Ecology's Voluntary Cleanup Program (VCP). It is the intent of the Port and the Maritime Trust Company {MTC; co-developer of the Site), that Site cleanup be adequate to meet MTCA requirements, and to obtain a no further action (NFA) determination from Ecology.

BACKGROUND

Site development extends back to around the turn of the century. From the early 1900s until about 1950, timber products operations dominated waterfront industrial activities. Over that period, the shoreline of Port Gardener 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 Site 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.

Following creation of additional Site uplands, businesses transitioned from primarily wood products industries to 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 Site is still dominated by businesses with a marine services orientation.

The Site is currently undergoing redevelopment into a mixed commercial, retail, and residential development. As part of the redevelopment, releases of hazardous substances associated with the industrial and commercial activities that have occurred on the Site over its operational history are being identified, and will be remediated, to comply with the MTCA regulations.

SCOPE OF ENVIRONMENTAL INVESTIGATIONS

Three environmental investigations were conducted at the Site prior to implementation of the DGI. These investigations included a Phase I ESA conducted in 2001 (Landau Associates 2001), a Phase II ESA conducted in late 2003 and early 2004 (Landau Associates 2004a), and an expedited soil investigation along the 14th Street bulkhead conducted in mid 2004, and reported in the DGI Work Plan (Landau Associates 2004b). The Phase I and Phase II ESAs were submitted to Ecology for review.

The DGI was conducted in late 2004 and early 2005 to fill data gaps in Site environmental characterization that remained following the completion of the previous Site investigations. The data gaps in Site characterization that were identified following completion of the Phase II ESAs that needed to be filled to complete the delineation of the nature and extent of contamination, and to develop a Site cleanup action plan (CAP) consisted of:

- Delineation of the vertical and lateral extent of shallow soil contamination detected at a number of locations during the Phase II ESAs
- Delineation of deeper soil contamination at one location (Investigation Area d)
- Delineation of arsenic groundwater contamination at two locations (Investigation Areas d and f)
- Characterization of environmental conditions in the vicinity of a number of former petroleum hydrocarbon underground storage tanks (USTs) that were not adequately documented at the time of closure for Ecology to issue a NFA determination.

Additionally, soil and groundwater quality needed to be characterized in Site areas not previously characterized during the Phase II ESAs.

This DGI report is intended to adequately delineate the nature and extent of contamination throughout the portion of the Site intended for cleanup by the Port during the early phases of Site redevelopment. The Planned Cleanup Area includes most, but not all, of the Site. The boundary of the Planned Cleanup Area is shown on Figure E-2. The remainder of the Site will either be cleaned up by others, or will be cleaned up at a later date by the Port.

Because of its large size, the Site is divided into 13 sub-areas (Investigation Areas a though m) for investigation and data management purposes. In some instances, these investigation areas constitute single leaseholds (such as Investigation Area d, the American Construction leasehold). In other instances, the investigation areas are comprised of multiple leaseholds, such as Investigation Area f. Investigation area boundaries are shown on Figure E-2.

A total of 233 borings and 26 groundwater monitoring wells were installed during the Phase II ESA and DGI investigations. Soil and groundwater samples from total of 192 soil explorations and 26 monitoring wells were collected and tested for various environmental constituents to delineate the nature and extent of contamination. Selected soil and groundwater samples were tested for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), heavy metals, gasoline-range to oil-range petroleum hydrocarbons, carcinogenic polycyclic aromatic hydrocarbons (cPAH), polychlorinated biphenyls (PCBs), and tributyl tin (TBT). The locations and designations for Site environmental explorations are shown on Figure E-3.

CONCLUSIONS

Site contamination consists of metals, cPAH and petroleum hydrocarbons in soil, and metals and petroleum hydrocarbons in groundwater, based on the data resulting from the environmental investigations, and observations made during field investigation activities,. VOCs andSVOCs were also tested for in soil, but none of these compounds were detected at concentrations exceeding the cleanup screening levels. One soil sample exceeded the cleanup screening level for PCB Aroclor 1254, although the cleanup screening level for total PCBs was not exceeded. VOCs and SVOCs were also tested for in groundwater, but did not exceed the cleanup screening levels. More specific conclusions are presented below.

Methane is not a hazardous substance regulated by the MTCA. However, the presence of methane was evaluated during the Phase II ESA, and the following conclusions regarding its presence and considerations for Site redevelopment have been drawn:

- Decomposing wood debris is present in subsurface soil throughout a large portion of the site, and significant methane gas is generated as a result of its presence.
- Concentrations of methane gas exceeded the lower explosive limit (LEL) at a number of monitoring locations; methane has the potential to accumulate in subsurface structures, voids, and vaults at concentrations that pose a risk for explosion or oxygen depletion.

The following conclusions have been drawn regarding the nature and extent of Site petroleum hydrocarbon contamination:

- Petroleum hydrocarbon contamination significant enough to warrant remedial action was only encountered at three locations:
  - Diesel-range contamination associated with the diesel fuel AST in Investigation Area d
  - Oil- and diesel-range contamination associated with the used oil AST in Investigation Area d
  - Diesel-range contamination that appears to be associated with the former diesel USTs in Investigation Area e.
- A NFA determination from Ecology is requested for several former USTs, where sufficient data were collected to conclude that no further action associated with these former tank locations is required

The following conclusions have been drawn regarding the nature and extent of Site cPAH and metals contamination in soil:

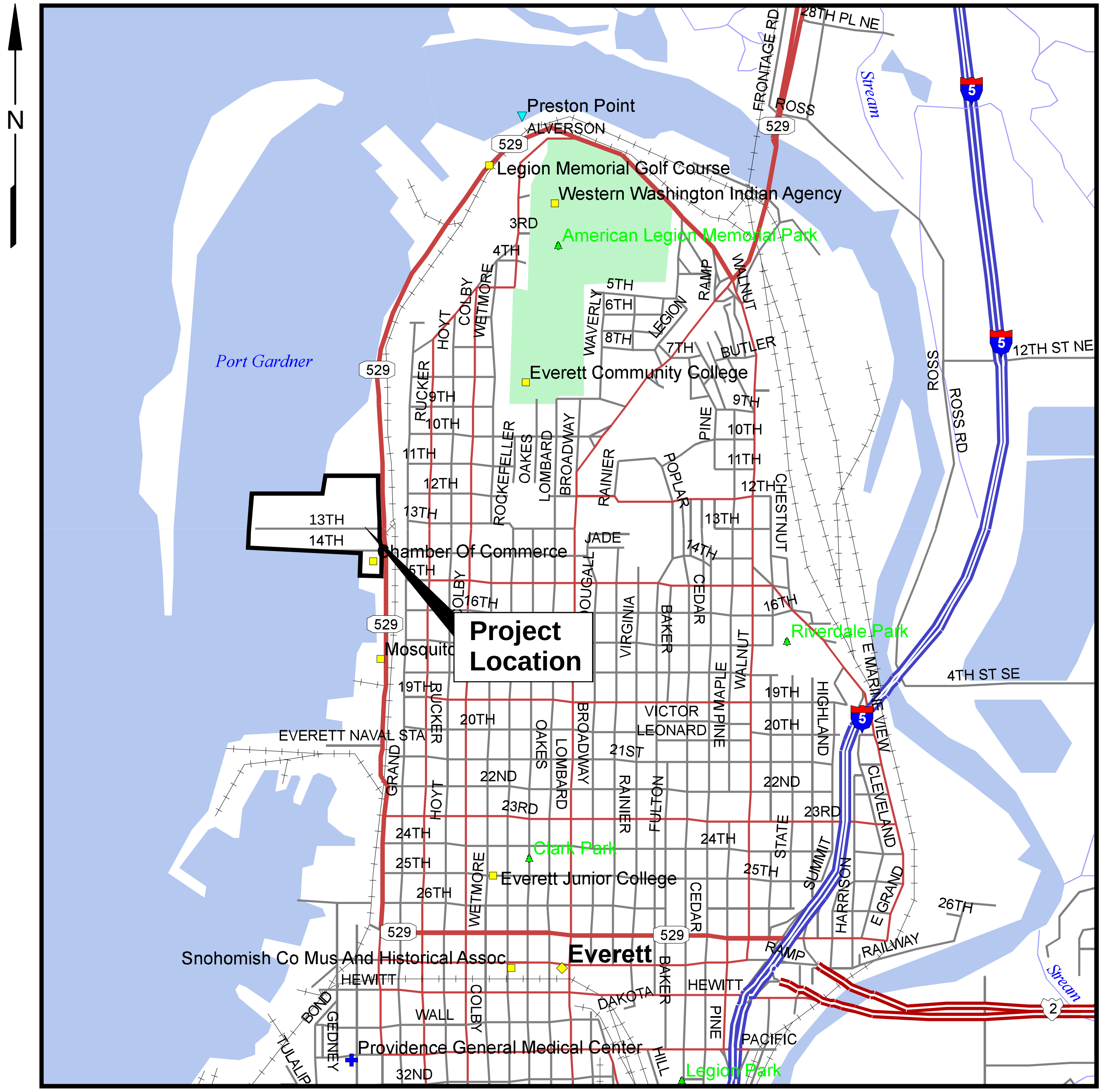
- Concentrations of metals and cPAHs in shallow soil exceed the cleanup screening levels at several locations. Arsenic is the most ubiquitous metal contaminant, with a limited number of excedances for lead, copper and mercury.

- Metals and cPAH soil contamination is limited to the upper 3 ft of soil, except for deeper arsenic and cPAH contamination present in the North Yard of Investigation Area d.
- Arsenic soil contamination is present in two soil stockpiles present in Investigation Area i
- The soil cleanup screening level for TBT was exceeded in one of 12 soil samples tested.

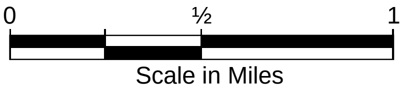
The following conclusions were drawn regarding the nature and extent of cPAH and metals contamination in groundwater:

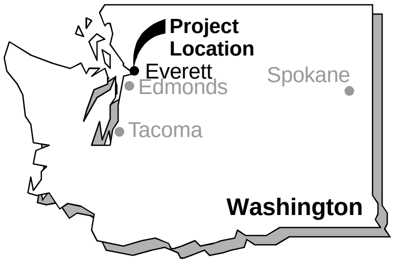
- The arsenic groundwater cleanup screening level was exceeded in two areas of Investigation Area d:
  1. The arsenic groundwater cleanup screening level was exceeded in the vicinity of the former graving dock, and appears to be related to arsenic-affected soil that extends below the groundwater table.
  2. The arsenic groundwater cleanup screening level was exceeded in a groundwater sample collected from Monitoring Well P-21, and may be caused by a reduced oxidation state in groundwater resulting from upgradient diesel-range petroleum hydrocarbon contamination associated with the diesel AST.
- The arsenic groundwater cleanup screening level was exceeded at a number of locations within the north-central portion of Investigation Area f. The exceedance appears to result from background levels of arsenic in soil in contact with groundwater in a reduced oxidation state. The reduced groundwater conditions appear to be the result of organic material in subsurface soil, not a release of hazardous substances.
- Although groundwater monitoring wells near the proposed downgradient point of compliance in Investigation Area f exceeded the arsenic cleanup screening level, the wells are located about 15 to 25 ft from the shoreline and it is anticipated that water collected from the groundwater/surface water interface will achieve the arsenic cleanup screening levels.
- The initial cPAH exceedances appear to be the result of particulates entrained during the sampling process, rather than dissolved constituents in groundwater, and cPAH are not considered a constituent of concern for groundwater.

The conclusions presented above will be used as the basis for developing a CAP for the portions of the Site planned for remedial action at this time. The CAP will be submitted to Ecology for review and concurrence under its VCP.



Map from DeLorme Street Atlas USA, 2002





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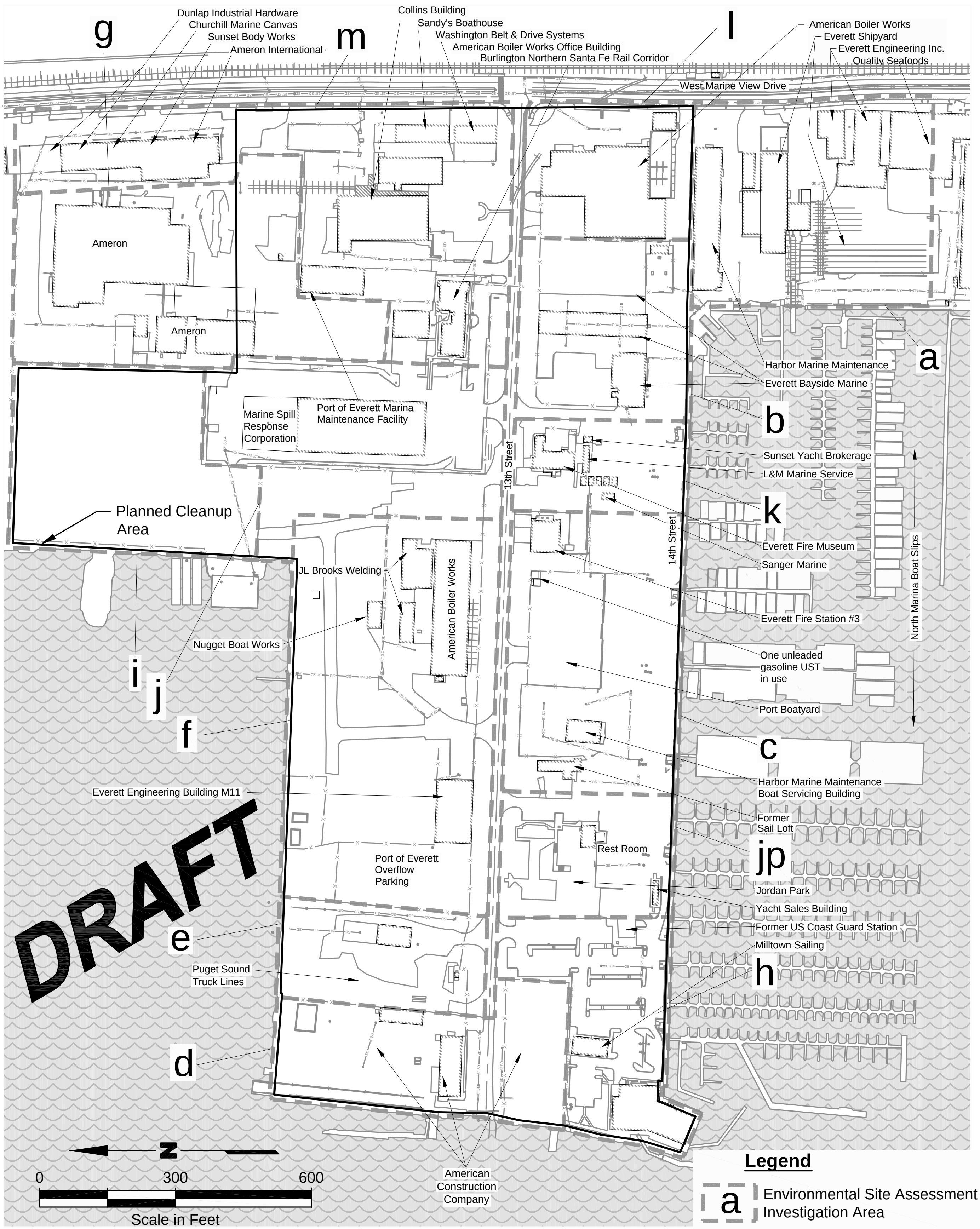
North Marina Data Gaps Investigation Everett, Washington	**Vicinity Map**	Figure E-1



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North Marina
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Site Plan

Figure
E-2

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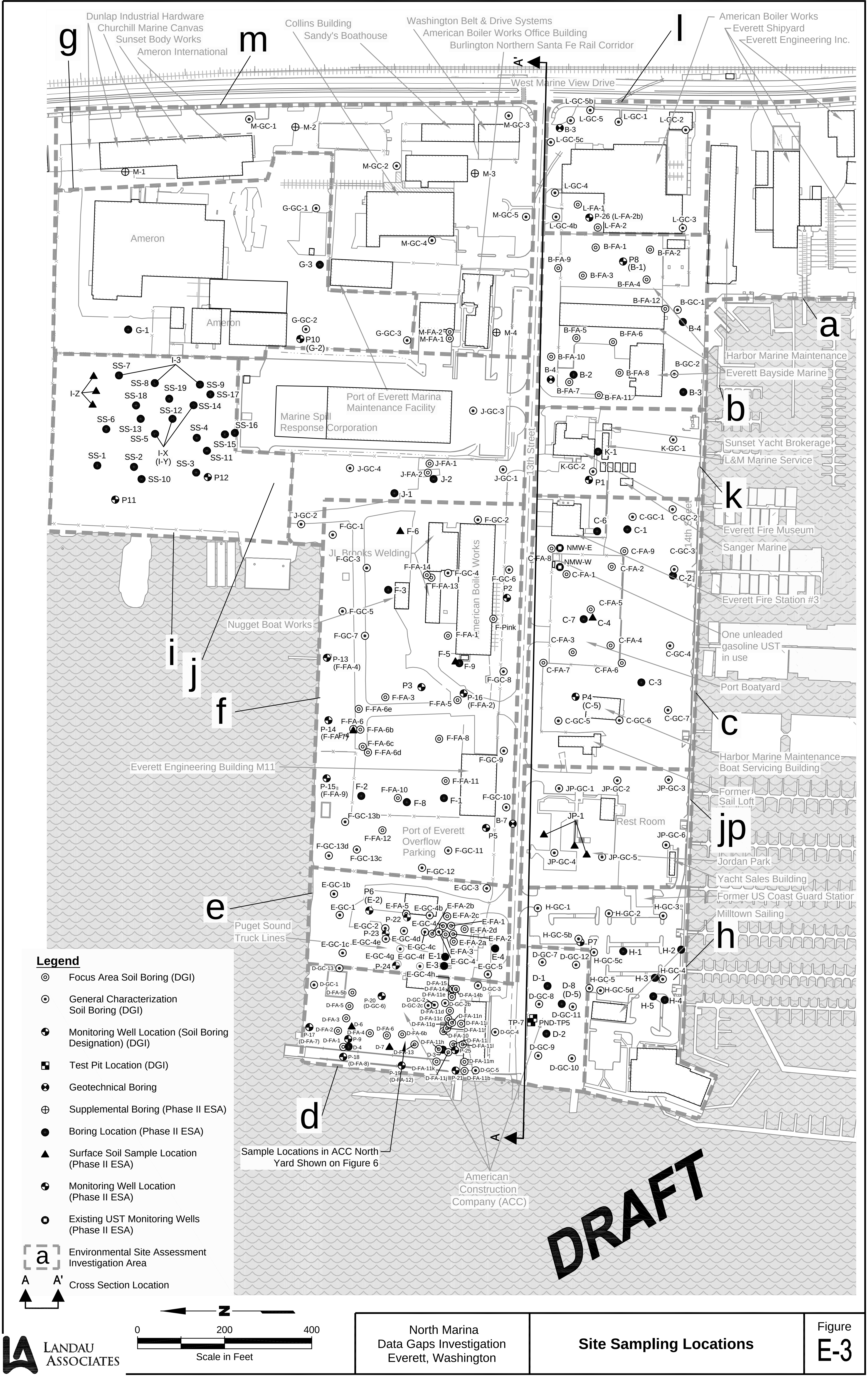

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1.0 INTRODUCTION

This report presents the results of the Data Gaps Investigation (DGI) for the Port of Everett (Port) North Marina Redevelopment Site located in Everett, Washington (Site). Figure 1 presents a Site vicinity map, and Figure 2 presents a Site plan showing the investigation areas created for investigation of the Site.

This DGI was conducted subsequent to one Phase I Environmental Site Assessment (ESA; Landau Associates 2001) and two Phase II ESAs conducted for different portions of the Site (Landau Associates 2003, 2004a). The Phase I and Phase II ESAs were submitted to the Washington State Department of Ecology (Ecology) for review.

Certain data gaps in Site characterization were identified following completion of the Phase II ESAs that needed to be filled to complete the delineation of the nature and extent of contamination, and to develop a Site cleanup action plan. These data gaps consist of:

- Delineation of the vertical and lateral extent of shallow soil contamination detected at a number of locations during the Phase II ESAs
- Delineation of deeper soil contamination at one location (Investigation Area d)
- Delineation of arsenic groundwater contamination at two locations (Investigation Areas d and f)
- Characterization of environmental conditions in the vicinity of a number of former petroleum hydrocarbon underground storage tanks (USTs) that were not adequately documented at the time of closure for Ecology to issue a no further action (NFA) determination.

Additionally, soil and groundwater quality needed to be characterized in Site areas not previously characterized during the Phase II ESAs.

1.1 OBJECTIVES

The primary objectives of the DGI are to:

- Fill the data gaps needed to adequately delineate the nature and extent of soil and groundwater contamination throughout the portion of the Site to be addressed as part of the Site cleanup action (the Planned Cleanup Area) to be implemented during this phase of the Site redevelopment
- Consolidate the data collected during the DGI with previously collected data to provide a comprehensive understanding of Site environmental conditions for the Planned Cleanup Area
- Identify the proposed cleanup levels for affected soil and groundwater that will provide the basis for the cleanup action for the Planned Cleanup Area.

The information presented in this report will be used to develop a cleanup action plan (CAP) for the Planned Cleanup Area, which will be prepared as a separate document, and submitted to Ecology for review and concurrence.

1.2 REGULATORY FRAMEWORK

Site investigation and cleanup are being accomplished to address the requirements of the Washington State Department of Ecology's (Ecology) Model Toxics Control Act (MTCA; WAC 173-340) under Ecology's Voluntary Cleanup Program (VCP). Previous Site reports, including the Phase I and Phase II ESAs, were submitted to Ecology for review. Additionally, the work plan for the DGI (Landau Associates 2004b) was submitted to Ecology in draft form for review and concurrence, and the work plan scope was modified to address Ecology comments. It is the intent of the Port and the Maritime Trust Company (MTC; co-developer of the Site), that Site cleanup be adequate to meet MTCA requirements and to obtain a no further action (NFA) determination from Ecology.

1.3 REPORT ORGANIZATION

Section 2.0 of this report presents the current and historical Site background. Section 3.0 describes the environmental investigations conducted to characterize Site soil and groundwater quality. Section 4.0 describes development of cleanup screening levels used to evaluate the nature and extent of Site contamination. Section 5.0 presents and evaluates the results of the soil and groundwater investigations, including Site hydrogeologic conditions and the nature and extent of contamination. Section 6.0 presents conclusions regarding Site environmental conditions and remedial action. Section 7.0 presents allowable uses of this report. Section 8.0 lists the documents referenced in this report.

2.0 SITE BACKGROUND

This section presents Site background, including a description of the Site development history and current and historical Site uses. Because of its large size, the Site is divided into 13 sub-areas (Investigation Areas a though m) for investigation and data management purposes. In some instances, these investigation areas constitute single leaseholds (such as Investigation Area d, the American Construction leasehold). In other instances, the investigation areas are comprised of multiple leaseholds, such as Investigation Area f.

The investigation areas were originally defined for the Phase II ESA (Landau Associates 2004a), but were expanded for the DGI to encompass Site areas not characterized during the Phase II ESA. Investigation Areas i, j, and a portion of g and m were added to the DGI after the DGI work plan was completed; however, these areas were investigated using the same strategy, sampling density, and field and laboratory procedures presented in the DGI work plan. The investigation areas are shown on Figure 2, and will be referenced when discussing Site features and environmental conditions.

The Planned Cleanup Area includes most, but not all, of the Site. The boundary of the Planned Cleanup Area is shown on Figure 2. The remainder of the Site will either be cleaned up by others, or will be cleaned up at a later date by the Port. The Site areas not included in the Planned Cleanup Area, and not addressed as part of the DGI include:

- Investigation Area a - the Port's tenant (Everett Shipyard) has committed to completing cleanup prior to vacating the property
- Most of Investigation Area g - occupied by a tenant (Ameron) whose lease extends through 2012.

2.1 SITE DEVELOPMENT HISTORY

Site development extends back to around the turn of the century. From the early 1900s until about 1950, timber products operations dominated waterfront industrial activities. Over that period, the shoreline of Port Gardener 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 Site 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.

Following creation of additional Site uplands, businesses transitioned from primarily wood products industries 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 Site is still dominated by businesses with a marine services orientation.

2.2 CURRENT AND HISTORICAL PROPERTY USE

This section describes the current and historical uses for the Site, subdivided into the investigation areas identified above. The general uses of each property or lease holding relevant to environmental issues are described for each investigation area. The Site usage history is based on the Phase I ESA (Landau Associates 2001), which should be reviewed for a more thorough description of Site historical uses and recognized environmental conditions.

As discussed in the Phase I ESA, a number of underground and aboveground storage tanks (USTs and ASTs, respectively) that contained petroleum hydrocarbons either currently exist, or previously existed, on the Site. In some instances, there have been documented or suspected releases from these tanks. Tank removal and cleanup have previously been conducted at some of these locations, although these activities were generally conducted in the early 1990s and cleanup documentation varies in adequacy and completeness. Based on Ecology records, it does not appear that a NFA has been obtained for any of these sites.

A summary of known UST and AST information is presented in Table 1 and locations are shown on Figure 3. Available information regarding these petroleum hydrocarbon sites are discussed in the appropriate historical sections below, and investigation activities implemented during the Phase II ESA and DGI to evaluate potential releases associated with these site are discussed in Section 3.3.2.

2.2.1 INVESTIGATION AREA a

Investigation Area a includes the Everett Shipyard (Fisherman's Boat Shop), some buildings occupied by Everett Engineering, Inc., and a portion of the Quality Seafoods facility. As previously discussed, this area was investigated during a separate Phase II ESA for the Port and cleanup related to this area is being addressed by the current tenant (Landau Associates 2003). As a result, this area is not part of the cleanup being implemented by the Port and is not addressed further in this document.

2.2.2 INVESTIGATION AREA b

Investigation Area b consists of the Everett Bayside Marina leasehold at 1001 14th Street, which specializes in boat maintenance and storage. Primary environmental concerns associated with these activities are heavy metals in shallow soil, and potential petroleum hydrocarbons associated with used oil or other fluids.

In addition to the above concerns, records indicate historical use of two gasoline USTs, identified as location UST-2 in Table 1 and shown on Figure 3. The tanks were removed in 1991; one of tanks is known to have leaked. Contaminated soil was reportedly excavated, landfarmed, and then stockpiled in the northern portion of the Site as clean soil (Landau Associates 2001, Appendix E). However, available documentation for the tank removal and cleanup is insufficient to confirm the adequacy of the cleanup.

2.2.3 INVESTIGATION AREA c

Investigation Area c comprises three properties: 1) the Everett Fire Station #3 leasehold, 2) the Port of Everett Boatyard, and 3) the Harbor Marine Maintenance Boat Servicing Center. The area extends from the southern edge of 13th Street to the 14th Street bulkhead.

At Everett Fire Station #3, a diesel UST, presented as location UST-3 in Table 1 and on Figure 3, was removed in 1991 and an active AST exists where the removed UST was located. Based on available information, the UST does not appear to have caused any releases to the environment, based on the results of five soil samples collected from the excavation (Landau Associates, Appendix E).

Harbor Marine Maintenance had reported historical use of multiple chemical products. However, no specific conditions of environmental concern were identified for this leasehold.

The Port of Everett Boatyard has been used for general boat maintenance. Primary environmental concerns associated with these boatyard activities are heavy metals in shallow soil, and potential petroleum hydrocarbons associated with used oil or other fluids. Additionally, there is an active unleaded gasoline UST (UST-4) on the northeast corner of the boatyard, with two existing monitoring wells in close proximity.

2.2.4 INVESTIGATION AREA d

Investigation Area d consists of the ACC leasehold, which specializes in pile driving, dredging and marine construction activities, and has operated at this location for approximately 50 years. Historical and current maritime construction activities on the American Construction Company (ACC) leasehold include, among other things, sandblasting, painting, and storage of creosote-treated timbers. Three active onsite ASTs are used for diesel, gas, and waste oil storage; these ASTs have not been reported as leaking. A number of potential sources of spills and/or releases of hazardous substances were noted during the Phase I ESA, 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.

2.2.5 INVESTIGATION AREA e

Investigation Area e is the former location of Puget Sound Truck Lines (PSTL) and Ethyl Corporation. Available information indicates that two diesel USTs (location UST-5) and a heating oil UST (UST-5b) were located on the property, as listed in Table 1 and shown on Figure 3. PSTL also operated a diesel AST on the property following removal of the diesel USTs, but removed it prior to vacating the property.

PSTL removed its diesel USTs in 1991 and its heating oil UST in 2002. A release from the diesel UST location was encountered during tank removal and contaminated soil 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 UST, the information in Ecology's files is incomplete and does not provide an adequate basis for Ecology to issue a NFA determination (Landau Associates 2001, Appendix E). 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 are the only identified environmental concerns for Investigation Area e.

2.2.6 INVESTIGATION AREA f

Investigation Area f includes five properties along the north side of 13th Street: 1) Everett Engineering Building M11, 2) Port overflow parking, 3) Nugget Boat Works, 4) former JL Brooks Welding, and 5) former American Boiler Works Plant 2. These properties have been used for general industrial and marine industrial purposes.

A potential UST at JL Brooks Welding (UST-6) was identified based on the presence of an asphalt patch and an apparent vent line attached to the south building; no records regarding a potential UST were identified in Ecology files or databases. Additionally, an unidentified subsurface vault or tank structure beneath the Everett Engineering Building M11 was identified during the Phase I ESA Site reconnaissance, although the use or contents of the structure could not be ascertained. Sandblast grit residue and surface soil staining by petroleum product were also noted in some portions of Investigation Area f. Everett Engineering Building M11 and its associated outdoor storage area exhibited poor housekeeping, and extensive industrial machinery and materials were observed to the north of the building. Boat maintenance activities have also taken place at several locations in Investigation Area f. Based on these identified site uses, there is the potential for shallow soil contamination from heavy metals and petroleum hydrocarbons associated with boat maintenance activities and general industrial activities.

2.2.7 INVESTIGATION AREA g

Investigation Area g consists of the Ameron International leasehold. An UST (location UST-7) reportedly is listed on Ecology's UST database as removed. However,no information regarding the tank location or removal was provided by the tenant or could be located in Ecology's files. Multiple chemical products are used and stored on this property, although no specific areas of environmental concern were identified during the Phase I ESA.

The Ameron leasehold is also the site of a historical fire that destroyed the wood products mill formerly located on the property. Fires on industrial properties generally have a moderate to high potential to release various hazardous substances such as cPAH.

2.2.8 INVESTIGATION AREA h

Investigation Area h includes a former U.S. Coast Guard station, the existing Milltown Sailing building, and current and former fuel USTs associated with the marina fuel dock. The removal of five former gasoline and diesel USTs (UST-2) and fuel lines occurred in 1992. About 80 yd^3 of stained soil was removed from around the tank fill pipes, and was remediated by aeration. None of the 14 soil samples collected from the excavation sidewalls and bottom contained detectable concentrations of petroleum hydrocarbons, and the data submitted to Ecology appear adequate to conclude that the tanks were appropriately closed and associated minor releases associated with spillage at the fill pipes were adequately remediated (Landau Associates 2001, Appendix E).

The USTs that replaced the closed tanks described above will be relocated and replaced as part of the Site redevelopment. Closure of these active USTs will be performed at that time and will be addressed separately from other Site cleanup activities.

No other conditions of environmental concern were identified for this investigation area.

2.2.9 INVESTIGATION AREA i

Investigation Area i is comprised of the property between the 12th Street Waterway and Investigation Area g. This portion of the North Marina Area is currently unused. Anecdotal information indicates that soil landfarming for remediation of petroleum hydrocarbon-impacted soil removed for Site UST closures conducted in the early 1990s was performed in this area. Additionally, it appears that the area has been used for the stockpiling of soil and/or debris. This area is also the location of a former lumber mill that burned down in the late 1960s. No other issues of environmental concern were identified for Investigation Area i.

2.2.10 INVESTIGATION AREA j

Investigation Area j includes the Marine Spill Response Corporation (MSRC) leasehold. An independent cleanup action was reportedly completed in 1993 to remove material impacted by petroleum hydrocarbons, and potentially other hazardous substances adjacent to, and west of, the MSRC facility. The approximate location of this independent cleanup action is shown on Figure 2, and labeled "MSRC Cleanup." This cleanup is documented in an independent cleanup action report (Kleinfelder 1993). The cleanup entailed removing diesel- and oil-contaminated soil, drums, scrap steel, and debris from a concrete vault encountered during construction of the drainage swale to the west of the MSRC building. A total of about 600 yd^3 of contaminated soil was excavated and disposed of at a solid waste facility. Although post-excavation confirmation soil samples indicated that the cleanup action did not leave contaminated material in place, no groundwater samples were collected as part of the cleanup action.

Also, an approximately 10,000-gal UST (UST-7) used for fueling Port vehicles, and later for waste oil storage, was reportedly removed in the late 1980s from the same vicinity as the concrete vault. No documentation regarding the presence or decommissioning of this UST is available, and its existence was not known until identified by Port personnel during the Phase II ESA.

No conditions of environmental concern other than the two issues described above were identified for Investigation Area j.

2.2.11 INVESTIGATION AREA jp

Investigation Area jp includes Jordan Park, which is a small recreational park located between Investigation Areas c and h. The park is characterized by several grass covered embankments constructed of fill material of unknown origin. The embankments are separated by concrete pathways. No specific areas of environmental concern were identified for this area, other than the unknown fill source for the park fill material.

2.2.12 INVESTIGATION AREA k

Investigation Area k includes the Everett Fire Museum, where the city maintenance shop was formerly located. Historical activities may have involved the use of fuel products and solvents, although no specific areas of environmental concern were identified.

2.2.13 INVESTIGATION AREA l

Investigation Area l consists of the American Boiler Works Plant 1 leasehold. The property is comprised of the factory warehouse where industrial boiler products are manufactured, and asphalted areas to the north, east, and west. The west yard (asphalted) was used for storage, including 55-gal drums containing various products such as MEK, hydraulic oil, paint and isopropanol. Additionally, two stormwater sumps are located in this yard. No specific areas of environmental concern were identified for this investigation area.

2.2.14 INVESTIGATION AREA M

Investigation Area m consists of several buildings, including the Collins Building, the current Port maintenance shop, and a number of businesses that front on West Marine View Drive. A former location for three gasoline and diesel USTs (UST-1), listed in Ecology records as having been removed from Bayside Marine (1100 13th Street), was determined to be incorrectly located; the correct location was identified with the assistance of Port personnel and historic site drawings showing the overlying concrete anchor pad. The USTs were located within the footprint of a planned building expansion, which was reportedly the reason for their removal. The correct location for these former USTs was identified subsequent to the Phase II ESA, and is shown on Figure 3.

3.0 SITE INVESTIGATION ACTIVITIES

This section provides a description of all investigation activities conducted to characterize the Site that were used for this report. Only those investigations associated with the portion of the Site that is currently being addressed are presented in this report. As a result, the data associated with Investigation Area a (the Everett Shipyard) and Investigation Area g (Ameron) are not presented in this document.

The Site investigation activities are organized into the following sections: Chronology of Site Investigation Activities (Section 3.1); Phase II ESA (Section 3.2); and DGI (Section 3.3). The results of these investigations are presented in Section 5.0.

3.1 CHRONOLOGY OF SITE INVESTIGATION ACTIVITIES

Two environmental investigations were conducted at the Site that provided data used in this DGI Report. Prior to implementation of the DGI. a Phase II ESA conducted in late 2003 and early 2004 (Landau Associates 2004a), and an expedited soil investigation along the 14th Street bulkhead conducted in

mid 2004 and reported in the DGI work plan (Landau Associates 2004b). The DGI was conducted in late 2004 and early 2005 to further characterize soil and groundwater conditions near known impacted areas, and to provide general characterization throughout portions of the Site where conditions of environmental concern were not identified.

3.2 PHASE II ESA

This section provides a summary of the environmental investigation activities conducted during the Phase II ESA. The locations of explorations completed during the Phase II ESA are shown on Figure 4, and the rationale for the selected sampling locations are presented in Table 2.

3.2.1 SOIL SAMPLING

A total of 64 borings and 14 surface soil samples, including 12 borings advanced for the installation of monitoring wells, were completed during the Phase II ESA to evaluate Site soil conditions. Most soil samples were collected using Geoprobe™ direct-push drilling techniques. Some surface soil samples were collected by hand using stainless-steel hand tools (i.e., spoon, hand auger, or spade). All procedures were conducted in general accordance with the Phase II ESA work plan (Landau Associates 2003).

Soil samples were collected, and tested for a variety of analytical parameters, depending on environmental concerns identified for the investigation area. The rationale for soil sampling and testing is presented in Table 2, and a summary of soil analytical testing completed during the Phase II ESA is presented in Table 3. It is important to recognize that soil samples from all borings were field screened for the presence of contamination using a photoionization detector (PID), and visual and olfactory observations; soil samples were submitted for chemical testing from locations where field screening indicated the potential presence of contamination, in addition to samples previously planned for laboratory analysis. The Phase II ESA soil exploration activities are summarized below.

- **Surface Soil Samples:** Surface soil samples were collected at locations where potential environmental impacts were likely to occur at ground surface, based on the historic activities for that location (e.g., boat maintenance), or at locations where visual evidence of environmental impact was present (e.g., surface staining). The surface soil samples were generally collected from the top 6 inches of soil. Fourteen surface soil samples were collected for laboratory analysis during the Phase II ESA. These 14 samples included 3 composite samples collected from soil stockpiles present in investigation area “i”.

- **Subsurface Soil Samples:** Subsurface soil samples were collected to bound the vertical extent of shallow soil contamination and to identify the presence of contamination that would likely be present in the vicinity of the groundwater table (e.g., petroleum hydrocarbon contamination). Boreholes were constructed to depths of 4 to 13 ft below ground surface (BGS). Continuous soil samples were collected to the total depth of each boring for geologic logging purposes and field screening for possible contamination. Sixteen of the subsurface soil samples collected from the borings were tested for chemical constituents during the Phase II ESA.

No evidence of gasoline- or diesel-range free-phase petroleum hydrocarbon contamination was observed during the Phase II ESA, although a slight petroleum odor was observed in shallow soil in a number of borings. However, evidence of heavy oil- or creosote-range hydrocarbon contamination was encountered in Investigation Area d, at locations D-3, D-4, and Monitoring Well P-9. The material was encountered within a relatively limited zone at a depth of 4 to 7 ft BGS.

Nineteen of the borings, identified as NMP2-SS-1 through NMP2-SS-19, were completed in Investigation Area i to characterize the soil stockpiles present in that investigation area. A discolored layer of material with a solvent odor was encountered at NMP2-SS-2, and 15 additional borings were completed within this stockpile area to delineate the lateral and vertical extent of this affected soil layer.

3.2.2 GROUNDWATER INVESTIGATION

During the Phase II ESA, groundwater samples were collected from 33 boreholes and 12 monitoring wells (P-1 through P-12) that were installed throughout the Site. The monitoring wells were installed to provide depth to groundwater data for future construction purposes, evaluate methane gas presence in the subsurface, and collect groundwater samples to evaluate water quality. The location of Phase II ESA Site monitoring wells and borings are shown on Figure 4. The rationale for groundwater sampling and analyses conducted during the Phase II ESA is presented in Table 2, and the analytical parameters for which groundwater samples were tested are presented in Table 4.

3.2.3 PHASE II ESA CONCLUSIONS

Detailed discussion of the Phase II ESA results is presented in conjunction with the results from the DGI in Section 5.0, to provide the reader a comprehensive understanding of Site environmental conditions. However, the conclusions and recommendations from the Phase II ESA (Landau Associates 2004a) regarding Site soil and groundwater quality are presented in this section to provide the reader with an understanding of the basis for the subsequent DGI scope of work. Based on the results from the Phase II ESA, the following conclusions were drawn regarding Site environmental conditions:

- Organic material (wood debris) is present in subsurface soil throughout a large portion of the Site, and significant methane gas is generated as a result of its presence.
- Although the Site has a history of extensive gasoline and diesel use, including numerous USTs, no significant contamination from petroleum hydrocarbons in these product ranges was encountered in soil or groundwater during the Phase II ESA.
- Concentrations of a limited number of metals and cPAHs exceeded cleanup levels protective of human health based on direct contact in surface soil in several locations. Arsenic was the only metal detected above its soil cleanup screening level at multiple locations.
- Soil contamination at the Site generally appears to be limited to near-surface soil (within the upper 3 ft), except for deeper arsenic and cPAHs/TPH contamination observed in the North Yard of Investigation Area d).
- Arsenic contamination is also present in two soil stockpiles present in Investigation Area i.
- Arsenic exceeded the groundwater cleanup level at four locations; the presence of sandblast grit and/or surface and subsurface soil contamination appear to be contributing influences to the elevated concentrations of arsenic in groundwater.

3.3 DATA GAPS INVESTIGATION

The DGI scope of work was developed to fill the data gaps remaining 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, or to characterize conditions in the vicinity of former UST locations that, in Ecology's opinion, did not have sufficient information regarding tank closure to support a NFA determination.

This section presents the scope of the DGI, including the planned activities presented in the DGI work plan (Landau Associates 2004b) and additional investigation activities conducted as a result of encountered conditions or additional areas of interest identified by the Port. The DGI work plan (Landau Associates 2004b) should be referred to for additional information regarding the scope elements and a description of sampling and analysis protocols.

With respect to the field investigation elements of the DGI, the work plan presented a scope that included the installation of 11 monitoring wells and 129 borings, and analysis of a minimum of 118 soil and 32 groundwater samples. Upon completion of the DGI, a total of 14 monitor wells, 181 borings, and 4 hand-auger explorations were completed, and 305 soil samples and 42 groundwater samples were analyzed. The basis for, and scope of, these additional investigation activities are explained in Sections 3.3.2.

Exploration locations completed as part of the DGI were labeled using a consistent format. Boring locations were labeled with the investigation area designation first, followed by "GC" or "FA" to designate the boring as a general characterization or focus area location, respectively, followed by a sequential number. For instance, the 3rd general characterization boring completed in Investigation Area f was labeled F-GC-3. Soil samples collected from DGI borings were labeled with the boring designation followed by the depth interval in parentheses, for instance, F-GC-3 (0.5-1.5) for a soil sample collected from 0.5 to 1.5 ft BGS from boring F-GC-3. Monitoring wells were labeled sequentially from P-12, the last well installed during the Phase II ESA. The locations for DGI explorations are shown on Figure 5.

3.3.1 GENERAL CHARACTERIZATION

As shown on Figure 5 and Figure 6 (ACC North Yard), and in accordance with the DGI work plan, general characterization borings were spaced approximately 100 to 150 ft from one another within the Planned Cleanup Area. Because Site conditions in some areas were not practicable for boring installation (e.g., large immovable industrial debris, Geoprobe™ refusal, etc.), some borings were installed slightly greater than 150 ft apart.

General characterization borings were installed to identify the presence of, and if present to delineate, shallow soil contamination that appeared to be widely distributed throughout the Site. Based on the results of the Phase II ESA, the uppermost soil sample collected from general characterization borings was tested for metals, cPAH, and petroleum hydrocarbons, with deeper samples tested if the uppermost sample exceeded the anticipated soil cleanup level. Analytical testing for soil samples collected from general characterization borings is summarized in Table 5.

At each general characterization boring location, soil samples from the ground surface to 3 ft BGS were collected and submitted to the laboratory for analysis and archive. Three intervals were sampled at each boring location: 0 to 0.5 ft, 1 to 2 ft, and 2 to 3 ft BGS. However; if soil samples were collected in paved areas or in areas where recent surface filling and grading was done, sample collection was initiated immediately below the recent clean fill layer rather than from the ground surface.

A majority of the general characterization borings were advanced to approximately 4 ft BGS (depending on asphalt/base course thickness). However, several general characterization borings were advanced to 8 to 12 ft BGS to confirm Site geologic conditions and confirm, by field screening, that contamination was not present.

Additional borings were installed subsequent to the initial phase of DGI field activities to bound contamination discovered at general characterization locations. A total of 13 supplemental borings were installed to delineate contamination encountered at general characterization locations: D-GC-12, E-GC-1, F-GC-13, H-GC-5, L-GC-4, and L-GC-5. These supplemental borings were advanced to 8 ft BGS and soil samples were collected in the same manor as the general characterization locations for the upper 3 ft. Below the upper 3 ft, 2-ft composite intervals were collected to the total boring depth.

The supplemental borings were given unique identification numbers that contain the location ID being investigated and a lower case alphabetic letter suffix. For example, boring locations F-GC-13b, F-GC-13c, and F-GC-13d were installed to delineate contamination found at F-GC-13. These samples were analyzed only for the analytes that exceeded cleanup screening levels at the primary location. The analyses conducted for supplemental general characterization soil samples are presented in Table 5, and supplemental boring locations are shown on Figures 5 and 6.

General characterization was conducted in Investigation Area m during two phases of the investigation. The first phase, described in the DGI work plan, included soil and groundwater characterization at four locations (M-1 through M-4), and the completion of borings up to 16 ft deep for geologic characterization. The purpose of this first phase was to provide general characterization, consistent with that performed for other areas of the Site during the Phase II ESA, but not necessarily to characterize the area sufficiently to obtain a NFA from Ecology.

The second phase of general characterization for Investigation Area m was implemented after it was determined that the southern portion may be developed earlier than originally anticipated, so sufficient characterization was needed to obtain a NFA determination from Ecology. As a result, an additional five borings were completed in Investigation Area m (M-GC-1 through M-GC-5), as well as two borings in Investigation Area g (G-GC-1 and -2) and three additional locations in Investigation Area j (J-GC-1 through -3). Soil samples from these locations were tested in the same manner as other general characterization samples.

3.3.2 FOCUS AREA CHARACTERIZATION

Focus areas were identified where contamination was identified by the Phase II ESA and in previously uncharacterized areas that may have been impacted by historical operations. As such, focus area soil borings were advanced, and monitoring wells installed, in these areas to better delineate previously identified contamination conditions, or to evaluate and delineate the impact of historical operations not previously characterized. Focus areas were identified within the following investigation areas:

- **Area b:** Bayside Marine leasehold: shallow soil affected by boat maintenance activities and additional UST characterization (UST 3)
- **Area c:** Port Boatyard: shallow soil affected by boat maintenance activities
- **Area d:** ACC leasehold: shallow and deep soil, and groundwater, affected by arsenic and cPAH identified during the Phase II ESA, and soil and groundwater in the vicinity of diesel and used oil ASTs
- **Area e:** PSTL former leasehold: additional UST characterization related to diesel and heating oil UST (UST 5 and UST 5b)
- **Area f:** Multiple leaseholds: shallow soil affected by boat maintenance and other commercial or industrial activities, groundwater affected by arsenic, and additional UST characterization related to the former JL Brooks leasehold (UST 6).
- **Area j:** Port of Everett Property: additional UST characterization (UST 7)
- **Area l:** American Boiler Works former leasehold soil (two stormwater sump locations)
- **Area m:** Additional UST characterization for location previously misidentified as Bayside Marina (UST 1).

Table 6 presents the rationale and planned analytical testing for the focus area investigation locations shown on Figures 5 and 6. A summary of chemical analyses for soil samples collected from focus area explorations is provided in Table 5 and chemical analyses for groundwater samples are provided in Table 7. The DGI activities, including supplemental investigation conducted in response to encountered conditions, are further described below.

3.3.2.1 Investigation Area b (Bayside Marine)

During the DGI, a total of eight shallow soil borings (B-FA-1 through B-FA-8) were installed in the east and west maintenance yards of the Bayside Marine leasehold to investigate the potential impacts of marine maintenance activities. These borings were advanced to 8 ft BGS, and were tested in the same manner as the general characterization borings. Three additional borings, B-FA-9 through B-FA-11, were installed at the periphery of the maintenance yards for potential testing. These samples were tested only if adjacent samples within the interior of the focus area exceeded cleanup screening levels.

Boring B-FA-12 was completed to verify Phase II ESA investigation results for UST-2, located just to the south of the Bayside Marine building, which did not encounter any evidence of petroleum hydrocarbon contamination.

3.3.2.2 Investigation Area c (Port Boatyard)

During the DGI, a total of nine borings were installed to better delineate impacts from boat maintenance activities identified in the Port Boatyard during the Phase II ESA. Five shallow borings (C-FA-1 through C-FA-5) were installed within the boatyard. These boring locations were extended to 8 ft BGS and were tested in the same manner as the general characterization locations, with deeper soil samples archived for potential future testing. Four additional borings, C-FA-5 through C-FA-8, were installed around the perimeter of the boatyard for potential testing. These perimeter samples were tested only if adjacent samples within the interior of the boatyard exceeded cleanup screening levels.

3.3.2.3 Investigation Area d (ACC leasehold)

During the DGI, a total of 32 borings were installed throughout the ACC North Yard related to focus area investigations, as shown on Figure 6. 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 to 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. These borings were advanced to a depth of probe refusal, which varied between about 11 and 12 ft BGS. It is suspected that refusal resulted from encountering a concrete slab reportedly left in place at the base of the former graving dock.

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 deep soil and groundwater contamination associated with fill contained in the former graving dock. Two unplanned 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. These additional borings were advanced to 16 ft BGS and were tested for arsenic to bound the depth of arsenic contamination. Monitoring Well P-9, installed during the Phase II ESA, could not be located during the DGI, so the planned groundwater sampling and analysis for cPAH and arsenic from this location could not be conducted.

Two planned 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. A third planned boring, D-FA-9, could not be installed because of access difficulties; therefore, groundwater sampling planned for that location was conducted at the adjacent D-FA-10 location.

Diesel range petroleum hydrocarbon contamination associated with releases from the diesel AST was observed in the planned borings, and 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 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, a second boring (D-FA-14b) was advanced during a subsequent field effort to resample groundwater for metals.

3.3.2.4 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 (UST-5 and UST-5b). 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 UST-5 location were observed during advancement of the 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.

3.3.2.5 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 in soil and arsenic contamination in groundwater identified during the Phase II ESA. Two additional borings (F-FA-13 and -14) were installed to evaluate soil and groundwater conditions in the vicinity of a potential former UST location (UST-6). In general, the focused investigation was conducted in the central portion of the Investigation Area f, with general characterization occurring toward the east and west ends.

Five additional borings (F-FA-6b through F-FA-6f) were installed 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 are the result of elevated arsenic concentrations present in subsurface soil in contact with groundwater, or if it is 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 additional 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.

One focus area boring location (F-FA-1) that was planned for installation adjacent to an apparent stormwater sump was installed in the vicinity of the planned location, but the stormwater sump could not be located. As a result, soil sampling at this location was conducted consistent with other Investigation Area f focus area borings.

A sample of pink, granular material (F-Pink) was collected from the south side of the former American Boiler Works building. The material was present in a shallow (about 1 ft thick) layer outside of two loading docks to the building. A sample of the material and two samples of the underlying soil were tested for heavy metals. The sample of the material was further tested for leachable arsenic and lead using the Toxicity Characteristics Leaching Procedure (TCLP) based on elevated concentrations of total metals detected in the sample.

3.3.2.6 Investigation Area j (Marine Spill Response Corporation)

During the DGI, two borings (J-FA-1 and J-FA-2) were installed in the immediate vicinity of former UST-9 to verify previous investigation results that did not encounter any evidence of petroleum hydrocarbon contamination. The borings were advanced to a total depth of 12 ft BGS and the capillary fringe soils and groundwater samples were tested for TPH-HCID. Field screening and observations during boring advancement did not indicate the presence of petroleum hydrocarbon contamination in any boring samples.

3.3.2.7 Investigation Area l (American Boiler Works, Plant 1)

Two borings (L-FA-1 and L-FA-2) were installed to investigate environmental conditions associated with two stormwater sumps (east and west) located in the northwest yard, as described in the DGI work plan. The investigation included evaluating whether a bottom seal existed in each sump, and then advancing a boring through each sump for soil and groundwater sampling if the sump did not contain an effective seal. It was confirmed by probing with a metal rod that the sumps did not have competent bottom seals.

One boring, L-FA-2, was installed through the center of the west sump to a total depth of 8 ft BGS. A composite soil sample of the upper one foot of material and a groundwater sample were submitted for laboratory analysis.

The east sump is located below an awning, which did not allow drill rig access. The boring location was adjusted to the nearest practicable downgradient location; however, because the location was moved outside of the sump, only a groundwater sample was collected for laboratory analysis.

Based on the elevated groundwater concentrations for arsenic in the L-FA-1 boring sample, Monitoring Well P-26 was installed in the vicinity of these two borings to obtain more reliable groundwater quality data. Shallow soil samples collected from the boring for P-26 (L-FA-2b) were analyzed for metals to further delineate shallow soil metals exceedances encountered at locations L-GC-4 and L-GC-4b.

3.3.2.8 Investigation Area m (Various tenants)

During the DGI, two borings (M-FA-1 and M-FA-2) were installed in the immediate vicinity of former gasoline and diesel USTs whose location had been incorrectly identified previously (UST-1). The borings were sampled to a total depth of 12 ft BGS and since no elevated PID readings were measured in the soil, the capillary fringe soil were tested for TPH-HCID. Field screening did not indicate the presence of petroleum hydrocarbon contamination at this location.

4.0 DEVELOPMENT OF CLEANUP STANDARDS FOR DATA SCREENING

This section develops cleanup standards for preliminary evaluation (screening) of constituents that were detected in Site soil and groundwater during the Phase II ESA and DGI investigations. Cleanup standards consist of: 1) cleanup levels 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 are used in Section 5.0 of this report as the basis for identifying the nature and extent of contamination.

The cleanup standards are considered preliminary and are being used as a screening tool for identifying the nature and extent of contamination based on the environmental data presented in this report. Applicable cleanup standards will be developed in the CAP and will not be considered final until Ecology concurrence has been obtained for the proposed cleanup levels and points of compliance set forth in the CAP. Remediation levels, as allowed for in the MTCA (WAC 173-340-355) may also be developed in the CAP to identify the concentration at which certain cleanup action components (such as excavation) will be implemented.

4.1 CLEANUP SCREENING LEVELS

Cleanup screening levels for Site soil and groundwater that are adequately protective of human health, terrestrial ecological receptors, and groundwater were developed in accordance with MTCA requirements. Cleanup screening levels for groundwater that are adequately protective of marine surface water were also developed in accordance with MTCA requirements. Exposure pathways and receptors based on current and likely future Site uses were identified as part of cleanup level development.

4.1.1 CURRENT AND LIKELY FUTURE LAND USE

The Site is currently zoned commercial and it is not anticipated that the zoning will change following redevelopment. Because of current zoning and future Site usage, cleanup standards will be developed based on unrestricted site use.

4.1.2 EXPOSURE PATHWAYS

Potential exposure pathways were identified for human and environmental impacts based on the planned land use. The potential exposure pathways are presented by media.

4.1.2.1 Soil

The potential exposure pathways for Site soil are:

- Human contact (dermal, incidental ingestion, or inhalation) with constituents in Site soil
- Uptake of constituents in Site soil by terrestrial plants and soil biota
- Contact by terrestrial wildlife (dermal, incidental ingestion, or inhalation) with constituents in the soil.

Sites that contain less than 1.5 acres of contiguous undeveloped area are excluded from having to conduct a terrestrial ecological evaluation, in accordance with WAC 173-340-7491(1)(c)(i). 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. As a result, the Site meets the exclusion to terrestrial ecological evaluation, and human contact is the only applicable pathway for Site soil.

4.1.2.2 Groundwater

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. If groundwater was pumped for drinking water use, saltwater intrusion due to the proximity of the Site to marine surface water is likely to result in increased salinity in groundwater at the Uplands Area and the vicinity. As a result, the potential exposure pathways for Site groundwater include:

- Human ingestion of marine organisms contaminated by releases of affected Site groundwater to adjacent marine surface water
- Acute or chronic effects to aquatic organisms resulting from exposure to constituents in groundwater discharging to adjacent marine surface water.

Groundwater cleanup criteria developed based on the exposure pathways identified in this subsection must be adequately protective of aquatic organisms and of humans that ingest these marine organisms.

4.1.3 CLEANUP LEVEL DEVELOPMENT

4.1.3.1 Soil

Soil cleanup screening levels for unrestricted land use were developed in accordance with WAC-173-340-740 using the exposure pathways identified above, based on the mixed residential and commercial uses that will be present on the Site following redevelopment. Under MTCA, 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 soil cleanup screening levels.

There are no soil cleanup levels established under applicable state or federal laws. Standard MTCA Method B soil cleanup screening levels protective of direct human contact were determined in accordance with WAC 173-340-740(3) using CLARC 3.1 (Ecology 2001). These cleanup screening levels are shown in Table 8. The cleanup screening level for benzo(a)pyrene will be used for the sum of cPAHs using TEFs in accordance with WAC 173-340-708(8)(e).

Soil cleanup screening levels protective of groundwater were determined using the fixed parameter three-phase partitioning model in accordance with WAC 173-340-747(4). Based on the exposure pathways identified above for Site groundwater, because groundwater is not a current or likely future source of drinking water and because it discharges to marine surface water, marine surface water cleanup screening levels protective of human health and aquatic organisms developed in accordance with WAC 173-340-730 were used in the calculation. The three-phase model provides a conservative estimate of the concentration of a contaminant in soil that is protective of groundwater. Soil cleanup screening levels protective of groundwater as marine surface water are shown in Table 8.

Soil cleanup screening levels may be adjusted to be no less than natural background in accordance with WAC 173-340-740(5)(c). Background concentrations for metals, based on statewide 90th percentile values (Ecology 1994), were compared to soil cleanup screening levels protective of human direct contact and groundwater. Cleanup screening levels for copper, mercury, and nickel were adjusted upward to the natural background level. Soil cleanup screening levels adjusted based on natural background are identified in Table 8.

For constituents present in soil at concentrations greater than the calculated soil cleanup screening levels protective of groundwater as marine surface water, an empirical demonstration that concentrations present in soil are not causing an exceedance of groundwater cleanup screening levels (based on marine surface water criteria) may be made. The Site meets the requirements for an empirical demonstration listed in WAC 173-340-747(9)(b) for hazardous substances tested for in soil, except arsenic, copper, and diesel-range petroleum hydrocarbons. The empirical demonstration requires that:

- Measured groundwater concentrations in proposed point of compliance wells (see Section 4.2.2) are less than the groundwater cleanup screening levels.

- Any hazardous substances in soil have been present for many years, allowing sufficient time for migration to the shallow groundwater to have occurred.
- Future Site use following redevelopment will reduce the potential for leaching from soil to groundwater due an increase of low-permeability cover resulting from additional buildings and paved areas.

4.1.3.2 Groundwater

Because human ingestion of constituents in groundwater is not a potential exposure pathway, as described in 4.1.2, potable groundwater cleanup screening levels were not developed for Site groundwater. However, cleanup screening levels protective of marine surface water were developed because Site groundwater discharges directly to Port Gardener Bay. MTCA Method B marine surface water cleanup screening levels were developed in accordance with WAC 173-340-730(3) for the detected constituents in groundwater. Cleanup screening levels were adjusted to be no less than the PQL or natural background concentration, in accordance with WAC 173-340-730(5)(c). Groundwater cleanup screening levels for detected constituents are shown in Table 9.

4.2 POINTS OF COMPLIANCE

Under MTCA, the point of compliance is the point or location on a site where the cleanup screening levels must be attained. It is necessary to identify proposed point(s) of compliance to develop and evaluate the extent of contamination (Section 5.0) of this report, and to develop a cleanup action for the Site. This section describes the proposed points of compliance for the Site.

4.2.1 SOIL

The point of compliance where soil cleanup screening levels protective of groundwater as surface water will be attained throughout the Site, in accordance with WAC 173-340-740(6)(b). The point of compliance where soil cleanup screening levels protective of direct human contact will be attained is throughout the Site from the ground surface to 15 ft BGS, in accordance with WAC 173-340-740(6)(d).

4.2.2 GROUNDWATER

Because groundwater cleanup screening levels are based on protection of marine surface water and not protection of groundwater as drinking water, the point of compliance where groundwater cleanup screening levels will be attained is at the point of discharge to marine surface water. Specific locations where groundwater has been monitored at the conditional point of compliance for groundwater is discussed in Section 5.0.

5.0 INVESTIGATION RESULTS

This section presents and evaluates the physical and chemical data collected during the Phase II ESA and the DGI investigations for the Planned Cleanup Area portion of the Site. This section is subdivided into Geologic and Hydrogeologic Conditions (Section 5.1); Methane Monitoring (Section 5.2); and Environmental Conditions (Section 5.3).

5.1 GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

Geologic and hydrogeologic conditions were evaluated based on the 233 borings and 26 groundwater monitoring wells installed during the Phase II ESA and DGI investigations conducted for the Site. Boring depths for environmental explorations extended from 3 to 16 ft BGS. However, geotechnical explorations extended to depths up to about 38 ft BGS, providing sufficient data for evaluating geologic and hydrogeologic conditions to significant depth beneath the Site.

5.1.1 GEOLOGIC CONDITIONS

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 course sand with silt or silty sand.

Figure 7 presents an east-west geologic cross section of the Site, relying on geotechnical borings for the information regarding deeper geologic conditions. The cross section alignment and the location of geotechnical borings used to develop the cross section are presented on Figure 7. As indicated on Figure 7, 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, slopes steeply downward from east to west, resulting in a thickening layer of marine sediment to the west.

Organic material in the form of wood chips, bark, and related material was encountered in the hydraulic fill at many of the borings. Organic material ranged from small wood fragments intermixed with fill to distinct layers of wood debris. The locations and depth intervals at which wood debris was encountered are presented in Table 10, and the distribution of wood debris is presented on Figure 8. Based on the distribution illustrated on Figure 8, wood debris is present throughout much of the North Marina Area, although it is most consistently present over the northern half of the Site.

5.1.2 Hydrogeologic Conditions

Site hydrogeologic conditions were evaluated using geologic data from the Phase II ESA and DGI investigations. Based on available boring and groundwater data, 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 measured in completed piezometers P1 though P26, ranged from 3.0 to 7.5 ft BGS, as presented in Table 11. 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 toward marine surface water. It should be noted that the groundwater elevation data presented in Table 11 was collected near low tide, and groundwater levels measured near the shoreline reflect low tide conditions and are likely significantly higher during high tide.

5.1.3 SATURATED THICKNESS, FLOW DIRECTION, AND TIDAL INFLUENCE

Based on the range in depth to groundwater presented in Table 11, the saturated thickness of the uppermost hydrostratigraphic unit is generally about 10 ft to 15 ft based on available geologic data and water level measurements.

Reference elevations were established for 22 of the 26 monitoring wells (P-1 through P-7, P-9, and P-13 through P-26) so groundwater flow could be characterized in the northwestern portion of the Site, where groundwater quality issues associated with Investigation Areas d, e, and f were encountered. Monitoring well reference elevations and groundwater elevations are presented in Table 11. A groundwater elevation contour map is presented on Figure 9. As shown on Figure 9, groundwater flows radially outward from the center of the Site toward surface water.

Tidal influence on groundwater was not specifically evaluated during the Phase II ESA or the DGI. However, based on data from other unconfined aquifers adjacent to Puget Sound, tidal influences are likely significant immediately adjacent to surface water and dissipate to less that an inch of tidal fluctuation about 200 ft from the shoreline.

5.1.4 HYDRAULIC CONDUCTIVITY

Grain size data collected during the Phase II ESA and the DGI were used to estimate hydraulic conductivity of the hydraulic fill unit using the Hazen formula:

$K = d^2_{10}$, where,

K = hydraulic conductivity in cm/s

d^2_{10} = diameter, in mm, of the 10 percent passing fraction from a mechanical grain size analysis

Grain size data for the samples of hydraulic fill are presented in Appendix A. Although material properties for the hydraulic fill vary and hydraulic fill in portions of the Site exhibit a higher silt content than that present in the tested samples, the gradation exhibited by samples collected from Borings E-GC-2 and F-FA-3 are typical of hydraulic fill material encountered throughout much of the Site, . The estimated hydraulic conductivity estimates based on these two samples ranged from about 0.1 cm/s to 0.14 cm/s, or between about 300 and 400 ft/day.

Hydraulic conductivity in the range of 0.1 cm/s is typical of clean sand, and is at the upper end of the range for silty sand (Freeze and Cherry 1979). A typical hydraulic conductivity for silty sand is 1 x 10^{-3} cm/s (Freeze and Cherry 1979). To avoid overestimating hydraulic conductivity, which would result in overestimating groundwater flow velocity, a hydraulic conductivity of 1 x 10^{-3} cm/s (3 ft/day) will be used for subsequent estimates of groundwater flow velocity and travel times rather than the 1 x 10^{-1} cm/s estimated from grain size analyses.

5.1.5 GROUNDWATER VELOCITY

Groundwater average linear velocity (v) is estimated from the equation:

$$v = Ki/n$$

where:

K = hydraulic conductivity (L/t)
i = hydraulic gradient (dimensionless)
n = effective porosity (dimensionless).

The hydraulic gradient for the western end of the Site ranges from about 0.004 to 0.01, and averages about 0.007 based on the groundwater elevation data presented on Figure 9. Based on the estimated hydraulic conductivity of 3 ft/d, and an assumed effective porosity of 0.20, the estimated average linear velocity likely ranges between about 0.06 and 0.15 ft/day, and averages about 0.1 ft/day.

5.2 METHANE MONITORING

Although methane concentrations were not measured for purposes of the DGI, methane concentrations were monitored during construction in soil borings completed during the two rounds of sampling during the Phase II ESA, as presented in Table 12. As shown in Table 12, methane was detected in most of the borings where wood debris was encountered during the Phase II ESA. Methane was detected in 20 of 45 borings, including piezometers, constructed during the Phase II ESA. At two locations, piezometer P-12 and boring B-4, methane concentrations during drilling were detected at concentrations exceeding the lower explosive limit (LEL), which is 5 percent methane by volume. The LEL is the lowest concentration at which methane would have the potential to explode. However, 20 percent of the LEL (i.e., 1 percent methane, by volume) is typically used as a rule of thumb to identify the potential for an explosive condition to develop.

As shown in Table 13, methane concentrations were detected in three of the seven monitoring wells, P-3, P-6, and P-7, at levels above the LEL. Methane concentrations observed in these same monitoring wells during boring completion were less than the LEL, which suggests that the methane levels observed during construction in other borings underestimate the actual methane concentrations when the subsurface is at equilibrium.

In addition to an explosion, the accumulation of methane can deplete the oxygen concentration to an unsafe level, which is a significant issue for confined space entry. These results suggest that subsurface methane accumulations could be a significant issue for design of any subsurface structures that are not properly sealed or ventilated, including utility vaults, parking garages, or pile-supported structures where voids can form beneath the floor slab.

It is likely that methane buildup will be greater under post-construction Site conditions because the increase in impermeable surface area resulting from increased paving and building density will tend to reduce natural venting of methane and result in greater accumulation of methane in subsurface soil gas, unventilated subsurface utility vaults and other subgrade features, and in any voids that develop beneath pile supported structures.

5.3 ENVIRONMENTAL CONDITIONS

This section presents Site environmental conditions based on the chemical data collected during the Phase II ESA and DGI investigations. The analytical results for these investigations were merged to facilitate comprehensive review and evaluation of the data. Detected constituents for groundwater are presented in Tables 14 through 17, and soil data are presented in Tables 18 through 25. Summary tables for all analytical testing parameters for soil and groundwater samples are presented in Appendix B. Original laboratory reports are maintained in Landau Associates' project files.

Cleanup screening levels are also presented in the data tables to provide a basis for evaluating the extent of contamination. In general, cleanup screening levels are those developed in Section 4.0. However, the soil cleanup screening level for some constituents that are based on protection of groundwater have been adjusted based on the lack of observed groundwater quality impacts, as discussed in Section 5.3.2.

Discussion regarding the need for remedial action is provided for those locations where detected concentrations of hazardous substances in soil or groundwater exceed the cleanup screening levels. The intent of these discussions is to screen out exceedances of the cleanup levels that do not appear to warrant cleanup action and, thus, allow the CAP to be focused on those exceedances that do. It is also important to note that “cleanup action” includes a broad range of technologies to achieve the cleanup standards, ranging from institutional controls and compliance monitoring to removal and destruction. Identifying exceedances as warranting cleanup action does not suggest the application of a specific remedy, only that one or more technologies that achieve the cleanup standards will be applied.

5.3.1 GROUNDWATER QUALITY

Groundwater samples were collected from 60 borings and 26 monitoring wells during the Site environmental investigations. The results for analyses performed on groundwater samples are presented in Tables 14 through 17. Groundwater quality results are discussed by chemical constituent categories, subdivided into VOCs, SVOCs, cPAHs, metals, and petroleum hydrocarbons, including TPH and BETX analyses.

5.3.1.1 VOCs

Thirty five groundwater samples were tested for VOC during the Phase II and DGI investigations; VOC results are presented in Table 14. A total of 10 VOCs were detected in one or more groundwater samples, VOCs were not detected in any groundwater sample at a concentration exceeding the groundwater cleanup screening level. Based on these results, no VOCs are considered constituents of concern for Site groundwater.

5.3.1.2 SVOCs

Ten groundwater samples were tested for SVOCs during the Phase II and DGI investigations; SVOC results are presented in Table 14. The only SVOC detected was naphthalene in groundwater collected from Boring D-FA-11c at a concentration of 10 µg/L, which is well below the naphthalene groundwater cleanup screening level of 4,940 µg/L. Based on these results, no SVOCs are considered constituents of concern for Site groundwater.

5.3.1.3 cPAHs

Twenty six groundwater samples were tested for cPAHs during the Phase II and DGI investigations; cPAH results are presented in Table 15. TEFs were used to develop the toxicity equivalency quotient (TEQ) for the summation of cPAH, as specified in WAC 173-340-708(8)(e)(ii). The TEQ approach to quantifying the risk to human health posed by cPAH applies TEFs to individual cPAH compounds to calculate a TEQ concentration equivalent to a benzo(a)pyrene concentration. The concentration was then compared to the benzo(a)pyrene cleanup screening level. The TEFs for individual cPAHs range from 0.1 to 1.0, and are provided in the footnotes to Table 15.

Two of the nine groundwater samples analyzed for cPAHs during the first round of Phase II ESA field activities contained cPAHs at concentrations exceeding the cleanup screening level, and eight of the nine samples contained detectable concentrations of one or more cPAH compounds. Both exceedances (D-1 and D-4) were located in Investigation Area d. No visible pattern to the locations of groundwater detections was identified, except for the two exceedances in Investigation Area d. Because cPAHs are not typically found in a dissolved phase in groundwater, it is suspected that the cPAHs detected in groundwater resulted from particulates entrained in the samples during collection rather than being present as dissolved constituents in groundwater.

Based on the initial Phase II ESA cPAH results for groundwater, groundwater samples collected during the second round of Phase II ESA field activities, and the five groundwater samples (including one duplicate) tested for cPAH during the DGI, were centrifuged by the lab to remove particulates prior to cPAH analysis. Of the 19 groundwater samples tested for cPAHs during the second Phase II ESA round of sampling, and the DGI sampling, only the sample from Monitoring Well P-9 during the Phase II ESA exhibited detectable concentrations of cPAHs, which did not exceed the cPAH cleanup screening level. As presented in Table 15, and as shown on Figure 10, the concentration of total cPAHs detected in the groundwater sample from Monitoring Well P-9 was 0.015 μg/L, compared to the MTCA Method A cleanup level of 0.1 μg/L for total cPAHs. As indicated in Section 3.3.2.3, Monitoring Well P-9 could not be located during the DGI, so a second round of testing for cPAH could not be conducted at this location.

The concentration of cPAHs observed during the second round of the Phase II ESA investigation and the DGI investigation results support the conclusion that the elevated cPAH levels detected in groundwater samples collected during the first round of Phase II ESA sampling were the result of particulate matter influences rather than reflective of actual groundwater quality. Based on these results, it has been demonstrated that the concentration of cPAHs in soil are protective of groundwater, consistent with WAC 173-340-747(3)(f).

It should be noted that Monitoring Well P-9 is located within the area where long chain hydrocarbons (possibly creosote) were observed in Investigation Area d, as described in Section 3.2. These results suggest that the soil cPAH contamination is affecting site groundwater in this area. However, based on the cPAH groundwater data from downgradient monitoring wells P-17, P-18, and P-19, soil contamination in the vicinity of monitoring well P-9 is not causing excedances of the cPAH groundwater cleanup screening level.

Based on these results, cPAH are not considered constituents of concern for groundwater.

5.3.1.4 Metals

Thirty nine groundwater samples were tested for a full suite of heavy metals during the Phase II and DGI investigations. Additionally, only dissolved lead was tested for at two locations near former gasoline UST locations during the Phase II ESA, and only dissolved arsenic was tested for at seven locations during a second round of DGI groundwater sampling conducted to further evaluate elevated groundwater arsenic concentrations encountered in Investigation Area f during the DGI.

The eighteen groundwater samples tested for metals during the Phase II ESA, ten groundwater samples collected from borings during the DGI, and the seven groundwater samples collected to further evaluate elevated arsenic groundwater concentrations detected during the initial phase of DGI sampling, were only tested for dissolved metals. However, the twelve groundwater samples collected from monitoring wells during the initial phase of DGI groundwater sampling were tested for both total and dissolved metals.

Analytical results for metals in groundwater are presented in Table 16. Based on the twelve groundwater samples tested for both total and dissolved metals, total metals concentrations are consistently higher than dissolved metals concentrations, with the exception of two instances where dissolved arsenic concentrations are higher than total arsenic concentrations. Based on these results, particulates containing naturally occurring heavy metals are affecting the measured concentrations of metals in Site groundwater, even though the monitoring wells were extensively developed and low flow sampling techniques were used to minimize the entrainment of particulates in groundwater samples. As a result, analytical results for total metals are not considered representative of Site groundwater conditions, and dissolved metals analytical data will be used to evaluate Site groundwater quality, consistent with WAC 173-340-720(9)(b).

Based on analytical results for dissolved metals, arsenic and copper appear to be the only constituents of concern for metals in groundwater. As indicated in Table 16, 19 of 46 groundwater samples tested for dissolved arsenic exceeded the groundwater cleanup screening level for arsenic of 8µg/L. The groundwater cleanup screening level for copper was exceeded in two of 39 samples tested. However, one of these exceedances was associated with a groundwater sample collected from Boring D-FA-14, where it appears that the disposable filter used to field filter the groundwater sample for metals at this location was defective; a follow-up sample collected from the same area (D-FA-14b) did not contain copper at a detectable concentration. The other dissolved copper exceedance occurred in the sample collected from Monitoring Well P-21, also in Investigation Area d. As a result, copper will be maintained as a constituent of concern for groundwater in this area.

The cleanup screening levels for arsenic, lead, and zinc also exceeded their respective cleanup screening levels in the groundwater sample collected from D-FA-14, but were either not detected or were below the cleanup screening level for these constituents in the sample collected fromD-FA-14b. As a result, lead and zinc are not considered constituents of concern for groundwater, but arsenic is retained as a constituent of concern because of exceedance of its cleanup screening level at other locations.

Based on the available groundwater data, the concentrations of metals in soil are not resulting in groundwater concentrations that exceed the cleanup screening levels, except for arsenic and copper. As a result, existing concentrations of metals other than arsenic and copper are adequately protective of groundwater quality and soil cleanup screening levels for these metals will not be based on protection of groundwater. However, protection of groundwater will be carried forward in soil cleanup screening levels for arsenic throughout the Site, and for copper in Investigation Area d.

The investigation areas where groundwater exceeded the groundwater cleanup screening level for one or more metals are discussed in the following sections.

Investigation Area d

The dissolved arsenic exceedances detected in groundwater from Investigation Area d appear to be related to extensive arsenic soil contamination detected in the northern potion (North Yard) of this leasehold, as will be discussed in Section 5.3.2.4. The most significant impact to groundwater is in the northwest corner of the leasehold, where a former graving dock was filled with arsenic-affected soil. Excedance of the groundwater cleanup level in the former graving dock vicinity occurred in Monitoring Well P-17, installed near the proposed conditional point of compliance for groundwater adjacent to marine surface water to the north of the former graving dock. The arsenic concentration measured at P-17 was 23.2 µg/L, about three times the arsenic cleanup screening level of 8 µg/L. The P-17 location is also where the former graving dock berm was reportedly breached to flood the graving dock and, as such, contains elevated arsenic concentrations is soil similar to those present in soil used to backfill the graving dock. The presence of large boulders (riprap) and other obstructions prevented the installation of P-17 any closer than about 15 ft from the shoreline. However, hydrodynamic dispersion increases rapidly as the shoreline is approached in a tidally influenced groundwater regime, and it is possible that water samples collected closer to the groundwater/surface water interface in the vicinity of P-17 would achieve the arsenic cleanup screening level for groundwater.

Arsenic and copper excedances occurred in a groundwater sample collected from Monitoring Well P-21, located near the southwest corner of the North Yard. Arsenic is present above the cleanup screening level in shallow soil in this area, but does not appear to extend to depths below the groundwater table (as is the case in the former graving dock vicinity). However, Monitoring Well P-21 is downgradient from diesel-affected soil and groundwater associated with a nearby AST (discussed in Section 5.3.1.5); elevated arsenic concentrations in groundwater associated with this location may result from reducing conditions caused by the diesel range petroleum hydrocarbon contamination associated with the AST.

The cause of the copper excedance at this location is not known. Copper was not significantly elevated in soil samples tested from Investigation Area d, nor does it become highly soluble under reducing conditions. Additional sampling and testing of groundwater from P-21 to confirm the copper exceedance will be conducted to confirm the copper groundwater concentration in this vicinity.

The presence of large rock and other obstructions prevented the installation of the P-21 any closer than about 20 ft from the shoreline. However, hydrodynamic dispersion increases rapidly as the shoreline is approached in a tidally influenced groundwater environment, and it is possible that water samples collected closer to the groundwater/surface water interface in the vicinity of P-17 would achieve the arsenic and copper cleanup screening levels for groundwater.

Based on these results, arsenic and copper are considered constituents of concern for groundwater in Investigation Area d and warrant remedial action.

Investigation Area f

Groundwater in the north-central portion of Investigation Area f is also affected by elevated arsenic concentrations. Arsenic concentrations exceed the groundwater cleanup screeninglevel at a number of locations, including the three monitoring wells (P-13, P-14, and P-15) installed along the proposed conditional point of compliance adjacent to marine surface water at the north Site boundary. As will be discussed in Section 5.3.2.4, shallow soil in portions of Investigation Area f is affected by arsenic. However, the locations of the affected areas do not closely correspond to the area over which arsenic-affected groundwater is present. Additionally, unlike Investigation Area d, arsenic- affected soil in Investigation Area f appears to be limited to shallow soil not in contact with groundwater, thus, lessening the impact of arsenic-affected soil on groundwater.

To further evaluate the cause of elevated arsenic groundwater concentrations in Investigation Area f, 43 archived soil samples collected from depths up to 8 ft BGS in the groundwater-affected area were submitted for arsenic analysis to determine whether arsenic concentrations for soil in contact with groundwater are elevated above background levels. The arsenic concentrations detected in these additional soil samples range from less than the reporting limit of 6 mg/kg to 14 mg/kg, with an average concentration of less than 8 mg/kg, which is significantly less than the state-wide arsenic background concentration for soil of 20 mg/kg. As a result, the elevated arsenic concentrations is groundwater do not appear to be directly related to elevated arsenic concentrations in soil.

As previously discussed in Sections 5.1, organic material in the form of wood debris is present in many areas of Site. As shown on Figure 8, wood debris is distributed throughout the arsenic-affected groundwater area in Investigation Area f. The presence of this organic material has a significant potential to cause reducing conditions in groundwater, as evidenced by the presence of methane gas detected in Site borings and monitoring wells (discussed in Section 5.2). Arsenic is more soluble under reducing conditions, which could be the cause of the elevated arsenic concentrations detected in Investigation Area f groundwater.

Additional groundwater monitoring was conducted to evaluate whether reducing (anoxic) conditions are present in the portion of Investigation Area f containing arsenic-affected groundwater. As described in Section 3.3.2.5, groundwater samples were collected from seven monitoring wells in Investigation Area f and tested for dissolved arsenic and a number of field and conventional parameters related to the groundwater oxidation-reduction state.

The results for these field and conventional parameters, presented in Table 26, support the conclusion that the cause of elevated arsenic concentrations in groundwater in Investigation Area f is reduced (anoxic) groundwater in contact with background concentrations of arsenic in soil. These conditions are readily apparent from the relative concentrations of alkalinity, ferrous iron, and TOC between samples collected from the affected area (P-3, and P-13 through 16) and from background wells (P-2 and P-5). The other field and conventional parameters generally support this conclusion as well, although the data are less consistent, potentially the result of the difficulties collecting a groundwater sample without affecting its oxidation-reduction state. Based on these results, the elevated concentrations of arsenic in Investigation Area f groundwater appear to result from natural background concentrations of arsenic in Site soil in contact with reduced groundwater conditions. Thus, these conditions are the result of factors unrelated to the release of hazardous substances,.

Monitoring wells P-13, P-14, and P-15 were installed as close as practicable to the proposed conditional point of compliance at the groundwater/surface water interface. However, the presence of large boulders (riprap) prevented the installation of the wells any closer than about 15 to 25 ft from the shoreline, with Monitoring Well P-13 located closest to the shoreline. As shown on Figure 11, the dissolved arsenic concentrations in these wells ranged from 9.3 to 71.3 µg/L, which are above the arsenic cleanup screening level of 8 µg/L. However, the relatively low arsenic concentration in P-13 of 9.3 µg/L, likely results from the greater hydrodynamic dispersion and increase in oxidation state associated with groundwater in close proximity to a tidally influenced shoreline. As a result, it is anticipated that water samples collected closer to the groundwater/surface water interface in Investigation Area f would achieve the arsenic cleanup screening level for groundwater.

Because the elevated concentrations of arsenic present in Investigation Area f groundwater result from background concentrations of arsenic in soil in contact with reduced groundwater, rather than a release of a hazardous substance, arsenic is not considered a constituent of concern for groundwater in Investigation Area f and arsenic groundwater contamination in Investigation Area f does not warrant remedial action.

Investigation Areas l and m

Analytical results for dissolved arsenic in groundwater are shown on Figure 11. As indicated on Figure 11, the primary areas of arsenic exceedance in groundwater are in Investigation Areas d and f. The arsenic cleanup screening level of 8 µg/L was also exceeded in groundwater boring samples collected from locations L-FA-1 and M-2. However, Monitoring Well P-26 was installed directly downgradient from L-FA-1 and the dissolved arsenic concentration detected in the groundwater sample collected from this location was well below the cleanup screening level. Similarly, dissolved arsenic concentrations were either below the detection limit or below the cleanup screening level at all locations downgradient (west) of Boring M-2. Based on these conditions, arsenic exceedances at L-FA-1 and M-4 are likely an artifact of sampling from a boring rather than a monitoring well, or are associated with localized contamination. As a result, arsenic is considered a potential constituent of concern in groundwater for Investigation Areas l and m (if confirmed by groundwater monitoring based on groundwater samples collected from monitoring wells). However, the limited extent of contamination and distance from the proposed conditional point of compliance indicates that arsenic groundwater contamination at these locations (if confirmed) does not warrant remedial action.

5.3.1.5 Petroleum Hydrocarbons

Seventy two groundwater samples were tested for TPH by method NWTPH-HCID, NWTPH-Dx (extended to the oil range), and/or NWTPH-G. Additionally, fifty groundwater samples were tested for BTEX. In general, NWTPH-HCID analysis was conducted first on groundwater samples collected from locations where the nature of the petroleum hydrocarbon release or potential release was not known or might include more than one petroleum product (e.g., gasoline and diesel), with follow up testing for specific petroleum hydrocarbon ranges detected by the HCID analysis. At locations where the nature of the release or potential release was known, the specific petroleum hydrocarbon range was tested for without first analyzing for NWTPH-HCID. BTEX was analyzed for at any location where the presence of gasoline-range petroleum hydrocarbons were suspected, at selected locations where diesel-range contamination was detected, and at a number of locations as part of general Site-wide groundwater quality characterization. The results for petroleum hydrocarbon and BTEX analyses in groundwater are presented in Table 17.

As indicated in Table 17, gasoline and BTEX detections were very limited, and no detections above the cleanup screening levels occurred. Exceedance of the Method A cleanup level for TPH in the diesel and oil ranges were detected in Investigation Areas b, d, and e. The single oil range exceedance in Investigation Area b appears to be anomalous and could be an artifact of collecting the groundwater sample directly from a boring rather than a monitoring well. However, the exceedances in Investigation Areas d and e appear to be related to diesel-range petroleum hydrocarbon releases observed in these areas during the DGI. The exceedance of the cleanup screening level for TPH in the oil range at location D-FA-11 appears to be the result of diesel-range compounds that extend into to oil range, and not indicative of oil range contamination. However, the exceedance of the cleanup screening level for TPH in the oil range at location D-FA-14 appears to be related to releases from a used oil tank immediately upgradient of the sampling location.

Based on these results, groundwater in the vicinity of the UST locations identified in Table 1, except for location UST-5 in Investigation Area e, achieve the groundwater cleanup screening levels for the applicable petroleum hydrocarbon criteria. The following sections discuss the groundwater quality results for petroleum hydrocarbons in Investigation Areas d and e.

Investigation Area d

Figure 12 shows the NWTPH-D or NWTPH-HCID results, as applicable, for Investigation Area d. Figure 12 also shows the estimated extent of the petroleum hydrocarbon releases, based on field observations and field screening. As indicated on the figure, the apparent extent of the release in Investigation Area d associated with the diesel ASTs extends about 60 ft downgradient of the ASTs, but is below detection limits at downgradient Monitoring Wells P-23 and P-24. Based on the lower estimate for groundwater average linear velocity of 0.06 ft/day (22 ft/year) presented in Section 5.1.5, it would require about 5 years for a release from the AST to migrate the approximately 100 ft to Monitoring Well P-21. Based on the ASTs being present since about 1960 (45 years), and the likelihood that releases from the AST have occurred throughout its usage history, groundwater contamination originating from the ASTs appears to have reached equilibrium through natural attenuation and it does not appear that the release will reach the proposed conditional point of compliance at the shoreline.

Monitoring Well P-25 was installed to evaluate whether any free product resulting from the diesel AST releases was present on the groundwater table. The well location was selected due to its close proximity to D-FA-11, where the highest groundwater concentration of diesel-range petroleum hydrocarbons associated with the diesel AST releases was detected. Monitoring Well P-26 was gauged on March 17, 2005, and no free product was observed.

The apparent extent of the release in Investigation Area d associated with the used oil tank is limited, as shown on Figure 12. The limits of this release are confirmed for groundwater by the results from D-FA-11e, which was located about 20 ft downgradient from the used oil AST. Based on the lower estimate for groundwater average linear velocity of 0.06 ft/day (22 ft/year) presented in Section 5.1.5, it would require about one year for a release from the AST to migrate to D-FA-11c. Based on the used oil AST being present since the late 1980s (over 15 years), and the likelihood that releases from the AST have occurred throughout its usage history, groundwater contamination originating from the AST appears to have reached equilibrium through natural attenuation, and does not exhibit detectable concentrations of petroleum hydrocarbons in groundwater at a distance of over 150 ft from the proposed conditional point of compliance at the shoreline.

Based on the conditions described above, petroleum hydrocarbons in the diesel and oil ranges are considered constituents of concern for Investigation Area d. As a result, remedial action to address petroleum hydrocarbon contamination is warranted on this area, although available data indicate that the cleanup standards can be achieved through natural recovery at the proposed conditional point of compliance.

Investigation Area e

Based on groundwater samples collected from Boring E-FA-5, located within the footprint of former heating oil UST-5b, and Monitoring Well P-22 (installed to bound groundwater contamination associated with the diesel UST-5 location), no release from the former heating oil tank has occurred.

The apparent extent of the release associated with the UST-5 location, based on field observations and field screening, is shown on Figure 12. As indicated on the figure, the extent of the release associated with the UST-5 appears to extend about 120 ft downgradient (northwest) of the former tanks. This conclusion is supported by the groundwater quality results for monitoring wells P-22, P-23, and P-24, which bound the plume on the downgradient perimeter. The plume is bounded on the upgradient boundary by observations in E-FA-2c and E-FA-2d, and groundwater quality results from E-FA-2a, which did not show evidence of petroleum hydrocarbon impacts.

The only groundwater quality sample collected from within the plume area was collected from Boring E-FA-2, located immediately adjacent to the southwest side of the former UST 5 location. As indicated in Table 17, the groundwater sample collected from this location exceeded the cleanup screening level for diesel range petroleum hydrocarbons by more than a factor of 10.

Monitoring Well P-23 is located about 120 ft downgradient from the maximum downgradient extent of residual NAPL observed during the DGI. Based on the lower estimate for groundwater average linear velocity of about 0.06 ft/day (22 ft/yr), diesel-affected groundwater would have reached P-23 from the source area in less than 6 years. Given that the USTs were removed about 13 years ago, and no indication of diesel-range hydrocarbons was detected in downgradient monitoring wells P-23 or P-24, it appears that the release from UST-5 has reached equilibrium through natural attenuation.

Based on these data, petroleum hydrocarbons in the diesel range are considered constituents of concern for groundwater in Investigation Area e, and warrant remedial action. However, available data indicate that the cleanup standards can be achieved through natural recovery at the proposed conditional point of compliance.

5.3.2 SOIL

Soil samples were collected for chemical analyses from 175 borings and 17 surface samples during the Site environmental investigations. The results for analyses performed on soil samples are presented in Tables 18 through 25. Soil quality results are discussed by chemical constituent categories, subdivided into VOCs/PCBs, SVOCs, cPAH, metals, TBT, and petroleum hydrocarbons, including TPH, EPH, naphthalenes, and BETX analyses.

5.3.2.1 VOCs/PCBs

A total of 3 soil samples were analyzed for VOCs during the Phase II and DGI investigations. VOC results are presented in Table 18. VOCs were detected in two of the three soil samples tested, and a total of 15 VOCs, including 7 petroleum hydrocarbon-related VOCs, were detected in one or more soil sample. VOCs were not detected in any soil sample at a concentration exceeding the soil cleanup screening level. Based on these results, VOCs are not considered constituents of concern for Site soil.

A total of 10 soil samples were analyzed for PCBs during the Phase II and DGI investigations. PCB results are presented in Table 19. PCB Aroclor 1254 was detected in sample G-3 at a concentration of 110 µg/kg, which exceeds the cleanup screening level of 40 µg/kg, but is well below the cleanup screening level of 1,000 µg/kg for total PCBs. Based on these results, PCBs are not considered constituents of concern for Site soil.

5.3.2.2 SVOCs

Thirty one soil samples were tested for SVOCs during the Phase II and DGI investigations. SVOC results are presented in Table 20. A total of 12 SVOC were detected in one or more samples, with all detected SVOCs being non-PAHs (cPAHs are presented separately in Section 5.3.2.3). Based on these results, no SVOCs are considered constituents of concern for Site soil.

Naphthalene was also analyzed for in conjunction with EPH and BTEX to evaluate whether diesel-affected soil encountered in Investigation Areas d and e represent an unacceptable risk to human health from direct contact. These additional naphthalene results are presented and evaluated in Section 5.3.2.6 in conjunction with related petroleum hydrocarbon data.

5.3.2.3 cPAHs

A total of 175 soil samples were tested for cPAHs during the Phase II and DGI investigations, cPAH results are presented in Table 21. TEFs were used to develop the TEQ for the summation of cPAH, as specified in WAC 173-340-708(8)(e)(ii). The TEQ approach to quantifying the risk to human health posed by cPAH applies TEFs to individual cPAH compounds to calculate a TEQ concentration equivalent to a benzo(a)pyrene concentration. The concentration is then compared to the benzo(a)pyrene cleanup screening level. The TEFs for individual cPAHs range from 0.01 to 1.0, and are provided in the footnotes to Table 21.

cPAH analytical results presented in Table 21 are also shown on Figures 13 and 14 (Investigation Area d North Yard). As indicated in Table 21, the soil cleanup screening level for cPAH was exceeded in 47 samples collected from 35 locations. The cPAH cleanup level exceedances only occurred in the uppermost soil sample tested, except for in Investigation Areas d and f. As described in the DGI work plan (Landau Associates 2004b), the uppermost soil sample tested was collected from the upper 0.5 ft of the first soil horizon encountered at a boring location. In most instances, the first soil horizon started at the ground surface. However, in paved areas, the first soil horizon started immediately below the pavement and underlying base course.

As shown on Figures 13 and 14, cPAH exceed the cleanup screening levels in the uppermost soil sample collected from boring locations in Investigation Areas b, c, d, e, f and m. As previously indicated, cPAH contamination in investigation areas other than d and f were limited to the uppermost sample tested. In the North Yard of Investigation Area d, cPAH contamination is limited to the upper 3 ft of soil throughout most of the area. However, cPAH contamination is deeper in the vicinity of the former graving dock, with excedances to a depth of at least 6 ft detected at Boring D-FA-6. It should be noted that cPAH were not tested for extensively within the former graving dock area, based on data from the

Phase II ESA that indicate that arsenic was the primary constituent of concern in this area. Based on the available data, cPAH contamination may be more extensive in the graving dock area, but (as discussed in Section 5.3.2.4) arsenic concentrations exceed the soil cleanup screening level to the full depth of the former graving dock, so further characterization of cPAH distribution appears unnecessary to delineate the extent of soil contamination in this area.

In Investigation Area f, cPAH soil contamination extends to 3 ft BGS at location F-GC-13, as shown on Figure 13. Three additional borings were advanced in this area (F-GC-13b, F-GC-13c, and F-GC-13d) to better delineate the vertical and lateral extent of contamination at this location. It should be noted that Boring F-GC-13d was co-located with Boring F-GC-13 to delineate the vertical extent of contamination at this location. Similar to the vicinity of the graving dock in Investigation Area d, supplemental testing relied primarily on arsenic results from metals analyses to further delineate the extent of contamination in this area.

cPAHs are ubiquitous in the environment, and the specific source(s) of Site cPAHs are unknown and likely vary with the nature of the activities conducted in the different investigation areas. In areas where boat maintenance activities predominate, cPAHs may originate from releases of used motor oil from vessels, from the use of creosote-treated wood for supporting vessels being maintained, or the use of creosote products for sealing or preserving wood or some types of marine equipment. In Investigation Area d, cPAHs may result from the storage and use of creosote treated timbers, the release of used oil from maintenance of equipment, or the use of creosote products for sealing or preserving wood or some types of marine equipment. At locations immediately underlying or adjacent to asphalt, the exceedances could be related to the presence of cPAHs in asphalt. At any of these locations, cPAH could be related to historic oiling of unpaved surfaces for dust suppression.

Regardless of the source, the generally shallow distribution of cPAH contamination suggests it is primarily the result of surface releases and not a general fill characteristic. The only location where cPAHs were encountered in soil at a depth greater than 3 ft was in the vicinity of the former graving dock in Investigation Area d. Because the graving dock was reportedly excavated and backfilled on two occasions, the deeper cPAH contamination at this location is likely the result of intermixing shallow contamination with deeper clean fill during the excavation and backfilling process.

Based on cPAH analytical results, cPAHs are considered a constituent of concern for Site soil and warrant remedial action.

5.3.2.4 Metals

A total of 214 soil samples were tested for a broad suite of heavy metals during the Phase II and DGI investigations. Forty six additional samples were tested for arsenic only to characterize arsenic subsurface soil concentrations in the portion of Investigation Area f that exhibits elevated arsenic groundwater concentrations (as described is Section 5.3.1.4), 15 subsurface soil samples from Investigation Area d were tested for arsenic only to delineate the vertical extent of contamination in the vicinity of the former graving dock; and 3 subsurface soil samples were tested for lead only in the vicinity of former gasoline USTs. Analytical results for detected metals in soil are presented in Table 22, and analytical results for arsenic in soil are presented on Figures 15 and 16 (Investigation Area d North Yard). Analytical results for metals other than arsenic that exceed the soil cleanup screening level are also presented on Figure 15.

As indicated in Table 22, arsenic is the most common metal that exceeds the soil cleanup screening level, with 75 of the 211 samples tested exceeding the criterion. Copper, lead, and mercury exceeded their soil cleanup screening levels in five, nine, and one sample, respectively. The lead excedance in sample C-FA-2(0-0.5) and the single mercury excedance at H-GC-5(1.8-2.8) were the only instances where arsenic was not detected above its cleanup screening level in a sample where another metal exceedance occurred; however, in sample C-FA-2 (0-0.5), the arsenic reporting limit was elevated above the cleanup screening level for arsenic.

Potential Arsenic Sources

As the most ubiquitous contaminant encountered on the Site, the potential sources of arsenic warrant additional discussion. A number of potential arsenic sources exist, including slag and arsenic-affected soil from former Everett smelter operations, slag-derived sand blast grit, arsenic-based herbicides and pesticides, marine paints, and arsenic-based wood preservatives.

A smelter was operated in Everett by ASARCO until 1912, and released significant amounts of arsenic to the environment through air emissions and disposal of slag. Because the majority of the Site upland was not created until 1947 or later, direct aerial deposition of arsenic on the Site from air emissions is not possible. However, the potential exists for affected soil or slag from the smelter to have been placed on the Site either during initial hydraulic filling or by the later use of affected coarse soil or slag for a trafficking layer. Additionally, slag from the ASARCO Tacoma smelter was processed into sandblast grit and aggregate during the 1970s and 1980s (Glass 1992). Because of the haul distance, it is unlikely that slag-derived aggregate from the Tacoma smelter was used at the Site for trafficking surfaces, but slag-derived sandblast grit was extensively used in the maintenance of marine vessels and other industrial operations that require the removal of paint or corrosion from metal surfaces and has a significant potential to have been used at the Site. Sandblast grit was also manufactured from slag generated by other metal refining industries that contained arsenic, as well as other heavy metals.

Arsenic was also used historically in various herbicides and pesticides, and as a pigment in paints (Glass 2003), which also had the potential to be used by various Port tenants on the Site in earlier years. Arsenic is also present in high concentrations in copper chromates arsenic (CCA) treated wood.

Slag from the ASARCO Everett and Tacoma smelters exhibit significantly different characteristics in the relative concentrations of arsenic compared to other heavy metals present in the slag material. The ASARCO Tacoma smelter was known for being able to process high-arsenic feedstocks (Glass 1992), so it tends to have very high arsenic concentrations relative to other heavy metals such as copper, lead, and zinc. Conversely, the ASARCO Everett smelter slag exhibits relatively low concentrations of arsenic compared to other heavy metals (Hydrometrics 1995).

Soil affected by air emissions from the Everett smelter exhibits significantly different characteristics than the slag due to the relative volatility of the metals and other factors. Because arsenic is more volatile than other heavy metals, it was present in significantly higher concentrations relative to other heavy metals in air emissions, which is evident from available data for smelter-affected soil from the Everett smelther vicinity (Hydrometrics 1995). The approximate concentration ratios of copper, lead, and zinc relative to arsenic for Everett and Tacoma smelter slag and Everett smelter-affected soil, are provided below:

Relative Concentrations of Heavy Metals in ASARCO Smelter Slag and Soil

Metal Ratio	Everett Smelter Slag (a)	Everett Affected Soil (a)	Tacoma Smelter Slag (b)
Copper/Arsenic	3	N/A (c)	0.4
Lead/Arsenic	30	0.4	0.6
Zinc/Arsenic	100	N/A (c)	2

a) Based on data contained in Hydrometrics 1995, Tables 3-8 and 3-9.
b) Based on data contained in Glass 1992, Table F-1.
c) Statistics not developed in Hydrometrics 1995 for average copper and zinc concentrations in affected soil due to insufficient data.

The relative concentrations of arsenic versus other metals may vary based on factors such as the source of feed stock, natural background concentrations in soil, and impacts from other anthropogenic sources, but should generally be in the range of the numbers above, if impacts from these potential sources are the primary cause of affected soil detected at a given location.

At least one soil sample from all investigation areas except Investigation Areas g, k, and m exceeded the soil cleanup screening level for one or more metals. Each affected area is discussed below, including a discussion of the likely source(s) of contamination. The concentrations of copper, lead, and zinc relative to arsenic are presented in Table 27 for all samples tested where the arsenic concentration exceeded 20 mg/kg.

Investigation Area b

Metals contamination in Investigation Area b is limited to the upper 0.5 ft of soil in the work yard on the east site of Everett Bayside Marine. Arsenic is the only metal that was detected above the cleanup screening level, although copper, lead, mercury, and zinc were also present at elevated concentrations. As indicated in Table 26, the average arsenic-normalized concentrations for copper, lead, and zinc in soil samples that exceeded an arsenic concentration of 20 are about 21, 5, and 11, respectively, indicating that the affected soil is enriched in these metals, relative to arsenic. However, the relative concentrations of lead and zinc are not high enough to indicate Everett smelter slag as the source and the relative lead concentrations are well above what would be expected if the source was soil affected by the Everett smelter. However, the data are consistent with slag-derived sandblast grit in conjunction with residue (or chips) of marine paints containing elevated levels of copper, lead, and zinc. Other possible sources are boat maintenance wastes that included arsenic-containing paint, or other potential arsenic sources described above. Based on the use of the Bayside Marine east work yard for boat maintenance activities, arsenic contamination is likely the result of boat hull sandblasting or similar activities, with arsenic potentially present in the sand blast grit or in hull paints from older vessels.

Based on available soil quality data, arsenic is considered a constituent of concern for soil in Investigation Area b and warrants remedial action.

Investigation Area c

Metals contamination in Investigation Area c is limited to the upper 0.5 ft of soil in the Port boatyard. Arsenic, copper, and lead are the metals that were detected above the cleanup screening levels, although mercury and zinc were also present at elevated concentrations. As indicated in Table 27, the average arsenic-normalized concentrations for copper, lead, and zinc in soil samples that exceeded an arsenic concentration of 20 are about 340, 200, and 26, respectively, indicating that the affected soil is enriched in these metals, relative to arsenic. The relative concentrations of copper and lead are too high to originate solely from a smelter-related source. However, the relative concentrations of copper, lead, and zinc are consistent with slag-derived sandblast grit in conjunction with marine paints containing elevated levels of copper, lead, and zinc. Other possible arsenic sources are boat maintenance wastes that included arsenic-containing paint, or other potential arsenic sources described above. Based on the use of the Port boatyard for boat maintenance activities, the observed shallow soil contamination is likely the result of boat maintenance activities, including hull scraping and sandblasting, with arsenic potentially present in the sand blast grit or in hull paints from older vessels.

Based on available soil quality data, arsenic, copper, and lead are considered constituents of concern for soil in Investigation Area c and warrant remedial action.

Investigation Area d

Copper also exceeds the cleanup screening level at a number of locations. However, the soil cleanup screening level for copper is based on protection of surface water due to the exceedance of the groundwater cleanup screening level for copper at monitoring well P-21 (see Section 5.3.1.4). The soil cleanup screening level for copper is established as the natural background concentration (36 mg/kg), and detected concentrations are not highly elevated, averaging about 61 mg/kg and exceeding 100 mg/kg in only 5 of 60 samples tested. Copper exceedances correlate well with arsenic exceedances, with 41 of 43 samples that exceeded the arsenic cleanup screening level also exceeding the copper cleanup screening level. Based on these considerations, the remaining discussion of metals contamination in Investigation Area d will focus on arsenic.

The most extensive metals contamination in soil occurs in Investigation Area d, where arsenic concentrations exceed the soil cleanup screening level throughout most of the North Yard. Limited arsenic contamination is also present near the east end of the South Yard (D-GC-12) in the upper 2 ft of soil. The vertical extent of arsenic contamination was delineated at all boring locations, except for D-GC-1, D-GC-6, D-GC-13, and D-FA-5, where contamination was present in the deepest sample collected. Although contamination was present in the deepest samples tested from borings D-FA-2, D-FA-3 and D-FA-4, it is bounded at these locations by the concrete slab encountered during drilling at these locations.

Metals contamination in Investigation Area d is limited to arsenic and copper;, other detected metals typically were not detected at significantly elevated concentrations. Arsenic contamination is 0.5 ft to greater than 3 ft deep throughout most of the North Yard. In the vicinity of the former graving dock, arsenic contamination extends to the concrete pad reportedly still present at the base of the former graving dock, a depth of about 14 ft BGS; the concrete slab reportedly present at the base of the former graving dock is assumed to be present based on encountering refusal during drilling at about 12 ft BGS in most borings located within the estimated footprint of the former graving dock.

Based on the analytical results for subsurface soil in the graving dock vicinity, it appears that the former graving dock was located somewhat further east, and extended further south, than estimated by American Construction personnel prior to implementation of the DGI. This conclusion is based on the presence of arsenic contamination extending to a depth of at least 14 ft at Boring D-FA-5 and a depth of 10 ft at B-FA-6, which were supposed to be located beyond the east and south boundaries of the former graving dick. Conversely, the soil samples tested from Boring D-FA-1, located within the estimated west boundary of the graving dock, did not exceed the arsenic cleanup level, suggesting that this boring was located west of the former graving dock footprint.

Borings F-FA-5b and F-FA-6b were installed subsequent to receiving arsenic analytical results for Borings D-FA-5 and D-FA-6 to bound the extent of arsenic contamination associated with the former graving dock. As shown on Figure 16, the arsenic contamination at these locations is limited to the upper 2 to 3 ft, consistent with other locations in the North Yard outside of the former graving dock footprint. The revised estimated footprint of the graving dock, based on analytical results from the DGI, is shown on Figure16.

It should be noted that an additional shallow soil sample [D-GC-13 (0-0.5)] was collected on the east side of the large crane in the northeast corner of the north yard to determine whether shallow soil contamination extended to the east property boundary in this area. Based on review of available aerial photographs, the large crane in this area was installed sometime between 1993 and 1999. Because of access issues resulting from the presence of the crane, only a surface soil sample could be collected from location D-GC-13, and the sample contained arsenic above the cleanup screening level. Because of the relatively recent placement of the large crane in this area, it is reasonable to assume that arsenic contamination is present beneath the crane. Based on analytical results from nearby borings, it is likely that arsenic contamination in the vicinity of the large crane extends from 2 ft to greater than 3 ft BGS.

Because arsenic concentrations in soil exceeded 100 mg/kg at a number of locations, the potential exists for arsenic to exceed dangerous waste criteria for leachable metals. As a result, the soil sample containing the highest arsenic concentration [D-FA-7 (1-2); 250 mg/kg] detected during the initial round of testing for the DGI was submitted for TCLP analysis for arsenic. Leachable arsenic was not detected in the sample. The analytical results are presented in Appendix B.

As indicated in Table 27, the average arsenic-normalized concentrations for copper, lead, and zinc in soil samples that exceeded an arsenic concentration of 20 are about 1, 1, and 3, respectively, indicating that the affected soil is not enriched in copper or lead, and only slightly enriched in zinc, relative to arsenic. The relative concentrations of copper, lead, and zinc are not high enough to indicate Everett smelter slag as a significant source. The relative lead concentration is above what would be expected if the primary source was soil affected by the Everett smelter. The data are consistent with slag-derived sandblast grit, but the relative concentrations of copper, lead, and zinc are only slightly higher than the relative concentrations present in Tacoma smelter slag. If elevated arsenic concentrations are associated with slag-derived sand blast grit, it does not appear that a significant percentage of the sand blasting was associated with removal of marine paints containing copper, lead, or zinc. Other possible arsenic sources are arsenic-containing paint, herbicides used for weed control, and ACC-treated wood.

Based on the historical review conducted for Investigation Area d (Farallon Consulting 2004) that was presented in the DGI work plan (Landau Associates 2004b), sandblasting activities and herbicide application were conducted over the operational history of American Construction on Investigation Area d. Consequently, these appear to be the most probable sources of arsenic contamination in Investigation Area d, although arsenic contamination could result from currently undocumented sources. It is probable that the deeper arsenic contamination encountered in the former graving dock area is the result of intermixing of shallow soil contamination with deeper clean soil during the two excavation and backfilling events associated with use of the graving dock.

Based on available soil quality data, arsenic and copper are considered constituents of concern for soil in Investigation Area d and warrant remedial action.

Investigation Area e

Metals contamination was encountered in shallow soil in the northwest and southwest corners of Investigation Area e. Similar to Investigation Area d, arsenic was the only metal that exceeded the cleanup screening level; the other metals tested were not significantly elevated. Arsenic contamination appears to be limited to the upper 0.5 to 2 ft of soil.

As indicated in Table 27, the average arsenic-normalized concentrations for copper, lead, and zinc in soil samples that exceeded an arsenic concentration of 20 are about 0.5, 0.2, and 1, respectively, indicating that the affected soil is not enriched in these metals, relative to arsenic. Although the relative concentrations of copper, lead, and zinc are in the range of what might be attributable to slag-based sandblast grit from the Tacoma smelter, and the relative lead concentration is consistent with Everett smelter affected soil, the copper, lead, and zinc concentrations are all in the range of natural background. Additionally, the concentrations of copper, lead, and zinc for individual samples from Investigation Area e do not correlate well with arsenic concentrations. Arsenic contamination could be related to the use of slag-derived sand blast grit on materials that were not coated with paints containing copper, lead, or zinc. Additionally, the observed concentrations could result from the use of soil affected by the Everett smelter for a trafficking layer within limited areas of the leasehold. Other possible arsenic sources are arsenic-containing paint, or application of herbicides or pesticides, although use of these materials have not been documented for Investigation Area e. As a result, the source of arsenic contamination in this area is not currently known..

Based on available soil quality data, arsenic is considered a constituent of concern for soil in Investigation Area e and warrants remedial action.

Investigation Area f

Metals contamination was encountered in shallow soil in three areas located within Investigation Area f. Arsenic exceeded the cleanup screening level in all three areas, and lead exceeded the cleanup screening level in one area. Copper, mercury, and zinc were also elevated in most samples that exceeded the cleanup screening level for arsenic, although they did not exceed their respective cleanup level.

The first location is in the northwest corner of the investigation area, in the vicinity of Boring F-GC-13, where arsenic and lead exceeded the soil cleanup screening levels to depths up to 3 ft BGS. Affected soil in this area was further delineated by additional borings F-GC-13b, F-GC-13c, and F-GC-13d that were completed following receipt of analytical results from the initial DGI sampling effort. Based on review of available aerial photographs, it appears that contamination in this area is related to filling a low area.

The second location is in the vicinity of surface sample F-4 and Boring F-FA-6, where arsenic exceeded the cleanup screening level in the upper 0.5 ft of soil. Heavy equipment and machinery have been stored in this area for a number of years, and sand blast grit was observed on the ground surface during the Phase I ESA (Landau Associates 2001).

The third location is at the west end of the former American Boiler Works building in the vicinity of surface soil sampling location F-5. The sample collected from this location exceeded the arsenic cleanup screening level, and exhibited elevated concentrations of copper, lead, mercury, and zinc. A subsurface soil sample was collected at 3 ft BGS from Boring F-9, which was co-located with the F-5 location;,no metals exceeded the cleanup screening levels in this deeper sample. No other samples in this area exceeded the cleanup screening level for metals, so contamination appears to be of limited aerial extent. Based on these results, and the distribution of shallow soil contamination at other locations, it is anticipated that shallow soil contamination is limited to the upper 1 ft of soil in the vicinity of the F-5 location.

A pink, granular material was observed outside of two loading docks on the south side of the building most recently occupied by American Boiler Works. A sample of the material was collected from one of the areas at the location labeled “F-Pink” on Figure 15. The material was about 1 ft thick and covered about an 8-ft wide by 20-ft long area outside of each loading dock. Based on the materials appearance and lack of odor, it was tested for heavy metals. The analytical results, presented in Table 22, indicate exceedance of the arsenic and lead cleanup levels, and elevated concentrations of copper, mercury, and zinc. Subsequent sampling and testing of underlying soil indicates that contaminated soil immediately underlying the material is contaminated to a depth of about 2 ft BGS (including the 1 ft of overlying material).

Due to the high concentrations of arsenic and lead, the sample of pink, granular material was also tested for TCLP arsenic and lead TCLP to determine whether it would exceed dangerous waste criteria for leachable metals. . Neither constituent was detected; the results are presented in Appendix B.

As indicated in Table 27, the average arsenic-normalized concentrations for copper, lead, and zinc in soil samples that exceeded an arsenic concentration of 20 are about 4, 2, and 25, respectively, indicating that the affected soil is enriched in these metals, relative to arsenic. However, the relative concentrations of lead and zinc are not high enough to indicate Everett smelter slag as the source and the relative lead concentrations are well above what would be expected if the source was soil affected by the Everett smelter. However, the data are consistent with slag-derived sandblast grit in conjunction with marine paints containing elevated levels of copper, lead, and zinc. Other possible sources are boat maintenance wastes that included arsenic-containing paint, or other potential arsenic sources described above. Based on the observed presence of sand blast grit in this area, the elevated concentrations of copper, lead, and zinc, as well as use of portions of the area for boat maintenance activities, the most probable source of arsenic soil contamination in this area is boat maintenance waste, possibly including the use of slag-derived sand blast grit.

As indicated in Table 27, the average arsenic-normalized concentrations for copper, lead, and zinc in samples or the pink, granular material present outside on the loading docks of the south side of the former ABW building exceeded an arsenic concentration of 20 are about 2, 2, and 19, respectively, indicating that the material is enriched in these metals, relative to arsenic. Due to its appearance, it does not originate from a slag-derived product or smelter affected soil. Rather, it appears to be either some type of feedstock or waste associated with a manufacturing process. The adjacent building was most recently occupied by American Boiler Works (1988 – 2003), and prior to that was occupied by Tidewater Plywood and other wood products businesses. Based on its location outside of the loading docks, it appears that the material was spilled during loading or unloading.

Based on available soil quality data, arsenic and lead are considered constituents of concern for soil in Investigation Area b and warrant remedial action.

Investigation Area h

Metals contamination was encountered in shallow soil at locations H-GC-1 and H-GC-5 within Investigation Area h. Arsenic exceeded the cleanup screening level at both locations, and mercury exceeded the cleanup screening level in a subsurface sample at H-GC-5. No other metals were detected at elevated concentrations. Additional Borings H-GC-5b, H-GC-5c, and H-GC-5d were installed to better delineate metals contamination following receipt of the analytical results for the initial DGI investigation.

Arsenic contamination is most likely associated with the adjacent South Yard of Investigation Area d. Boring H-GC-5 is located immediately south of the South Yard fence line, and contamination at this location was bounded about 25 ft to the south by Boring H-GC-5d, which did not exceed any cleanup screening levels. As shown on Figure 15, the portion of Investigation Area h located to the east of the current Investigation Area d South Yard used to be part of the South Yard. Aerial photographs indicate that the South Yard included this area until about 1988, as well as the area between the convention center to the south and the current South Yard.

As indicated in Table 27, the average arsenic-normalized concentrations for copper, lead, and zinc in soil samples that exceeded an arsenic concentration of 20 are about 1, 0.3, and 2, respectively, indicating that the affected soil is not enriched in these metals relative to arsenic. Although the relative concentrations of copper, lead, and zinc are in the range of what might be attributable to slag-based sandblast grit from the Tacoma smelter, and the relative lead concentration is consistent with Everett smelter affected soil, the copper, lead, and zinc concentrations are all in the range of natural background. Arsenic contamination could be related to the use of slag-derived sand blast grit on materials that were not coated with paints containing copper, lead or zinc. Additionally, the observed concentrations could result from the use of soil affected by the Everett smelter for a trafficking layer within limited areas of the leasehold. Other possible arsenic sources are arsenic-containing paint, or application of herbicides or pesticides. As a result, the source of arsenic contamination in this area is not currently known.

The source of the mercury contamination encountered at Boring H-GC-5 is unknown. However, the sampling location is immediately adjacent to the Investigation Area d South Yard, which is the only Site location where the cleanup screening level for mercury was exceeded, and exhibited mercury concentrations in shallower and deeper samples that were more elevated than any other location. However, the extent of mercury contamination appears to be limited, based on the analytical data from nearby exploration locations.

Based on available soil quality data, arsenic and mercury are considered constituents of concern for soil in Investigation Area h and warrant remedial action.

Investigation Area i

Arsenic concentrations exceeding the soil cleanup screening level was detected in samples collected from two soil stockpiles in Investigation Area I, and lead exceeded the cleanup screening level in one of the samples. Arsenic contamination in one soil stockpile was encountered in a discrete layer of discolored, odorous material at a depth of 1.3 to 3 ft BGS (sample I-X), and a composite sample collected from the soil layer beneath this material (I-Y) contained arsenic at a concentration of 5.3 mg/kg. Arsenic-affected soil in the stockpile in the northeast corner of investigation area “i” appeared to be more broadly distributed within the stockpile material, and a composite sample collected from this stockpile (I-Z) contained an arsenic concentration of 240 mg/kg.

The stockpiles appear to contain materials from multiple sources, and reportedly consist of soil that was excavated from various locations within the Site. As a result, evaluation of potential sources is not possible without additional information regarding the origin of the soil. Based on available soil quality data, arsenic and lead are considered constituents of concern for the two soil stockpiles present in Investigation Area i and warrant remedial action.

As previously discussed, soil throughout Investigation Area i was not characterized, other than the stockpiled material, because the area is anticipated for use to contain affected soil from other Site areas.; Under this type of future use and associated engineering controls, soil quality characterization does not appear necessary. However, if the area is not used for containment of affected Site soil, additional characterization will be needed to evaluate soil quality, consistent with other areas of the Site.

Investigation Area j

Metals contamination was encountered in shallow soil at location J-GC-4 within Investigation Area j. Arsenic exceeded the cleanup screening level at this location in the upper 0.5 ft of soil. No other metals were detected at elevated concentrations at this location. As indicated in Table 27, the average arsenic-normalized concentrations for copper, lead, and zinc in the soil sample that exceeded an arsenic concentration of 20 are about 1, 1, and 3, respectively, indicating that the affected soil is not enriched in copper or lead, and only slightly enriched in zinc, relative to arsenic. The relative concentrations of copper, lead, and zinc are not high enough to indicate Everett smelter slag as a significant source. The relative lead concentration is above what would be expected if the primary source was soil affected by the Everett smelter. The data are consistent with slag-derived sandblast grit, but the relative concentrations of copper, lead, and zinc are only slightly higher than the relative concentrations present in Tacoma smelter slag. So, if elevated arsenic concentrations are associated with slag-derived sand blast grit, it does not appear that a significant percentage of the sand blasting was associated with removal of marine paints containing copper, lead, or zinc. Other possible arsenic sources are arsenic-containing paint, and herbicides or pesticides. The specific source of this contamination is unknown at this time.

Based on available soil quality data, arsenic is considered a constituent of concern for Investigation Area j and warrants remedial action. However, the extent of contamination appears to be limited.

Investigation Area l

Metals contamination was encountered in shallow soil collected from three locations along the north side of Investigation Area l. Arsenic exceeded the cleanup screening level at all three locations, and lead exceeded the cleanup level at one location. Copper and zinc also tended to be elevated at these locations, but did not exceed their respective cleanup levels.

Arsenic was exceeded in the uppermost sample from locations L-GC-4 and -5 during the initial DGI field effort. Based on the results from the initial field effort, Borings L-GC-4b, L-GC-4c, L-GC-5b, and L-GC-5c were installed to better delineate metals contamination in the vicinity of these locations. Arsenic and lead exceeded the cleanup screening level in the uppermost sample from Boring L-GC-4b, and was the only exceedance detected during the supplemental DGI investigation.

As indicated in Table 27, the average arsenic-normalized concentrations for copper, lead, and zinc in soil samples that exceeded an arsenic concentration of 20 are about 3, 2, and 11, respectively, indicating that the affected soil is enriched in these metals, relative to arsenic. However, the relative concentrations of lead and zinc are not high enough to indicate Everett smelter slag as the source and the relative lead concentrations are well above what would be expected if the source was soil affected by the Everett smelter. However, the data are consistent with slag-derived sandblast grit in conjunction with marine paints containing elevated levels of copper, lead, and zinc. The relative concentrations are also similar to the relative concentrations of copper, lead, and zinc for the pink, granular material present outside the loading docks for the building in Investigation Area f previously occupied by American Boiler Works. Other possible sources are boat maintenance wastes from the adjacent property (Investigation Area b), the use of arsenic-containing herbicides or pesticides, or unidentified arsenic sources.

Based on available soil quality data, arsenic is considered a constituent of concern for Investigation Area l and warrants remedial action.

5.3.2.5 TBT

TBT is an organotin compound that was used for a number of years in anti-fouling paints applied to boat hulls. TBT was banned for most applications in the 1980s due to impacts to marine organisms. However, it is a common contaminant at most boatyards that have been in operation for a number of years, and is still used on larger ships and out-drives for smaller vessels. TBT was tested for at nine Site locations where boat maintenance activities commonly occur.

TBT analytical results are presented in Table 23. As indicated in the table, TBT was detected in samples collected from seven of the nine locations sampled, and it exceeded the soil cleanup screening level in one surface soil sample[C-FA-3 (0-0.5)], collected from the Port boatyard. The underlying soil at this location was below the TBT cleanup screening level, indicating contamination is limited to surface soil. It should be noted that arsenic also exceeded the cleanup screening level at this location.

Based on the available data, TBT is considered a potential constituent of concern for Site soil in areas where boat maintenance activities have occurred. However, it is likely that the arsenic cleanup level is also exceeded at locations where the TBT cleanup level is exceeded. As a result, arsenic will likely function as an indicator hazardous substance for metals contamination, including TBT, so extensive TBT testing should not be required as part of compliance monitoring to verify cleanup.

Based on available soil quality data, TBT is considered a constituent of concern for Investigation Area c and warrants remedial action.

5.3.2.6 Petroleum Hydrocarbons

A total of 138 soil samples were tested for TPH by method NWTPH-HCID, NWTPH-Dx (extended to the oil range), and/or NWTPH-G. Additionally, 17 soil samples were tested for BTEX, and eight samples were tested for EPH and naphthalenes. In general, NWTPH-HCID analysis was conducted on soil samples collected from general characterization locations, and from locations where a petroleum hydrocarbon release potentially occurred (e.g., the location of a former UST), but the nature of the petroleum hydrocarbon release (if present) was not known or might include more than one petroleum product (e.g., gasoline and diesel). Follow-up testing was conducted for specific petroleum hydrocarbon ranges detected by the HCID analysis. At locations where the nature of the release or potential release was known, the specific petroleum hydrocarbon-range was tested for without first analyzing for NWTPH-HCID. BTEX was analyzed for at any location where the presence of gasoline-range petroleum hydrocarbons was suspected, and at selected locations where diesel-range contamination was detected. The risk to human health was evaluated based on the MTCA petroleum mixtures approach (WAC 173-340-740(3)(b)(B)(III).

The results for petroleum hydrocarbon and BTEX analyses in groundwater are presented in Table 24. Based on these results, soil in the vicinity of the UST locations identified in Table 1, except for UST-5 in Investigation Area e, achieve the soil cleanup screening levels for the applicable petroleum hydrocarbon criteria.

As indicated in Table 24, TPH-G and BTEX detections were very limited. No exceedance of the cleanup screening levels for BTEX was detected. One detection of TPH-G above the cleanup screening level occurred, but the detected petroleum hydrocarbon did not match the gasoline standard and the detected constituents appear to be lighter fraction diesel-range compounds. Exceedance of the Method A cleanup level for TPH in the diesel and oil ranges were detected in Investigation Areas b, d, e, and j. The nature and extent of the petroleum hydrocarbon releases in these areas are discussed below.

Petroleum Mixtures

The risk to human health posed by direct contact with noncarcinogenic petroleum mixtures was evaluated at locations where significant diesel-range petroleum hydrocarbon releases occurred, and at locations where visual evidence of petroleum hydrocarbon contamination was observed. This evaluation was conducted using Ecology's spreadsheet (MTCATPH10) for calculating the hazard index (HI) for affected soil collected from locations within the release area. This approach calculates the HI for a given sample based on the results of EPH, BTEX, and naphthalenes analyses.

The results of this evaluation are presented in Table 25. The majority of the samples tested for this suite of parameters were related to identified diesel-range petroleum hydrocarbon releases in Investigation Areas d and e. However, one sample [D-GC-2 (0.8-1.0)] was collected from an area of discolored, odiferous shallow soil in Investigation Area d that was unrelated the AST diesel release present in that area. Two other samples [F-FA-6 (1-2) and F-FA-10 (2-3)] was collected from discolored soil encountered in Investigation Area f. The results of the petroleum mixtures evaluation are discussed in the applicable section below.

Investigation Area b

The single diesel-range exceedance in Investigation Area b occurred in the Bayside Marine East Yard at location B-GC-4. As described above, a gasoline-range exceedance also occurred at this location, but the chromatogram did not match the gasoline standard, and it likely represents the light fraction of the diesel-range product. This exceedance is likely related to a minor fuel spill from a vessel being serviced at Bayside Marine. A more extensive release is unlikely because no diesel-range exceedances occurred in deeper soil from this location or at nearby locations, and there is no information indicating that diesel was stored or used on this parcel.

Based on available soil quality data, petroleum hydrocarbons in the diesel range are considered constituents of concern for Investigation Area b and warrant remedial action. Due to the exceedance of the arsenic cleanup screening level in the surface soil samples collected from the other four exploration locations completed in the Bayside Marine East Yard during the DGI (B-GC-1 through B-GC-4, and B-GC-9), the diesel-affected soil in the vicinity of B-GC-4 will likely be remediated in conjunction with metals contamination in shallow soil throughout the East Yard.

Investigation Area d

The exceedance of cleanup screening levels related to petroleum hydrocarbons occurred in five areas of Investigation Area d. The most extensive release is associated with the diesel AST located to the north of the maintenance shop. A release associated with the used oil tank located on the south side of the storage shed was also identified. Additionally, petroleum hydrocarbon affected soil was also encountered in the vicinity of boring locations D-3, D-GC-2, and D-FA-11e.

The diesel release associated with the ASTs was delineated based on visual observations and field screening, and is shown on Figure 18. The three soil samples submitted for NWTPH-D analyses collected from within the area of the release (D-FA-10, D-FA-11, and D-FA-11c) did not exceed the cleanup screening level for diesel-range hydrocarbons of 2,000 mg/kg. However, because only a limited number of samples were collected, and they were collected at the water table, they may not be representative of soil concentrations throughout the observed affected area. It should also be recognized that the soil cleanup screening level for diesel-range hydrocarbons is based on protection of groundwater, and because groundwater contamination resulting from this release was documented in a groundwater sample collected from Borings D-FA-10 and D-FA-11. There is empirical evidence that diesel-range petroleum hydrocarbons present in soil are affecting groundwater. Additionally, as indicated in Table 24, the risk posed by the direct contact with diesel-affected soil for D-FA-11c and D-FA-11h exceeded a HI of 1.0, which is the risk threshold for noncarcinogenic affects. As a result, the diesel-affected soil associated with the diesel AST exceeds the soil cleanup screening levels for diesel-range petroleum hydrocarbons.

The impact to soil associated with releases from the used oil AST was evaluated based on testing of soil samples collected from Borings D-FA-14 and D-FA-15. D-FA-15, collected from immediately below the AST, had TPH concentrations in the diesel range that slightly exceeded the cleanup screening level and concentrations in the oil range that significantly exceeded the cleanup level. However, petroleum hydrocarbons were not detected in the soil sample tested from Boring D-FA-15, located about 10 ft downgradient of the AST. Based on these results, petroleum hydrocarbon soil contamination appears to be limited to the immediate vicinity of the AST.

A layer of discolored and odiferous soil about 1 ft thick was encountered at Boring D-GC-2 at a depth of about 1 ft BGS. Additional borings D-GC-2b and D-GC-2c were installed to further delineate the affected soil in this area. Additional delineation could not be completed to the east due to the presence of underground utilities. Similar affected soil was encountered in Boring D-GC-2b, but not D-GC-2c. Samples tested from Borings D-GC-2 and -2b were tested for TPH-Dx. Additionally, the sample from D-GC-2 was tested for EPH and naphthalenes. Analytical results for these samples exceeded the cleanup screening levels for TPH in the diesel and oil ranges, and exceeded the cleanup screening level for petroleum mixtures (HI>1). Based on these results, the affected soil present in the D-GC-2 vicinity will be addressed as part of Site cleanup.

A soil sample collected from discolored material present at about 3 ft BGS in Boring D-3 during the Phase II ESA exceeded the soil cleanup level for petroleum hydrocarbons in the oil range. However, this affected soil was not observed in nearby borings completed during the DGI. Additionally, petroleum hydrocarbons were not detected in groundwater collected from Boring D-3 during the Phase II ESA, or in groundwater tested during the DGI from downgradient monitoring well P-21. Due to the limited extent of affected soil associated with D-3, and the lack of impact to groundwater, it does not appear that remediation associated with this release is necessary.

A soil sample collected from 2 ft BGS at location D-FA-11e contained diesel-range petroleum hydrocarbons above the cleanup screening level. Based on groundwater analytical results for a sample collected from this location, the affected soil is not impacting groundwater. Due to its physical separation and lack of groundwater impact, the affected soil at this location does not appear to be related to the releases from either the diesel or used oil ASTs, and is likely the result of a localized diesel spill.

Based on available soil quality data, petroleum hydrocarbons in the diesel and oil ranges are considered constituents of concern for Investigation Area c and warrant remedial action.

Investigation Area e

Soil affected by petroleum hydrocarbons were encountered in an area downgradient of the former diesel USTs at the UST 5 location. Delineation of the diesel-affected area was conducted based on field screening and visual observation, with limited analysis of soil samples to document the extent of contaminated soil. Soil samples were collected for laboratory analysis from six locations within the observed affected area, as shown on Figure 18. Two of these samples, E-GC-4c and E-GC-4d, were also tested for EPH, naphthalenes, and BTEX to calculate the hazard index based on the noncarcinogenic toxicity of the petroleum mixture. Additionally, a soil sample from Boring E-GC-4g, located outside the area of observed impact, was tested for the same parameters to confirm the boundary of affected soil. The results for TPH and BTEX analyses are presented in Table 24, and the results for the evaluation of the HI for petroleum mixtures are presented in Table 25. The results are also shown on Figure 18.

As shown in Tables 24 and 25, and illustrated on Figure18, soil in close proximity to the former diesel USTs did not exceed the cleanup screening levels for either TPH in the diesel range or the hazard index based on petroleum mixtures. However, the sample collected from near the leading edge of the plume exceeded both the cleanup screening levels for diesel-range petroleum hydrocarbons and the hazard index based on petroleum mixtures. This distribution of soil contamination is consistent with the cleanup that was implemented in the immediate UST vicinity in 1991 because it addressed the immediate UST vicinity, but not the area downgradient.

Based on available soil quality data, petroleum hydrocarbons in the diesel range are considered constituents of concern for Investigation Area e and warrant remedial action.

Investigation Area j

The exceedance of cleanup screening level for oil-range petroleum hydrocarbons at J-GC-1 was the only cleanup level exceedance encountered in Investigation Area j. The exceedance occurred in the upper 0.5 ft of soil and in likely results from oil leakage or spillage in this high traffic, driveway area. The limited depth of this exceedance, combined with the lack of detection of any petroleum hydrocarbon constituents in groundwater samples collected downgradient from this location (J-1, J-2, J-FA-1 and J-FA-2), supports the conclusion that remedial action does not appear to be warranted to address this release.

6.0 CONCLUSIONS

The primary objectives of the DGI were to address the Site characterization data gaps that remained following completion of the Phase II ESA, and to use the resulting consolidated data to delineate the nature and extent of Site contamination. These objectives were achieved.

Soil and groundwater samples from a total of 192 soil explorations and 26 monitoring wells were collected and tested for various environmental constituents to delineate the nature and extent of contamination. Based on the data resulting from these monitoring activities, and observations made during field investigation activities, Site contamination consists of metals, cPAH and petroleum hydrocarbons in soil, and metals and petroleum hydrocarbons in groundwater. VOCs, SVOCs, and PCBs were also tested for in soil, but none of these compounds were detected at concentrations exceeding the cleanup screening levels. One soil sample exceeded the cleanup screening level for PCB Aroclor 1254, although the cleanup screening level for total PCBs was not exceeded. VOCs and SVOCs were also tested for in groundwater, but did not exceed the cleanup screening levels.

Methane is not a hazardous substance regulated by the MTCA. However, the presence of methane was evaluated during the Phase II ESA, and the following conclusions regarding its presence and considerations for Site redevelopment have been drawn:

- Decomposing wood debris is present in subsurface soil throughout a large portion of the site, and significant methane gas is generated as a result of its presence.
- Concentrations of methane gas exceeded the LEL at a number of monitoring locations, and methane has the potential to accumulate in subsurface structures, voids, and vaults at concentrations that pose a risk for explosion or oxygen depletion.

The following conclusions have been drawn regarding the nature and extent of Site petroleum hydrocarbon contamination:

- Petroleum hydrocarbon contamination significant enough to warrant remedial action was only encountered at three locations:
  - Diesel-range soil and groundwater contamination associated with the diesel fuel AST in Investigation Area d
  - Oil- and diesel-range soil and groundwater contamination associated with the used oil AST in Investigation Area d
  - Diesel-range soil and groundwater contamination that appears to be associated with the former diesel USTs (UST 5) in Investigation Area e.
- Remedial action to address petroleum hydrocarbon contamination at the above locations is warranted, although available data indicate that groundwater contamination is naturally attenuating in these areas.

- A NFA determination from Ecology is requested for UST locations 1, 2, 3, 5b, 8, and 9. Sufficient data were collected from these UST locations (identified in Table 1 and shown on Figure 3) to conclude that no further action associated with these former tank locations is required

- UST location 6 should be dropped as a potential UST location. A UST is not listed at this location on Ecology's database and no evidence of the current or former presence of a UST was identified during Site investigation activities in this area.

The following conclusions have been drawn regarding the nature and extent of Site cPAH and metals contamination is soil:

- Concentrations of metals and cPAHs in shallow soil exceed the cleanup screening levels at several locations. Arsenic is the most ubiquitous metal contaminant, with a limited number of exceedances for lead, copper, and mercury.

- Metals and cPAH soil contamination is limited to the upper 3 ft of soil, except for deeper arsenic and cPAH contamination present in the North Yard of Investigation Area d. The deeper contamination in the North Yard appears to be associated with the use of contaminated fill to backfill a former graving dock. Arsenic soil contamination in the former graving dock vicinity extends to about 12 to 14 ft BGS.

- Arsenic soil contamination is present in two soil stockpiles present in Investigation Area i.

- The soil cleanup screening level for TBT was exceeded in one of 12 soil samples tested.

The following conclusions were drawn regarding the nature and extent of cPAH and metals contamination in groundwater:

- Dissolved metals are considered more representative of groundwater quality than total metals. Comparison of total and dissolved metals analytical data for groundwater showed consistently elevated concentrations for total metals, even though significant effort was expended developing groundwater monitoring wells.

- The arsenic groundwater cleanup screening level was exceeded in Investigation Areas d, f, l, and m.

- The arsenic groundwater cleanup screening level was exceeded in two areas of Investigation Area d. The arsenic groundwater cleanup level was exceeded in the vicinity of the former graving dock, and appears to be related to arsenic-affected soil that extends below the groundwater table. The arsenic groundwater cleanup level was exceeded in a groundwater sample collected from Monitoring Well P-21, and may be caused by a reduced oxidation state in groundwater resulting from upgradient diesel-range petroleum hydrocarbon contamination associated with the diesel AST.

- The arsenic groundwater cleanup screening level was exceeded at a number of locations within the north-central portion of Investigation Area f. The exceedance appears to result from background levels of arsenic in soil in contact with groundwater in a reduced oxidation state. The reduced groundwater conditions appear to be the result of organic material in subsurface soil, not a release of hazardous substances.

- Although groundwater monitoring wells near the proposed downgradient point of compliance in Investigation Area f exceeded the arsenic cleanup screening level, the wells are located about 15 to 25 ft from the shoreline and it is anticipated that water collected from the groundwater/surface water interface will achieve the arsenic cleanup screening levels.

- Groundwater in Investigation Area l does not appear to exceed the groundwater cleanup screening level for arsenic. Although the arsenic cleanup screening level was exceeded in a groundwater sample collected from Boring L-FA-1, subsequent testing of a groundwater sample collected from Monitoring Well P-26, installed immediately downgradient from Boring L-FA-1, did not exceed the groundwater cleanup screening level for arsenic.

- Remedial action is not warranted to address the exceedance of the arsenic cleanup screening level detected at Boring M-2. Although the arsenic cleanup screening level was exceeded in a groundwater sample collected from Boring M-2, the detected concentration (14 µg/L) was less than twice the cleanup screening level of 8 µg/L, and dissolved arsenic concentrations were either below the detection limit or below the cleanup screening level at all locations downgradient (west) of Boring M-2.

- The initial cPAH exceedances appear to be the result of particulates entrained during the sampling process, rather than dissolved constituents in groundwater, and cPAHs are not considered a constituent of concern for groundwater.

The conclusions presented above will be used as the basis for developing a CAP for the portions of the Site planned for remedial action at this time. The cleanup action plan will be submitted to Ecology for review and concurrence under its VCP.

7.0 USE OF THIS REPORT

This report has been prepared for the exclusive use of Port of Everett for specific application to the North Marina Redevelopment Project. No other party is entitled to rely on the information or conclusions included in this document without the express written consent of Landau Associates. Further, the reuse of information or conclusions provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with the 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 expressed or implied.

We appreciate the opportunity to provide these services to the Port. Please contact us if you have any questions or wish to discuss the project further. This document was prepared under the supervision and direction of the following key staff.

LANDAU ASSOCIATES, INC.

Erik Gerking
Senior Staff Geologist

Lawrence D. Beard, P.E.
Principal

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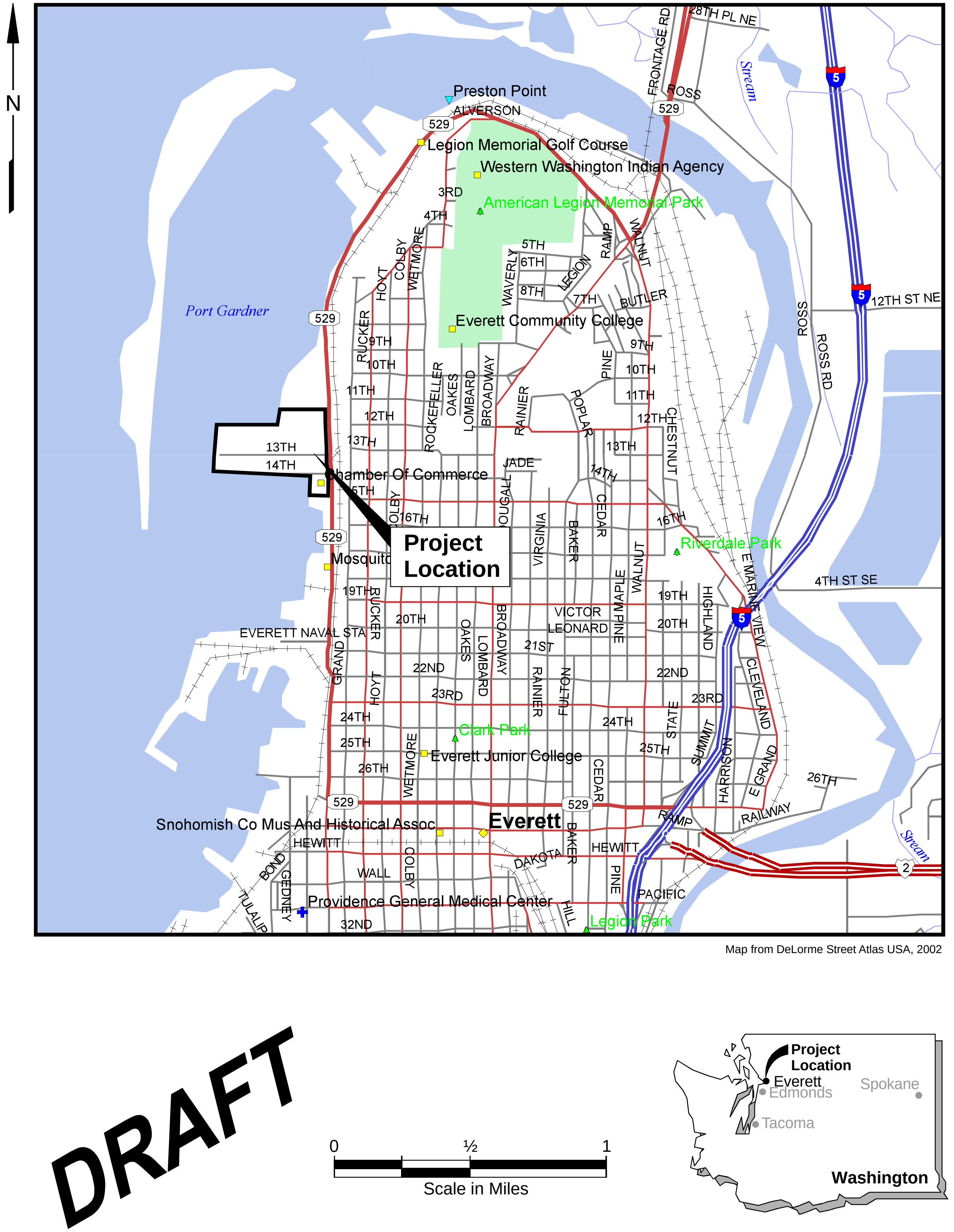

Map from DeLorme Street Atlas USA, 2002

Port of Everett/North Marina/Data Gaps Investigation | T:\1147\020\090\DGI\Fig1.cdr 4/12/2005

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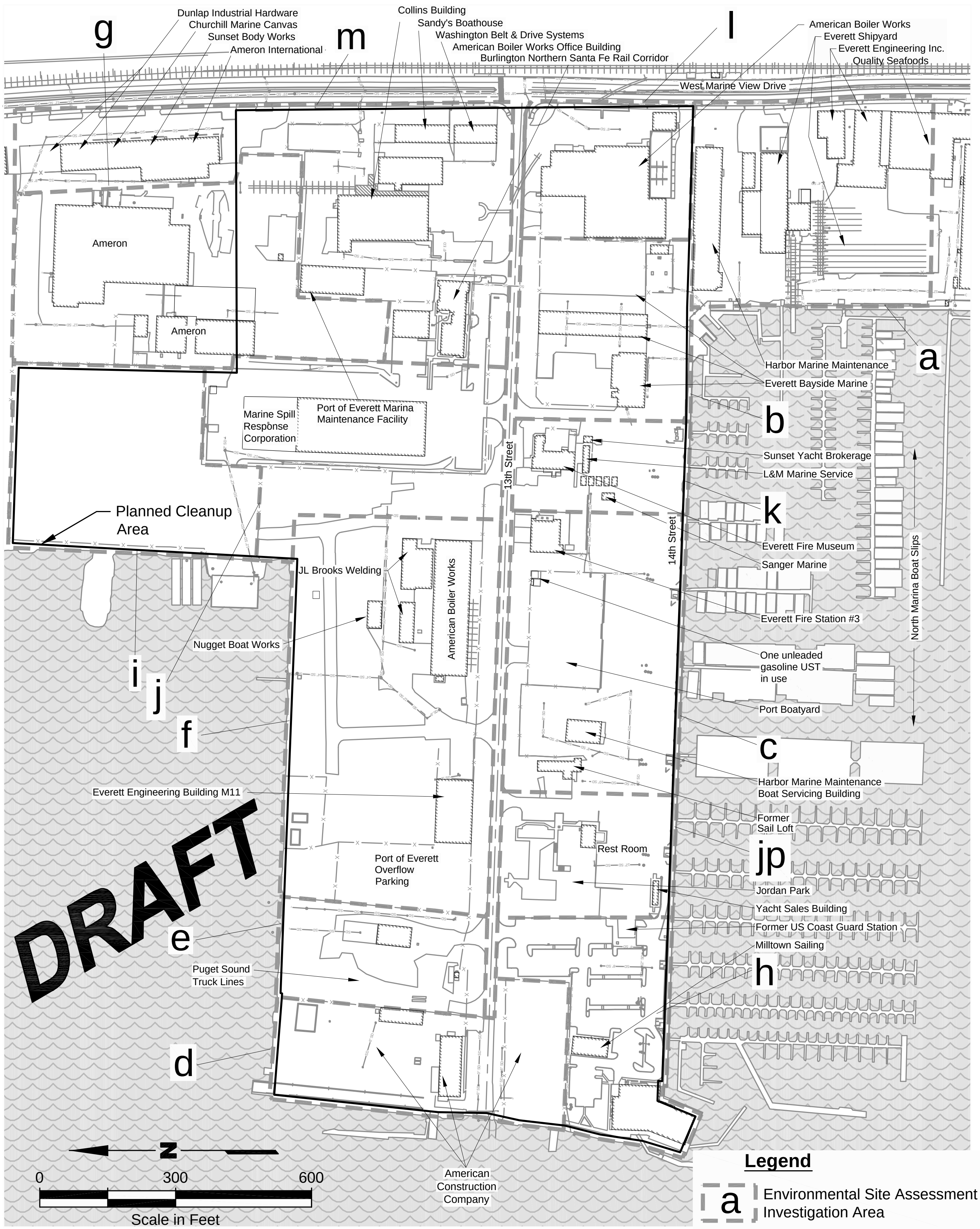
Everett, Washington

Vicinity Map

Figure
1



NOT FOR PRODUCTION Port of Everett/North Marina/Data Gaps Investigation | T:\147\020\090\DGI Report\Fig2.dwg (A) "Figure 2" 5/16/2005

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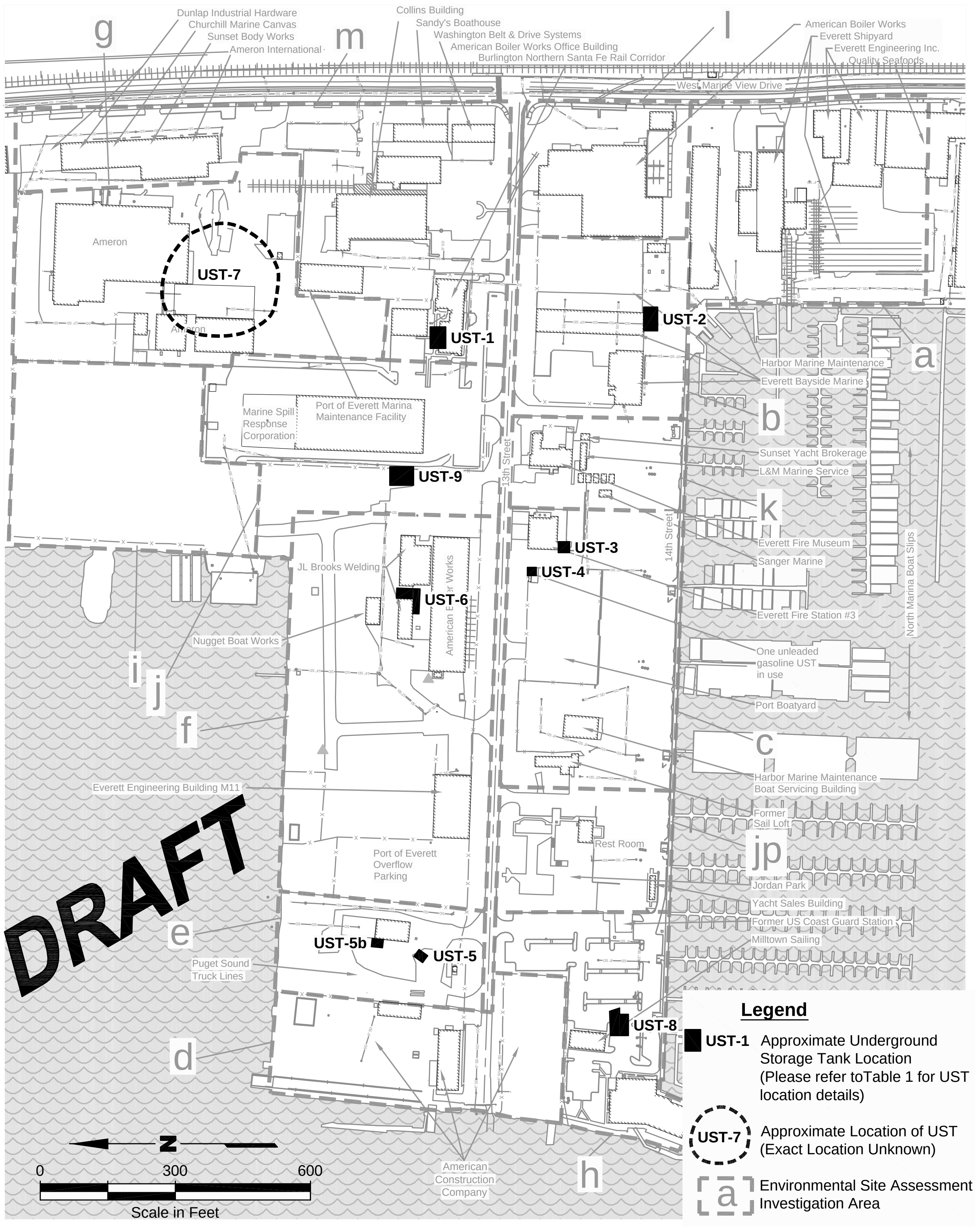
Site Plan

Figure
2



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UST Locations

Figure
3

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Phase II ESA
Sampling Locations

Figure
4

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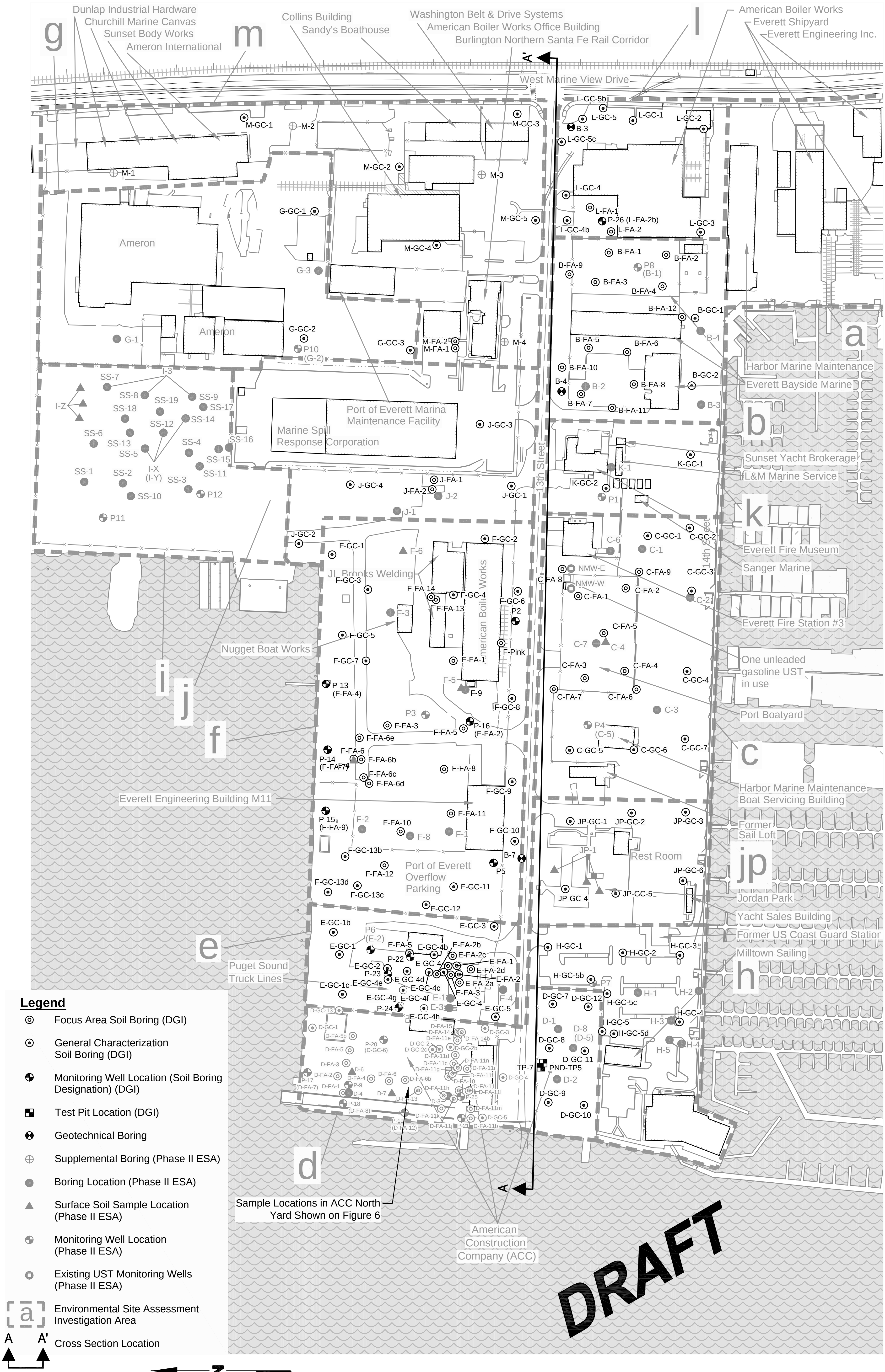

N

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Scale in Feet

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DGI Sampling Locations

Figure
5

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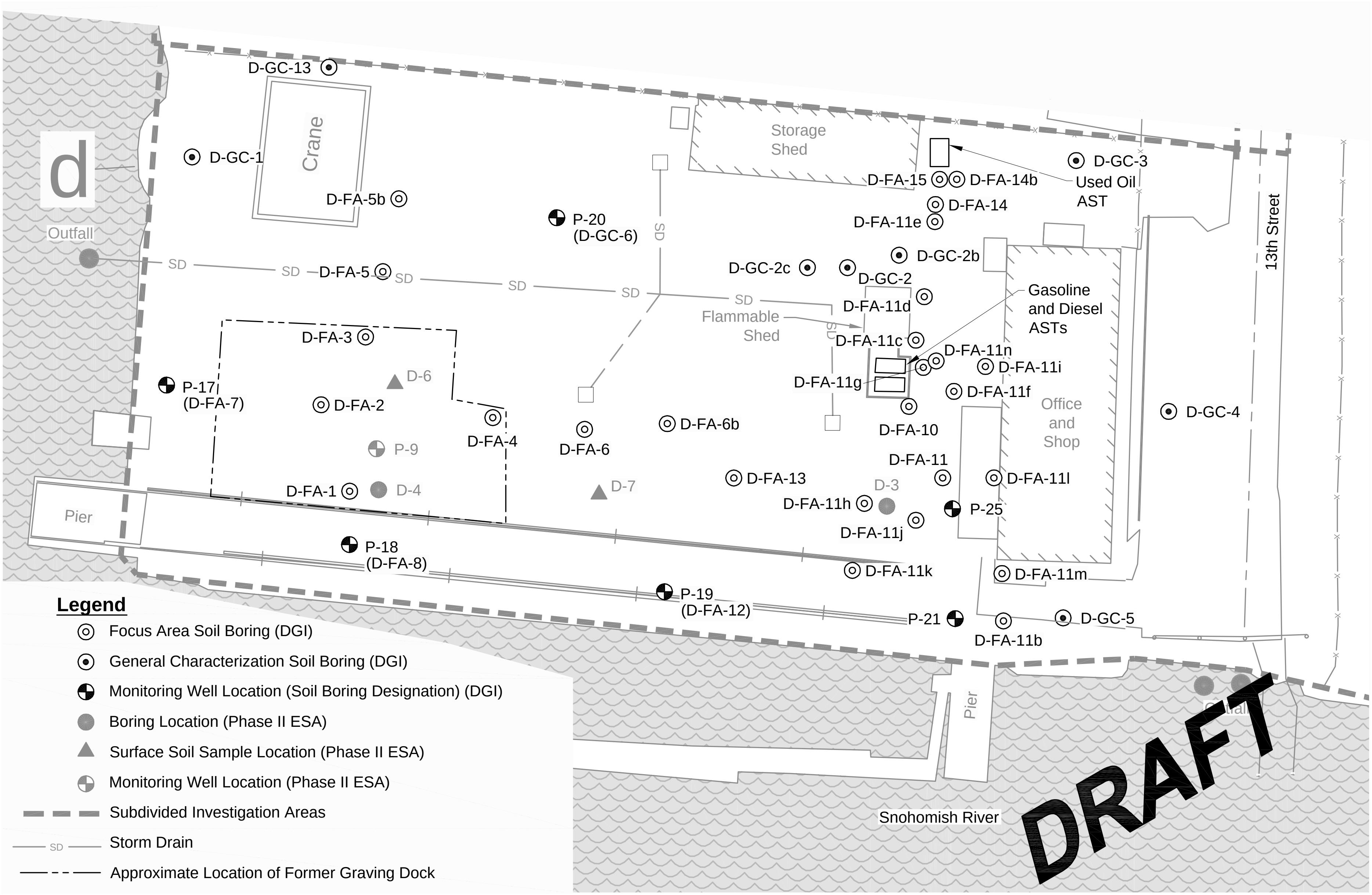

Legend

- ◎ Focus Area Soil Boring (DGI)
- ⊙ General Characterization Soil Boring (DGI)
- ◐ Monitoring Well Location (Soil Boring Designation) (DGI)
- ● Boring Location (Phase II ESA)
- ▲ Surface Soil Sample Location (Phase II ESA)
- ◐ Monitoring Well Location (Phase II ESA)
- ▬ ▬ ▬ Subdivided Investigation Areas
- —— SD —— Storm Drain
- —— - - —— Approximate Location of Former Graving Dock
- ☐ Catch Basin

N

0 60 120

Scale in Feet

Base map source: Farallon Consulting 2004

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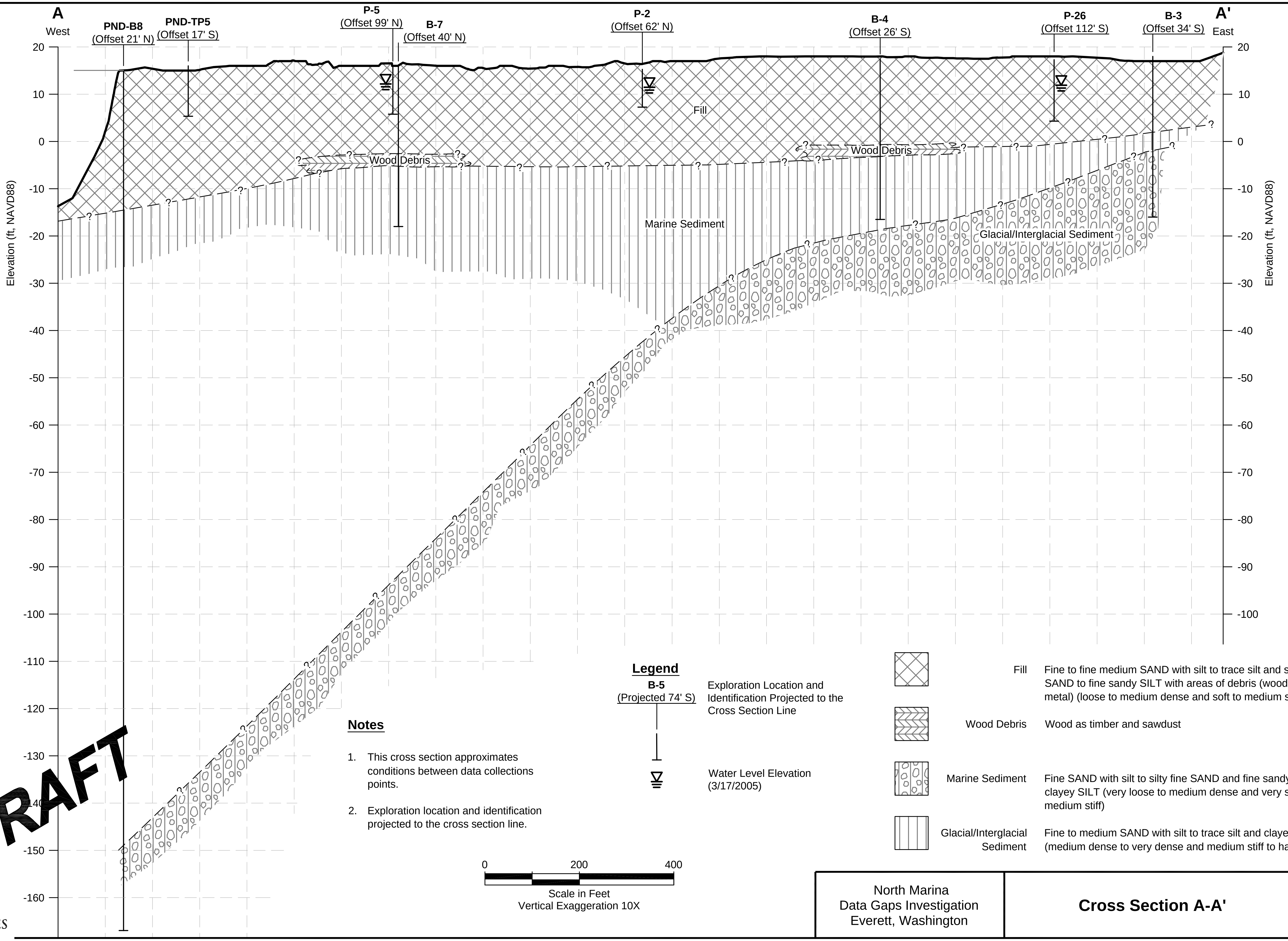
Everett, Washington

DGI Sampling Locations
ACC - North Yard

Figure
6



Scale in Feet
Vertical Exaggeration 10X

Notes

1. This cross section approximates conditions between data collections points.
2. Exploration location and identification projected to the cross section line.

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
▨	Marine 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)
▥	Glacial/Interglacial Sediment	Fine to medium SAND with silt to trace silt and clayey SILT (medium dense to very dense and medium stiff to hard)

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Cross Section A-A'

Figure
7

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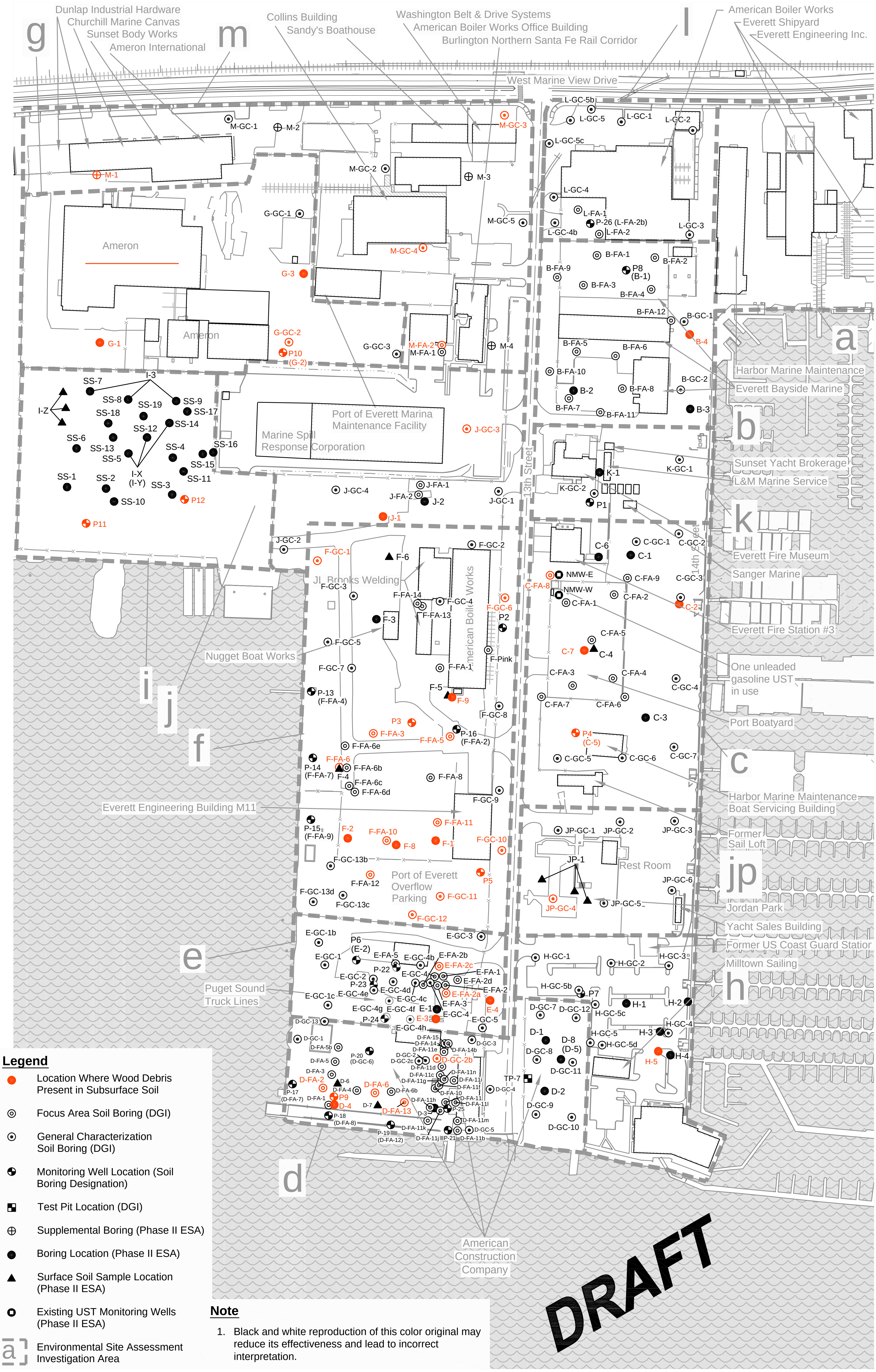

Legend

- ● Location Where Wood Debris Present in Subsurface Soil
- ◎ Focus Area Soil Boring (DGI)
- ⊙ General Characterization Soil Boring (DGI)
- ◕ Monitoring Well Location (Soil Boring Designation)
- ▚ Test Pit Location (DGI)
- ⊕ Supplemental Boring (Phase II ESA)
- ● Boring Location (Phase II ESA)
- ▲ Surface Soil Sample Location (Phase II ESA)
- ○ Existing UST Monitoring Wells (Phase II ESA)
- [a] Environmental Site Assessment Investigation Area

Note

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

N

0 200 400

Scale in Feet

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Distrubution of Wood Debris

Figure
8

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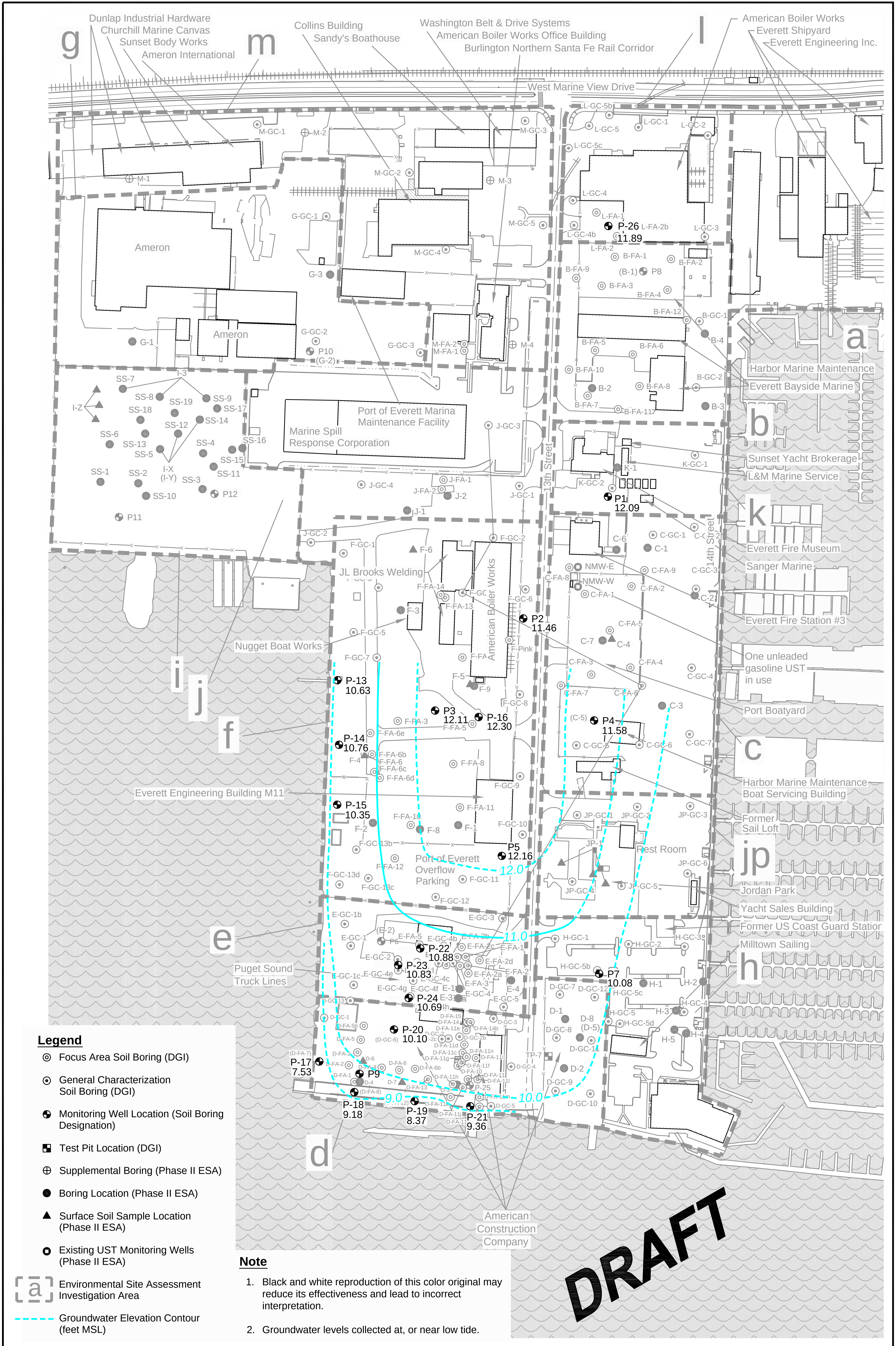

Legend

- ◎ Focus Area Soil Boring (DGI)
- ⊙ General Characterization Soil Boring (DGI)
- ◕ Monitoring Well Location (Soil Boring Designation)
- ▚ Test Pit Location (DGI)
- ⊕ Supplemental Boring (Phase II ESA)
- ● Boring Location (Phase II ESA)
- ▲ Surface Soil Sample Location (Phase II ESA)
- ◘ Existing UST Monitoring Wells (Phase II ESA)
- [a] Environmental Site Assessment Investigation Area
- - - - Groundwater Elevation Contour (feet MSL)

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.

N

0 200 400

Scale in Feet

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Groundwater Elevation Contour Map

Figure
9

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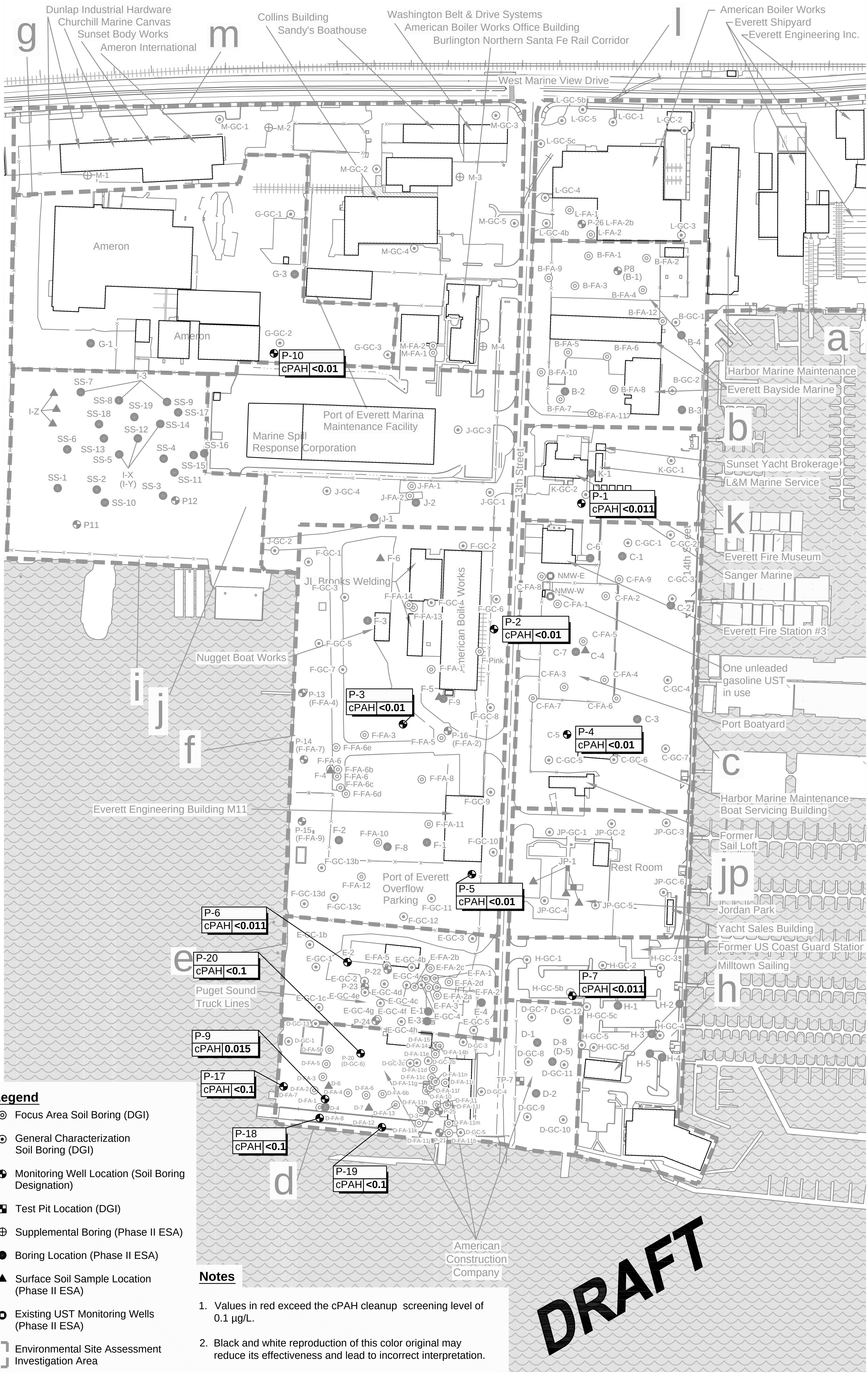

Legend

- ◎ Focus Area Soil Boring (DGI)
- ⊙ General Characterization Soil Boring (DGI)
- ◍ Monitoring Well Location (Soil Boring Designation)
- ◪ Test Pit Location (DGI)
- ⊕ Supplemental Boring (Phase II ESA)
- ● Boring Location (Phase II ESA)
- ▲ Surface Soil Sample Location (Phase II ESA)
- ◘ Existing UST Monitoring Wells (Phase II ESA)
- [a] Environmental Site Assessment Investigation Area

Notes

1. Values in red exceed the cPAH cleanup screening level of 0.1 µg/L.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

N

0 200 400

Scale in Feet

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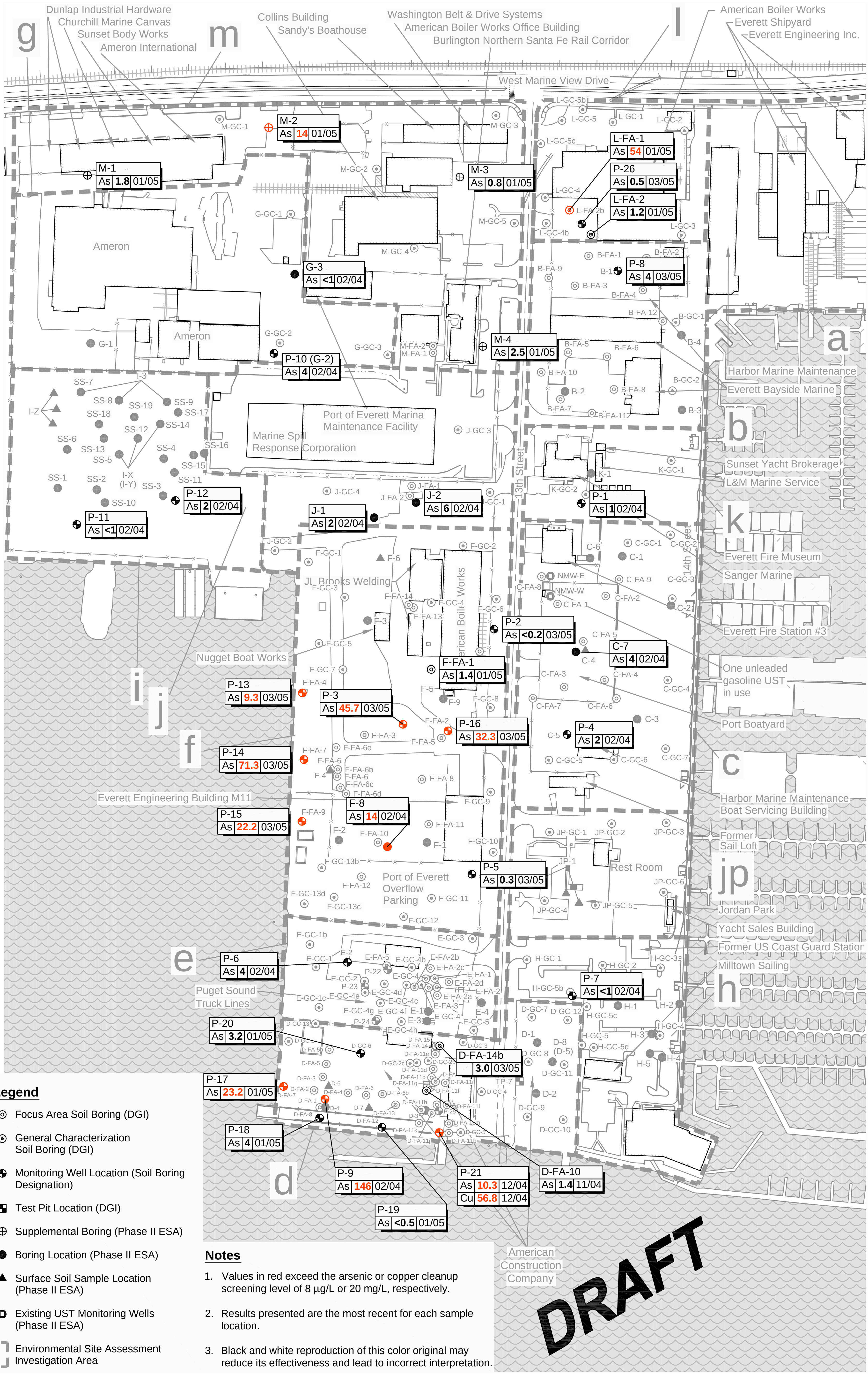
cPAHs in Groundwater

Figure
10

NOT FOR PRODUCTION Port of Everett/North Marina/Data Gaps Investigation | T:\147\020\090\DGI Report\Fig11.dwg (A) "Figure 11" 5/16/2005



Legend

- ◎ Focus Area Soil Boring (DGI)
- ⊙ General Characterization Soil Boring (DGI)
- ◐ Monitoring Well Location (Soil Boring Designation)
- ▣ Test Pit Location (DGI)
- ⊕ Supplemental Boring (Phase II ESA)
- ● Boring Location (Phase II ESA)
- ▲ Surface Soil Sample Location (Phase II ESA)
- ○ Existing UST Monitoring Wells (Phase II ESA)
- [a] Environmental Site Assessment Investigation Area

Notes

1. Values in red exceed the arsenic or copper cleanup screening level of 8 µg/L or 20 mg/L, respectively.
2. Results presented are the most recent for each sample location.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

N

0 200 400

Scale in Feet

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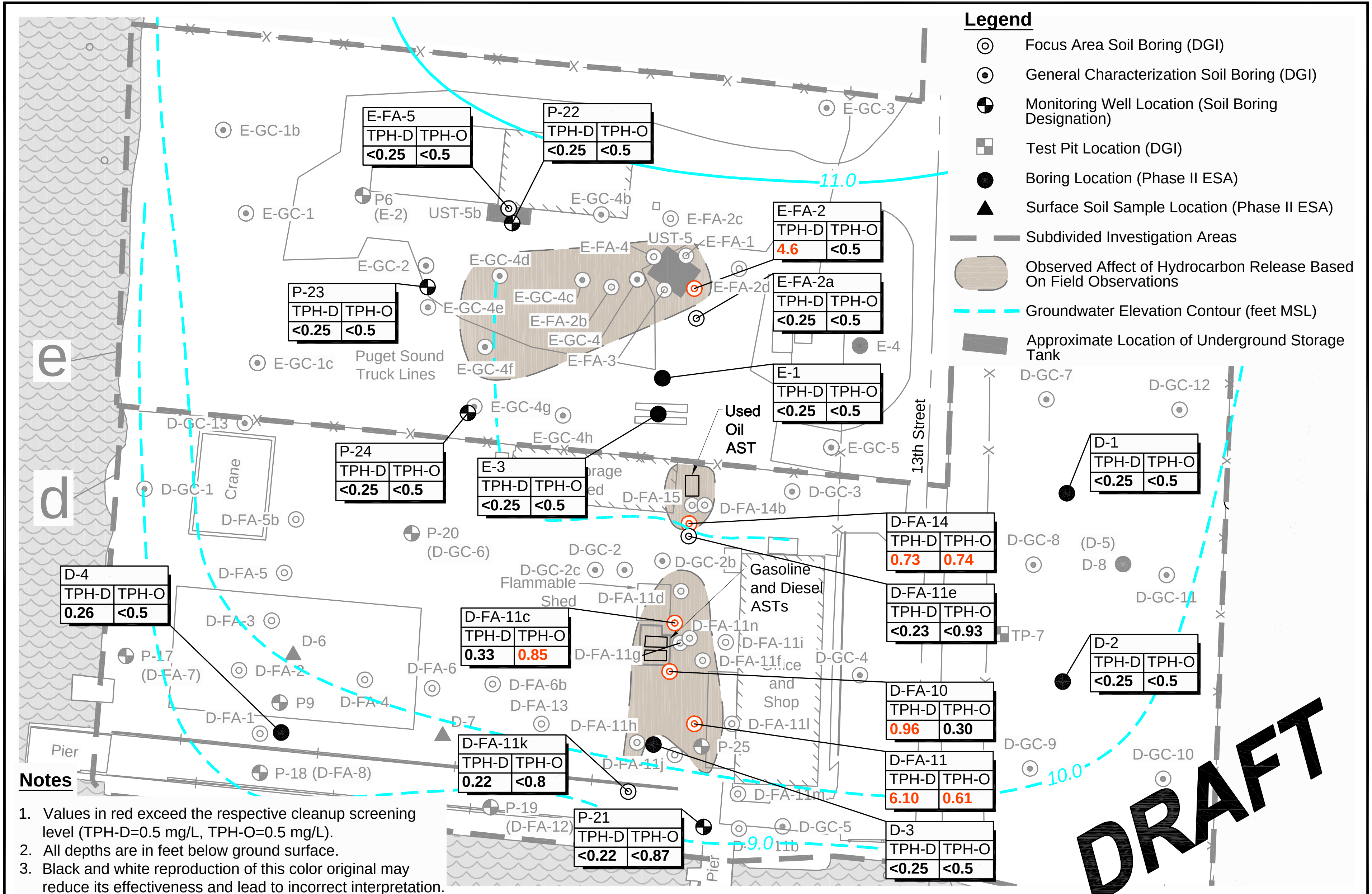
Dissolved Metals in Groundwater

Figure
11



Notes

1. Values in red exceed the respective cleanup screening level (TPH-D=0.5 mg/L, TPH-O=0.5 mg/L).
2. All depths are in feet below ground surface.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Base map source: Farallon Consulting 2004

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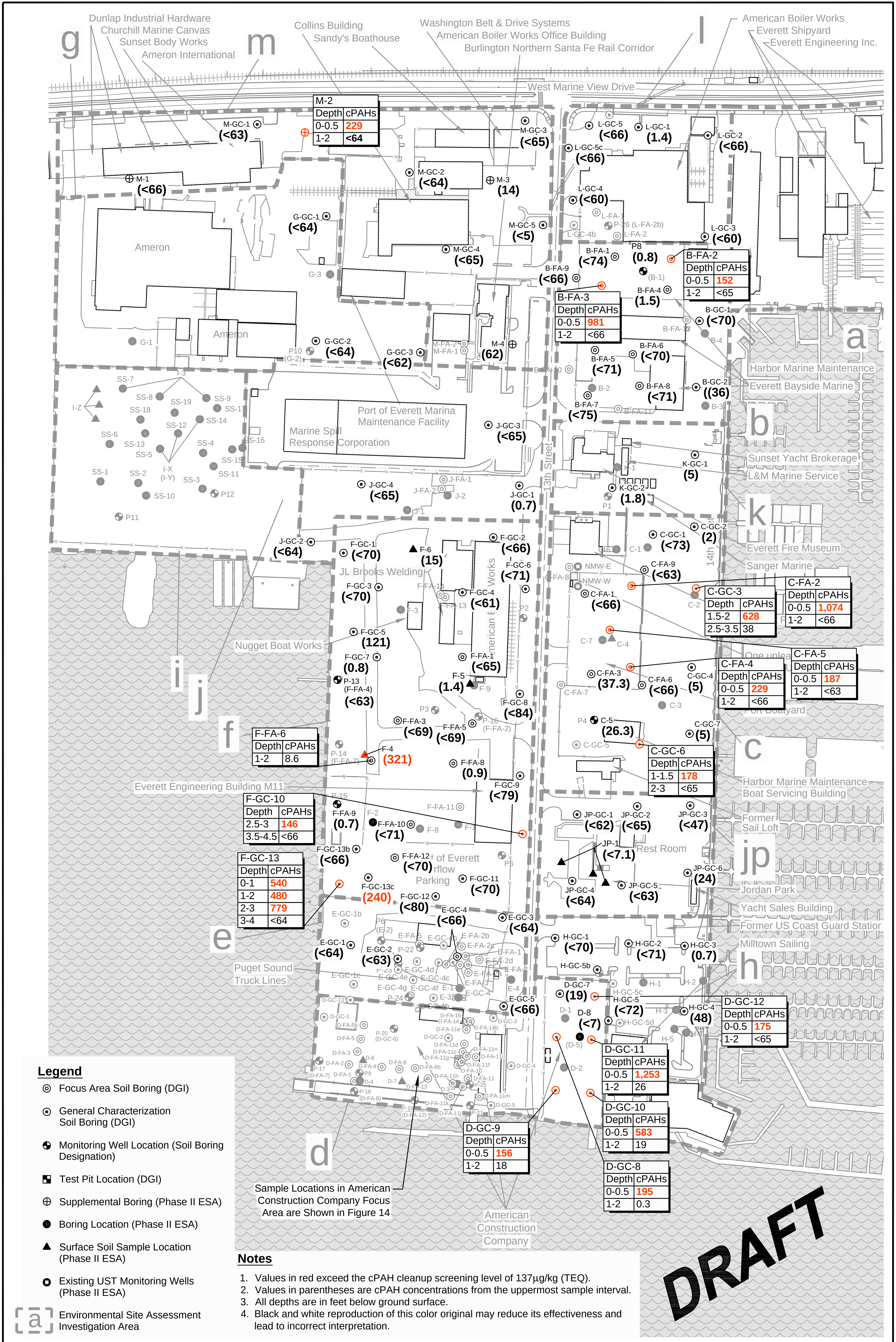
Everett, Washington

Petroleum Hydrocarbons in Groundwater Areas d and e

Figure
12



Notes

1. Values in red exceed the cPAH cleanup screening level of 137µg/kg (TEQ).
2. Values in parentheses are cPAH concentrations from the uppermost sample interval.
3. All depths are in feet below ground surface.
4. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

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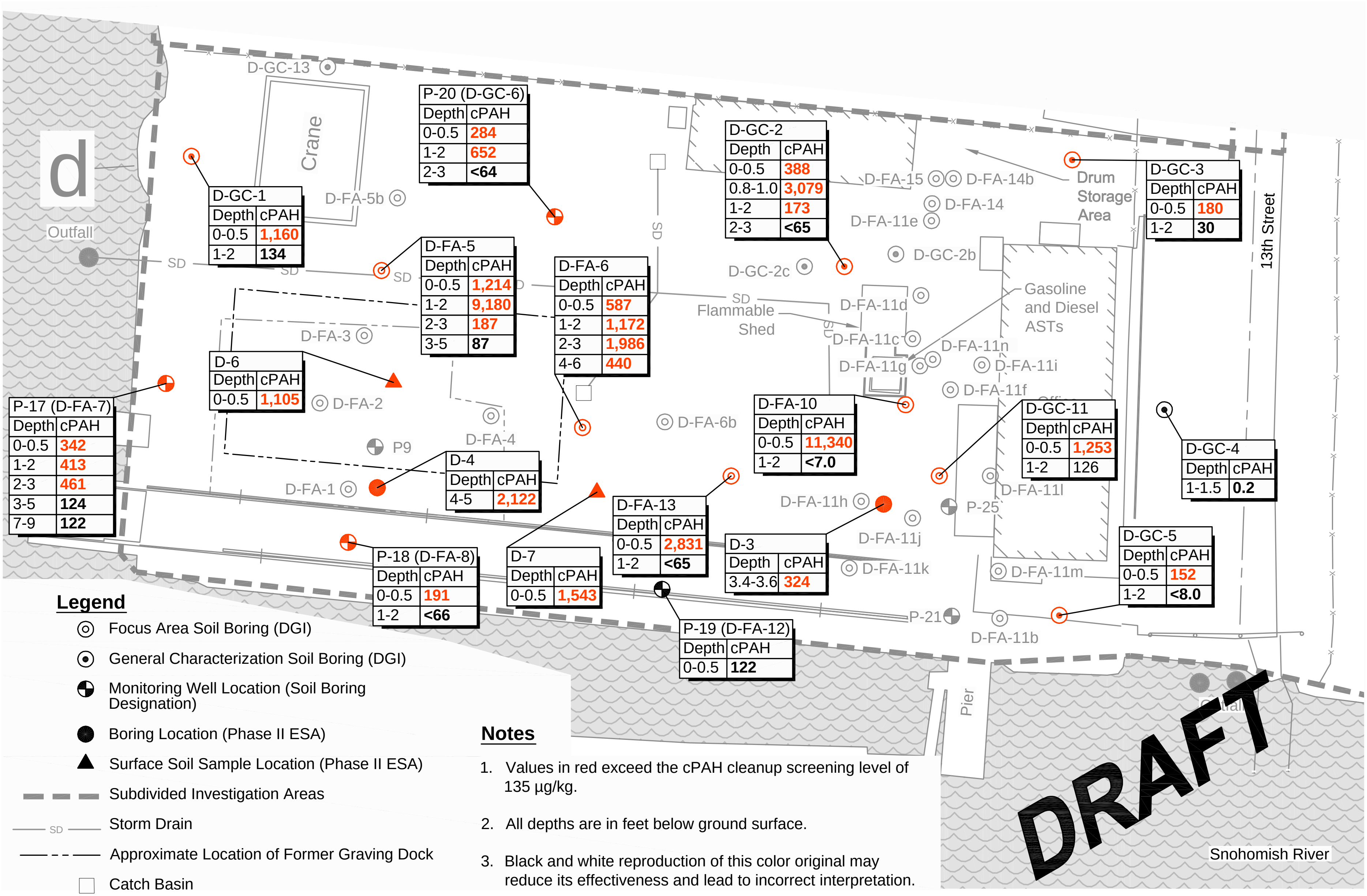
cPAHs in Soil

Figure
13

NOT FOR PRODUCTION Port of Everett/North Marina/Data Gaps Investigation | T:\147\020\090\DGI Report\Fig14.dwg (A) "Figure 14" 5/16/2005



Legend

- ◎ Focus Area Soil Boring (DGI)
- ⊙ General Characterization Soil Boring (DGI)
- ⊕ Monitoring Well Location (Soil Boring Designation)
- ● Boring Location (Phase II ESA)
- ▲ Surface Soil Sample Location (Phase II ESA)
- ▬ ▬ ▬ Subdivided Investigation Areas
- —— SD —— Storm Drain
- —— - - —— Approximate Location of Former Graving Dock
- ☐ Catch Basin

Notes

1. Values in red exceed the cPAH cleanup screening level of 135 µg/kg.
2. All depths are in feet below ground surface.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Base map source: Farallon Consulting 2004

LANDAU ASSOCIATES

North Marina
Data Gaps Investigation
Everett, Washington

cPAHs in Soil
ACC - North Yard

Figure
14

Legend

- ◎ Focus Area Soil Boring (DGI)
- ⊙ General Characterization Soil Boring (DGI)
- ◕ Monitoring Well Location (Soil Boring Designation)
- ▚ Test Pit Location (DGI)
- ⊕ Supplemental Boring (Phase II ESA)
- ● Boring Location (Phase II ESA)
- ▲ Surface Soil Sample Location (Phase II ESA)
- ○ Existing UST Monitoring Wells (Phase II ESA)
- [a] Environmental Site Assessment Investigation Area
- ▬ ▪ ▬ Former Lease Hold Boundary for ACC

Notes

1. Values in red exceed the respective cleanup screening level (As=20 mg/kg, Hg=24 mg/kg, Cu=2,960 mg/kg, Pb=250 mg/kg).
2. Values in parentheses are arsenic concentrations from the uppermost sample interval.
3. All depths are in feet below ground surface.
4. All results are from shallow soil samples and are reported in mg/kg.
5. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

N

0 200 400

Scale in Feet

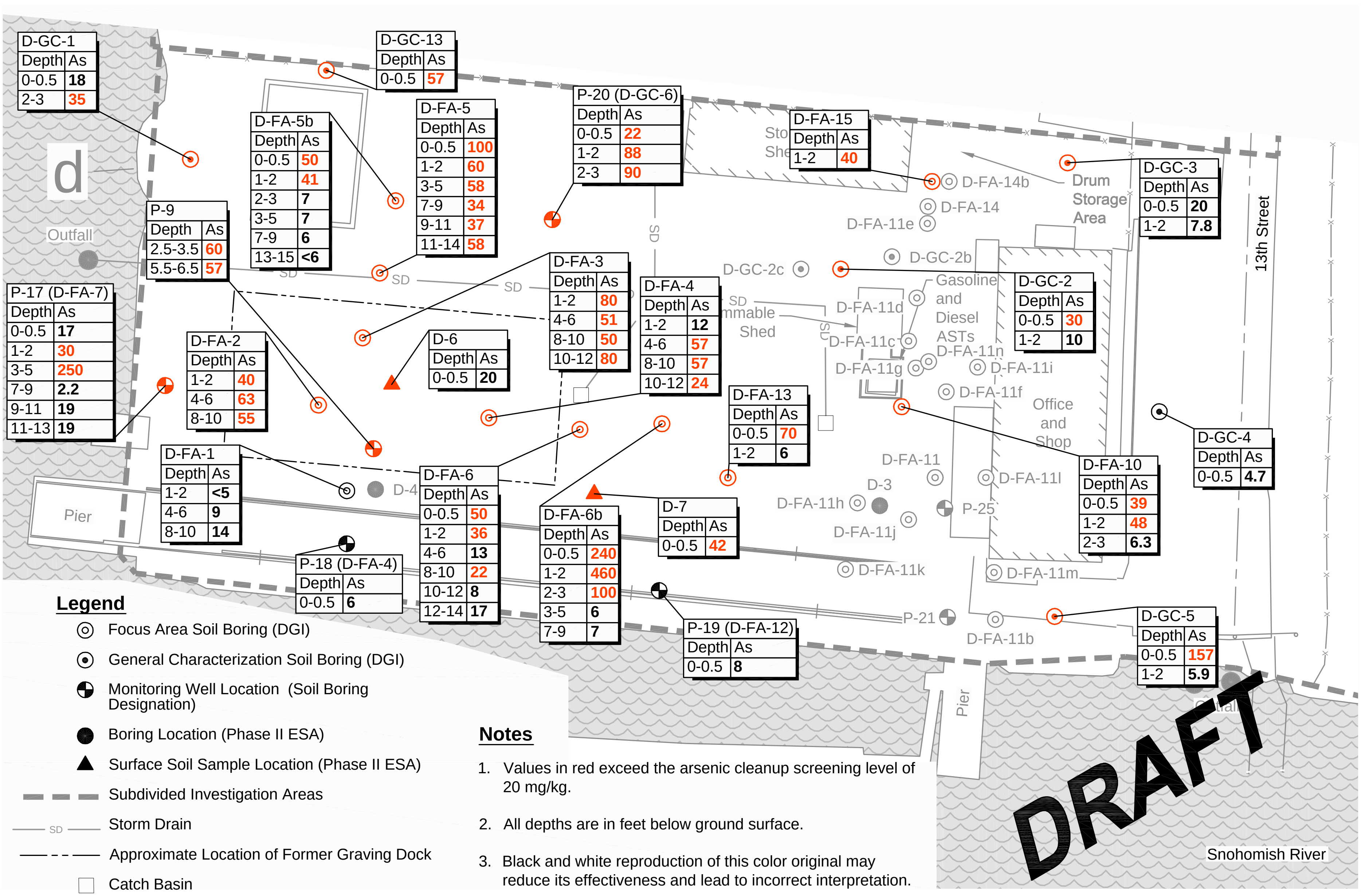
LANDAU ASSOCIATES

North Marina
Data Gaps Investigation
Everett, Washington

Metals in Shallow Soil

Figure
15

NOT FOR PRODUCTION Port of Everett/North Marina/Data Gaps Investigation | T:\147\020\090\DGI Report\Fig16.dwg (A) "Figure 16" 5/16/2005



Legend

◎ Focus Area Soil Boring (DGI)

⊙ General Characterization Soil Boring (DGI)

◐ Monitoring Well Location (Soil Boring Designation)

● Boring Location (Phase II ESA)

▲ Surface Soil Sample Location (Phase II ESA)

▬ ▬ ▬ Subdivided Investigation Areas

—— SD —— Storm Drain

—— - - —— Approximate Location of Former Graving Dock

☐ Catch Basin

Notes

1. Values in red exceed the arsenic cleanup screening level of 20 mg/kg.
2. All depths are in feet below ground surface.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Base map source: Farallon Consulting 2004

N

0 60 120

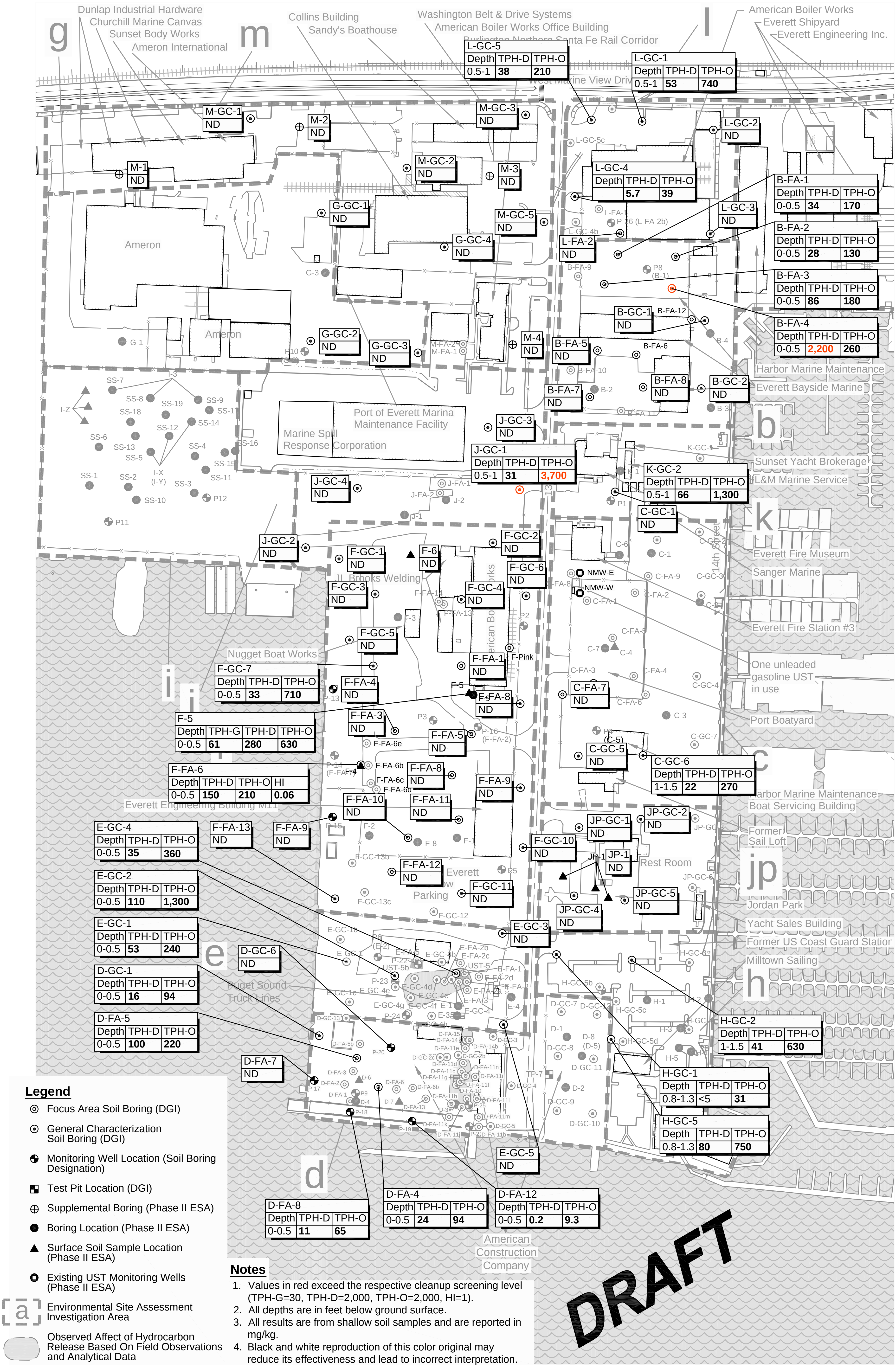
Scale in Feet

LANDAU ASSOCIATES

North Marina
Data Gaps Investigation
Everett, Washington

Arsenic in Soil
ACC - North Yard

Figure
16



Legend

- ⊚ Focus Area Soil Boring (DGI)
- ⊙ General Characterization Soil Boring (DGI)
- ⊕ Monitoring Well Location (Soil Boring Designation)
- ▚ Test Pit Location (DGI)
- ⊕ Supplemental Boring (Phase II ESA)
- ● Boring Location (Phase II ESA)
- ▲ Surface Soil Sample Location (Phase II ESA)
- ⊙ Existing UST Monitoring Wells (Phase II ESA)
- [a] Environmental Site Assessment Investigation Area
- ⬭ Observed Affect of Hydrocarbon Release Based On Field Observations and Analytical Data

Notes

1. Values in red exceed the respective cleanup screening level (TPH-G=30, TPH-D=2,000, TPH-O=2,000, HI=1).
2. All depths are in feet below ground surface.
3. All results are from shallow soil samples and are reported in mg/kg.
4. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

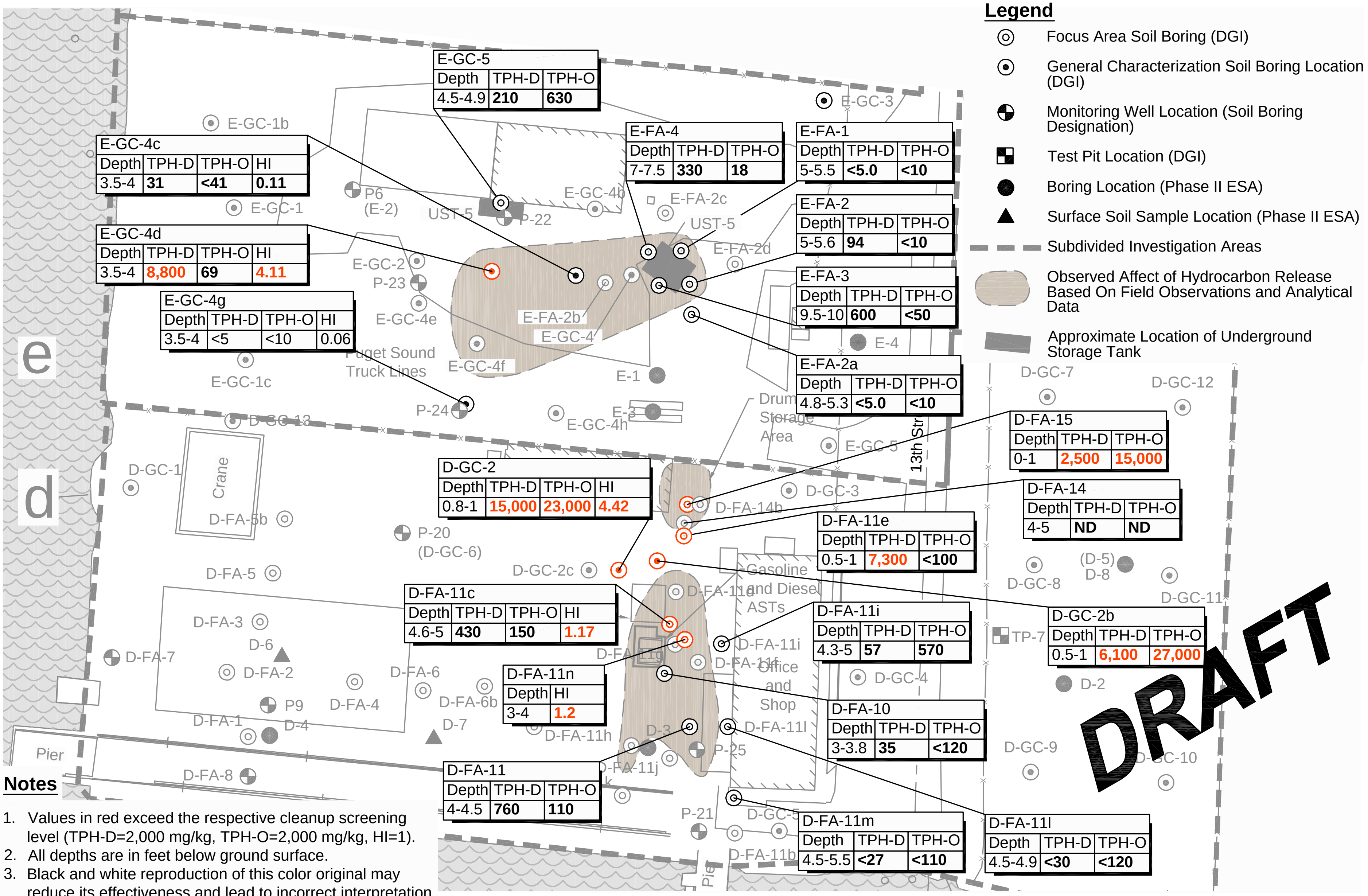
Landau Associates

North Marina
Data Gaps Investigation
Everett, Washington

Petroleum Hydrocarbons in Surface Soil

Figure
17

NOT FOR PRODUCTION Port of Everett/North Marina/Data Gaps Investigation | T:\147\020\090\DGI Report\Fig18.dwg (A) "Figure 18" 5/16/2005



E-GC-5

Depth	TPH-D	TPH-O
4.5-4.9	**210**	**630**

E-GC-4c

Depth	TPH-D	TPH-O	HI
3.5-4	**31**	**<41**	**0.11**

E-GC-4d

Depth	TPH-D	TPH-O	HI
3.5-4	**8,800**	**69**	**4.11**

E-GC-4g

Depth	TPH-D	TPH-O	HI
3.5-4	<5	<10	0.06

E-FA-4

Depth	TPH-D	TPH-O
7-7.5	**330**	**18**

E-FA-1

Depth	TPH-D	TPH-O
5-5.5	**<5.0**	**<10**

E-FA-2

Depth	TPH-D	TPH-O
5-5.6	**94**	**<10**

E-FA-3

Depth	TPH-D	TPH-O
9.5-10	**600**	**<50**

E-FA-2a

Depth	TPH-D	TPH-O
4.8-5.3	**<5.0**	**<10**

D-FA-15

Depth	TPH-D	TPH-O
0-1	**2,500**	**15,000**

D-GC-2

Depth	TPH-D	TPH-O	HI
0.8-1	**15,000**	**23,000**	**4.42**

D-FA-14

Depth	TPH-D	TPH-O
4-5	**ND**	**ND**

D-FA-11e

Depth	TPH-D	TPH-O
0.5-1	**7,300**	**<100**

D-FA-11c

Depth	TPH-D	TPH-O	HI
4.6-5	**430**	**150**	**1.17**

D-GC-2b

Depth	TPH-D	TPH-O
0.5-1	**6,100**	**27,000**

D-FA-11i

Depth	TPH-D	TPH-O
4.3-5	**57**	**570**

D-FA-11n

Depth	HI
3-4	**1.2**

D-FA-10

Depth	TPH-D	TPH-O
3-3.8	**35**	**<120**

D-FA-11

Depth	TPH-D	TPH-O
4-4.5	**760**	**110**

D-FA-11m

Depth	TPH-D	TPH-O
4.5-5.5	**<27**	**<110**

D-FA-11l

Depth	TPH-D	TPH-O
4.5-4.9	**<30**	**<120**

Legend

◎	Focus Area Soil Boring (DGI)
⊙	General Characterization Soil Boring Location (DGI)
◑	Monitoring Well Location (Soil Boring Designation)
▚	Test Pit Location (DGI)
●	Boring Location (Phase II ESA)
▲	Surface Soil Sample Location (Phase II ESA)
‒ ‒	Subdivided Investigation Areas
▨	Observed Affect of Hydrocarbon Release Based On Field Observations and Analytical Data
▬	Approximate Location of Underground Storage Tank

Notes

1. Values in red exceed the respective cleanup screening level (TPH-D=2,000 mg/kg, TPH-O=2,000 mg/kg, HI=1).
2. All depths are in feet below ground surface.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Base map source: Farallon Consulting 2004

N

0 80 160

Scale in Feet

Landau Associates

North Marina
Data Gaps Investigation
Everett, Washington

Petroleum Hydrocarbons in Subsurface Soil Areas d and e

Figure
18

TABLE 1
SUMMARY OF UNDERGROUND STORAGE TANKS (USTs) INVESTIGATION STATUS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location No.	USTs	UST Capacity (gallons)	Ecology Facitity/ Site Name	Ecology Identifier	Tank Use	Tank Status	Observed Contamination During Removal	Located on map	Landau Associates' Samples	Comments
UST-1	Port of Everett Bay Side Marina 1100 13th Street (3 Tanks)	1,000; 500; and 300	Everett Port	98335668	Gas, Gas and Diesel	Removed 1991	Sheen on water	Yes, based on concrete slab	M-FA-1, M-FA-2 (Soil and Groundwater) immediately downgradient	Ecology file copy included in the Phase I ESA, Appendix E (Landau Associates 2001). Location identified based on Ecology file site map and site visit with Port personnel. Location is beneath building extension constructed in mid-1990s. Samples confirm the area is clean.
UST-2	Bay Side Marina 1001 14th Street (2 Tanks)	2,000 and 500	Everett Bayside Marine Inc.	98168816	Gas	Removed 1991	Free product on water	Yes, based on asphalt patch	B-4 (Groundwater) immediately downgradient, and B-GC-12 (Soil and Groundwater) from former UST location	Ecology file copy included in the Phase I ESA, Appendix E (Landau Associates 2001). Field located with assistance of Port Personnel. Asphalt patch clearly delineates location. Samples B-4 and B-GC-12 confirm the area is clean.
UST-3	Fire Station # 3 620 13th Street (1 Tank)	1,000	U/K	DOE site no. 005728	Diesel	Removed 1993	Soil odor (PID)	Yes, located beneath current AST	C-6 (Soil and Groundwater)	Ecology file copy included in the Phase I ESA, Appendix E (Landau Associates 2001). Data appear adequate to demonstrate cleanup. Landau Associates' sample consistent with previous testing.
UST-4	Port of Everett Boatyard 609 14th St (1 tank)	U/K	Everett Port UST 7044	1613865	Unleaded Gas	Active	N/A	NE corner of Boatyard	NMW-E and -W (Groundwater), both clean	Tank is actively monitored and does not need further investigation.
UST-5	Puget Sound Truck Lines 615 13th Street (2 Tanks)	10,000 and 4,000	Puget Sound Truck Lines	2809	Diesel	Removed 1991	N/A	Yes, based on concrete slab	E-1, E-3 (Groundwater) downgradient and near filling station; E-FA-1 through E-FA-4 and E-FA-2a through E-FA-2b (Field Screening; Soil and Groundwater samples) in immediate vicinity and downgradient	Ecology file copy included in the Phase I ESA, Appendix E (Landau Associates 2001). Data appears adequate to demonstrate cleanup.
UST-5b	Puget Sound Truck Lines 615 13th Street (1 Tank)	U/K	Puget Sound Truck Lines	2809	Heating Oil	Removed 2002	U/K	Yes, based on observations prior to removal	E-FA-5 (Groundwater) in immediate vicinity; E-GC-4b through E-GC-4h (Field screening; Soil samples) downgradient; and P-22 through P-24 (Groundwater) downgradient and in immediate vicinity	Borings/wells appear adequate to conclude that significant residual contamination is not present, but Port has requested documentation of tank removal from Puget Sound Truck Lines.
UST-6	JL Brooks Welding 915 14t Street (Possible Tank)	U/K	N/E	N/E	U/K	Either never present or removed, based on GPR survey	U/K	Yes, based on asphalt patch	Geophysical Survey, no tank found; F-FA-13, F-FA-14 (Soil and Groundwater) in immediate vicinity of suspected UST location	No tank present based on GPR survey. Boring locations were added to confirm GPR findings.
UST-7	Ameron International 1130 W Marine View Dr Suite 101 (1 Tank)	U/K	Ameron Inc. PPD	68853261	Diesel	Reported Removed	U/K	No, location unknown	P-10, G-1, G-2 and G-3 (Soil and Groundwater), installed on the property, not specific to UST	Unable to confirm location for Phase II ESA. Will defer additional characterization to later phase since property still under lease for at least 8 more years.
UST-8	Port of Everett Yacht Basin Marina 609 14th Street (5 Tanks)	Three 10,000; 4,000; and 5,000	Everett Port UST 7044	1613865	Gas, Diesel #1, Diesel #2, Premix, Gas	Removed 1992	Stained Soil	Yes, based on concrete slab	H-4 and H-5 (Soil and Groundwater)	Ecology file copy included in the Phase I ESA, Appendix E (Landau Associates 2001). Data appear adequate to demonstrate cleanup, and are presented in the Phase I ESA.
UST-9	Marine Spill Response Corp. 1105 13th Street (1 Tank)	10,000	Marine Spill Response Corp., Everett	66396823	Waste Oil, previous gas or diesel	Removed 1980s	U/K	Yes, based on excavated area of asphalt	J-2 (Groundwater), located in former tank excavation area; J-FA-1 and J-FA-2 located in immediate vicinity of tank excavation	Samples from these sample locations confirm that the area is clean.

N/A = Not Applicable
U/K = Unknown
N/E = Not Established
GPR = Ground Penetrating Radar
PID = Photoionization Detector
AST = Aboveground Storage Tank
ESA = Environmental Site Assessment

TABLE 2
SUMMARY OF PHASE II ESA SAMPLE LOCATIONS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location ID	Location	Rationale for Sample Collection	Surface Conditions	Sample Types	Surface Soil Analyses	Subsurface Soil Analyses	Groundwater Analyses
P1	Area k	Near railroad spur; potential sitewide contamination	--	Groundwater	--	--	cPAHs, TPH-Dx, TPH-G, Metals (a), VOCs
P2	Drainage Swale on southern margin of Area f	Near railroad spur; potential sitewide contamination	--	Groundwater	--	--	cPAHs, TPH-Dx, TPH-G, Metals (a), VOCs
P3	Center of Area f	Potential sitewide contamination	--	Groundwater	--	--	Metals (a), cPAHs, TPH-G
P4	Western end of Area c	Near railroad spur; potential sitewide contamination	--	Groundwater	--	--	cPAHs, TPH-Dx, TPH-G, Metals (a), VOCs
P5	Area f	Near railroad spur; potential sitewide contamination	--	Groundwater	--	--	cPAHs, TPH-Dx, TPH-G, Metals (a), VOCs
P6	Area e	Potential sitewide contamination	--	Groundwater	--	--	Metals (a), cPAHs, TPH-G
P7	Area h	Near railroad spur; potential sitewide contamination	--	Groundwater	--	--	cPAHs, TPH-Dx, TPH-G, Metals (a), VOCs
P8	Everett Bayside Marina; boatyard center; previously NMP2-B-1	General marine industrial property use	Gravel	Surface Soil, Subsurface Soil (3ft, 6ft archive), Groundwater	Metals (a), cPAHs	Metals (a), cPAHs	Metals (a), cPAHs, TPH-G
P9	American Construction Company; south storage yard, near previous sample location NMP2-D-6	Potential general industrial sources of spills/releases of hazardous chemicals	Gravel	Subsurface Soil (3ft, 6ft archive), Groundwater	--	Metals (a), cPAHs	Metals (a), cPAHs
P10	Ameron (former Mill Site) south storage yard near previous sample location NMP2-G-2	Underground storage tank (UST) removed (location unknown), multiple chemicals stored and used; west of patched asphalt	Asphalt	Subsurface Soil (3ft, 6ft archive), Groundwater	--	Metals (a), cPAHs, TPH-Dx, TPH-G, BTEX, PCB	Metals (a), cPAHs, TPH-G
P11	Head of 12th Street waterway	Area used currently and historically for soil stockpiling downgradient from former saw mill	Gravel	Groundwater	--	--	SVOCs,TPH-Dx, TPH-G, Metals (a), VOCs
P12	Head of 12th Street waterway	Area used currently and historically for soil stockpiling downgradient from former saw mill	Gravel	Groundwater	--	--	SVOCs, TPH-Dx, TPH-G, Metals (a), VOCs
B-1	Everett Bayside Marina; middle of boatyard	Historical use of USTs, including one known leaking UST (LUST); specific locations of USTs unknown	Asphalt	Groundwater	--	--	TPH-Dx, TPH-G
B-2	Everett Bayside Marina; north of Bayside Marina	Historical use of USTs, including one known LUST; specific locations of USTs unknown	Asphalt	Groundwater	--	--	TPH-Dx, TPH-G
B-3	Everett Bayside Marina; south parking lot	Historical use of USTs, including one known LUST; specific locations of USTs unknown	Asphalt	Groundwater	--	--	TPH-Dx, TPH-G
B-4	Everett Bayside Marina; north of Bayside Marina	Downgradient of identified former UST	Asphalt	Subsurface Soil, Groundwater	--	Metals (b)	TPH-Dx, TPH-G, BTEX, Metals (b)
C-1	Everett Fire Station #3; storage area south of fire station fence	Downgradient of former UST and current aboveground storage tank (AST) location	Asphalt	Groundwater	--	--	TPH-Dx, TPH-G
C-2	Port boatyard; south parking lot	Downgradient of former UST location	Asphalt	Groundwater	--	--	TPH-Dx, TPH-G
C-3	Harbor Marine Maintenance; storage area south of maintenance shed	Historical use of multiple chemical products; downgradient of patched asphalt area	Asphalt	Groundwater	--	--	TPH-Dx, TPH-G, VOCs

TABLE 2
SUMMARY OF PHASE II ESA SAMPLE LOCATIONS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location ID	Location	Rationale for Sample Collection	Surface Conditions	Sample Types	Surface Soil Analyses	Subsurface Soil Analyses	Groundwater Analyses
C-4	Port boatyard; middle of boatyard, west of temporary maintenance shed	General marine industrial property use	Gravel	Surface Soil	Metals (a)	--	--
C-5	Harbor Marine Maintenance; storage area north of maintenance shed	Historic use of multiple chemical products	Asphalt	Surface Soil	TPH-HCID, TPH-G, cPAHs	--	--
C-6	Everett Fire Station #3	Downgradient of former UST and current AST	Asphalt	Groundwater	--	--	TPH-Dx, TPH-G, BTEX, Metals (b)
C-7	Port boatyard; middle of boatyard, west of temporary maintenance shed	General marine industrial property use	Asphalt	Core samples at 3ft and 6ft (6 ft samples archived)	--	Metals (a), cPAHs	Metals (a)
C-MW-E	Port boatyard; active UST western most observation well; south side of UST	Active UST	Protective surface vault	Groundwater	--	--	TPH-Dx, TPH-G, BTEX
C-MW-W	Port boatyard; active UST western most observation well, south side of UST	Active UST	Protective surface vault	Groundwater	--	--	TPH-Dx, TPH-G, BTEX
D-1	American Construction Company; east end of south storage yard	Potential sources of spills/ releases of hazardous chemicals	Gravel	Groundwater	--	--	TPH-Dx, TPH-G, VOCs, cPAHs
D-2	American Construction Company; west end of south storage yard	Potential sources of spills/ releases of hazardous chemicals	Gravel	Groundwater	--	--	TPH-Dx, TPH-G, VOCs, cPAHs
D-3	American Construction Company; north storage yard, west of ASTs	Downgradient of two current ASTs with staining	Gravel	Subsurface soil, Groundwater	--	cPAH, TPH-Dx	TPH-Dx, TPH-G, VOCs, cPAHs
D-4	American Construction Company; north storage yard, north of creosote timbers	Potential sources of spills/ releases of hazardous chemicals	Gravel	Subsurface soil, Groundwater	--	cPAH	TPH-Dx, TPH-G, VOCs, cPAHs
D-5	American Construction Company; south storage yard	Potential sources of spills/ releases of hazardous chemicals	Gravel	Surface Soil	TPH-HCID, cPAHs, Metals (a), PCBs	--	--
D-6	American Construction Company; north storage yard, sand blasting area	Potential sources of spills/ releases of hazardous chemicals	Gravel	Surface Soil	TPH-HCID, cPAHs, Metals (a), PCBs	--	--
D-7	American Construction Company; north storage yard, east of creosote timbers	Potential sources of spills/ releases of hazardous chemicals	Gravel	Surface Soil	TPH-HCID, cPAHs, Metals (a), PCBs	--	--
D-8	American Construction Company; south storage yard, previous MP2-D-6 location	Potential sources of spills/ releases of hazardous chemicals	Gravel	Core samples at 3 ft and 6 ft (6 ft samples archived)	--	cPAHs	--
E-1	Puget Sound Truck Lines; southwest end of parking lot	Former USTs were removed (poor documentation)	Asphalt	Groundwater	--	--	TPH-Dx, TPH-G
E-2	Puget Sound Truck Lines; northwest corner of building	Staining on ground near former AST location	Asphalt	Groundwater (from finished piezometer NMP2-P6)	--	--	TPH-Dx, TPH-G
E-3	Puget Sound Truck Lines; southwest end of parking lot	Former USTs were more accurately located	Gravel	Groundwater	--	--	TPH-Dx, TPH-G, BTEX, Metals (b)
E-4	Puget Sound Truck Lines (former Ethyl Corp.); south end of parking lot	Potential sources of spills/ releases of hazardous chemicals from former tenant	Gravel	Groundwater	--	--	VOCs

TABLE 2
SUMMARY OF PHASE II ESA SAMPLE LOCATIONS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location ID	Location	Rationale for Sample Collection	Surface Conditions	Sample Types	Surface Soil Analyses	Subsurface Soil Analyses	Groundwater Analyses
F-1	Everett Engineering Building M11; north of building	Northwest of unidentified subsurface structure in Building M11	Gravel	Groundwater	--	--	TPH-G, TPH-Dx, VOCs, cPAHs
F-2	Everett Engineering Building M11; north storage yard	AST soil staining, suspected USTs, and poor housekeeping	Gravel	Groundwater	--	--	TPH-G, TPH-Dx, VOCs, cPAHs
F-3	Nugget Boat Works; boat maintenance area	Downgradient of suspected UST at JL Brooks Welding Building M14	Gravel	Groundwater	--	--	TPH-G, TPH-Dx, VOCs, cPAHs
F-4	Northeast of Everett Engineering Building M11; near water	General marine industrial property use	Gravel	Surface Soil	TPH-HCID, cPAHs, Metals (a)	--	--
F-5	American Boiler Works Building; northwest corner of building	Soil staining	Gravel	Surface Soil	TPH-HCID, cPAHs, Metals (a), BTEX	--	--
F-6	North of JL Brooks Welding; boat maintenance area	General marine industrial property use	Gravel	Surface Soil	TPH-HCID, cPAHs, Metals (a)	--	--
F-7	Everett Engineering Building M11; subsurface structure	Unidentified structure considered to be a potential UST	Surface cover welded shut; concrete floor	Water	--	--	TPH-G, TPH-Dx, VOCs, cPAHs
F-8	Everett Engineering Building M11; north storage yard	Observed sandblast grit	Gravel	Groundwater	--	--	Metals (a)
F-9	American Boiler Works Building; northwest corner of building	Previous sample NMP2-F-5-ss showed high metals and cPAHs	Gravel	Groundwater	--	Metals (a), cPAHs	--
G-1	Ameron; west of large industrial warehouse	UST removed (location unkown); multiple chemicals stored and used	Gravel	Groundwater	--	--	TPH-G, TPH-Dx, VOCs, cPAHs
G-2	Ameron; south storage yard	UST removed (location unkown); multiple chemicals stored and used; West of patched asphalt	Asphalt	Groundwater	--	--	TPH-G, TPH-Dx, VOCs, cPAHs
G-3	Ameron (former Mill Site) east corner of south storage yard	Previous Mill activities and Fire	Asphalt	Core samples at 3 ft and 6 ft (6 ft samples archived)	--	Metals (a), cPAHs, TPH-Dx, TPH-G, BTEX, PCB	SVOCs, Metals (a), VOCs
H-1	Milltown Sailing; parking area	Petroleum hydrocarbon observed during replacement of marina fuel lines	Asphalt	Subsurface Soil, Groundwater	--	TPH-Dx, TPH-G	TPH-Dx, TPH-G
H-2	Milltown Sailing; parking area	Petroleum hydrocarbon observed during replacement of marina fuel lines	Asphalt	Subsurface Soil; Groundwater	--	TPH-Dx, TPH-G	TPH-Dx, TPH-G
H-3	Milltown Sailing; parking area	Petroleum hydrocarbon observed during replacement of marina fuel lines	Asphalt	Subsurface Soil, Groundwater	--	TPH-Dx, TPH-G	TPH-Dx, TPH-G
H-4	Milltown Sailing; parking area	Petroleum hydrocarbon observed during removal of marina fuel UST and replacement of marina fuel lines	Asphalt	Subsurface Soil, Groundwater	--	TPH-Dx, TPH-G, Metals (b), BTEX	TPH-Dx, TPH-G, Metals (b), BTEX
H-5	Milltown Sailing; parking area	Petroleum hydrocarbon observed during removal of marina fuel UST and replacement of marina fuel lines	Asphalt	Subsurface Soil, Groundwater	--	TPH-Dx, TPH-G, BTEX, Metals (b)	TPH-Dx, TPH-G, BTEX, Metals (b)
I-X	Head of 12th Street waterway	Area of observed discolored soil	Gravel	Composite Surface Soil (2 to 3 ft BGS)	TPH-Dx, Metals (a), SVOCs, PCBs	--	--

TABLE 2
SUMMARY OF PHASE II ESA SAMPLE LOCATIONS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location ID	Location	Rationale for Sample Collection	Surface Conditions	Sample Types	Surface Soil Analyses	Subsurface Soil Analyses	Groundwater Analyses
I-Y	Head of 12th Street waterway	Soil beneath area of observed discolored soil in sample NMP2-I-X	Gravel	Composite Surface Soil (4 ft BGS)	TPH-Dx, Metals (a), SVOCs, PCBs	--	--
I-Z	Head of 12th Street waterway	Area used currently and historically for soil stockpiling	Gravel	Composite Stockpile Soil	TPH-Dx, Metals (a), cPAHs	--	--
I-3	Head of 12th Street waterway	Area used currently and historically for soil stockpiling	Gravel	Composite Stockpile Soil	TPH-Dx, Metals (a), cPAHs	--	--
J-1	West of MSRC building, downgradient of 1993 bunker excavation	Voluntary cleanup excavation of waste disposal bunker, no groundwater samples collected	Gravel	Groundwater	--	--	SVOCs, TPH-Dx, TPH-G, Metals (a), VOCs
J-2	West of MSRC building, downgradient of late 1980s UST removal	UST was originally used for fuel storage, and later used for waste oil disposal tank; potential for LUST; unknown decommissioning	Gravel	Groundwater	--	--	SVOCs, TPH-Dx, TPH-G, Metals (a), VOCs
JP-1	Jordan Park	Unidentified source of fill material for berm construction	Grass	Composite Surface Soil	TPH-HCID, cPAHs, Metals (a)	--	--
K-1	South of Everett Fire Museum (former City Maintenance Shop)	Removed UST; possible LUST	Asphalt	Groundwater	--	--	SVOCs, TPH-Dx, TPH-G, Metals (b), VOCs

(a) Metals = arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc.

(b) Dissolved lead analysis only.

TABLE 3
SUMMARY OF SOIL SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Number	Metals (a)	cPAHs (b)	SVOCs (c)	TPH (d)	BTEX (e)	PCBs (f)
NMP2-B-4-CS	Lead					
NMP2-C-4-SS	X					
NMP2-C-5-SS		X		X		
NMP2-C-7-CS-3	X	X				
NMP2-D-3-CS		X		X		
NMP2-D-4-CS		X				
NMP2-D-5-SS	X	X		X		X
NMP2-D-6-SS	X	X		X		X
NMP2-D-7-SS	X	X		X		X
NMP2-D-8-CS-3		X				
NMP2-F-4-SS	X	X		X		
NMP2-F-5-SS	X	X		X	X	
NMP2-F-6-SS	X	X		X		
NMP2-F-9-CS-3	X	X				
NMP2-G-3-CS-3	X	X		X	X	X
NMP2-H-1-CS				X		
NMP2-H-2-CS				X		
NMP2-H-3-CS				X		
NMP2-H-4-CS	Lead			X	X	
NMP2-H-5-CS	Lead			X	X	
NMP2-I-3-SS	X	X		X		
NMP2-I-X-SS	X		X	X		X
NMP2-I-Y-SS	X		X	X		X
NMP2-I-Z-SS	X	X		X		
NMP2-JP-1-SS	X	X		X		
NMP2-PZ-8-CS-3	X	X				
NMP2-PZ-8-SS	X	X				
NMP2-PZ-9-CS-3	X	X				
NMP2-PZ-9-CS-6	X					
NMP2-PZ-10-CS-3	X	X		X	X	X

(a) Metals include As, Cd, Cr, Cu, Pb, Hg, Ag, Zn analyzed by EPA Method series 6000/7000, unless otherw
(b) cPAHs analyzed using EPA Method 8270-SIM after being centrifuged by the lab.
(c) SVOCs analyzed using EPA Method 8270.
(d) TPH analyzed using methods NWTPH-Dx (with acid/silica gel cleanup) and NWTPH-G.
(e) BTEX analyzed using EPA Method 8260.
(f) PCBs analyzed using EPA Method 8082.

TABLE 4
SUMMARY OF PHASE II ESA GROUNDWATER SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Number	Dissolved Metals (a)	cPAHs (b)	SVOCs (c)	TPH (d)	BTEX (e)	VOCs (f)	Notes
B-1-GW				X			
B-2-GW				X			
B-3-GW				X			
B-4-GW	Lead			X	X		
C-1-GW				X			
C-2-GW				X			
C-3-GW				X		X	
C-8-GW				X			Duplicate of NMP2-C-3-GW
C-6-GW	Lead			X	X		
C-7-GW	X						
D-1-GW		X		X		X	
D-2-GW		X		X		X	
D-3-GW		X		X		X	
D-4-GW		X		X		X	
E-1-GW				X			
E-2-GW				X			Collected from NMP2-P6
E-3-GW	Lead			X	X		
E-4-GW						X	
F-1-GW		X		X		X	
F-2-GW		X		X		X	
F-3-GW		X		X		X	
F-8-GW	X						
G-1-GW		X		X		X	
G-2-GW		X		X		X	
G-3-GW	X		X			X	
H-1-GW				X			
H-2-GW				X			
H-3-GW				X			
H-4-GW	Lead			X	X		
H-5-GW	Lead			X	X		
J-1-GW	X		X	X		X	
J-2-GW	X		X	X		X	
K-1-GW	Lead		X	X		X	
P2-1-GW				X			Collected from NMP2-P1
P1	X	X		X		X	
P2	X	X		X		X	
P3	X	X		Gasoline			
P4	X	X		X		X	
P5	X	X		X		X	
P50	X	X		X		X	Duplicate of NMP2-P5
P6	X	X		Gasoline			
P7	X	X		X		X	
P8	X	X		Gasoline			
P9	X	X					
P10	X	X		Gasoline			
P11	X		X	X		X	
P12	X		X	X		X	
NMW-E				X	X		Sample near boatyard UST
NMW-W				X	X		Sample near boatyard UST

(a) Dissolved metals include As, Cd, Cr, Cu, Pb, Hg, Ag, Zn analyzed by EPA Method series 6000/7000 unless otherwise indicated.
Sample portions for metals analysis were field filtered.

(b) Samples collected during Phase II were centrifuged by the lab to minimize particulate matter interferences.
cPAHs analyzed by EPA Method 8270-SIM.

(c) SVOCs analyzed by EPA Method 8270.

(d) TPH were analyzed using methods NWTPH-Dx (with acid/silica gel cleanup) and NWTPH-G unless otherwise indicated.

(e) BTEX analyzed by EPA Method 8260.

(f) VOCs analyzed by EPA Method 8260.

TABLE 5
SUMMARY OF DGI SOIL SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Location	Sample Interval	Metals (a)	SVOCs (b)	cPAHs (b)	PCBs (c)	TBT (d)	HCID (e)	TPH-Dx (f)	TPH-G (g)	VOCs (h)	EPH/ Napthalene (i)
Investigation Area b											
B-FA-1	0-0.5	X		X			X	X			
B-FA-1	1-2	X									
B-FA-2	0-0.5	X		X			X	X			
B-FA-2	1-2	X		X							
B-FA-3	0-0.5	X		X			X	X			
B-FA-3	1-2	X		X							
B-FA-4	0-0.5	X		X		X	X	X	X	BTEX	
B-FA-4	1-2	X						X			
B-FA-5	0.9-1.4	X		X			X				
B-FA-6	0-0.5	X		X			X	X			
B-FA-6	1-2	X									
B-FA-7	0-0.5	X		X			X				
B-FA-8	0-0.5	X		X		X	X				
B-FA-9	0-0.5	X		X							
B-FA-12	3.5-4								X	BTEX	
B-GC-1	1-1.5	X		X			X				
B-GC-2	0-0.5	X		X							
Investigation Area c											
C-FA-1	1-2	X				X					
C-FA-1	0-0.5	X		X							
C-FA-2	0-0.5	X		X							
C-FA-2	1-2	X		X							
C-FA-3	1-2	X				X					
C-FA-3	0-0.5	X		X							
C-FA-4	0-0.5	X		X							
C-FA-4	1-2	X		X							
C-FA-5	1-2	X		X							
C-FA-5	0-0.5	X		X							
C-FA-6	1.1-1.6	X		X							
C-FA-7	0-0.5	X									
C-FA-7	1-2	X									
C-FA-7`	0-0.5						X				
C-FA-8	0-0.5	X									
C-FA-9	1.1-1.6	X		X							
C-GC-1	0.6-1.1	X		X			X				
C-GC-2	0-0.5	X		X							
C-GC-3	0-0.5	X		X							
C-GC-3	1-2			X							
C-GC-4	0-0.5	X		X							
C-GC-5	1.4-1.9	X		X			X				
C-GC-6	2-3	X		X							
C-GC-6	1-1.5	X		X			X	X			
C-GC-7	0-0.5	X		X							
Investigation Area d											
D-FA-1	1-2	X									
D-FA-1	4-6	X									
D-FA-1	8-10	X									
D-FA-2	1-2	X									
D-FA-2	4-6	X									
D-FA-2	8-10	X									
D-FA-3	1-2	X									

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TABLE 5
SUMMARY OF DGI SOIL SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Location	Sample Interval	Metals (a)	SVOCs (b)	cPAHs (b)	PCBs (c)	TBT (d)	HCID (e)	TPH-Dx (f)	TPH-G (g)	VOCs (h)	EPH/ Napthalene (i)
D-FA-3	4-6	X									
D-FA-3	8-10	X									
D-FA-3	10-12	X									
D-FA-4	1-2	X									
D-FA-4	4-6	X									
D-FA-4	8-10	X									
D-FA-4	10-12	X									
D-FA-5	11-14	X									
D-FA-5	3-5	X		X							
D-FA-5	0-0.5	X		X			X	X			
D-FA-5	1-2	X		X							
D-FA-5	7-9	X									
D-FA-5	9-11	X									
D-FA-5b	3-5	Arsenic									
D-FA-5b	1-2	Arsenic									
D-FA-5b	2-3	Arsenic									
D-FA-5b	0-0.5	Arsenic									
D-FA-5b	7-9	Arsenic									
D-FA-5b	13-15	Arsenic									
D-FA-6	1-2	X		X							
D-FA-6	0-0.5	X		X			X	X			
D-FA-6	2-3			X							
D-FA-6	3-4			X							
D-FA-6	4-6	X									
D-FA-6	8-10	X									
D-FA-6	10-12	X									
D-FA-6	12-14	X									
D-FA-6b	0-0.5	Arsenic									
D-FA-6b	1-2	Arsenic									
D-FA-6b	2-3	Arsenic									
D-FA-6b	3-5	Arsenic									
D-FA-6b	7-9	Arsenic									
D-FA-7	0-0.5	X		X			X				
D-FA-7	1-2	X									
D-FA-7	3-5	X + As-TCLP		X							
D-FA-7	7-9	X		X							
D-FA-7	9-11	X									
D-FA-7	11-13	X									
D-FA-7	2-3			X							
D-FA-8	0-0.5	X		X			X	X			
D-FA-10	0-0.5	X		X							
D-FA-10	1-2	X		X							
D-FA-10	2-3	X									
D-FA-10	3-3.8							X			
D-FA-11	1-2			X							
D-FA-11	4.5-5						X	X			
D-FA-11c	3.5-4										X
D-FA-11c	4.6-5							X			
D-FA-11e	2-3							X			
D-FA-11i	4.3-5							X			
D-Fa-11l	4.5-4.9							X			
D-FA-11m	4.5-5.5							X			

TABLE 5
SUMMARY OF DGI SOIL SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Location	Sample Interval	Metals (a)	SVOCs (b)	cPAHs (b)	PCBs (c)	TBT (d)	HCID (e)	TPH-Dx (f)	TPH-G (g)	VOCs (h)	EPH/ Napthalene (i)
D-FA-11n	3-4										X
D-FA-11o	3.5-4										X
D-FA-12	0-0.5	X		X			X	X			
D-FA-13	0-0.5	X		X							
D-FA-13	1-2	X		X							
D-FA-14	4-5	X	X	X	X		X			X	
D-FA-15	0-1	X	X		X		X	X		X	
D-GC-1	0-0.5	X		X			X	X			
D-GC-1	1-2			X							
D-GC-2	0.8-1.3							X			
D-GC-2	1-2	X		X							
D-GC-2	2-3			X							
D-GC-2	0-0.5						X	X			
D-GC-2	0.8-1						X				
D-GC-2	1.9-2.2						X				
D-GC-2b	0.5-1						X				
D-GC-2b	0-1							X			
D-GC-3	0-0.5	X		X							
D-GC-3	1-2	X		X							
D-GC-3	1.9-2.4						X				
D-GC-4	1-1.5	X		X							
D-GC-5	0-0.5	X		X							
D-GC-5	1-2	X		X							
D-GC-6	0-0.5	X		X			X				
D-GC-6	1-2	X									
D-GC-6	2-3	X		X							
D-GC-7	0-0.5	X		X			X				
D-GC-8	0-0.5	X		X							
D-GC-8	1-2			X							
D-GC-9	0-0.5	X		X							
D-GC-9	1-2			X							
D-GC-10	0-0.5	X		X							
D-GC-10	1-2			X							
D-GC-11	0-0.5	X		X							
D-GC-11	1-2			X							
D-GC-12	0-0.5	X		X			X	X			
D-GC-12	1-2	X		X							
D-GC-13	0-0.5	Arsenic									
ACC-EAST-SUMP		X	X		X						
Investigation Area e											
E-FA-1	5-5.5							X			
E-FA-2	5.5-6							X		BTEX	
E-FA-2a	4.8-5.3							X			
E-FA-2b	3.8-4.2							X			
E-FA-3	9.5-10							X		BTEX	
E-FA-4	7-7.5							X			
E-FA-5	4.5-4.9							X			
E-GC-1	0-0.5	X		X			X	X			
E-GC-1	1-2	X									
E-GC-1b	0-0.5	X									
E-GC-1c	1-2	X									
E-GC-1c	0-0.5	X									

TABLE 5
SUMMARY OF DGI SOIL SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Location	Sample Interval	Metals (a)	SVOCs (b)	cPAHs (b)	PCBs (c)	TBT (d)	HCID (e)	TPH-Dx (f)	TPH-G (g)	VOCs (h)	EPH/ Napthalene (i)
E-GC-2	0-0.5	X		X			X	X			
E-GC-3	0-0.5	X		X			X				
E-GC-4	0.5-1	X		X			X	X			
E-GC-4	1.5-2.5			X			X				
E-GC-4c	3.5-4							X		BTEX	X
E-GC-4d	3.5-4						X	X		BTEX	X
E-GC-4g	3.5-4							X		BTEX	X
E-GC-5	2.5-3.5	X									
E-GC-5	1.5-2	X		X			X				
Investigation Area f											
F-FA-1	0.8-1.3	X		X			X				
F-FA-10	4-6	Arsenic									
F-FA-10	6-8	Arsenic									
F-FA-10	1-2	X									
F-FA-10	0-1	X		X			X				
F-FA-10	2-3	Arsenic					X				X
F-FA-11	1-2	Arsenic									
F-FA-11	2-3	Arsenic									
F-FA-11	4-6	Arsenic									
F-FA-11	6-8	Arsenic									
F-FA-11	0-1	X		X			X				
F-FA-12	0-0.5	X		X			X				
F-FA-13	4-6						X	X			
F-FA-14	4-6						X	X			
F-FA-2	0-2	Arsenic									
F-FA-2	2-4	Arsenic									
F-FA-2	4-6	Arsenic									
F-FA-2	6-8	Arsenic									
F-FA-3	3.5-4.5	Arsenic									
F-FA-3	4.5-5.5	Arsenic									
F-FA-3	5.5-7	Arsenic									
F-FA-3	7-8	Arsenic									
F-FA-3	0-0.5	X		X			X				
F-FA-4	1-2	Arsenic									
F-FA-4	2-3	Arsenic									
F-FA-4	4-6	Arsenic									
F-FA-4	6-8	Arsenic									
F-FA-4	0-0.5	X		X			X				
F-FA-5	1.7-2.7	Arsenic									
F-FA-5	2.7-3.7	Arsenic									
F-FA-5	4-6	Arsenic									
F-FA-5	6-8	Arsenic									
F-FA-5	0.7-1.2	X		X			X				
F-FA-6	2-3	Arsenic									
F-FA-6	4-6	Arsenic									
F-FA-6	6-8	Arsenic									
F-FA-6	1-2	X		X			X	X			X
F-FA-7	0-2	Arsenic									
F-FA-7	2-4	Arsenic									
F-FA-7	4-6	Arsenic									
F-FA-7	6-8	Arsenic									
F-FA-8	2-3	Arsenic									

TABLE 5
SUMMARY OF DGI SOIL SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Location	Sample Interval	Metals (a)	SVOCs (b)	cPAHs (b)	PCBs (c)	TBT (d)	HCID (e)	TPH-Dx (f)	TPH-G (g)	VOCs (h)	EPH/ Napthalene (i)
F-FA-8	4-6	Arsenic									
F-FA-8	6-8	Arsenic									
F-FA-8	0-0.5	X		X		X	X				
F-FA-8	1-2	X				X					
F-FA-9	1-2	Arsenic									
F-FA-9	2-3	Arsenic									
F-FA-9	4.5-6	Arsenic									
F-FA-9	6-8	Arsenic									
F-FA-9	0-0.5	X		X			X				
F-GC-1	0-0.5	X		X		X	X				
F-GC-10	4.5-5.5	Arsenic									
F-GC-10	3.5-4			X							
F-GC-10	2.5-3	X		X			X				
F-GC-11	0-0.5	X		X			X				
F-GC-12	0-0.5	X		X			X				
F-GC-13	2-3	X									
F-GC-13	0-1	X		X			X				
F-GC-13	1-2	X		X							
F-GC-13b	0-0.5	X		X							
F-GC-13b	1-2	X									
F-GC-13c	0-0.5	X		X							
F-GC-13c	2-3	X									
F-GC-13c	3-5	X									
F-GC-13c	5-7	X									
F-GC-13c	1-2	X									
F-GC-13d	3-4	X		X							
F-GC-2	1-1.5	X		X			X				
F-GC-3	0-0.5	X		X			X				
F-GC-4	0.7-1.2	X		X			X				
F-GC-5	0-0.5	X		X		X	X				
F-GC-6	0-0.5	X		X			X				
F-GC-7	0-0.5	X		X			X	X			
F-GC-8	0.8-1.3	X		X			X				
F-GC-8	1.8-2.8	Arsenic									
F-GC-8	2.8-3.8	Arsenic									
F-GC-9	2.5-3.5	Arsenic									
F-GC-9	3.5-4.5	Arsenic									
F-GC-9	1.5-2	X		X			X				
F-PINK	0-1	X + As-and Pb-TCLP									
F-PINK	2.5-3	X									
F-PINK	1.2 - 1.5	X									
Investigation Area g											
G-GC-1	1.5-2	X		X			X				
G-GC-2	1.4-1.9	X		X			X				
G-GC-3	1-1.5	X		X			X				
Investigation Area h											
H-GC-1	0.8-1.3	X		X			X	X			
H-GC-1	1.8-2.8	X									
H-GC-2	1-1.5	X		X			X	X			
H-GC-3	0-0.5	X		X							
H-GC-4	0-0.5	X		X							
H-GC-5	0.8-1.3	X		X			X	X			

TABLE 5
SUMMARY OF DGI SOIL SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Location	Sample Interval	Metals (a)	SVOCs (b)	cPAHs (b)	PCBs (c)	TBT (d)	HCID (e)	TPH-Dx (f)	TPH-G (g)	VOCs (h)	EPH/ Napthalene (i)
H-GC-5	1.8-2.8	X									
H-GC-5b	1.3-1.6	X									
H-GC-5c	3-4	Arsenic, Mercury									
H-GC-5c	2-2.5	X									
H-GC-5d	1.8-2.8	X									
H-GC-5d	2.8-3.8	Arsenic, Mercury									
Investigation Area j											
J-FA-1	4-5						X				
J-FA-2	4-5						X	X			
J-GC-1	1.5-2.5							X			
J-GC-1	0.5-1	X		X			X	X			
J-GC-2	0-0.5	X		X			X				
J-GC-3	0-0.5	X		X			X				
J-GC-4	2.5-3.5	Arsenic									
J-GC-4	3.5-4.5	Arsenic									
J-GC-4	1.5-2	X		X			X				
Investigation Area jp											
JP-GC-1	1-1.5	X		X			X				
JP-GC-2	1.5-2	X		X			X				
JP-GC-3	0-0.5	X		X							
JP-GC-4	0.5-1	X		X			X				
JP-GC-5	0.5-1	X		X			X				
JP-GC-6	0-0.5	X		X							
Investigation Area k											
K-GC-1	0-0.5	X		X							
K-GC-2	0.5-1	X		X			X	X			
Investigation Area l											
L-FA-2	1.5-2.5	X									
L-FA-2	1.5-2.5		X		X		X			X	
L-FA-2b	1-1.5	X									
L-FA-2b	2-3	X									
L-GC-1	0.5-1	X		X			X	X			
L-GC-2	0-0.5	X		X			X				
L-GC-2	1-1.5					X					
L-GC-3	0.7-1.4	X		X			X				
L-GC-4	0-0.5	X		X			X	X			
L-GC-4	2.3-3.3	X									
L-GC-4	0-0.5							X			
L-GC-4	0.7-1.2					X					
L-GC-4b	1.7-2.2	X									
L-GC-4b	2.7-3.7	X									
L-GC-5	1.5-2.5	X									
L-GC-5	0.5-1	X		X			X	X			
L-GC-5b	2.3-2.8	X									
L-GC-5c	1-1.5	X									
Investigation Area m											
M-1	0.3-0.8	X		X			X				
M-2	0-0.5	X		X			X				
M-2	1-2			X							
M-3	0-0.5	X		X			X				
M-4	0.8-1.3	X		X			X				
M-FA-1	3.5-4								X	BTEX	

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TABLE 5
SUMMARY OF DGI SOIL SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Location	Sample Interval	Metals (a)	SVOCs (b)	cPAHs (b)	PCBs (c)	TBT (d)	HCID (e)	TPH-Dx (f)	TPH-G (g)	VOCs (h)	EPH/ Napthalene (i)
M-FA-2	3.5-4								X	BTEX	
M-GC-1	1.6-2.1	X		X			X				
M-GC-2	1.5-2	X		X			X				
M-GC-3	1-1.5	X		X			X				
M-GC-4	1.5-2	X		X			X				
M-GC-5	1-1.5	X		X			X				

(a) Metals include As, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag, and Zn were analyzed by EPA Method series 6000/7000, unless otherwise noted. Cd and Hg were not analyzed in the soil samples collected prior to the primary DGI field event. TCLP (toxic characteristic leaching procedure) was analyzed where indicated by EPA Method 6010b.

(b) SVOCs and cPAHs analyzed using EPA Method 8270.

(c) PCBs analyzed using EPA method 8082.

(d) TBT (tributyl tin ion) analyzed by SIM.

(e) HCID (hydrocarbon identification) was analyzed by Method NWTPH-HCID.

(f) TPH-Dx (diesel and motor oil range petroleum hydrocarbons) analyzed by NWTPH-D extended with acid silica gel cleanup.

(g) TPH-G (gas range petroleum hydrocarbons) analyzed by Method NWTPH-G.

(h) VOCs (volatile organic hydrocarbons) analyzed using EPA method 8260.

(i) EPH (extended petroleum hydrocabons)+A306/Napthalene analyzed using EPA Method EPH 8015b and SW8270c-SIM, respectively.

TABLE 6
SUMMARY OF PLANNED FOCUS AREA SAMPLE LOCATIONS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location ID	Location	Rationale for Sample Collection	Surface Conditions	Shallow Soil (0 to 4 ft BGS) Testing	Deep Soil (≥4 ft BGS) Testing	Groundwater Analyses
INVESTIGATION AREA b						
B-FA-1 through B-FA-4	Everett Bayside Marina, east boat maintenance and storage yard	Boat maintenance activities.	Gravel	0 to 0.5 ft: Metals (a), cPAHs; TBT at B-FA-4 or location with evidence of boat maintenance materials 1 to 2 ft: archive 2 to 3 ft: archive	--	--
B-FA-5 through B-FA-8	Everett Bayside Marina, west boat maintenance/storage yard	Boat maintenance activities.	Gravel	0 to 0.5 ft: Metals (a), cPAHs; TBT at B-FA-6 or location with evidence of boat maintenance materials 1 to 2 ft: archive 2 to 3 ft: archive	--	--
B-FA-9 through BFA-11	Outside perimeter of the east and west boat maintenance/storage yards	Assist delineation of potential soil contamination. Samples will only be analyzed if nearby east or west yard samples exceed preliminary cleanup level.	B-FA-10 and B-FA-11: Gravel; B-FA-12: Asphalt	0 to 0.5 ft: archive 1 to 2 ft: archive 2 to 3 ft: archive	--	--
B-FA-12	Within footprint of former gasoline UST	Additional characterization of former UST location based on Ecology comment on draft DGI work plan. Contingent action, will not be implemented if sufficient information obtained from PSTL on tank removal	Paved	—	Sample soil in 2-ft intervals up to 12 ft BGS and screen with PID. Test sample with highest PID reading and test for NWTPH-G and BTEX. If no elevated PID readtings, test sample at capillary fringe.	Collect sample and test for NWTPH-G and BTEX
INVESTIGATION AREA c						
C-FA-1 through C-FA-5	Port boatyard	Boat maintenance activities. Phase II ESA results indicate shallow soil contamination.	Gravel	0 to 0.5 ft: Metals (a), cPAHs; TBT at C-FA-1 or C-FA-3, or 2 locations with evidence of boat maintenance materials 1 to 2 ft: archive 2 to 3 ft: archive	--	--
C-FA-6 through C-FA-9	Outside perimeter of the Port boatyard	Assist delineation of potential soil contamination. Samples will only be analyzed if nearby Port Boatyard samples exceed preliminary cleanup level.	Gravel	0 to 0.5 ft: archive 1 to 2 ft: archive 2 to 3 ft: archive	--	--
INVESTIGATION AREA d						
D-FA-1 through D-FA-4	Former graving dock area	Explore extent of detected arsenic and hydrocarbon contamination in vicinity of former graving dock excavation.	Gravel	Composite samples in 2-ft intervals; test 1- to 2-ft interval for metals (a); archive 2 to 4 ft sample	Test 4 to 6 ft, 8 to 10 ft, and 12 to 14 ft samples for metals (a). Archive remaining 2 ft composite samples. Subsample zone of heavy end petroleum contamination, if present, and test up to two samples for NWTPH-HCID, SVOCs, and PCBs; additional TPH analysis based on HCID results.	--
D-FA-5 through D-FA-8	Outside of former graving dock area	Explore extent of detected arsenic and hydrocarbon contamination in vicinity of former graving dock excavation.	Gravel	0 to 0.5 ft: Metals (a), cPAHs 1 to 2 ft: archive 2 to 3 ft: archive	Archive samples in 2-ft increments for potential testing, depending on shallow soil results. Subsample zone of heavy end petroleum contamination, if present, and archive for possible future testing.	--
D-FA-9	Flammable storage area sump	Investigate potential release from flammable area drain to sump.	Gravel	Note, pre-investigation reconnaissance determined that the sump had a solid bottom and the location was inaccessible for drill rig access. As a result, soil sampling was eliminated.		Groundwater sampling was relocated to boring D-FA-10 due to accessibility issues associated with the sump location
D-FA-10	West of former gasoline and diesel ASTs, east of heavy end petroleum hydrocarbon contamination detected at D-3	Delineate heavy end petroleum hydrocarbon contamination from D-3, and potential fuel releases from gasoline and diesel ASTs.	Gravel	Collect soil samples from zone of observed contamination (if present); if no evidence of contamination, sample and test consistent with shallow soil general characterization locations.	Extend boring up to 10 ft BGS. Subsample and archive heavy end petroleum hydrocarbon contamination, if present. Composite samples into 2-ft intervals and test samples that appear to be most affected by gasoline and/or diesel UST release (if applicable) for NWTPH-G and -D.	TPH-HCID, SVOC, VOC, dissolved metals (Pb, Cr, Cu, Cd, Hg, Zn, As); follow up with additional TPH analysis based on HCID results.

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TABLE 6
SUMMARY OF PLANNED FOCUS AREA SAMPLE LOCATIONS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location ID	Location	Rationale for Sample Collection	Surface Conditions	Shallow Soil (0 to 4 ft BGS) Testing	Deep Soil (≥4 ft BGS) Testing	Groundwater Analyses
D-FA-11 and D-FA-13	South and north of boring D-3, respectively	Delineate heavy end petroleum hydrocarbon contamination from D-3 vicinity.	Gravel	--	Extend boring up to 10 ft BGS. Subsample heavy end petroleum hydrocarbon contamination, if present. Test one sample for NWTPH-HCID, SVOCs, and PCBs; additional TPH analysis based on HCID results.	--
D-FA-12	West of boring D-3	Delineate heavy end petroleum hydrocarbon contamination from D-3 vicinity and provide general characterization of shallow soil.	Gravel	0 to 0.5 ft: Metals (a), cPAHs 1 to 2 ft: archive 2 to 3 ft: archive	Extend boring up to 10 ft BGS. Subsample and heavy end petroleum hydrocarbon contamination for potential future testing, if present.	--
D-FA-14	Waste oil storage AST	Evaluate potential impact from used oil AST on soil and groundwater. Boring planned due to access limitations at D-FA-17.	Gravel	--	If visual evidence of contamination is present, delineate extent and collect 1 ft composite of most highly stained zone. Test for same parameters as D-FA-15 shallow soil.	TPH-HCID, SVOC, VOC, dissolved metals (Pb, Cr, Cu, Zn, As); follow up with additional TPH analysis based on HCID results.
D-FA-15	Waste oil storage AST	Evaluate extent of used oil AST release; investigation limited to hand auger due to accessibility limitations beneath tank.	Gravel	0 to 1 ft: metals, TPH-HCID, SVOC.VOC, PCBs; follow up with additional TPH analysis 1 to 2 ft: archive 2 to 3 ft: archive	--	--
P-17 and P-18	North and west of former graving dock area	Downgradient of P-9 and former graving dock footprint.	Gravel	--	--	Dissolved As and cPAH.
P-19	West of D-3, ASTs	Downgradient of D-3 and ASTs.	Gravel	--	--	Dissolved As and cPAH.
P-20	Southeast of former graving dock area	Upgradient of P-9 and former graving dock footprint.	Gravel	--	--	Dissolved As and cPAH.
P-9	Interior of former graving dock area	Significant exceedance of arsenic groundwater cleanup level during Phase II ESA and detection of cPAHs.	Gravel	--	--	Dissolved As and cPAH.
INVESTIGATION AREA e						
E-FA-1 thorugh E-FA-4	Former diesel USTs location; co-locate E-GC-4 with E-FA-4	Additional characterization of former UST location based on Ecology comment on draft DGI work plan. Contingent action, will not be implemented if sufficient information obtained from Puget Sound Truck Lines on tank removal.	Gravel	—	Sample soil in 2-ft intervals up to 12 ft BGS and screen with PID. Test sample with highest PID reading and test for NWTPH-G and BTEX. If no elevated PID readings, test sample at capillary fringe.	Collect sample and test for NWTPH-D from sample in the SE corner of former tank location.
E-FA-5	Former heating oil UST location	Additional characterization of former UST location based on Ecology comment on draft DGI work plan. Contingent action, will not be implemented if sufficient information obtained from Puget Sound Truck Lines on tank removal.	Gravel	—	Sample soil in 2-ft intervals up to 12 ft BGS and screen with PID. Test sample with highest PID reading and test for NWTPH-G and BTEX. If no elevated PID readings, test sample at capillary fringe.	Sample existing piezometer P6 and test for NWTPH-D.
INVESTIGATION AREA f						
F-FA-1	Investigation Area f	General marine industrial property use and presence of stormwater sump. Phase II ESA metals and cPAHs above cleanup levels.	Gravel	0 to 1 ft: metals (a), TPH-HCID, SVOC.VOC, PCBs; follow up with additional TPH analysis 1 to 2 ft: archive 2 to 4 ft: archive	Archive samples in 2-ft intervals up to 8 ft BGS for possible future testing, depending on shallow soil results.	TPH-HCID, VOC, dissolved metals (Pb, Cu, Cd, Hg, As, Zn); follow up with additional TPH analysis based on HCID results.
F-FA-2 (P16), F-FA-7 (P14)	Investigation Area f	General marine industrial property use. Phase II ESA groundwater arsenic concentrations suggest potential deeper soil contamination.	Gravel	0 to 2 ft: archive 2 to 4 ft: archive	4 to 6 ft: archive 6 to 8 ft: archive	See P14 , P16.
F-FA-3	Investigation Area f	General marine industrial property use. Phase II ESA groundwater arsenic concentrations suggest potential deeper soil contamination.	Gravel	0 to 0.5 ft: Metals (a), cPAHs 1 to 2 ft: archive 2 to 3 ft: archive	4 to 6 ft: archive 6 t- 8 ft: archive	--

TABLE 6
SUMMARY OF PLANNED FOCUS AREA SAMPLE LOCATIONS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location ID	Location	Rationale for Sample Collection	Surface Conditions	Shallow Soil (0 to 4 ft BGS) Testing	Deep Soil (≥4 ft BGS) Testing	Groundwater Analyses
F-FA-4 (P-13), F-FA-9 (P15)	Near north shoreline of Investigation Area f	General marine industrial property use. Phase II ESA groundwater arsenic concentrations suggest potential deeper soil contamination.	Gravel	0 to 0.5 ft: Metals (a), cPAHs 1 to 2 ft: archive 2 to 3 ft: archive	4 to 6 ft: archive 6 to 8 ft: archive	See P13, 15.
F-FA-5	Investigation Area f	General marine industrial property use. Phase II ESA groundwater arsenic concentrations suggest potential deeper soil contamination.	Gravel	0 to 0.5 ft: Metals (a), cPAHs 1 to 2 ft: archive 2 to 3 ft: archive	4 to 6 ft: archive 6 to 8 ft: archive	--
F-FA-6	Investigation Area f	General marine industrial property use. Co-located to Phase II ESA sample NMP2-F-4-SS, which showed levels of cPAHs above cleanup levels.	Gravel	0 to 0.5 ft: TBT 1 to 2 ft: Metals (a), cPAHs 2 to 3 ft: archive	4 to 6 ft: archive 6 to 8 ft: archive	--
F-FA-8	Investigation Area f	General marine industrial property use. Phase II ESA groundwater arsenic concentrations suggest potential deeper soil contamination.	Gravel	0 to 0.5 ft: Metals (a), cPAHs 1 to 2 ft: archive 2 to 3 ft: archive	4 to 6 ft: archive 6 to 8 ft: archive	--
F-FA-10	Investigation Area f	General marine industrial property use. Phase II ESA groundwater arsenic concentrations suggest potential deeper soil contamination.	Gravel	0 to 0.5 ft: Metals (a), cPAHs 1 to 2 ft: archive 2 to 3 ft: archive	4 to 6 ft: archive 6 to 8 ft: archive	--
F-FA-11	Investigation Area f	General marine industrial property use. Phase II ESA groundwater arsenic concentrations suggest potential deeper soil contamination.	Gravel	0 to 0.5 ft: Metals (a), cPAHs 1 to 2 ft: archive 2 to 3 ft: archive	4 to 6 ft: archive 6 to 8 ft: archive	--
F-FA-12	Investigation Area f	General marine industrial property use. Phase II ESA groundwater arsenic concentrations suggest potential deeper soil contamination.	Gravel	0 to 0.5 ft: Metals (a),cPAHs 1 to 2 ft: archive 2 to 3 ft: archive	4 to 6 ft: archive 6 to 8 ft: archive	--
F-FA-13, -14	Potential former UST location on JL Brooks leasehold	Possible former UST vent line present on east side of building. GPR survey did not indicate presence of tank	Asphalt	—	Sample soil in 2-ft intervals up to 12 ft BGS and screen with PID. Test sample with highest PID reading and test for NWTPH-HCID, with follow up NWTPH-G, NWTPH-D, and BTEX analyses, as appropriate. If no elevated PID readings, test sample at capillary fringe.	Test samples for NWTPH-HCID from both borings with appropriate follow up TPH and BTEX testing if positive HCID results.
P-13, P-14, P-15	Near north shoreline of Investigation Area f	Downgradient compliance monitoring wells to evaluate arsenic groundwater conditions.	Gravel	--	--	Dissolved metals (Pb, Cu, Cd, Hg, As, Zn)
F-GC-1, -5	Vicinity of Nugget Boatworks	Surface soil in vicinity of boat maintenance activities	Gravel	0 to 0.5 ft: TBT, in addition to other genral characterization parameters 1 to 2 ft: archive 2 to 3 ft: archive	—	—
P-16	Upgradient of existing piezometer P-3	Upgradient compliance monitoring wells to evaluate arsenic groundwater conditions.	Gravel	--	--	Dissolved metals (Pb, Cu, Cd, Hg, As, Zn)
P-3	Near center of investigation Area f	Previous exceedance of arsenic preliminary groundwater cleanup level.	Gravel	--	--	Dissolved metals (Pb, Cu, Cd, Hg, As, Zn)
INVESTIGATION AREA j						

TABLE 6
SUMMARY OF PLANNED FOCUS AREA SAMPLE LOCATIONS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location ID	Location	Rationale for Sample Collection	Surface Conditions	Shallow Soil (0 to 4 ft BGS) Testing	Deep Soil (≥4 ft BGS) Testing	Groundwater Analyses
J-FA-1, -2	Former fuel and oil UST location	Additional characterization of former UST location based on Ecology comment on draft DGI work plan. Contingent action will not be implemented if sufficient information obtained from PSTL on tank removal.	Gravel	—	Sample soil in 2-ft intervals up to 12 ft BGS and screen with PID. Test sample with highest PID reading and test for NWTPH-HCID, with follow up NWTPH-G, -D and BTEX analyses, as appropriate. If no elevated PID readings, test sample at capillary fringe.	Test samples for NWTPH-HCID from both borings with appropriate follow up TPH and BTEX testing if positive HCID results.
INVESTIGATION AREA l						
L-FA-1, -2	Location of stormwater sumps	General industrial property use and presence of stormwater sumps.	Asphalt	0 to 1 ft: metals (a), TPH-HCID, SVOC, VOC, PCBs; follow up with additional TPH analysis 1 to 2 ft: archive 2 to 4 ft: archive	Archive samples in 2-ft intervals up to 8 ft BGS for possible future testing, depending on shallow soil results.	TPH-HCID, VOC, dissolved metals (Pb, Cu, As, Zn); follow up with additional TPH analysis based on HCID results.
INVESTIGATION AREA m (SUPPLEMENTAL PHASE II ESA)						
M-FA-1, -2	Location of former diesel and gasoline USTs, identified in Ecology files as 1100 13th Street. Jensen and Reynolds building addition constructed over former tank location. Explorations to be as close as practicable to northwest building corner.	Existing documentation inadequate for NFA determination.	Asphalt		Sample soil in 2-ft intervals up to 12 ft BGS and screen with PID. Test sample with highest PID reading and test for NWTPH-G, NWTPH-D and BTEX. If no elevated PID readings, test sample at capillary fringe.	TPH-G, TPH-D and BETX
M-GC-1 through M-GC-4	General characterization throughout Area "m"	Verify Phase I ESA results, which did not identify a high risk of releases to the environment based on previous site activities	Asphalt	0 to 0.5 ft: archive 1 to 2 ft: archive 2 to 3 ft: archive	--	TPH-HCID, VOC, dissolved metals (Pb, Cr, Cu, Cd, Hg, Zn, As); follow up with additional TPH analysis based on HCID results.

(a) Metals to be analyzed (As, Cd, Cu, Hg, Pb, Zn). Groundwater samples will be field filtered and sampled for dissolved metals.

TABLE 7
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Sample Location	Dissolved Metals (a)	Total Metals (a)	Conventional Parameters (b)	SVOCs (c)	cPAHs (d)	HCID (e)	TPH-D (f)	TPH-G (g)	BTEX (h)	VOCs (i)
B-FA-12								X	X	
D-FA-10	X			X		X	X			X
D-FA-11						X	X	X		
D-FA-11b								X	X	
D-FA-11c				X			X			X
D-FA-11e							X			
D-FA-11k							X			
D-FA-14	X			X		X	X			
D-GC-14b	X									
E-FA-2							X		X	
E-FA-2a							X		X	
E-FA-5							X			
F-FA-1	X					X				X
F-FA-13						X				
F-FA-14						X				
G-FA-4	X			X			X			X
G-FA-7	X			X			X			X
J-FA-1						X				
J-FA-2						X				
L-FA-1	X					X				X
L-FA-2	X					X				X
M-1	X					X				X
M-2	X					X				X
M-3	X					X				X
M-4	X					X				X
M-FA-1							X	X	X	
M-FA-2							X	X	X	
P-3	X	X	X							
P-5			X							
P-13	X	X	X							
P-14	X	X	X							
P-15	X	X	X							
P-16	X	X								
P-17	X	X			X					
P-18	X	X			X					
P-19	X	X			X					
P-20	X	X			X					
P-21	X	X		X			X			X
P-22							X		X	
P-23							X		X	
P-24							X		X	
P-25	X	X								

(a) Metals include As, Cd, Cr, Cu, Pb, Hg, Ag, and Zn analyzed by EPA methods series 6000/7000 unless otherwise indicated. Sample portions for dissolved metals analysis were field filtered.

(b) Conventional parameters include ferous iron, alkalinity, total organic carbon, nitrate, and sulfate and were analyzed by EPA methods SM-3500, EPA 310.1, EPA EPA 415.1, EPA 353.2, and EPA 375.2, respectively. Dissolved arsenic was also analyzed as part of the conventional testing.

(c) SVOCs were analyzed by EPA Method 8270.

(d) cPAHs (carcinogenic polynuclear aromatic hydrocarbons) were analyzed by EPA Method 8270-SIM and were centrifuged by the laboratory prior to analysis.

(e) HCID (hydrocarbon identifiacation) were analyzed by NWTPH-HCID.

(f) TPH-Dx (diesel and motor oil range hydrocarbons) were analyzed by method NWTPH-D extended.

(g) TPH-G (gasolune range hydrocarbons) were analyzed by method NWTPH-G.

(h) BTEX (benzene, toluene, ethylbenzene, and xylene) were analyzed by EPA Method 8021.

(i) VOCs (volatile organic hydrocarbons) were analyzed by EPA Method 8260.

TABLE 8
SOIL SCREENING CRITERIA EVALUATION FOR DETECTED CONSTITUENTS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	MTCA Method B Direct Contact (a)	MTCA Protection of Surface Water (b)	Background (c)	Practical Quantitation Limit (d)	Cleanup Screening Level (e)
VOLATILES (mg/kg)					
1,1,1-Trichloroethane	72,000 (f)	3,301	--	0.001	3,301
1,1-Dichloroethane	8,000	--	--	0.001	8,000
Acetone	8,000 (f)	--	--	0.001	8,000
Benzene	18 (g)	0.40	--	0.001	0.40
Carbon Disulfide	8,000	---	--	0.001	8,000
Ethylbenzene	8,000 (f)	60	--	0.001	60
Isopropylbenzene	8,000	--	--	0.001	8,000
m,p-Xylene	160,000 (f, h)	--	--	0.001	160,000
Methyl Ethyl Ketone	48,000	--	--	0.001	48,000
Methylene Chloride	133 (g)	6.97	--	0.001	6.97
o-Xylene	160,000 (e)	--	--	0.001	160,000
Tetrachloroethylene	20 (g)	0.09			0.09
Toluene	16,000 (e)	352	--	0.001	352
Trichloroethene	91 (g)	0.54	--	0.001	0.54
1,2,4-Trimethylbenzene	--	--	--	0.001	--
1,3,5-Trimethylbenzene	--	--	--	0.001	--
4-Isopropyltoluene	--	--	--	0.001	--
n-Butylbenzene	--	--	--	0.001	--
n-Propylbenzene	--	--	--	0.001	--
sec-Butylbenzene	--	--	--	0.001	--
Total Xylenes	--	--	--	0.001	--
TOTAL PETROLEUM HYDROCARBONS (mg/kg)					
Gasoline-range	--	--	--	5.00	30 (i)
Diesel-range	--	--	--	10.00	2,000 (i)
Oil-range	--	--	--	10.00	2,000 (i)
EPH/VPH	--	--	--		--
METALS (mg/kg)					
Arsenic	0.67 (g)	0.08	20 (j)	5.00	20.0
Cadmium	80 (f)	1.28	1.00	0.20	1.28
Chromium III	120,000 (f)	1x10^{6} (k)	48	0.50	120,000
Copper	2,960 (f)	1.38	36	0.20	36
Lead	250 (l)	1,620	17	2.00	250 (l)
Mercury	24 (f)	0.03	0.07	0.05	0.07
Selenium	400 (f)	7.38	--	5.00	7.38
Silver	400 (f)	0.32	--		0.32
Zinc	24,000 (f)	101	85	0.60	101
Barium	--	--	--	--	--
Tributyl tin	--	--	--	--	--
PAHs (mg/kg)					
Naphthalene	1,600.00 (f)	138	--	0.02	138
2-Methylnapthalene	--	--	--	0.02	--
1-Methylnapthalene	--	--	--	0.02	--
Total Napthalene	--	--	--	--	--
Benzo(a)anthracene	TEQ (m)		--	0.02	(m)
Chrysene	TEQ (m)		--	0.02	(m)
Benzo(b)fluoranthene	TEQ (m)		--	0.02	(m)
Benzo(k)fluoranthene	TEQ (m)		--	0.02	(m)
Benzo(a)pyrene	0.14 (g)	0.60	--	0.02	0.14
Indeno(1,2,3-cd)pyrene	TEQ (m)		--	0.02	(m)
Dibenz(a,h)anthracene	TEQ (m)		--	0.02	(m)
cPAH TEQ	0.14	--		--	0.14
SVOCs (mg/kg)					
Acenaphthene	4,800 (f)	66	--	0.02	66
Acenaphthylene	--	--	--	0.02	--
Anthracene	24,000 (f)	12,300	--	0.02	12,300
Benzo[g,h,i]perylene	--	--	--	0.02	--
Fluoranthene	3,200 (f)	89	--	0.02	89
Fluorene	3,200 (f)	547	--	0.02	547
Phenanthrene	--	--	--	0.02	--
Pyrene	2,400 (f)	3,500	--	0.02	2,400
2-Methylnaphthalene	--	--	--	0.02	--
Bis(2-ethylhexyl)pthalate	71 (g)	13	--	--	13
PCBs (mg/kg)					
Aroclor-1254	1.60	0.00033	--	0.04	0.04
TOTAL PCBs (mg/kg)	1.00 (n)	--	--	0.04	1.0
TBT(mg/kg)					
Tributyltin Ion	2.40 (o)	--		0.04	2.40

-- = Soil criteria not established.
Shaded value = selected as cleanup screening level.

(a) MTCA Method B standard formula values based on direct contact (CLARC 3.1, November 2001).
(b) MTCA Method B values based on protection of marine surface water using MTCA equation 747-1 (February 2001).
(c) From Ecology's Natural Background Soil Metals Concentrations in Puget Sound (Ecology 1994). Used 90th percentile for Puget Sound unless noted otherwise.
(d) Practical quantitation limits (PQLs) based on analytical methods used during site investigation.
(e) Preliminary cleanup level based on lowest soil criteria corrected for PQL and background, as indicated by shading.
(f) MTCA Method B soil standard formula value based on criteria as a non-carcinogen.
(g) MTCA Method B soil standard formula value based on criteria as a carcinogen.
(h) Value for m-xylene.
(i) Preliminary cleanup level based on MTCA Method A soil cleanup levels for unrestricted land uses (February 2001) criteria do not exist for this constituent.
(j) MTCA Method A soil cleanup level based on direct contact using equation 740-2 and protection of drinking water using the procedures in WAC 173-340-747(4), adjusted for natural background of soil (Ecology 2001, table 740-1).
(k) Calculated cleanup level is greater than 100% of constituent.
(l) MTCA Method A soil cleanup level based on preventing unacceptable blood lead levels.
(m) In addition to this preliminary cleanup level for individual PAHs, a toxicity equivalency quotient (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) Method A soil cleanup level for unrestricted site use. Value based on applicable federal law.
(o) Direct contact for TBT oxide.

TABLE 9
GROUNDWATER SCREENING CRITERIA EVALUATION FOR DETECTED CONSTITUENTS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	Federal Standards (a)			State Standards					
	Acute	Chronic	Human Health (Consumption of organisms only)	Acute (b)	Chronic (b)	MTCA Method B Surface Water Equation for Human Health (c)	Practical Quantitation Limit (d)	Background Groundwater Concentration e)	Cleanup Screening Level (f)
VOLATILES (µg/L)									
1,1,1-Trichloroethane	--	--	--	--	--	417,000 (g)	1		417,000
1,2-Dichloroethane	--	--	99			59.4 (h)	1		99 (i)
Benzene	--	--	71	--	--	22.7 (h)	1		71 (i)
Ethylbenzene	--	--	29,000	--	--	6,910 (h)	1		6,910
m,p-Xylene	--	--	--	--	--	--	1		--
o-Xylene	--	--	--	--	--	--	1		--
Toluene	--	--	200,000	--	--	48,500 (h)	1		48,500
Total Xylenes	--	--	--	--	--	--	1		--
Trichloroethene	--	--	81	--	--	55.6 (h)	1		81 (i)
Vinyl Chloride	--	--	525	--	--	3.69 (h)	1		36.90 (j)
1,1-Dichloroethane	--	--	--	--	--	--	1		--
1,2,4-Trimethylbenzene	--	--	--	--	--	--	1		--
1,3,5-Trimethylbenzene	--	--	--	--	--	--	1		--
Acetone	--	--	--	--	--	--	1		--
Carbon Disulfide	--	--	--	--	--	--	1		--
cis-1,2-Dichloroethene	--	--	--	--	--	--	1		--
Isopropylbenzene	--	--	--	--	--	--	1		--
n-Propylbenzene	--	--	--	--	--	--	1		--
TOTAL PETROLEUM HYDROCARBONS (mg/L)									
Gasoline-range	--	--	--	--	--	--	0.1		0.8 (k)
Diesel-range	--	--	--	--	--	--	0.1		0.5 (k)
Oil-range	--	--	--	--	--	--	0.25		0.5 (k)
METALS (µg/L)									
Arsenic	69 (l)	36 (l)	0.14	69 (m)	36 (m)	0.0982 (h)	0.2	8	8
Cadmium	42 (l)	9.3 (l)	--	42 (m)	9.3 (m)	20.3 (g)	0.2	2	9.3
Chromium (III)	--	--	--	--	--	24300 (g)	1	10 (n)	24300
Copper	2.4 (l)	2.4 (l)	--	4.8 (m)	3.1 (m)	2,660 (g)	1	20	20
Lead	210 (l)	8.1 (l)	--	210 (m)	8.1 (m)	--	1	10	10
Mercury	1.8 (l)	0.025 (o)	0.15	1.8	0.025	--	0.1	--	0.1
Zinc	90 (f)	81 (f)	--	90 (m)	81 (m)	16,500 (g)	1	160	160
PAHs (µg/L)									
Benzo(a)anthracene	--	--	0.031	--	--	(p)	0.1	--	0.1
Benzo(a)pyrene	--	--	0.031	--	--	0.0296 (p)	0.1	--	0.1
Benzo(b)fluoranthene	--	--	0.031	--	--	(p)	0.1	--	0.1
Benzo(k)fluoranthene	--	--	0.031	--	--	(p)	0.1	--	0.1
Chrysene	--	--	0.031	--	--	(p)	0.1	--	0.1
Dibenz(a,h)anthracene	--	--	0.031	--	--	(p)	0.1	--	0.1
Indeno(1,2,3-cd)pyrene	--	--	0.031	--	--	(p)	0.1	--	0.1
Naphthalene	--	--	--	--	--	4940 (g)	0.1	--	4,940
cPAH TEQ	--	--	--	--	--	--	--	--	0.1

Shaded value = Basis for cleanup screening level
--' = Water Quality Standard or other criteria not established.

(a) All federal standards from 40 CFR 131.36 (November 9, 1999).
(b) Washington State acute and chronic standards from WAC 173-201A-040 (November 18, 1997).
(c) MTCA Method B standard formula values (CLARC, Version 3.1, November 2001).
(d) Practical quantitation limits (PQLs) based on analytical methods used during site investigation.
(e) Groundwater background concentration of Washington State (PTI 1989).
(f) Cleanup level based on lowest Water Quality Standard or PQL on background, indicated by shading, except as noted otherwise.
(g) MTCA Method B surface water standard formula value based on criteria as a non-carcinogen.
(h) MTCA Method B surface water standard formula value based on criteria as a carcinogen.
(i) Cleanup level defered to federal standard because it is considered reasonably protective of human health for carcinogens as described in WAC 173-340-730(5)(b).
(j) Standard adjusted to cancer risk of $1x10^{-5}$ using MTCA Method B equations in accordance with MTCA as presented in Figure 3 of CLARC 2001.
(k) Preliminary cleanup level based on MTCA Method A groundwater cleanup level in accordance with WAC 173-340-730(a)(b)(iii)(c)
(l) The water effect ratio was assumed to be equal to one for these metals.
(m) Indicated criteria are for dissolved fraction.
(n) Listed concentration is for total chromium.
(o) If mercury exceeds 0.012 µg/L more than once in a 3 yr period, see regulations. Criterion expressed as total recoverable mercury.
(p) A toxicity equivalency quotient (TEQ) would be completed for each sample containing carcinogenic PAHs above reporting limits and compared to the benzo(a)pyrene cleanup level in accordance with 173-340-708(8)(e). However, federal criteria are adequately protective, so calculation is not required.

TABLE 10
ENCOUNTERED WOOD DEBRIS
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Boring Location	Depth to Wood Debris (a) Interval(s) (ft BGS)
B-4	3.0 - 4.0
C-2	3.5 - 4.0
C-7	1.5 - 5.5 (b)
C-FA-B	2 - 2.4
D-4	5.0 - 8.0 (b)
D-FA-13	6.4 - 6.7
D-FA-2	2.8 - 2.9
D-FA-6	2.8 - 3.0, 5.7 - 5.9, 7.0 - 7.2
D-GC-2b	3.1 - 3.2, 4.5 - 4.6, 5.5 - 5.6
E-3	3.0 - 8.0 (c)
E-4	6.25 - 6.5, 7.0 - 7.25, 7.5 - 7.75
E-FA-2a	7.0 - 7.2
E-FA-2c	3.3 - 8.0 (b)
F-1	1 - 3.5 (d)
F-2	3.0 - 6.0
F-8	3.7 - 4.0
F-9	1.5 - 2.0, 6.0 - 7.0 (b)
F-FA-10	3.4 - 5.0 (b)
F-FA-11	2.2 - 2.4, 7.1 - 7.4
F-FA-12	4.0 - 5.0 (b)
F-FA-3	1.0 - 3.5
F-FA-5	1.3 - 1.5
F-FA-6	2.0 - 4.5
F-GC-1	1.5 - 2.0
F-GC-10	1.7 - 2.5
F-GC-11	1.0 - 1.8
F-GC-12	1.0 - 1.5
F-GC-6	2.0 - 4.0 (b)
G-1	7.0 - 7.2
G-2	7.5 - 8.0 (e)
G-3	NA
G-GC-2	7.3 - 7.8
H-5	0.0 - 1.5 (b)
J-1	1.5 - 1.8
J-GC-3	7.5 - 7.6
JP-GC-4	3.5 - 4.0 (b)
M-1	1.5 - 1.7
M-FA-2	6.0 - 12.0 (b)
M-GC-3	6.0 - 8.0
M-GC-4	5.4 - 5.6, 6-1 - 6.3
P-10	6.5 - 8.0
P-11	3.0 - 13.0 (a)
P-12	2.0 - 13.0 (a)
P-3	2.5 - 4.0
P-4	8.0 - 8.1, 8.5 - 8.6
P-5	5.5 - 5.6
P-9	8.0 (f)

---

ft BGS = Feet below ground surface
NA = Not Applicable; Wood debris not encountered during boring installation

(a) Wood debris characterized by 1 to 2-inch diameter wood fragments unless otherwise noted.
(b) Wood fibers intermixed with soil.
(c) Intermittent wood debris.
(d) No recovery from 5.0 to 8.0 ft BGS. However, cutting shoe contained wood debris blockage. Also, little resistance to drilling was observed in the 5.0 to 8.0 ft BGS interval, suggesting that this interval may consist primarily of decomposed wood debris.
(e) Black wood debris (no odor).

TABLE 11
SUMMARY OF GROUNDWATER ELEVATION DATA
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Well ID	Total Well Depth (ft)	Date	Time (a)	DTW (b)	Thickness of Product	Top of Casing Elevation (c)	Groundwater Elevation
P-1	13	3/17/2005	15:40	4.86	--	16.95	12.09
P-2	8	3/17/2005	16:18	3.81	--	15.27	11.46
P-3	13	3/17/2005	16:15	4.85	--	16.96	12.11
P-4	13	3/17/2005	15:55	3.62	--	15.2	11.58
P-5	10	3/17/2005	17:20	3.61	--	15.77	12.16
P-7	11	3/17/2005	15:50	4.76	--	14.84	10.08
P-13	13	3/17/2005	17:35	6.21	--	16.84	10.63
P-14	13	3/17/2005	17:27	6.11	--	16.87	10.76
P-15	13	3/17/2005	17:25	6.10	--	16.45	10.35
P-16	13	3/17/2005	16:08	3.68	--	15.98	12.30
P-17	13	3/17/2005	16:48	7.58	--	15.11	7.53
P-18	13	3/17/2005	16:51	6.62	--	15.8	9.18
P-19	13	3/17/2005	16:53	7.51	--	15.88	8.37
P-20	13	3/17/2005	16:45	4.68	--	14.78	10.10
P-21	13	3/17/2005	16:58	5.38	--	14.74	9.36
P-22	13	3/17/2005	17:10	4.71	--	15.59	10.88
P-23	13	3/17/2005	17:09	3.31	--	14.14	10.83
P-24	13	3/17/2005	17:05	3.00	--	13.69	10.69
P-25	13	3/17/2005	15:35	5.15	0.00	15.24	10.09
P-26	13	3/17/2005	16:59	5.40	--	17.29	11.89

DTW = Depth to water
-- = Not Applicable

(a) Low tide was at 16:27 with a height of 1.0 ft MLLW.

(b) Measured from top of casing at the survey point.

(c) Top of casing elevation (ft MSL) surveyed by David Evans and Associates on 3/16/05.

TABLE 12
CONSTRUCTION METHANE CONCENTRATION MONITORING
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Date	Boring Location	Methane (%CH4)	Depth to wood debris (a) interval(s) (ft BGS)
12/23/2003	P1	0.0	NA
12/29/2003	P2	0.0	NA
12/29/2003	P3	3.0	2.5 - 4.0
12/29/2003	P4	0.0	8.0 - 8.1, 8.5 - 8.6
12/29/2003	P5	0.0	5.5 - 5.6
12/29/2003	P6	0.0	NA
12/29/2003	P7	0.0	NA
2/11/2004	P8	0.0	NA
2/11/2004	P9	0.9	8.0 (b)
2/11/2003	P10	0.0	6.5 - 8.0
2/11/2004	P11	0.9	3.0 - 13.0 (a)
2/11/2004	P12	24.0	2.0 - 13.0 (a)
12/23/2003	B-1	0.0	NA
12/23/2003	B-2	0.0	NA
12/23/2003	B-3	0.0	NA
2/11/2004	B-4	7.0	3.0 - 4.0
12/23/2003	C-1	0.0	NA
12/23/2003	C-2	0.2	3.5 - 4.0
12/23/2003	C-3	0.0	NA
2/12/2004	C-6	0.5	NA
2/12/2004	C-7	1.3	1.5 - 5.5 (c)
12/29/2003	D-1	0.0	NA
12/29/2003	D-2	0.0	NA
12/29/2003	D-3	0.3	NA
12/29/2003	D-4	0.2	5.0 - 8.0 (c)
2/11/2004	D-8	0.0	NA
12/22/2003	E-1	0.0	NA
2/12/2004	E-3	0.0	3.0 - 8.0 (d)
2/12/2004	E-4	0.4	6.25 - 6.5, 7.0 - 7.25, 7.5 - 7.75
12/22/2003	F-1	0.0	1-3.5 (e)
12/22/2003	F-2	0.2	3.0-6.0
12/22/2003	F-3	0.0	NA
2/12/2004	F-8	2.3	3.7 - 4.0
2/12/2004	F-9	0.5	1.5 - 2.0, 6.0 - 7.0 (b)
12/22/2003	G-1	0.0	7.0 - 7.2
12/22/2003	G-2	0.0	7.5 - 8.0 (b)
2/11/2004	G-3	0.0	NA
12/23/2003	H-1	0.0	NA
12/23/2003	H-2	0.0	NA
12/22/2003	H-3	0.0	NA
2/11/2004	H-4	0.0	NA
2/11/2004	H-5	0.0	0.0 - 1.5 (c)
2/11/2004	J-1	0.9	1.5 -1.8
2/12/2004	J-2	0.0	NA
2/12/2004	K-1	0.0	NA

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ft BGS = Feet below ground surface.
NA = Not Applicable; Wood debris not encountered during boring installation.

(a) Wood debris characterized by 1- to 2-inch diameter wood fragments unless otherwise noted.
(b) Black wood debris (no odor).
(c) Small fragments of wood intermixed with soil.
(d) Intermittent wood debris.
(e) No recovery from 5.0 to 8.0 ft BGS. However, cutting shoe contained wood debris blockage. Also, little resistance to drilling was observed in the 5.0 to 8.0 ft BGS interval, suggesting that this interval may consist primarily of decomposed wood debris.

Note: The lower explosive limit is equivalent to 5 percent methane, by volume.

TABLE 13
POST-CONSTRUCTION METHANE CONCENTRATION MONITORING
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Date	P1	P2	P3	P4	P5	P6	P7
1/5/2004	0	0	37.4	0	0.2	76	16
1/27/2004	0	0	5.2	0	0.3	66	21

Note: Methane measurements reported as percent by volume methane. The lower explosive limit (LEL = 100%) is equivalent to 5 percent by volume methane.

TABLE 14
DETECTED VOCs AND SVOCs IN GROUNDWATER
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	Cleanup Screening Level (a)	C-3 GE48P 12/23/2003	D-1 GE75A 12/29/2003	D-2 GE75B 12/29/2003	D-3 GE75C 12/29/2003	D-4 GE75D 12/29/2003	D-FA-10 0411208-06 11/9/2004	D-FA-11 0411208-08 11/9/2004	D-FA-11c 0412318-01 12/21/2004	D-FA-14 0411208-09 11/9/2004
VOLATILE ORGANIC COMPOUNDS (µg/L)										
Method 8260B										
Vinyl chloride	36.9	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U
Acetone	---	1.0 U	**5.7**	1.0 U	**2.5**	**1.9**	5.0 U	5.0 U	5.0 U	5.0 U
Carbon disulfide	---	0.2 U	**0.2**	0.2 U	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	---	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	**7.3**
cis-1,2-Dichloroethene	---	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	99	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	417,000	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	**34**
Trichloroethene	81	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	---	0.2 U	0.2 U	0.2 U	0.2 U	**0.4**	NA	NA	NA	NA
1,2,4-Trimethylbenzene	---	0.2 U	0.2 U	0.2 U	0.2 U	**0.9**	NA	NA	NA	NA
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)										
Method 8270C										
Naphthalene	4,940						5.0 U		**10.0**	5.0 U

TABLE 14
DETECTED VOCs AND SVOCs IN GROUNDWATER
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	Cleanup Screening Level (a)	E-4 GI07E 2/12/2004	F-1 GE48D 12/22/2003	F-2 GE48E 12/22/2003	F-3 GE48F 12/22/2003	F-FA-1 HP99C 1/19/2005	G-1 GE48G 12/22/2003	G-2 GE48H 12/22/2003	G-3 GI07G 2/11/2004	J-1 GI07J 2/12/2004
VOLATILE ORGANIC COMPOUNDS (µg/L)										
Method 8260B										
Vinyl chloride	36.9	0.2 U	**0.5**	**17**	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U
Acetone	---	1.0 U	**1.6** M	**2.4**	1.0 U	5.0 U	**2.8**	1.0 U	1.0 U	1.0 U
Carbon disulfide	---	0.2 U	**0.2**	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1-Dichloroethane	---	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,2-Dichloroethene	---	0.2 U	**0.8**	**0.4**	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichloroethane	99	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1,1-Trichloroethane	417,000	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U
Trichloroethene	81	0.2 U	**0.2**	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3,5-Trimethylbenzene	---	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2,4-Trimethylbenzene	---	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)										
Method 8270C										
Naphthalene	4,940								1.1 U	1.1 U

TABLE 14
DETECTED VOCs AND SVOCs IN GROUNDWATER
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	Cleanup Screening Level (a)	J-2 GI07K 2/12/2004	K-1 GI07L 2/12/2004	L-FA-1 HP99B 1/19/2005	L-FA-2 HP99A 1/19/2005	M-1 HP77C 1/18/2005	M-2 HP77B 1/18/2005	M-3 HP77A 1/18/2005	M-4 HP56E 1/17/2005	P-1 GI71A 2/18/2004	P-2 GI71B 2/18/2004
VOLATILE ORGANIC COMPOUNDS (µg/L)											
Method 8260B											
Vinyl chloride	36.9	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	**13**	1.0 U	0.2 U	0.2 U
Acetone	---	1.0 U	1.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U
Carbon disulfide	---	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U
1,1-Dichloroethane	---	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U
cis-1,2-Dichloroethene	---	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U
1,2-Dichloroethane	99	0.2 U	**1.3**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U
1,1,1-Trichloroethane	417,000	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U
Trichloroethene	81	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U
1,3,5-Trimethylbenzene	---	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U
1,2,4-Trimethylbenzene	---	0.2 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)											
Method 8270C											
Naphthalene	4,940	1.1 U	1.1 U								

TABLE 14
DETECTED VOCs AND SVOCs IN GROUNDWATER
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	Cleanup Screening Level (a)	P-4 GI71D 2/19/2004	P-5 GI71E 2/19/2004	Dup of P5 GI71F 2/19/2004	P-7 GI71H 2/18/2004	P-11 GI71K 2/19/2004	P-12 GI71L 2/19/2004	P-21 0412400-01 12/29/2004
VOLATILE ORGANIC COMPOUNDS (µg/L)								
Method 8260B								
Vinyl chloride	36.9	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
Acetone	---	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U
Carbon disulfide	---	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
1,1-Dichloroethane	---	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
cis-1,2-Dichloroethene	---	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
1,2-Dichloroethane	99	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
1,1,1-Trichloroethane	417,000	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
Trichloroethene	81	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
1,3,5-Trimethylbenzene	---	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA
1,2,4-Trimethylbenzene	---	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)								
Method 8270C								
Naphthalene	4,940					1.0 U	1.1 U	5.0 U

Bold indicates detected value.

NA = Not analyzed.

U = Indicates the compound was undetected at the reported concentration.

M = Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match.

(a) See Table 9, Groundwater Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria.

TABLE 15
DETECTED cPAHs IN GROUNDWATER
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

		cPAHs (µg/L) SW8270C-SIM							
Location	Date Collected	Benzo[a] anthracene	Chrysene	Benzo[b] fluoranthene	Benzo[k] fluoranthene	Benzo[a] pyrene	Indeno[1,2,3-cd] pyrene	Dibenz[a,h] anthracene	cPAH TEQ (a)
		Cleanup Screening Level (b):							**0.1**
F-1	12/22/2003	**0.080** J	**0.081** J	**0.029** J	**0.029** J	**0.067** J	**0.021** J	0.010 UJ	**0.084** J
F-2	12/22/2003	**0.027** J	**0.028** J	**0.012** J	**0.012** J	**0.025** J	0.010 UJ	0.010 UJ	**0.030** J
F-3	12/22/2003	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	ND
G-1	12/22/2003	**0.019** J	**0.025** J	**0.012** J	**0.012** J	**0.018** J	0.011 UJ	0.011 UJ	**0.023** J
G-2	12/22/2003	**0.042** J	**0.059** J	**0.034** J	**0.034** J	**0.052** J	**0.031** J	**0.012** J	**0.071** J
D-1	12/29/2003	**0.15** J	**0.20** J	**0.13** J	**0.13** J	**0.19** J	**0.10** J	**0.042** J	**0.26** J
D-2	12/29/2003	**0.017** J	**0.021** J	**0.022** J	**0.21** J	**0.021** J	**0.014** J	0.011 UJ	**0.048** J
D-3	12/29/2003	0.011 UJ	**0.012** J	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	**0.00012** J
D-4	12/29/2003	**0.26** J	**0.24** J	**0.062** J	**0.062** J	**0.070** J	**0.022** J	0.020 UJ	**0.113** J
P-1	2/18/2004	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	ND
P-2	2/18/2004	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	ND
P-3	2/19/2004	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	ND
P-4	2/19/2004	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	ND
P-5	2/19/2004	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	ND
P-5-Dup	2/19/2004	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	ND
P-6	2/19/2004	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	ND
P-7	2/18/2004	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	ND
P-8	2/18/2004	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	0.010 UJ	ND
P-9	2/23/2004	**0.015** J	0.030 UJ	0.022 UJ	**0.018** J	**0.012** J	0.011 UJ	0.011 UJ	**0.015** J
P-10	2/18/2004	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	ND
P-17	1/28/2005	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	ND
P-18	1/28/2005	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	ND
P-18-Dup	1/28/2005	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	ND
P-19	1/28/2005	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	ND
P-20	1/28/2005	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	ND

Box indicates exceedance of cleanup screening level
Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample

(a) Criteria for individual cPAH compounds were not developed. Screening criteria based upon the TEQ (Toxicity Equivalency Quotient)
The TEQ for each sample was calculated based on the following TEFs: Benzo[a]anthracene (0.1), Chrysene (0.01), Benzo[b]fluoranthene (0.1)
Benzo[k]fluoranthene (0.1), Benzo[a]pyrene (1), Indeno[1,2,3-cd]pyrene (0.1), and Dibenz[a,h]anthracene (0.4
(b) See Table 9, Groundwater Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria

TABLE 16
DETECTED METALS IN GROUNDWATER
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location	Date Collected		DISSOLVED METALS (µg/L) SW6000-7000 Series Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
			Cleanup Screening Level (a):						
			8	**9.3**	**24,300**	**20**	**10**	**0.1**	**160**
B-4	2/11/2004	Dissolved					1 U		
C-6	2/12/2004	Dissolved					1 U		
C-7	2/12/2004	Dissolved	**4**	2 U	5 U	**2**	1 U	0.1 U	**12**
D-FA-10	11/9/2004	Dissolved	**1.4**		1.0 U	2.0 U	0.02 U		**16.1**
D-FA-14	11/9/2004	Dissolved	**67.2**		**77.5**	**81.3**	**90.6**		**279**
D-FA-14b	3/3/2005	Dissolved	**3.0**	0.2 U		0.5 U	1 U	0.1 U	4 U
E-3	2/12/2004	Dissolved					1 U		
F-8	2/12/2004	Dissolved	**14**	2 U	5 U	2 U	1 U	0.1 U	6 U
F-FA-1	1/19/2005	Dissolved	**1.4**	0.2 U		0.5 U	1 U	0.1 U	4 U
G-3	2/11/2004	Dissolved	1 U	2 U	5 U	2 U	1 U	0.1 U	6 U
H-4	2/11/2004	Dissolved					1 U		
H-5	2/11/2004	Dissolved					1 U		
J-1	2/12/2004	Dissolved	**2**	2 U	5 U	**4**	1 U	0.1 U	6 U
J-2	2/12/2004	Dissolved	**6**	2 U	5 U	2 U	1 U	0.1 U	6 U
K-1	2/12/2004	Dissolved					1 U		
L-FA-1	1/19/2005	Dissolved	**54**	0.2 U		0.5 U	1 U	0.1 U	**6**
L-FA-2	1/19/2005	Dissolved	**1.2**	0.2 U		**0.7**	1 U	0.1 U	**158**
M-1	1/18/2005	Dissolved	**1.8**	0.2 U		**0.7**	1 U	0.1 U	4 U
M-2	1/18/2005	Dissolved	**14.0**	0.2 U		**0.6**	1 U	0.1 U	4 U
M-3	1/18/2005	Dissolved	**0.8**	0.2 U		0.5 U	1 U	0.1 U	4 U
M-4	1/17/2005	Dissolved	**2.5**	0.2 U		0.5 U	1 U	0.1 U	4 U
P-1	2/18/2004	Dissolved	**1**	2 U	5 U	2 U	1 U	0.1 U	6 U
P-2	2/18/2004	Dissolved	1 U	2 U	5 U	2 U	1 U	0.1 U	6 U
P-2	3/4/2005	Dissolved	0.2 U						
P-3	2/19/2004	Dissolved	**90**	2 U	5 U	2 U	1 U	0.1 U	6 U
P-3	1/24/2005	Total	**62.3**	0.2 U		**2.4**	**1**	0.1 U	**5**
P-3	1/24/2005	Dissolved	**66.7**	0.2 U		**0.9**	1 U	0.1 U	4 U
P-3	3/4/2005	Dissolved	**45.7**						
P-4	2/19/2004	Dissolved	**2**	2 U	5 U	2 U	1 U	0.1 U	6 U
P-5	2/19/2004	Dissolved	**1**	2 U	5 U	2 U	1 U	0.1 U	6 U
P-5-Dup	2/19/2004	Dissolved	**2**	2 U	5 U	2 U	1 U	0.1 U	6 U
P-5	3/4/2005	Dissolved	**0.3**						
P-6	2/19/2004	Dissolved	**4**	2 U	5 U	2 U	1 U	0.1 U	6 U
P-7	2/18/2004	Dissolved	1 U	2 U	5 U	2 U	1 U	0.1 U	6 U
P-8	2/18/2004	Dissolved	1 U	2 U	5 U	2 U	1 U	0.1 U	6 U
P-9	2/23/2004	Dissolved	**146**	4 U	10 U	4 U	1	0.1 U	10 U
P-10	2/18/2004	Dissolved	**4**	2 U	5 U	2 U	1 U	0.1 U	6 U

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TABLE 16
DETECTED METALS IN GROUNDWATER
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			DISSOLVED METALS (µg/L) SW6000-7000 Series						
Location	Date Collected		Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
			Cleanup Screening Level (a):						
			8	**9.3**	**24,300**	**20**	**10**	**0.1**	**160**
P-11	2/19/2004	Dissolved	1 U	2 U	5 U	2 U	1 U	0.1 U	6 U
P-12	2/19/2004	Dissolved	**2**	2 U	5 U	2 U	1 U	0.1 U	6 U
P-13	1/24/2005	Total	**19.0**	**0.4**		**31.6**	**7**	0.1 U	**53**
P-13	1/24/2005	Dissolved	**12.3**	0.2 U		**0.6**	1 U	0.1 U	4 U
P-13	3/4/2005	Dissolved	**9.3**						
P-13-Dup	3/4/2005	Dissolved	**9.6**						
P-14	1/24/2005	Total	**79.7**	**0.2**		**30.8**	**11**	0.1 U	**51**
P-14	1/24/2005	Dissolved	**68.4**	0.2 U		**0.6**	1 U	0.1 U	4 U
P-14	3/4/2005	Dissolved	**71.3**						
P-15	1/24/2005	Total	**39.6**	**0.6**		**62.0**	**24**	0.1	**120**
P-15	1/24/2005	Dissolved	**30.0**	0.2 U		**0.8**	1 U	0.1 U	4 U
P-15	3/4/2005	Dissolved	**22.2**						
P-15-Dup	1/24/2005	Total	**38.1**	**0.6**		**57.6**	**19**	**0.1**	**110**
P-15-Dup	1/24/2005	Dissolved	**29.1**	0.2 U		**0.8**	1 U	0.1 U	4 U
P-16	1/24/2005	Total	**41.5**	**0.2**		**17.4**	**5**	0.1 U	**38**
P-16	1/24/2005	Dissolved	**39.4**	0.2 U		0.5 U	1 U	0.1 U	**5**
P-16	3/4/2005	Dissolved	**32.3**						
P-17	1/28/2005	Total	**13.9** J	0.2 U		**3.3**	1 U	0.1 U	**11**
P-17	1/28/2005	Dissolved	**23.2**	0.2 U		**2.8**	1 U	0.1 U	**10**
P-18	1/28/2005	Total	**4**	1 U		**3**	2 U	0.1 U	20 U
P-18	1/28/2005	Dissolved	**4**	1 U		**4**	5 U	0.1 U	20 U
P-18-Dup	1/28/2005	Total	**4**	1 U		**4**	2 U	0.1 U	20 U
P-18-Dup	1/28/2005	Dissolved	**6**	1 U		**5**	5 U	0.1 U	20 U
P-19	1/28/2005	Total	**7.0**	**0.2**		**27.3**	**8**	0.1 U	**10**
P-19	1/28/2005	Dissolved	0.5 U	0.2 U		**1.8**	1 U	0.1 U	4 U
P-20	1/28/2005	Total	**9.7**	0.2 U		**15.1**	**11**	0.1 U	**42**
P-20	1/28/2005	Dissolved	**3.2**	0.2 U		**0.5**	1 U	0.1 U	**7**
P-21 (b)	12/29/2004	Total	**13.0**	1.0 U	9.4 J	**57.3**	**3.0**	0.20 U	**13.9**
P-21 (b)	12/29/2004	Dissolved	**10.3**	1.0 U	2.0 U	**46.8**	1.0 U	0.20 U	10.0 U
P-26	3/4/2005	Total	**0.6**	0.2 U		**1.6**	1 U	0.1 U	**15**
P-26	3/4/2005	Dissolved	**0.5**	0.2 U		0.5 U	1 U	0.1 U	**13**

Box indicates exceedance of cleanup screening level.
Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration.
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

(a) See Table 9, Groundwater Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria
(b) Dissolved metals and total metals results for sample P-21 were exchanged on this table due to probable error in reporting

TABLE 17
DETECTED PETROLEUM HYDROCARBONS AND BTEX IN GROUNDWATER
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

		PETROLEUM HYDROCARBONS						BTEX (µg/kg)				
		NWTPH-HCID (mg/L)			NWTPH-Dx (mg/L)		NWTPH-G (mg/L)					
Location	Date Collected	Gasoline	Diesel	Motor Oil	Diesel	Motor Oil	Gasoline	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene
		Cleanup Screening Level (a):										
		---	**---**	**---**	**0.5**	**0.5**	**0.8**	**71**	**48,500**	**6,910**	**---**	**---**
B-1	12/23/2003				0.25 U	0.50 U	0.25 U					
B-2	12/23/2003				0.25 U	0.50 U	0.25 U					
B-3	12/23/2003				0.25 U	0.50 U	0.25 U					
B-4	2/11/2004				0.25 U	**0.92**	0.25 U	1.0 U	1.2 U	1.0 U	1.0 U	1.0 U
B-FA-12	1/18/2005						0.25 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
C-1	12/23/2003				0.25 U	0.50 U	0.25 U					
C-2	12/23/2003				0.25 U	0.50 U	0.25 U					
C-3	12/23/2003				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
C-3-Dup	12/23/2003				0.25 U	0.50 U	0.25 U					
C-6	2/12/2004				0.25 U	0.50 U	0.25 U	1.0 U	**1.3**	1.0 U	1.0 U	1.0 U
D-1	12/29/2003				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
D-2	12/29/2003				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
D-3	12/29/2003				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
D-4	12/29/2003				**0.26**	0.50 U	0.25 U	0.2 U	0.2 U	**0.2**	0.4 U	**0.2**
D-FA-10	11/9/2004	0.12 U	**>0.300**	**>0.240**	**0.960**	**0.300**		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
D-FA-11	11/9/2004	**>0.096**	**>0.240**	0.190 U	**6.10**	**0.610**	**0.34**	1.0 U	1.0 U	**3.0**	1.0 U	1.0 U
D-FA-11b	11/9/2004						0.025 U	0.20 U	0.30 U	0.20 U	0.40 U	0.20 U
D-FA-11c	12/21/2004				**0.330**	0.850 U		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
D-FA-11e	12/21/2004				0.230 U	0.930 U						
D-FA-11k	12/21/2004				**0.220**	0.800 U						
D-FA-14	11/9/2004	0.110 U	**>0.270**	**>0.210**	**0.730**	**0.740**		1.0 U	**1.4**	1.0 U	**3.9**	**1.9**
E-1	12/22/2003				0.25 U	0.50 U	0.25 U					
E-2	12/29/2003				0.25 U	0.50 U	0.25 U					
E-3	2/12/2004				0.25 U	0.50 U	0.25 U	1.0 U	1.8 U	1.0 U	1.0 U	1.0 U
E-4	2/12/2004							0.2 U	**3.8**	0.2 U	0.4 U	0.2 U
E-FA-2	1/27/2005				**4.6**	0.50 U		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
E-FA-2a	1/27/2005				0.25 U	0.50 U		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
E-FA-5	1/18/2005				0.25 U	0.50 U						
F-1	12/22/2003				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
F-2	12/22/2003				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
F-3	12/22/2003				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
F-FA-1	1/19/2005	0.25 U	0.63 U	0.63 U				1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
F-FA-13	1/17/2005	0.25 U	0.63 U	0.63 U								
F-FA-14	1/17/2005	0.25 U	0.63 U	0.63 U								
G-1	12/22/2003				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
G-2	12/22/2003				0.25 U	0.50 U	0.25 U	0.2 U	**0.4**	0.2 U	0.4 U	0.2 U
G-3	2/11/2004							0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
H-1	12/23/2003				0.25 U	0.50 U	0.25 U					
H-2	12/23/2003				0.25 U	0.50 U	0.25 U					
H-3	12/22/2003				0.25 U	0.50 U	0.25 U					
H-4	2/11/2004				0.25 U	0.50 U	0.25 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
H-5	2/11/2004				0.25 U	0.50 U	0.25 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ

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TABLE 17
DETECTED PETROLEUM HYDROCARBONS AND BTEX IN GROUNDWATER
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

		PETROLEUM HYDROCARBONS						BTEX (µg/kg)				
		NWTPH-HCID (mg/L)			NWTPH-Dx (mg/L)		NWTPH-G (mg/L)					
Location	Date Collected	Gasoline	Diesel	Motor Oil	Diesel	Motor Oil	Gasoline	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene
		Cleanup Screening Level (a):										
		---	**---**	**---**	**0.5**	**0.5**	**0.8**	**71**	**48,500**	**6,910**	**---**	**---**
J-1	2/12/2004				0.25 U	0.50 U	0.25 U	0.2 U	**1.6**	0.2 U	0.4 U	0.2 U
J-2	2/12/2004				0.25 U	0.50 U	0.25 U	0.2 U	**2.3**	0.2 U	0.4 U	0.2 U
J-FA-1	1/17/2005	0.25 U	0.63 U	0.63 U								
J-FA-2	1/17/2005	0.25 U	0.63 U	0.63 U								
K-1	2/12/2004				0.25 U	0.50 U	0.25 U	0.2 U	**1.2**	0.2 U	0.4 U	0.2 U
L-FA-1	1/19/2005	0.25 U	0.63 U	0.63 U				1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
L-FA-2	1/19/2005	0.25 U	0.63 U	0.63 U				1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
M-1	1/18/2005	0.25 U	0.63 U	0.63 U				1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
M-2	1/18/2005	0.25 U	0.63 U	0.63 U				1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
M-3	1/18/2005	0.25 U	0.63 U	0.63 U				**6.4**	1.0 U	1.0 U	1.0 U	1.0 U
M-4	1/17/2005	0.25 U	0.63 U	0.63 U				1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
M-FA-1	1/17/2005				0.25 U	0.50 U	0.25 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
M-FA-2	1/17/2005				0.25 U	0.50 U	0.25 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
NMW-E	2/19/2004				0.25 U	0.50 U	0.25 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
NMW-W	2/19/2004				0.25 U	0.50 U	0.25 U	1.0 U	**10**	1.0 U	1.0 U	1.0 U
P-1	2/18/2004				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
P-2	2/18/2004				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
P2-1	12/30/2003				0.25 U	0.50 U	0.25 U					
P-3	2/19/2004						0.25 U					
P-4	2/19/2004				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
P-5	2/19/2004				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
P-5-Dup	2/19/2004				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
P-6	2/19/2004						0.25 U					
P-7	2/18/2004				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
P-8	2/18/2004						0.25 U					
P-10	2/18/2004						0.25 U					
P-11	2/19/2004				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
P-12	2/19/2004				0.25 U	0.50 U	0.25 U	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U
P-21	12/29/2004				0.220 U	0.870 U		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
P-22	1/27/2005				0.25 U	0.50 U		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
P-22-Dup	1/27/2005				0.25 U	0.50 U		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
P-23	1/28/2005				0.25 U	0.50 U		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
P-24	1/28/2005				0.25 U	0.50 U		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Box indicates exceedance of cleanup screening level
Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate

(a) See Table 9, Groundwater Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria

TABLE 18
DETECTED VOCs IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	Cleanup Screening Level (a)	D-FA-14 (4-5) 0411208-10 11/9/2004		D-FA-15 (0-1) HQ85L 1/27/2005		L-FA-2 (1.5-2.5) HQ00E/HT11A 1/19/2005	
VOLATILE ORGANIC COMPOUNDS (μg/kg) Method 8260B							
Acetone	8,000,000	13.00	U	**280**		17	U
Carbon disulfide	8,000,000	4.00	U	2.5	U	**2.2**	
1,1-Dichloroethane	8,000,000	4.00	U	**150**		0.6	U
Methyl ethyl ketone	48,000,000	13.0	U	**78**		**5.0**	
1,1,1-Trichloroethane	3,301,000	4.00	U	**460**		0.6	U
Trichloroethene	540	4.00	U	**6.1**	M	0.6	U
Tetrachloroethene	90	4.00	U	**13**		0.6	U
1,3,5-Trimethylbenzene	---	NA		**870**		0.6	U
1,2,4-Trimethylbenzene	---	NA		**2400**		0.6	U
Isopropylbenzene	8,000,000	NA		**200**		0.6	U
n-Propylbenzene	---	NA		**400**		0.6	U
sec-Butylbenzene	---	NA		**95**		0.6	U
4-Isopropyltoluene	---	NA		**72**		0.6	U
n-Butylbenzene	---	NA		**240**	M	0.6	U
Naphthalene	138,000	NA		**280**		3.0	U

Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration.
M = Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match.

(a) See Table 8, Soil Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria.

TABLE 19
DETECTED PCBs IN SOIL
DATA GAPS INVESTIGATION
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	Cleanup Screening Level (a)	D-FA-14 (4-5) 0411208-10 11/9/2004	D-FA-15 (0-1) HQ85L 1/27/2005	L-FA-2 (1.5-2.5) HQ00E/HT11A 1/19/2005	D-5 (0-0.5) GE76G 12/30/2003	D-6 (0-0.5) GE76H 12/30/2003	D-7 (0-0.5) GE76I 12/30/2003	G-3 (2.5-3.5) GI08M 2/11/2004	I-X 0 GI08T 2/12/2004	I-Y 0 GI08U 2/12/2004	P-10 3 GI08O 2/11/2004
PCBs (µg/kg)											
Method SW8082											
Aroclor-1254	40	21.0 U	81 U	33 U	36 U	35 U	36 U	$\boxed{\textbf{110}}$	67 U	40 U	36 U
Total PCBs	1,000	ND	ND	ND	ND	ND	ND	**110**	ND	ND	ND

Box indicates exceedance of cleanup level.
Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration

(a) See Table 8, Soil Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria

TABLE 20
DETECTED SVOCS IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			SVOCs (µg/kg)											
Location	Depth (ft)	Date Collected	Naphthalene	2-Methyl naphthalene	1-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo [g,h,i] perylene	bis(2-Ethylhexyl) phthalate	Fluoranthene	Fluorene	Phenanthrene	Pyrene
			Cleanup Screening Level (a):											
			138,000	**---**	**---**	**66,000**	**---**	**1.23E+07**	**---**	**13,000**	**89,000**	**547,000**	**---**	**2.40E+06**
D-FA-10	(0-0.5)	11/9/2004	**120**	**100**		**590**	**280**	**1,500**	**7,100** J		**60,000** J	**790**	**25,000** J	**72,000** J
D-FA-10	(1-2)	11/9/2004	7.0 UJ	7.0 UJ		7.0 UJ	7.0 UJ	7.0 UJ	7.0 UJ		7.0 UJ	7.0 UJ	7.0 UJ	7.0 UJ
D-FA-11	(1-2)	11/9/2004	**19** J	**14** J		**12** J	7.0 UJ	**31** J	**140** J		**140** J	**11.0** J	**120** J	**300** J
D-FA-11c	(3.5-4.0)	1/27/2005	**730**	**6,500**	**6,700**									
D-FA-11n	(3-4)	1/27/2005	**3,000**	**14,000**	**11,000**									
D-FA-14	(4-5)	11/9/2004	**20**	8.0 U		8.0 U	8.0 U	8.0 U	8.0 U	430 U	8.0 U	8.0 U	8.0 U	8.0 U
D-FA-15	(0-1)	1/27/2005								**2,400**	1800 U			
D-GC-2	(0.8-1.0)	1/27/2005	**1,400** J	**23,000** J	**22,000** J									
D-GC-3	(0-0.5)	11/9/2004	**24**	**17**		**8.0**	7.0 U	**24**	**230**		**200**	**7.0**	**150**	**320**
D-GC-3	(1-2)	11/9/2004	**54** J	**33** J		7.0 UJ	7.0 UJ	**14** J	**59** J		**38** J	7.0 UJ	**48** J	**150** J
D-GC-4	(1-1.5)	11/9/2004	7.0 U	7.0 U		7.0 U	7.0 U	7.0 U	7.0 U		7.0 U	7.0 U	**12**	**17**
D-GC-5	(0-0.5)	11/9/2004	29 U	29 U		29 U	29 U	**53**	**220**		**170**	29 U	**130**	**280**
D-GC-5	(1-2)	11/9/2004	8.0 UJ	8.0 UJ		8.0 UJ	8.0 UJ	8.0 UJ	8.0 UJ		8.0 UJ	8.0 UJ	8.0 UJ	8.0 UJ
D-GC-8	(0-0.5)	11/9/2004	**16**	**8.0**		**12**	7.0 U	**40**	**100**		**350**	**12**	**190**	**400**
D-GC-8	(1-2)	11/9/2004	14 UJ	14 UJ		14 UJ	14 UJ	14 UJ	14 UJ		**19** J	14 UJ	**24** J	**54** J
D-GC-9	(0-0.5)	11/9/2004	**120**	**66**		**25**	**8.0**	**48**	**150**		**230**	**13**	**320**	**260**
D-GC-9	(1-2)	11/9/2004	8.0 U	8.0 U		8.0 U	8.0 U	8.0 U	**10**		**25**	8.0 U	**8.0**	**27**
D-GC-10	(0-0.5)	11/9/2004	**47**	**25**		**17**	**22**	**62**	**450**		**530**	**23**	**390**	**1,000**
D-GC-10	(1-2)	11/9/2004	**310**	**51**		7.0 U	7.0 U	**29**	**10**		**130**	7.0 U	**250**	**77**
D-GC-11	(0-0.5)	11/9/2004	**28**	**37**		**31**	**29**	**1,200**	**340**		**4,900**	**200**	**1,000**	**6,900**
D-GC-11	(1-2)	12/17/04	8 UJ			8 UJ	8 UJ	**9** J	**78** J		**140** J	8 UJ	**51** J	**160** J
E-GC-4c	(3.5-4.0)	1/12/2005	**200**	**560**	**1,100**									
E-GC-4d	(3.5-4.0)	1/12/2005	**690** M	**1,400**	**2,500**									
E-GC-4g	(3.5-4.0)	1/12/2005	64 U	64 U	64 U									
F-FA-6	(1-2)	1/13/2005	**240**	74 U	74 U									
F-FA-10	(2-3)	1/17/2005	**660**	**170**	**120**									
G-GC-1	(1.5-2.0)	3/2/2005			64 U									
L-FA-2	(1.5-2.5)	1/19/2005								64 U	64 U			
I-X	(1.2-3) (b)	2/12/2004								140 U	140 U			
I-Y	(3-4) (c)	2/12/2004								81 U	81 U			
TP-7		11/11/2004	**3,300**	**1,500**		**1,500**	**97**	**770**	**91**		**980**	**1,200**	**3,400**	**1,300**

Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration.
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate.
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M = Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match.

(a) See Table 8, Soil Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria.
(b) Sample is a composite collected from boring locations SS-5, SS-12 and SS-14 from sampling intervals 1.2-5, 1.4-2.8, and 1.6-2.4, respectively.
(c) Sample is a composite collected from boring locations SS-5, SS-12, and SS-14 from sampling intervals 2.6-4.0, 2.8-4.0, and 2.4-4.0, respectively.

TABLE 21
DETECTED cPAHs IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			cPAHs (µg/kg) SW8270C-SIM							
Location	Depth (ft)	Date Collected	Benzo[a] anthracene	Chrysene	Benzo[b] fluoranthene	Benzo[k] fluoranthene	Benzo[a] pyrene	Indeno[1,2,3-cd] pyrene	Dibenz[a,h] anthracene	cPAH TEQ (b)
							Cleanup Screening Level (a):			137
B-FA-1	(0-0.5)	1/14/2005	74 U	74 U	74 U	74 U	74 U	74 U	74 U	ND
B-FA-2	(0-0.5)	1/14/2005	**87**	**170**	**160**	**160**	**110**	72 U	72 U	**152**
B-FA-2	(1-2)	1/14/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
B-FA-3	(0-0.5)	1/14/2005	**550**	**760**	**740**	**740**	**680**	**420**	**120**	**981**
B-FA-3	(1-2)	1/14/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
B-FA-4	(0-0.5)	1/14/2005	99 U	**150**	99 U	99 U	99 U	99 U	99 U	**1.5**
B-FA-5	(0.9-1.4)	1/14/2005	71 U	71 U	71 U	71 U	71 U	71 U	71 U	ND
B-FA-6	(0-0.5)	1/14/2005	70 U	70 U	70 U	70 U	70 U	70 U	70 U	ND
B-FA-7	(0-0.5)	1/14/2005	75 U	75 U	75 U	75 U	75 U	75 U	75 U	ND
B-FA-8	(0-0.5)	1/14/2005	71 U	71 U	71 U	71 U	71 U	71 U	71 U	ND
B-FA-9	(0-0.5)	1/19/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
B-GC-1	(1-1.5)	1/14/2005	70 U	70 U	70 U	70 U	70 U	70 U	70 U	ND
B-GC-2	(0-0.5)	9/10/2004	**34**	**38**	**23**	16 U	**30**	16 U	16 U	**36**
C-5	(0-0.5)	12/29/2003	7.2 U	**31**	**15**	**15**	**23**	7.2 U	7.2 U	**26**
C-7	(2.5-3.5)	2/12/2004	**29**	**48**	**26**	**27**	**28**	**18**	7.6 U	**38**
C-FA-1	(0-0.5)	1/12/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
C-FA-2	(0-0.5)	1/12/2005	**1,300**	**1,300**	**870**	**840**	**760**	490 U	490 U	**1,074**
C-FA-2	(1-2)	1/12/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
C-FA-3	(0-0.5)	1/12/2005	**87**	**160**	**140**	**130**	66 U	66 U	66 U	**37**
C-FA-4	(0-0.5)	1/12/2005	**93**	**180**	**240**	**220**	**160**	**120**	63 U	**229**
C-FA-4	(1-2)	1/12/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
C-FA-5	(0-0.5)	1/12/2005	**130**	**240**	**240**	**180**	**130**	64 U	64 U	**187**
C-FA-5	(1-2)	1/12/2005	63 U	63 U	63 U	63 U	63 U	63 U	63 U	ND
C-FA-6	(1.1-1.6)	1/14/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
C-FA-9	(1.1-1.6)	1/14/2005	63 U	63 U	63 U	63 U	63 U	63 U	63 U	ND
C-GC-1	(0.6-1.1)	1/14/2005	73 U	73 U	73 U	73 U	73 U	73 U	73 U	ND
C-GC-2	(0-0.5)	9/10/2004	**20**	**22**	14 U	14 U	14 U	14 U	14 U	**2.2**
C-GC-3	(0-0.5)	9/10/2004	**370**	**610**	**340**	**290**	**500**	**220**	37 U	**628**
C-GC-3	(1-2)	9/10/2004	**30**	**46**	**25**	**22**	**28**	**22**	8 U	**38**
C-GC-4	(0-0.5)	9/10/2004	**43**	**110**	36 U	36 U	36 U	36 U	36 U	**5.4**
C-GC-5	(1.4-1.9)	1/12/2005	63 U	63 U	63 U	63 U	63 U	63 U	63 U	ND
C-GC-6	(1-1.5)	1/12/2005	**83**	**120**	**140**	**120**	**130**	**120**	65 U	**178**
C-GC-6	(2-3)	1/12/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
C-GC-7	(0-0.5)	9/10/2004	**39**	**61**	37 U	37 U	37 U	37 U	37 U	**4.5**
D-3	(3.4-3.6)	12/29/2003	**200** J	**370** J	**340** J	**340** J	**220** J	**120** J	87 UJ	**324** J
D-4	(4-5)	12/29/2003	**3,900** J	**3,200** J	**1,700** J	**1,200** J	**1,300** J	**260** J	**210** J	**2,122** J
D-5	(0-0.5)	12/30/2003	**680**	**1,300**	**1,100**	**750**	**590**	**230**	**84**	**913**
D-6	(0-0.5)	12/30/2003	**810**	**1,100**	**980**	**770**	**760**	**300**	**120**	**1,105**
D-7	(0-0.5)	12/30/2003	**1,600**	**3,400**	**1,900**	**1,200**	**950**	**370**	**130**	**1,543**
D-8	(2.5-3.5)	2/11/2004	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U	ND
D-FA-5	(0-0.5)	1/27/2005	**1,500**	**2,300**	**1,100**	**1,100**	**770**	**210**	**76**	**1,214**
D-FA-5	(1-2)	1/27/2005	**6,700**	**15,000**	**5,000**	**5,000**	**6,600**	**2,800**	**1,200**	**9,180**
D-FA-5	(2-3)	1/27/2005	**140**	**210**	**120**	**120**	**140**	**65**	64 U	**187**

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TABLE 21
DETECTED cPAHs IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			cPAHs (µg/kg) SW8270C-SIM							
Location	Depth (ft)	Date Collected	Benzo[a] anthracene	Chrysene	Benzo[b] fluoranthene	Benzo[k] fluoranthene	Benzo[a] pyrene	Indeno[1,2,3-cd] pyrene	Dibenz[a,h] anthracene	cPAH TEQ (b)
						Cleanup Screening Level (a):				**137**
D-FA-5	(3-5)	1/27/2005	**66** J	**99** J	**94** J	**74** J	**63** J	66 UJ	66 UJ	**87**
D-FA-6	(0-0.5)	1/27/2005	**550**	**1,100**	**600**	**600**	**390**	**110**	64 U	**587**
D-FA-6	(1-2)	1/27/2005	**1,600**	**1,900**	**1,100**	**940**	**740**	**170**	**80**	**1,172**
D-FA-6	(2-3)	1/27/2005	**1,900**	**2,800**	**1,300**	**1,300**	**1,400**	**360**	**180**	**1,986**
D-FA-6	(4-6)	1/27/2005	**350** J	**430** J	**340** J	**190** J	**340** J	**81** J	63 UJ	**440**
D-FA-7	(0-0.5)	1/24/2005	**210**	**330**	**240**	**240**	**260**	**97**	65 U	**342**
D-FA-7	(1-2)	1/24/2005	**300**	**600**	**400**	**400**	**290**	**67**	64 U	**413**
D-FA-7	(2-3)	1/24/2005	**320**	**420**	**280**	**320**	**320**	**190**	**65**	**461**
D-FA-7	(3-5)	1/24/2005	**95** J	**200** J	**97** J	**97** J	**93** J	65 UJ	65 UJ	**124**
D-FA-7	(7-9)	1/24/2005	**93** J	**140** J	**81** J	**81** J	**95** J	66 UJ	66 UJ	**122**
D-FA-8	(0-0.5)	1/24/2005	**100**	**190**	**170**	**170**	**130**	**150**	65 U	**191**
D-FA-8	(1-2)	1/24/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
D-FA-10	(0-0.5)	11/9/2004	**8,100** J	**25,000** J	**14,000** J	**11,000** J	**6,500** J	**6,400** J	**1,600**	**11,340**
D-FA-10	(1-2)	11/9/2004	7.0 UJ	7.0 UJ	7.0 UJ	7.0 UJ	7.0 UJ	7.0 UJ	7.0 UJ	ND
D-FA-11	(1-2)	11/9/2004	**100** J	**140** J	**130** J	**73** J	**100** J	**110** J	7.0 UJ	**143** J
D-FA-11c	(3.5-4.0)	1/27/2005								
D-FA-11n	(3-4)	1/27/2005								
D-FA-12	(0-0.5)	1/24/2005	**67**	**180**	**140**	**140**	**78**	**70**	65 U	**122**
D-FA-13	(0-0.5)	1/27/2005	**1,800** J	**2,900** J	**2,000** J	**2,000** J	**2,000** J	**820** J	**350** J	**2,831** J
D-FA-13	(1-2)	1/27/2005	65 UJ	65 UJ	65 UJ	65 UJ	65 UJ	65 UJ	65 UJ	ND
D-FA-14	(4-5)	11/9/2004	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	8.0 U	ND
D-GC-1	(0-0.5)	1/27/2005	**840**	**950**	**790**	**790**	**850**	**210**	**93**	**1,160**
D-GC-1	(1-2)	1/27/2005	**100**	**170**	**100**	**120**	**100**	65 U	65 U	**134**
D-GC-2	(0-0.5)	1/27/2005	**170**	**390**	**310**	**310**	**290**	**150**	65 U	**388**
D-GC-2	(0.8-1.0)	1/27/2005	**3,600** J	**3,700** J	**2,500** J	**2,500** J	**2,100** J	**820** J	160 UJ	**3,079** J
D-GC-2	(1-2)	1/27/2005	**96**	**170**	**160** M	**160** M	**130** M	85 U	85 U	**173**
D-GC-2	(2-3)	1/27/2005	65 UJ	65 UJ	65 UJ	65 UJ	65 UJ	65 UJ	65 UJ	ND
D-GC-3	(0-0.5)	11/9/2004	**100**	**200**	**190**	**120**	**120**	**170**	7.0 U	**180**
D-GC-3	(1-2)	11/9/2004	**17** J	**47** J	**57** J	**28** J	**15** J	**41.0** J	7.0 UJ	**30** J
D-GC-4	(1-1.5)	11/9/2004	7.0 U	**17**	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	**0.2**
D-GC-5	(0-0.5)	11/9/2004	**81**	**260**	**230**	**78**	**97**	**130**	29 U	**152**
D-GC-5	(1-2)	11/9/2004	8.0 UJ	8.0 UJ	8.0 UJ	8.0 UJ	8.0 UJ	8.0 UJ	8.0 UJ	ND
D-GC-6	(0-0.5)	1/24/2005	**180**	**380**	**260**	**260**	**200**	**100**	65 U	**284**
D-GC-6	(1-2)	1/24/2005	**450**	**1,100**	**580**	**580**	**440**	**140**	**66**	**652**
D-GC-6	(2-3)	1/24/2005	64 U	64 U	64 U	64 U	64 U	64 U	64 U	ND
D-GC-7	(0-0.5)	1/27/2005	62 U	**110**	**87**	**93**	62 U	62 U	62 U	**19**
D-GC-8	(0-0.5)	11/9/2004	**150**	**210**	**170**	**110**	**130**	**86**	**27**	**195**
D-GC-8	(1-2)	11/9/2004	14 UJ	**34** J	14 UJ	14 UJ	14 UJ	14 UJ	14 UJ	**0.3**
D-GC-9	(0-0.5)	11/9/2004	**100**	**160**	**120**	**93**	**100**	**97**	**33.0**	**156**
D-GC-9	(1-2)	11/9/2004	**16**	**18**	**14**	**10**	**14**	8.0 U	8.0 U	**18**
D-GC-10	(0-0.5)	11/9/2004	**380**	**490**	**400**	**300**	**390**	**360**	**110**	**583**
D-GC-10	(1-2)	11/9/2004	**23**	**39**	**20**	**11**	**12**	**8.0**	7.0 U	**19**
D-GC-11	(0-0.5)	11/9/2004	**1,500**	**2,100**	**1,400**	**700**	**790**	**340**	**120**	**1,253**

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TABLE 21
DETECTED cPAHs IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			cPAHs (µg/kg) SW8270C-SIM							
Location	Depth (ft)	Date Collected	Benzo[a] anthracene	Chrysene	Benzo[b] fluoranthene	Benzo[k] fluoranthene	Benzo[a] pyrene	Indeno[1,2,3-cd] pyrene	Dibenz[a,h] anthracene	cPAH TEQ (b)
			Cleanup Screening Level (a):							**137**
D-GC-11	(1-2)	12/17/04	**90** J	**100** J	**91** J	**62** J	**84** J	**67** J	**26** J	**126** J
D-GC-12	(0-0.5)	1/27/2005	**130**	**190**	**150**	**150**	**130**	64 U	64 U	**175**
D-GC-12	(1-2)	1/27/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
E-GC-1	(0-0.5)	1/12/2005	64 U	64 U	64 U	64 U	64 U	64 U	64 U	ND
E-GC-2	(0-0.5)	1/12/2005	63 U	63 U	63 U	63 U	63 U	63 U	63 U	ND
E-GC-3	(0-0.5)	1/12/2005	64 U	64 U	64 U	64 U	64 U	64 U	64 U	ND
E-GC-4	(0.5-1.0)	1/12/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
E-GC-4	(1.5-2.5)	1/12/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
E-GC-4c	(3.5-4.0)	1/12/2005								
E-GC-4d	(3.5-4.0)	1/12/2005								
E-GC-4g	(3.5-4.0)	1/12/2005								
E-GC-5	(1.5-2.0)	1/12/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
F-4	(0-0.5)	12/30/2003	**210**	**260**	**270**	**210**	**220**	**110**	**45**	**321**
F-5	(0-0.5)	12/30/2003	**82** J	**140** J	**120** J	**77** J	**87** J	51 UJ	51 UJ	**1.4** J
F-6	(0-0.5)	12/30/2003	**12**	**25**	**24**	**17**	**9.1**	7.0 U	7.0 U	**15**
F-9	(2.5-3.5)	2/12/2004	7.7 U	7.7 U	7.7 U	7.7 U	7.7 U	7.7 U	7.7 U	ND
F-FA-1	(0.8-1.3)	1/19/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
F-FA-3	(0-0.5)	1/13/2005	69 U	69 U	69 U	69 U	69 U	69 U	69 U	ND
F-FA-4	(0-0.5)	1/18/2005	63 U	63 U	63 U	63 U	63 U	63 U	63 U	ND
F-FA-5	(0.7-1.2)	1/13/2005	69 U	69 U	69 U	69 U	69 U	69 U	69 U	ND
F-FA-6	(1-2)	1/13/2005	**76**	**100**	74 U	74 U	74 U	74 U	74 U	**8.6**
F-FA-8	(0-0.5)	1/13/2005	74 U	**90**	74 U	74 U	74 U	74 U	74 U	**0.9**
F-FA-9	(0-0.5)	1/18/2005	64 U	**68**	64 U	64 U	64 U	64 U	64 U	**0.7**
F-FA-10	(0-1)	1/17/2005	71 U	71 U	71 U	71 U	71 U	71 U	71 U	ND
F-FA-10	(2-3)	1/17/2005	**130**	**180**	**87**	86 U	86 U	86 U	86 U	**24**
F-FA-11	(0-1)	1/17/2005	72 U	72 U	72 U	72 U	72 U	72 U	72 U	ND
F-FA-12	(0-0.5)	1/17/2005	70 U	70 U	70 U	70 U	70 U	70 U	70 U	ND
F-GC-1	(0-0.5)	1/14/2005	70 U	70 U	70 U	70 U	70 U	70 U	70 U	ND
F-GC-2	(1-1.5)	1/19/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
F-GC-3	(0-0.5)	1/13/2005	70 U	70 U	70 U	70 U	70 U	70 U	70 U	ND
F-GC-4	(0.7-1.2)	1/19/2005	61 U	61 U	61 U	61 U	61 U	61 U	61 U	ND
F-GC-5	(0-0.5)	1/13/2005	**75**	**110**	**83**	**71** J	**97**	72 U	72 U	**121**
F-GC-6	(0-0.5)	1/14/2005	71 U	71 U	71 U	71 U	71 U	71 U	71 U	ND
F-GC-7	(0-0.5)	1/13/2005	69 U	**84**	69 U	69 U	69 U	69 U	69 U	**0.8**
F-GC-8	(0.8-1.3)	1/13/2005	84 U	84 U	84 U	84 U	84 U	84 U	84 U	ND
F-GC-9	(1.5-2.0)	1/13/2005	79 U	79 U	79 U	79 U	79 U	79 U	79 U	ND
F-GC-10	(2.5-3.0)	1/13/2005	**100**	**160**	**140**	**110**	**100**	**96**	80 U	**146**
F-GC-10	(3.5-4.5)	1/13/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
F-GC-11	(0-0.5)	1/13/2005	70 U	70 U	70 U	70 U	70 U	70 U	70 U	ND
F-GC-12	(0-0.5)	1/13/2005	80 U	80 U	80 U	80 U	80 U	80 U	80 U	ND
F-GC-13	(0-1)	1/17/2005	**330**	**340**	**440**	**460**	**400**	**140**	72 U	**540**
F-GC-13	(1-2)	1/17/2005	**280**	**340**	**300**	**300**	**390**	190 U	190 U	**480**
F-GC-13	(2-3)	1/17/2005	**560** J	**1,900** J	**670** J	**670** J	**500** J	**260** J	**110** J	**779** J

TABLE 21
DETECTED cPAHs IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			cPAHs (µg/kg) SW8270C-SIM							
Location	Depth (ft)	Date Collected	Benzo[a] anthracene	Chrysene	Benzo[b] fluoranthene	Benzo[k] fluoranthene	Benzo[a] pyrene	Indeno[1,2,3-cd] pyrene	Dibenz[a,h] anthracene	cPAH TEQ (b)
			Cleanup Screening Level (a):							**137**
F-GC-13b	(0-0.5)	3/3/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
F-GC-13c	(0-0.5)	3/3/2005	**130**	**390**	**320**	**170**	**160**	**140**	63 U	**240**
F-GC-13d	(3-4)	3/3/2005	64 U	64 U	64 U	64 U	64 U	64 U	64 U	ND
G-3	(2.5-3.5)	2/11/2004	**51**	**71**	**63**	**52**	**47**	**32**	9.5 U	**68**
G-GC-1	(1.5-2.0)	3/2/2005	64 U	64 U	64 U	64 U	64 U	64 U	64 U	ND
G-GC-2	(1.4-1.9)	3/2/2005	62 U	62 U	62 U	62 U	62 U	62 U	62 U	ND
G-GC-3	(1.0-1.5)	3/2/2005	62 U	62 U	62 U	62 U	62 U	62 U	62 U	ND
H-GC-1	(0.8-1.3)	1/13/2005	70 U	70 U	70 U	70 U	70 U	70 U	70 U	ND
H-GC-2	(1-1.5)	1/14/2005	71 U	71 U	71 U	71 U	71 U	71 U	71 U	ND
H-GC-3	(0-0.5)	9/10/2004	35 U	**74**	35 U	35 U	35 U	35 U	35 U	**0.7**
H-GC-4	(0-0.5)	9/10/2004	**34**	**39**	**28**	**29**	**38**	15 U	15 U	**47**
H-GC-5	(0.8-1.3)	1/13/2005	72 U	72 U	72 U	72 U	72 U	72 U	72 U	ND
I-3	(0-0.5)	2/12/2004	**19**	**40**	**40**	**28**	**19**	**13**	8.4 U	**29**
I-Z	(0-0.5)	2/12/2004	**21**	**31**	**28**	**15**	**17**	**10**	8.7 U	**25**
J-GC-1	(0.5-1)	1/14/2005	66 U	**74**	66 U	66 U	66 U	66 U	66 U	0.7
J-GC-2	(0-0.5)	3/2/2005	64 U	64 U	64 U	64 U	64 U	64 U	64 U	ND
J-GC-3	(0-0.5)	3/2/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
J-GC-4	(1.5-2)	3/3/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
JP-1	(0-0.5)	12/23/2003	7.1 U	7.1 U	7.1 U	7.1 U	7.1 U	7.1 U	7.1 U	ND
JP-GC-1	(1-1.5)	1/12/2005	62 U	62 U	62 U	62 U	62 U	62 U	62 U	ND
JP-GC-2	(1.5-2)	1/12/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
JP-GC-3	(0-0.5)	9/10/2004	**38**	**47**	**42**	**24**	**36**	14 U	14 U	**47**
JP-GC-4	(0.5-1)	1/12/2005	64 U	64 U	64 U	64 U	64 U	64 U	64 U	ND
JP-GC-5	(0.5-1)	1/12/2005	63 U	63 U	63 U	63 U	63 U	63 U	63 U	ND
JP-GC-6	(0-0.5)	9/10/2004	**21**	**26**	15 U	15 U	**22**	15 U	15 U	**24**
K-GC-1	(0-0.5)	9/10/2004	**39**	**85**	35 U	35 U	35 U	35 U	35 U	**4.8**
K-GC-2	(0.5-1)	1/14/2005	72 U	**180**	72 U	72 U	72 U	72 U	72 U	**1.8**
L-GC-1	(0.5-1)	1/19/2005	61 U	**140**	61 U	61 U	61 U	61 U	61 U	**1.4**
L-GC-2	(0-0.5)	1/19/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
L-GC-3	(0.7-1.4)	1/19/2005	60 U	60 U	60 U	60 U	60 U	60 U	60 U	ND
L-GC-4	(0-0.5)	1/19/2005	60 U	60 U	60 U	60 U	60 U	60 U	60 U	ND
L-GC-5	(0.5-1)	1/19/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
M-1	(0.3-0.8)	1/18/2005	66 U	66 U	66 U	66 U	66 U	66 U	66 U	ND
M-2	(0-0.5)	1/18/2005	**130**	**210**	**120**	**120**	**180**	**95**	64 U	**229**
M-2	(1-2)	1/18/2005	64 UJ	64 UJ	64 UJ	64 UJ	64 UJ	64 UJ	64 UJ	ND
M-3	(0-0.5)	1/18/2005	64 U	64 U	64 U	64 U	64 U	64 U	64 U	ND
M-4	(0.8-1.3)	1/17/2005	62 UJ	62 UJ	62 UJ	62 UJ	62 UJ	62 UJ	62 UJ	ND
M-GC-1	(1.6-2.1)	3/3/2005	63 U	63 U	63 U	63 U	63 U	63 U	63 U	ND
M-GC-2	(1.5-2)	3/2/2005	62 U	62 U	62 U	62 U	62 U	62 U	62 U	ND
M-GC-3	(1-1.5)	3/3/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
M-GC-4	(1.5-2)	3/2/2005	65 U	65 U	65 U	65 U	65 U	65 U	65 U	ND
M-GC-5	(1-1.5)	3/2/2005	64 U	64 U	64 U	64 U	64 U	64 U	64 U	ND
P-8	(2.5-3.5)	2/11/2004	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U	ND

TABLE 21
DETECTED cPAHs IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Location	Depth (ft)	Date Collected	Benzo[a] anthracene	Chrysene	Benzo[b] fluoranthene	Benzo[k] fluoranthene	Benzo[a] pyrene	Indeno[1,2,3-cd] pyrene	Dibenz[a,h] anthracene	cPAH TEQ (b)
			cPAHs (µg/kg) SW8270C-SIM							
			Cleanup Screening Level (a):							**137**
P-8	(0-0.5)	2/11/2004	**7.2** J	**9.9**	7.6 U	7.6 U	7.6 U	7.6 U	7.6 U	**0.8**
P-9	(2.5-3.5)	2/11/2004	**81**	**120**	**100**	**72**	**53**	**33**	8.0 U	**83**
P-10	(2.5-3.5)	2/11/2004	**11**	**19**	**9.8**	**9.8**	**9.3**	7.2 U	7.2 U	**13**
TP-7		11/11/2004	**180**	**220**	**130**	**70**	**94**	**57**	8.0	**140**

Box indicates exceedance of cleanup screening level.
Bold indicates detected value.
ND = Not Detected.
U = Indicates the compound was undetected at the reported concentration.
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate.
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

(a) See Table 8, Soil Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria.
(b) The TEQ for each sample was calculated based on the following TEFs: Benzo[a]anthracene (0.1), Chrysene (0.01), Benzo[b]fluoranthene (0.1), Benzo[k]fluoranthene (0.1), Benzo[a]pyrene (1), Indeno[1,2,3-cd]pyrene (0.1), and Dibenz[a,h]anthracene (0.4)

TABLE 22
DETECTED METALS IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			TOTAL METALS (mg/kg) SW6000-7000 Series						
Location	Depth (ft)	Date Collected	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
			Cleanup Screening Level (a):						
			20	**80 (b)**	**$1.2x10^5$**	**2960 (36) (b)**	**250**	**24 (b)**	**24000 (b)**
B-4	(2-3)	2/11/2004					**9**		
B-FA-1	(0-0.5)	1/14/2005	**40**	0.5 U		**343**	**205**	**0.52**	**533**
B-FA-1	(1-2)	1/14/2005	**6**	0.2 U		**27**	**114**	**0.06**	**122**
B-FA-2	(0-0.5)	1/14/2005	**22**	**0.5**		**1,000**	**192**	**1.18**	**292**
B-FA-2	(1-2)	1/14/2005	6 U	0.2 U		**16.5**	**3**	0.05 U	**34.1**
B-FA-3	(0-0.5)	1/14/2005	**57**	**1.4**		**1,600**	**237**	**1.78**	**606**
B-FA-3	(1-2)	1/14/2005	5 U	0.2 U		**13.9**	**3**	0.05 U	**33.9**
B-FA-4	(0-0.5)	1/14/2005	**12**	**0.2**		**135**	**127**	**0.20**	**508**
B-FA-4	(1-2)	1/14/2005	5 U	0.2 U		**15.5**	**4**	0.05 U	**43.8**
B-FA-5	(0.9-1.4)	1/14/2005	**8**	0.2 U		**15.0**	**3**	0.05 U	**35.3**
B-FA-6	(0-0.5)	1/14/2005	**12**	**2.2**		**192**	**70**	**0.25**	**236**
B-FA-6	(1-2)	1/14/2005	**7**	0.2 U		**18.1**	**4**	0.05 U	**40.0**
B-FA-7	(0-0.5)	1/14/2005	**10**	**0.3**		**94.5**	**14**	**0.14**	**47.9**
B-FA-8	(0-0.5)	1/14/2005	**16**	**0.3**		**96.9**	**42**	**0.14**	**96.0**
B-FA-9	(0-0.5)	1/19/2005	**35**	**0.3**		**84.7**	**61**	0.05 U	**212**
B-FA-9	(1-2)	1/19/2005	**6**	0.2 U		**17.0**	**9**	0.05 UJ	**44.1**
B-GC-1	(1-1.5)	1/14/2005	**9**	0.2 U		**14.5**	**25**	0.05 U	**37.3**
B-GC-2	(0-0.5)	9/10/2004	**6.1**			**30.9**	**51.6**	**0.054**	
C-4	(0-0.5)	12/30/2003	**21**	2 U	**54**	**11,900**	**3,080**	**1.20**	**827**
C-7	(2.5-3.5)	2/12/2004	**4.5**	0.2 U	**27.2**	**17.0**	**4**	0.04 U	**40.1**
C-FA-1	(0-0.5)	1/12/2005	**11**	0.2 U		**417**	**26**	**0.06**	**93.1**
C-FA-1	(1-2)	1/12/2005	5 U	0.2 U		**14.9**	**4**	0.04 U	**38.1**
C-FA-2	(0-0.5)	1/12/2005	30 U	**7**		**12,300**	**19,700**	**1.21**	**878**
C-FA-2	(1-2)	1/12/2005	**7**	0.2 U		**34.8**	**4**	0.04 U	**37.2**
C-FA-3	(0-0.5)	1/12/2005	**40**	**1**		**9,060**	**240**	**0.85**	**897**
C-FA-3	(1-2)	1/12/2005	**9**	0.2 U		**37.6**	**13**	0.05 U	**54.1**
C-FA-4	(0-0.5)	1/12/2005	**40**	0.5 U		**5,750**	**176**	**0.30**	**482**
C-FA-4	(1-2)	1/12/2005	**8**	0.2 U		**17.1**	**4**	0.04 U	**41.0**
C-FA-5	(0-0.5)	1/12/2005	**20** J	**1.9** J		**6,700**	**359** J	**1.26**	**684**
C-FA-5	(1-2)	1/12/2005	**8**	0.2 U		**19.7**	**16**	0.05 U	**50.5**
C-FA-6	(1.1-1.6)	1/14/2005	**11**	0.2 U		**42.7**	**9**	0.04 U	**51.0**
C-FA-7	(0-0.5)	1/20/2005	**7**	0.2 U		**24.0**	**5**	0.04 U	**42.0**
C-FA-8	(0-0.5)	1/18/2005	**7**	0.2 U		**20.1**	**5**	**0.05**	**42.6**
C-FA-9	(1.1-1.6)	1/14/2005	**9**	0.2 U		**95.8**	**17**	**0.07**	**56.8**
C-GC-1	(0.6-1.1)	1/14/2005	**8**	0.2 U		**21.4**	**5**	0.05 U	**39.4**
C-GC-2	(0-0.5)	9/10/2004	**5.0**			**39.5**	**8.6**	**0.031**	
C-GC-3	(0-0.5)	9/10/2004	**3.9**			**21.0**	**8.0**	**0.038**	
C-GC-4	(0-0.5)	9/10/2004	**5.0**			**21.9**	**19.3**	**0.035**	
C-GC-5	(1.4-1.9)	1/12/2005	**5**	0.2 U		**13.2**	**4**	0.05 U	**33.5**
C-GC-6	(1-1.5)	1/12/2005	**8**	0.2 U		**78.1**	**24**	**0.70**	**72.5**
C-GC-6	(2-3)	1/12/2005	5 U	0.2 U		**17.7**	**4**	0.05 U	**40.0**
C-GC-7	(0-0.5)	9/10/2004	**4.7**			**23.9**	**5.8**	**0.034**	
D-5	(0-0.5)	12/30/2003	**4.9**	0.5 U	**51**	**43.7**	14	**0.08**	**74**
D-6	(0-0.5)	12/30/2003	**20**	0.5 U	**61**	**42.2**	**8**	0.05 U	**81**
D-7	(0-0.5)	12/30/2003	**42**	0.5 U	**26**	**45.5**	**13**	0.04 U	**89**
D-FA-1	(1-2)	1/27/2005	5 U	0.2 U		**19.4**	**3**	0.05 U	**57.2**
D-FA-1	(4-6)	1/27/2005	**9**	0.2 U		**37.5**	**21**	0.05 U	**55.8**
D-FA-1	(8-10)	1/27/2005	**14**	0.3 U		**40.7**	**6**	0.07 U	**56.1**
D-FA-2	(1-2)	1/24/2005	**40**	0.5 U		**78.6**	**47**	0.05 U	**174**
D-FA-2	(4-6)	1/24/2005	**63**	**0.3**		**98.1**	**57**	**0.06**	**299**
D-FA-2	(8-10)	1/24/2005	**55**	**0.5**		**97.7**	**51**	**0.06**	**266**
D-FA-3	(1-2)	1/24/2005	**80**	0.5 U		**57.1**	**21**	0.05 U	**155**
D-FA-3	(4-6)	1/24/2005	**51**	0.2 U		**77.7**	**61**	**0.05**	**157**
D-FA-3	(8-10)	1/24/2005	**50**	0.2 U		**78.3**	**42**	**0.06**	**202** J
D-FA-3	(10-12)	1/24/2005	**80**	**0.4**		**105**	**56**	0.05 U	**202** J
D-FA-4	(1-2)	1/24/2005	**12**	0.2 U		**39.5**	**10**	0.05 U	**54.0**
D-FA-4	(4-6)	1/24/2005	**57**	**0.3**		**78.7**	**44**	**0.08**	**185**
D-FA-4	(8-10)	1/24/2005	**57**	0.2 U		**76.9**	**58**	0.06 U	**155**
D-FA-4	(10-12)	1/24/2005	**24**	**0.5**		**38.6**	**11**	**0.06**	**68.5**
D-FA-5	(0-0.5)	1/27/2005	**100**	**0.8**		**57.1**	**23**	0.05 U	**158**

TABLE 22
DETECTED METALS IN SOIL
NORTH MARINA REDEVELOPMENT SITE
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TOTAL METALS (mg/kg)
SW6000-7000 Series

Location	Depth (ft)	Date Collected	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
			Cleanup Screening Level (a):						
			20	**80 (b)**	**$1.2x10^5$**	**2960 (36) (b)**	**250**	**24 (b)**	**24000 (b)**
D-FA-5	(1-2)	1/27/2005	60	0.6 U		79.5	21	0.05	154
D-FA-5	(3-5)	1/27/2005	58	0.3		88.2	45	0.06	175
D-FA-5	(7-9)	1/27/2005	34	0.3		56.6	27	0.06	111
D-FA-5	(9-11)	1/27/2005	37	0.4		60.5	78	0.06 U	196
D-FA-5	(11-14)	1/27/2005	58	0.4		79.5	56	0.06 UJ	0.06
D-FA-5b	(0-0.5)	3/2/2005	50						
D-FA-5b	(1-2)	3/2/2005	41						
D-FA-5b	(2-3)	3/2/2005	7						
D-FA-5b	(3-5)	3/2/2005	7						
D-FA-5b	(7-9)	3/2/2005	6						
D-FA-5b	(13-15)	3/2/2005	6 U						
D-FA-6	(0-0.5)	1/27/2005	50	0.5 U		69.1	21	0.04 U	234
D-FA-6	(1-2)	1/27/2005	36	0.3		60.2	27	0.06	113
D-FA-6	(4-6)	1/27/2005	13	0.4		29.3	4	0.07	93.3
D-FA-6	(8-10)	1/27/2005	22	0.4		45.4	15	0.08	82.7
D-FA-6	(10-12)	1/27/2005	8	0.3		31.2	5	0.05 J	51.2
D-FA-6	(12-14)	1/27/2005	17	0.3		31.3	10	0.08 J	93.8
D-FA-6b	(0-0.5)	3/2/2005	240						
D-FA-6b	(1-2)	3/2/2005	460						
D-FA-6b	(2-3)	3/2/2005	100						
D-FA-6b	(3-5)	3/2/2005	6						
D-FA-6b	(7-9)	3/2/2005	7 U						
D-FA-7	(0-0.5)	1/24/2005	17	0.2 U		35.3	10	0.05 U	58.0
D-FA-7	(1-2)	1/24/2005	30	0.5 U		41.3	12	0.05 U	80
D-FA-7	(3-5)	1/24/2005	250	0.8		494	172	0.07	535
D-FA-7	(7-9)	1/24/2005	22	0.3		40.5	44	0.06	99.0
D-FA-7	(9-11)	1/24/2005	19	0.3		43.3	74	0.06 U	114
D-FA-7	(11-13)	1/24/2005	19	0.3		38.9	46	0.06	90.6
D-FA-8	(0-0.5)	1/24/2005	6	0.2 U		26.8	12	0.05 U	51.0
D-FA-10	(0-0.5)	11/9/2004	38.8			138	153		404
D-FA-10	(1-2)	11/9/2004	47.6			13.1	4.3		40.4
D-FA-10	(2-3)	11/9/2004	6.3			15.1	2.6		44.2
D-FA-12	(0-0.5)	1/24/2005	8	0.2		29.9	94	0.04 U	73.3
D-FA-13	(0-0.5)	1/27/2005	70						
D-FA-13	(1-2)	1/27/2005	6						
D-FA-15	(0-1)	1/27/2005	40	0.8		72.1	65	0.05 U	340
D-GC-1	(0-0.5)	1/27/2005	18	0.3		37.1	23	0.05 U	97.2
D-GC-1	(2-3)	1/27/2005	35						
D-GC-2	(0-0.5)	1/27/2005	30	0.7		78.1	61	0.04 U	164
D-GC-2	(1-2)	1/27/2005	10	0.2 U		18.3	6	0.05 U	38.8
D-GC-3	(0-0.5)	11/9/2004	20.1			114	79.7		164 J
D-GC-3	(1-2)	11/9/2004	7.8			52.10	87.7		127
D-GC-4	(1-1.5)	11/9/2004	4.7			14.0	3.2		33.7 J
D-GC-5	(0-0.5)	11/9/2004	157			36.6	41.2		76.9 J
D-GC-5	(1-2)	11/9/2004	5.9			17.5	9.9		54.7
D-GC-6	(0-0.5)	1/24/2005	22	0.2 U		36.9	13	0.04 U	132
D-GC-6	(1-2)	1/24/2005	88	0.9		92.8	64	0.05 U	442
D-GC-6	(2-3)	1/24/2005	90	1.0		125	88	0.04 UJ	656
D-GC-7	(0-0.5)	1/27/2005	10	0.3		38.4	15	0.05 U	101
D-GC-8	(0-0.5)	11/9/2004	7.2			45.9	17.4		78.4 J
D-GC-9	(0-0.5)	11/9/2004	7.8			31.0	102		131 J
D-GC-10	(0-0.5)	11/9/2004	15.0			59.4	99.8		127 J
D-GC-11	(0-0.5)	11/9/2004	6.9			43.3	15.8		103 J
D-GC-12	(0-0.5)	1/27/2005	30	0.5 U		59.7	53	0.04 U	137
D-GC-12	(1-2)	1/27/2005	29	0.2 U		32.7	5	0.05 U	73.6
D-GC-12	(2-3)	1/27/2005	5	0.2 U		14.2	3	0.05 UJ	35.5
D-GC-13	(0-0.5)	3/2/2005	57						
E-GC-1	(0-0.5)	1/12/2005	29	0.6		35.7	15	0.05 U	65.9
E-GC-1	(1-2)	1/12/2005	23	0.2 U		18.4	7	0.05 U	41.2
E-GC-1	(2-3)	1/12/2005	10	0.2 U		16.2	4	0.04 UJ	41.1

TABLE 22
DETECTED METALS IN SOIL
NORTH MARINA REDEVELOPMENT SITE
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			TOTAL METALS (mg/kg) SW6000-7000 Series						
Location	Depth (ft)	Date Collected	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
			Cleanup Screening Level (a):						
			20	80 (b)	$1.2x10^5$	2960 (36) (b)	250	24 (b)	24000 (b)
E-GC-1b	(0-0.5)	3/3/2005	8	0.7		16.8	26	0.05 U	74.2
E-GC-1c	(0-0.5)	3/3/2005	48	0.7		23.4	7	0.4 U	47.5
E-GC-1c	(1-2)	3/3/2005	7	0.5		20.9	54	0.13	70.7
E-GC-2	(0-0.5)	1/12/2005	6	0.2 U		15.7	43	0.05 U	46.9
E-GC-3	(0-0.5)	1/12/2005	5 U	0.2 U		9.0	5	0.04 U	30.2
E-GC-4	(0.5-1.0)	1/12/2005	5	0.2 U		20.5	4	0.05 U	35.6
E-GC-5	(1.5-2.0)	1/12/2005	90	0.2 U		20.1	6	0.07	52.5
E-GC-5	(2.5-3.5)	1/12/2005	6 U	0.2 U		16.6	4	0.05 U	65.7
F-4	(0-0.5)	12/30/2003	57	0.9	54.6	190	115	0.11	810
F-5	(0-0.5)	12/30/2003	53	2.1	71	1,190 J	241	1.03	1790
F-6	(0-0.5)	12/30/2003	14.5	0.7	29.5	1,120	43	0.73	376
F-9	(2.5-3.5)	2/12/2004	4.6	0.2 U	24.0	13.6	3	0.05 U	38.0
F-Pink	(0-1)	1/28/2005	440	4.8		971	919	0.61	7530
F-Pink	(1.2-1.5)	3/2/2005	110	1.8		230	376	0.16	2770
F-Pink	(2.5-3)	3/17/2005	10	0.2 U		22.5	9	0.05 U	103
F-FA-1	(0.8-1.3)	1/19/2005	6	0.2 U		26.1	5	0.04 U	38.9
F-FA-2	(0-2)	1/18/2005	13						
F-FA-2	(2-4)	1/18/2005	6						
F-FA-2	(4-6)	1/18/2005	10						
F-FA-2	(6-8)	1/18/2005	10						
F-FA-3	(0-0.5)	1/13/2005	18	0.2 U		25.7	11	0.05 U	73.1
F-FA-3	(3.5-4.5)	1/13/2005	7						
F-FA-3	(4.5-5.5)	1/13/2005	7						
F-FA-3	(5.5-7.0)	1/13/2005	7						
F-FA-3	(7.0-8.0)	1/13/2005	10						
F-FA-4	(0-0.5)	1/18/2005	8	0.2		40.6	12	0.05 U	76.9
F-FA-4	(1-2)	1/18/2005	6 U						
F-FA-4	(2-3)	1/18/2005	6 U						
F-FA-4	(4-6)	1/18/2005	9						
F-FA-4	(6-8)	1/18/2005	10						
F-FA-5	(0.7-1.2)	1/13/2005	13	0.2 U		32.8	16	0.05 U	94.4
F-FA-5	(1.7-2.7)	1/13/2005	8						
F-FA-5	(2.7-3.7)	1/13/2005	6 U						
F-FA-5	(4-6)	1/13/2005	8						
F-FA-5	(6-8)	1/13/2005	12						
F-FA-6	(1-2)	1/13/2005	6	0.2		28.9	19	0.17	48.1
F-FA-6	(2-4)	1/13/2005	9 U						
F-FA-6	(4-6)	1/13/2005	8						
F-FA-6	(6-8)	1/13/2005	10						
F-FA-7	(0-2)	1/18/2005	7						
F-FA-7	(2-4)	1/18/2005	6						
F-FA-7	(4-6)	1/18/2005	10						
F-FA-7	(6-8)	1/18/2005	7						
F-FA-8	(0-0.5)	1/13/2005	20	0.4		118	54	0.11	252
F-FA-8	(1-2)	1/13/2005	5 U	0.2 U		25.3	4	0.04 U	43.8
F-FA-8	(2-3)	1/13/2005	7						
F-FA-8	(4-6)	1/13/2005	6 U						
F-FA-8	(6-8)	1/13/2005	9						
F-FA-9	(0-0.5)	1/18/2005	8	0.2 U		26.0	11	0.05 U	225
F-FA-9	(1-2)	1/18/2005	6						
F-FA-9	(2-3)	1/18/2005	6						
F-FA-9	(4.5-6)	1/18/2005	6 U						
F-FA-9	(6-8)	1/18/2005	6 U						
F-FA-10	(0-1)	1/17/2005	30	0.5 U		91.3 J	27	0.05 U	180 J
F-FA-10	(1-2)	1/17/2005	6 U	2 U		29.3	18	0.06	51.3
F-FA-10	(2-3)	1/17/2005	7						
F-FA-10	(4-6)	1/17/2005	12						
F-FA-10	(6-8)	1/17/2005	6 U						
F-FA-11	(0-1)	1/17/2005	15	0.2 U		52.5	26	0.04 U	149
F-FA-11	(1-2)	1/17/2005	6 U						

TABLE 22
DETECTED METALS IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			TOTAL METALS (mg/kg) SW6000-7000 Series						
Location	Depth (ft)	Date Collected	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
			Cleanup Screening Level (a):						
			20	80 (b)	$1.2x10^5$	2960 (36) (b)	250	24 (b)	24000 (b)
F-FA-11	(2-3)	1/17/2005	7						
F-FA-11	(4-6)	1/17/2005	6						
F-FA-11	(6-8)	1/17/2005	13						
F-FA-12	(0-0.5)	1/17/2005	14	0.2 U		23.3	10	0.05 U	66.8
F-GC-1	(0-0.5)	1/14/2005	12	0.2 U		83.3 J	14	0.04 U	105 J
F-GC-2	(1-1.5)	1/19/2005	7	0.2 U		18.0	7	0.05 U	47.0
F-GC-3	(0-0.5)	1/13/2005	6	0.2 U		31.4	4	0.05 U	39.6
F-GC-4	(0.7-1.2)	1/19/2005	7	0.2 U		27.3	8	0.08	60.1
F-GC-5	(0-0.5)	1/13/2005	17	0.4		101	152	0.09	293
F-GC-5	(1-2)	1/13/2005	6	0.2 U		19.8	7	0.05 U	44.5
F-GC-6	(0-0.5)	1/14/2005	8	0.2 U		21.2	7	0.04 U	54.7
F-GC-7	(0-0.5)	1/13/2005	9	0.2 U		33.5	6	0.04 U	45.6
F-GC-8	(0.8-1.3)	1/13/2005	8	0.2 U		23.1	5	0.06	37.6
F-GC-8	(1.8-2.8)	1/13/2005	10						
F-GC-8	(2.8-3.8)	1/13/2005	13						
F-GC-9	(1.5-2.0)	1/13/2005	8	0.2 U		21.9	5	0.05 U	35.2
F-GC-9	(2.5-3.5)	1/13/2005	7						
F-GC-9	(3.5-4.5)	1/13/2005	14						
F-GC-10	(2.5-3.0)	1/13/2005	6	0.2 U		21.5	11	0.05 U	50.1
F-GC-10	(4.5-5.5)	1/13/2005	9						
F-GC-11	(0-0.5)	1/13/2005	9	0.2 U		34.6	11	0.04 U	77.6
F-GC-12	(0-0.5)	1/13/2005	6	0.2 U		38.3	8	0.06 U	43.1
F-GC-13	(0-1)	1/17/2005	200	0.8		420	246	0.10	1570
F-GC-13	(1-2)	1/17/2005	410	1.2		775	351	0.04 UJ	2970
F-GC-13	(2-3)	1/17/2005	50	0.6		297	78	0.04 UJ	1840
F-GC-13b	(0-0.5)	3/3/2005	28	0.3		97.8	36	0.05 U	370
F-GC-13b	(1-2)	3/3/2005	5 U	0.4		35.2	28	0.16	56.5
F-GC-13c	(0-0.5)	3/3/2005	90	1.0		607	194	0.06	1990
F-GC-13c	(1-2)	3/3/2005	54	3.9		62.7	223	0.04 U	7770
F-GC-13c	(2-3)	3/3/2005	48	2.7		62.5	286	0.05 U	6500
F-GC-13c	(3-5)	3/3/2005	7	0.2 U		17.6	4	0.05 UJ	43.7
F-GC-13c	(5-7)	3/3/2005	6 U	0.2 U		16.7	4	0.05 UJ	36.9
F-GC-13d	(3-4)	3/3/2005	5 U	0.2 U		16.1	4	0.05 U	34.6
G-3	(2.5-3.5)	2/11/2004	10.2	25.2	63.6	60.0	49	0.37	130
G-GC-1	(1.5-2.0)	3/2/2005	6	0.2 U		24.0	10	0.05 U	46.6
G-GC-2	(1.4-1.9)	3/2/2005	6	0.2 U		17.8	5	0.04 U	39.9
G-GC-3	(1.0-1.5)	3/2/2005	6	0.2		18.3	6	0.05 U	39.0
H-4	(5-6)	2/11/2004					6		
H-5	(5-5.5)	2/11/2004					5		
H-GC-1	(0.8-1.3)	1/13/2005	21	0.2 U		23.3	5	0.05 U	37.4
H-GC-1	(1.8-2.8)	1/13/2005	10	0.2 U		28.5	7	0.05	51.0
H-GC-2	(1-1.5)	1/14/2005	11	0.2 U		21.5	13	0.05 U	85.8
H-GC-3	(0-0.5)	9/10/2004	5.8			35.0	6.8	0.03	
H-GC-4	(0-0.5)	9/10/2004	5.0			14.2	10.6	0.02 J	
H-GC-5	(0.8-1.3)	1/13/2005	24	0.2 U		23.1	7	5.7	49.1
H-GC-5	(1.8-2.8)	1/13/2005	11	0.2 U		27.0	11	26.3 J	67.3
H-GC-5	(2.8-3.8)	1/13/2005						20 J	
H-GC-5b	(1.3-1.6)	3/2/2005	7	0.2 U		13.3	3	0.04 U	33.4
H-GC-5c	(2-2.5)	3/2/2005	10	0.2 U		18.9	6	0.05 U	44.5
H-GC-5c	(3-4)	3/2/2005	5					0.05 U	
H-GC-5d	(1.8-2.3)	3/2/2005	17	0.2 U		24.7	15	0.05 U	62.3
H-GC-5d	(2.8-3.8)	3/2/2005	13					0.05 U	
I-3	(0-0.5)	2/12/2004	6.2	0.2 U	32.7	21.1	6	0.06	44.3
I-X	(1.2-3) (c)	2/12/2004	60	0.4	41.4		41	0.07 U	
I-Y	(3-4) (d)	2/12/2004	5.3	0.2 U	33.2		6	0.05	
I-Z	(0-0.5)	2/12/2004	240	0.7	56	868	280	0.83	863
J-GC-1	(0.5-1)	1/14/2005	8	0.2 U		19.7	6	0.05 U	69.6
J-GC-2	(0-0.5)	3/2/2005	5 U	0.2 U		18.2	4	0.04 U	34.0
J-GC-3	(0-0.5)	3/2/2005	14	0.3		287	23	0.05 U	339
J-GC-4	(1.5-2)	3/3/2005	30	0.5 U		31.8	42	0.08	77

TABLE 22
DETECTED METALS IN SOIL
NORTH MARINA REDEVELOPMENT SITE
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			TOTAL METALS (mg/kg) SW6000-7000 Series						
Location	Depth (ft)	Date Collected	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
			Cleanup Screening Level (a):						
			20	**80 (b)**	**$1.2x10^5$**	**2960 (36) (b)**	**250**	**24 (b)**	**24000 (b)**
J-GC-4	(2.5-3.5)	3/3/2005	**7**						
J-GC-4	(3.5-4.5)	3/3/2005	**8**						
JP-1	(0-0.5)	12/23/2003	**3.3**	0.2 U	**43.8**	**19.9**	**8**	0.05 U	**44.7**
JP-GC-1	(1-1.5)	1/12/2005	**8**	0.2 U		**19.5**	**3**	0.04 U	**27.8**
JP-GC-2	(1.5-2)	1/12/2005	**6**	0.2 U		**25.3**	**15**	0.05 U	**44.2**
JP-GC-3	(0-0.5)	9/10/2004	**4.4**			**17.6**	**11.5**	**0.029**	
JP-GC-4	(0.5-1)	1/12/2005	5 U	0.2 U		**19.9**	**3**	0.04 U	**27.2**
JP-GC-5	(0.5-1)	1/12/2005	5 U	0.2 U		**23.8**	**9**	0.05 U	**27.7**
JP-GC-6	(0-0.5)	9/10/2004	**3.8**			**20.5**	**13.2**	**0.019** J	
K-GC-1	(0-0.5)	9/10/2004	**6.9**			**18.9**	**56.3**	**0.035**	
K-GC-2	(0.5-1)	1/14/2005	**11**	0.2 U		**20.7**	**5**	0.05 U	**39.0**
L-FA-2	(1.5-2.5)	1/19/2005	**7**	0.2 U		**16.2**	**4**	0.05 UJ	**41.1**
L-FA-2b	(1-1.5)	3/3/2005	**6**	**0.3**		**45.9**	**76**	**0.08** J	**391**
L-FA-2b	(2-3)	3/3/2005	6 U	**0.3**		**24.4**	**30**	**0.13** J	**219**
L-GC-1	(0.5-1)	1/19/2005	**7**	0.2 U		**31.7**	**31**	**0.11**	**97.4**
L-GC-2	(0-0.5)	1/19/2005	**19**	**0.2**		**71.9**	**48**	**0.07**	**170**
L-GC-3	(0.7-1.4)	1/19/2005	5 U	0.2 U		**20.8**	**6**	**0.04**	**40.7**
L-GC-4	(0-0.5)	1/19/2005	**34**	**0.4**		**90.5**	**66**	**0.18**	**315**
L-GC-4	(2.3-3.3)	1/19/2005	6 U	0.2 U		**22.7**	**4**	0.05 U	**41.6**
L-GC-4b	(1.7-2.2)	3/3/2005	**270**	**2**		**838**	**330**	**0.21**	**3130**
L-GC-4b	(2.7-3.7)	3/3/2005	5 U	0.2 U		**14.1**	**4**	0.04 U	**38.4**
L-GC-5	(0.5-1)	1/19/2005	**70**	**0.6**		**201**	**190**	0.05 U	**728**
L-GC-5	(1.5-2.5)	1/19/2005	**6**	0.2 U		**21.2**	**7**	**0.04**	**42.0**
L-GC-5b	(2.3-2.8)	3/3/2005	**9**	0.2 U		**16.9**	**13**	0.05 U	**42.5**
L-GC-5c	(1-1.5)	3/3/2005	5 U	0.2 U		**14.1**	**6**	0.05 U	**28.7**
M-1	(0.3-0.8)	1/18/2005	5 U	0.2 U		**14.1**	**7**	0.04 U	**32.5**
M-2	(0-0.5)	1/18/2005	5 U	**0.3**		**23.2**	**47**	0.05 U	**118**
M-3	(0-0.5)	1/18/2005	**14**	0.2 U		**85.3**	**184**	0.05 U	**106**
M-4	(0.8-1.3)	1/17/2005	**6**	0.2 U		**16.4**	**6**	0.05 U	**36.2**
M-GC-1	(1.6-2.1)	3/3/2005	5 U	0.2 U		**17.6**	**28**	**0.06**	**60.8**
M-GC-2	(1.5-2)	3/2/2005	**5**	**0.3**		**18.7**	**5**	0.04 U	**33.6**
M-GC-3	(1-1.5)	3/3/2005	5 U	0.2 U		**10.7**	**2**	0.05 U	**20.4**
M-GC-4	(1.5-2)	3/2/2005	**8**	0.2 U		**23.2**	**28**	0.05 U	**78.5**
M-GC-5	(1-1.5)	3/2/2005	5 U	0.2 U		**15.4**	**3**	0.05 U	**33.3**
P-8	(0-0.5)	2/11/2004	**6.5**	0.2 U	**30.0**	**53.4**	26	**0.07**	**79.6** J
P-8	(2.5-3.5)	2/11/2004	**4**	0.2 U	**23.0**	**11.7**	**4**	0.05 U	**29.8**
P-9	(2.5-3.5)	2/11/2004	**60**	**0.3**	**39.4**	**87.9**	**54**	**0.09**	**188**
P-9	(5.5-6.5)	2/11/2004	**57**	**0.3**	**38.9**	**91.3**	**56**	**0.06**	**201**
P-10	(2.5-3.5)	2/11/2004	**6.3**	0.2 U	**31.3**	**22.1**	**8**	**0.07**	**52.1**

Box indicates exceedance of cleanup screening level.
Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration.
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate.
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

(a) See Table 8, Soil Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria.
(b) No to few groundwater detects above cleanup screening level. Method B screening level for direct contact used as cleanup level, except in Investigation Area d where groundwater protection value in parantheses is applied.
(c) Sample is a composite collected from boring locations SS-5, SS-12 and SS-14 from sampling intervals 1.2-2.6, 1.4-2.8, and 1.6-2.4, respectively.
(d) Sample is a composite collected from boring locations SS-5, SS-12, and SS-14 from sampling intervals 2.6-4.0, 2.8-4.0, and 2.4-4.0, respectively.

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TABLE 23
DETECTED TBT IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	Preliminary Cleanup Level (a)	B-FA-4 (0-0.5) HP39L 1/14/2005	B-FA-8 (0-0.5) HP39H 1/14/2005	C-FA-1 (0-0.5) HP08E 1/12/2005	C-FA-1 (1-2) HP09I 1/12/2005	C-FA-3 (0-0.5) HP08C 1/12/2005	C-FA-3 (1-2) HP09E 1/12/2005	F-FA-8 (0-0.5) HP32I 1/13/2005	F-FA-8 (1-2) HP33S 1/13/2005	F-GC-1 (0-0.5) HP39A 1/14/2005	F-GC-2 (1-1.5) HQ00G 1/19/2005	F-GC-4 (0.7-1.2) HQ00H 1/19/2005	F-GC-5 (0-0.5) HP32M 1/13/2005
TRIBUTYL TIN (µg/kg)													
TBT Ion by SIM													
Tributyl Tin Chloride		**41**	**23**	**2,300**	3.9 U	**30,000**	**160**	**1,100**	**4.8**	**69**	3.9 U	3.9 U	**35**
Dibutyl Tin Dichloride		**46**	**49**	**950**	5.3 U	**26,000**	**38**	**250**	**260**	**38**	5.3 U	5.4 U	**50**
Butyl Tin Trichloride		**14**	**13**	**1,400**	5.3 U	**10,000**	**39**	**23**	**28**	**10**	5.3 U	5.4 U	**8.4**
TBT as Tin ion	2,400	**37**	**20**	**2,100**	3.4 U	**27,000**	**140**	**1,000**	**4.3**	**61**	3.4 U	3.5 U	**31**

Box indicates exceedance of cleanup screening level.
Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration.

(a) See Table 8, Groundwater Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria.

TABLE 24
DETECTED PETROLEUM HYDROCARBONS AND BTEX IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			PETROLEUM HYDROCARBONS						BTEX (µg/kg)				
			NWTPH-HCID (mg/kg)			NWTPH-Dx (mg/kg)		NWTPH-G (mg/kg)					
Location	Depth (ft)	Date Collected	Gasoline	Diesel	Motor Oil	Diesel	Motor Oil	Gasoline	Benzene	Toluene	Ethyl-benzene	m,p-Xylene	o-Xylene
			Cleanup Screening Level (a):										
			---	---	---	2000	2000	100 (b)	400	352,000	60,000	1.60E+08	1.60E+08
B-FA-1	(0-0.5)	1/14/2005	22 U	**>55**	**>110**	**34**	**170**						
B-FA-2	(0-0.5)	1/14/2005	22 U	**>54**	**>110**	**28**	**130**						
B-FA-3	(0-0.5)	1/14/2005	23 U	**>58**	**>120**	**86**	**180**						
B-FA-4	(0-0.5)	1/14/2005	**>22**	**>55**	**>110**	**2,200**	**260**	**160** (c)	17 U	33 U	33 U	67 U	33 U
B-FA-4	(1-2)	1/14/2005				**5.4** J	**22** J						
B-FA-5	(0.9-1.4)	1/14/2005	21 U	53 U	110 U								
B-FA-6	(0-0.5)	1/14/2005	21 U	52 U	**>100**	**23**	**170**						
B-FA-7	(0-0.5)	1/14/2005	22 U	56 U	110 U								
B-FA-8	(0-0.5)	1/14/2005	21 U	53 U	110 U								
B-FA-12	(3.5-4.0)	1/27/2005						**8.4**	10 U	21 U	21 U	**44**	21 U
B-GC-1	(1-1.5)	1/14/2005	21 U	53 U	100 U								
C-5	(0-0.5)	12/29/2003	27 U	50 U	100 U			5.3 U					
C-FA-7	(0-0.5)	1/20/2005	23 U	58 U	120 U								
C-GC-1	(0.6-1.1)	1/14/2005	22 U	55 U	110 U								
C-GC-5	(1.4-1.9)	1/12/2005	22 U	54 U	110 U								
C-GC-6	(1-1.5)	1/12/2005	21 U	52 U	**>100**	**22**	**270**						
D-3	(3.4-3.6)	12/29/2003				**990** J	**9,500** J						
D-4	(4-5)	12/29/2003				**69** J	**48** J						
D-5	(0-0.5)	12/30/2003	27 U	50 U	100 U								
D-6	(0-0.5)	12/30/2003	26 U	**76**	**110**								
D-7	(0-0.5)	12/30/2003	27 U	**78**	100 U								
D-FA-5	(0-0.5)	1/27/2005	22 U	**>55**	**>110**	**100** J	**220** J						
D-FA-6	(0-0.5)	1/27/2005	22 U	54 U	**>110**	**24** J	**94** J						
D-FA-7	(0-0.5)	1/24/2005	22 U	55 U	110 U								
D-FA-8	(0-0.5)	1/24/2005	21 U	52 U	**>100**	**11**	**65**						
D-FA-10	(3-3.8)	11/9/2004				**35.0** J	120 UJ						
D-FA-11	(4.5-5)	11/9/2004	22.0 U	**>55.0**	110 U	**760**	110 U						
D-FA-11c	(4.6-5.0)	12/21/2004				**430**	**150**						
D-FA-11e	(2-3)	12/21/2004				**7,300** J	100 UJ						
D-FA-11i	(4.3-5.0)	12/21/2004				**57**	**570**						
D-FA-11l	(4.5-4.9)	12/21/2004				30 U	120 U						
D-FA-11m	(4.5-5.5)	12/21/2004				27 U	110 U						
D-FA-12	(0-0.5)	1/24/2005	21 U	52 U	**>100**	**9.2**	**93**						
D-FA-14	(4-5)	11/9/2004	26.0 U	64.0 U	130 U				4.00 U	4.00 U	4.00 U	4.00 U	4.00 U
D-FA-15	(0-1)	1/27/2005	**>22**	**>55**	**>110**	**2,500** J	**15,000** J		**160**	**2400**	**830**	**3200**	**1400**
D-GC-1	(0-0.5)	1/27/2005	23 U	58 U	**>120**	**16** J	**94** J						
D-GC-2	(0-0.5)	1/27/2005	22 U	**>55**	**>110**	**220** J	**560** J						
D-GC-2	(0.8-1.0)	1/27/2005	**>21**	**>53**	**>110**	**15,000** J	**23,000** J						
D-GC-2	(2-3)	1/27/2005	25 U	64 U	130 U								
D-GC-2	(1.9-2.2)	1/27/2005	25 U	64 U	130 U								
D-GC-2b	(0.5-1.0)	1/27/2005	**>21**	**>52**	**>100**	**6,100** J	**27,000** J						
D-GC-3	(1.9-2.4)	11/9/2004	25.0 U	62.0 U	120 U								

TABLE 24
DETECTED PETROLEUM HYDROCARBONS AND BTEX IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			PETROLEUM HYDROCARBONS						BTEX (µg/kg)				
			NWTPH-HCID (mg/kg)			NWTPH-Dx (mg/kg)		NWTPH-G (mg/kg)					
Location	Depth (ft)	Date Collected	Gasoline	Diesel	Motor Oil	Diesel	Motor Oil	Gasoline	Benzene	Toluene	Ethyl-benzene	m,p-Xylene	o-Xylene
			Cleanup Screening Level (a):										
			---	**---**	**---**	**2000**	**2000**	**100 (b)**	**400**	**352,000**	**60,000**	**1.60E+08**	**1.60E+08**
D-GC-6	(0-0.5)	1/24/2005	22 U	55 U	110 U								
D-GC-7	(0-0.5)	1/27/2005	21 U	53 U	110 U								
D-GC-12	(0-0.5)	1/27/2005	22 U	54 U	**>110**	**15** J	**210** J						
E-FA-1	(5-5.5)	1/27/2005				5.0 U	10 U						
E-FA-2	(5.5-6.0)	1/27/2005				**94**	10 U		14 U	28 U	**34**	56 U	28 U
E-FA-2a	(4.8-5.3)	1/27/2005				5.0 U	10 U						
E-FA-2b	(3.8-4.2)	1/27/2005				**610**	**180**						
E-FA-3	(9.5-10)	1/27/2005				**600**	50 U		25 U	50 U	**140**	99 U	**84**
E-FA-4	(7-7.5)	1/27/2005				**330** J	**18** J						
E-FA-5	(4.5-4.9)	1/18/2005				**210**	**630**						
E-GC-1	(0-0.5)	1/12/2005	23 U	58 U	**>120**	**53**	**240**						
E-GC-2	(0-0.5)	1/12/2005	22 U	**>54**	**>120**	**110**	**1,300**						
E-GC-3	(0-0.5)	1/12/2005	22 U	54 U	110 U								
E-GC-4	(0.5-1.0)	1/12/2005	21 U	53 U	**>100**	**35**	**360**						
E-GC-4	(1.5-2.5)	1/12/2005	23 U	59 U	120 U								
E-GC-4c	(3.5-4.0)	1/12/2005				**31**	41 U		29 U	59 U	59 U	**140**	**300**
E-GC-4d	(3.5-4.0)	1/12/2005	**>33**	**>83**	160 U	**8,800**	**69**		33 U	67 U	67 U	130 U	**480**
E-GC-4g	(3.5-4.0)	1/12/2005				5.0 U	10 U		11 U	22 U	22 U	44 U	22 U
E-GC-5	(1.5-2.0)	1/12/2005	21 U	53 U	110 U								
F-4	(0-0.5)	12/30/2003	30 U	50 U	100 U								
F-5	(0-0.5)	12/30/2003	**61**	**280**	**630**				1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ
F-6	(0-0.5)	12/30/2003	26 U	50 U	100 U								
F-FA-1	(0.8-1.3)	1/19/2005	21 U	52 U	100 U								
F-FA-3	(0-0.5)	1/13/2005	21 U	52 U	100 U								
F-FA-4	(0-0.5)	1/18/2005	22 U	54 U	110 U								
F-FA-5	(0.7-1.2)	1/13/2005	21 U	52 U	100 U								
F-FA-6	(1-2)	1/13/2005	22 U	**>55**	**>110**	**150**	**210**						
F-FA-8	(0-0.5)	1/13/2005	22 U	55 U	110 U								
F-FA-9	(0-0.5)	1/18/2005	22 U	54 U	110 U								
F-FA-10	(0-1)	1/17/2005	21 U	53 U	110 U								
F-FA-10	(2-3)	1/17/2005	24 U	**>60**	**>120**	**210**	**270**						
F-FA-11	(0-1)	1/17/2005	22 U	54 U	110 U								
F-FA-12	(0-0.5)	1/17/2005	21 U	53 U	100 U								
F-FA-13	(4-6)	1/17/2005	24 U	59 U	**>120**	**14**	**170**						
F-FA-14	(4-6)	1/17/2005	24 U	59 U	**>120**	5.0 U	**25**						
F-GC-1	(0-0.5)	1/14/2005	21 U	53 U	100 U								
F-GC-2	(1-1.5)	1/19/2005	21 U	53 U	110 U								
F-GC-3	(0-0.5)	1/13/2005	21 U	53 U	110 U								
F-GC-4	(0.7-1.2)	1/19/2005	22 U	55 U	110 U								
F-GC-5	(0-0.5)	1/13/2005	22 U	55 U	110 U								
F-GC-6	(0-0.5)	1/14/2005	21 U	54 U	110 U								
F-GC-7	(0-0.5)	1/13/2005	210 U	520 U	**>100**	**33**	**710**						

TABLE 24
DETECTED PETROLEUM HYDROCARBONS AND BTEX IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			PETROLEUM HYDROCARBONS						BTEX (µg/kg)				
			NWTPH-HCID (mg/kg)			NWTPH-Dx (mg/kg)		NWTPH-G (mg/kg)					
Location	Depth (ft)	Date Collected	Gasoline	Diesel	Motor Oil	Diesel	Motor Oil	Gasoline	Benzene	Toluene	Ethyl-benzene	m,p-Xylene	o-Xylene
			Cleanup Screening Level (a):										
			---	**---**	**---**	**2000**	**2000**	**100 (b)**	**400**	**352,000**	**60,000**	**1.60E+08**	**1.60E+08**
F-GC-8	(0.8-1.3)	1/13/2005	25 U	63 U	120 U								
F-GC-9	(1.5-2.0)	1/13/2005	24 U	59 U	120 U								
F-GC-10	(2.5-3.0)	1/13/2005	24 U	60 U	120 U								
F-GC-11	(0-0.5)	1/13/2005	21 U	52 U	100 U								
F-GC-12	(0-0.5)	1/13/2005	24 U	60 U	120 U								
F-GC-13	(0-1)	1/17/2005	22 U	54 U	110 U								
G-3	(2.5-3.5)	2/11/2004				**13**	**62**	6.7 UJ	33 UJ	33 UJ	33 UJ	67 UJ	33 UJ
G-GC-1	(1.5-2.0)	3/2/2005	20 U	50 U	100 U								
G-GC-2	(1.4-1.9)	3/2/2005	20 U	50 U	100 U								
G-GC-3	(1.0-1.5)	3/2/2005	20 U	50 U	100 U								
H-1	(4-4.5)	12/23/2003				5.0 U	10 U	7.2 UJ					
H-2	(4-5)	12/23/2003				5.0 U	**12**	5.9 U					
H-3	(4.5-5)	12/22/2003				5.0 U	10 U	6.6 UJ					
H-4	(5-6)	2/11/2004				**17**	**140**	5.9 UJ	30 UJ	30 UJ	30 UJ	59 UJ	30 UJ
H-5	(5-5.5)	2/11/2004				5.0 U	10 U	6.6 UJ	33 UJ	33 UJ	33 UJ	66 UJ	33 UJ
H-GC-1	(0.8-1.3)	1/13/2005	21 U	53 U	**>100**	5.0 U	**31**						
H-GC-2	(1-1.5)	1/14/2005	21 U	**>53**	**>110**	**41**	**630**						
H-GC-5	(0.8-1.3)	1/13/2005	22 U	54 U	**>110**	**80**	**750**						
I-3	(0-0.5)	2/12/2004				**19**	**34**						
I-X	(1.2-3) (d)	2/12/2004				**940**	**150**						
I-Y	(3-4) (e)	2/12/2004				**7.0**	10 U						
I-Z	(0-0.5)	2/12/2004				5.0 U	**14**						
J-FA-1	(4-5)	1/17/2005	24 U	60 U	120 U								
J-FA-2	(4-5)	1/17/2005	22 U	**>56**	**>110**	**46** J	**540**						
J-GC-1	(0.5-1)	1/14/2005	22 U	**>52**	**>100**	**310**	**3,700**						
J-GC-1	(1.5-2.5)	1/14/2005				5.0 UJ	10 UJ						
J-GC-2	(0-0.5)	3/2/2005	20 U	50 U	100 U								
J-GC-3	(0-0.5)	3/2/2005	20 U	50 U	100 U								
J-GC-4	(1.5-2)	3/3/2005	20 U	50 U	100 U								
JP-1	(0-0.5)	12/23/2003	27 U	50 U	100 U								
JP-GC-1	(1-1.5)	1/12/2005	21 U	53 U	110 U								
JP-GC-2	(1.5-2)	1/12/2005	22 U	55 U	110 U								
JP-GC-4	(0.5-1)	1/12/2005	22 U	54 U	110 U								
JP-GC-5	(0.5-1)	1/12/2005	22 U	54 U	110 U								
K-GC-2	(0.5-1)	1/14/2005	22 U	**>54**	**>110**	**66**	**1,300**						
L-FA-2	(1.5-2.5)	1/19/2005	26 U	65 U	130 U				0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
L-GC-1	(0.5-1)	1/19/2005	22 U	**>55**	**>110**	**53** J	**740** J						
L-GC-2	(0-0.5)	1/19/2005	24 U	59 U	120 U								
L-GC-3	(0.7-1.4)	1/19/2005	22 U	54 U	110 U								
L-GC-4	(0-0.5)	1/19/2005	22 U	54 U	**>110**	**5.7** J	**39** J						
L-GC-5	(0.5-1)	1/19/2005	21 U	**>53**	**>110**	**38** J	**210** J						
M-1	(0.3-0.8)	1/18/2005	21 U	52 U	100 U								

TABLE 24
DETECTED PETROLEUM HYDROCARBONS AND BTEX IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

			PETROLEUM HYDROCARBONS						BTEX (µg/kg)				
			NWTPH-HCID (mg/kg)			NWTPH-Dx (mg/kg)		NWTPH-G (mg/kg)					
Location	Depth (ft)	Date Collected	Gasoline	Diesel	Motor Oil	Diesel	Motor Oil	Gasoline	Benzene	Toluene	Ethyl-benzene	m,p-Xylene	o-Xylene
			Cleanup Screening Level (a):										
			---	**---**	**---**	**2000**	**2000**	**100 (b)**	**400**	**352,000**	**60,000**	**1.60E+08**	**1.60E+08**
M-2	(0-0.5)	1/18/2005	23 U	58 U	120 U								
M-3	(0-0.5)	1/18/2005	23 U	58 U	120 U								
M-4	(0.8-1.3)	1/17/2005	21 UJ	53 UJ	100 UJ								
M-FA-1	(3.5-4)	1/17/2005				5.0 U	10 U		6.8 U	14 U	14 U	27 U	14 U
M-FA-2	(3.5-4)	1/17/2005				5.0 U	10 U		8.5 U	17 U	17 U	34 U	17 U
M-GC-1	(1.6-2.1)	3/3/2005	20 U	50 U	100 U								
M-GC-2	(1.5-2)	3/2/2005	20 U	50 U	100 U								
M-GC-3	(1-1.5)	3/3/2005	20 U	50 U	100 U								
M-GC-4	(1.5-2)	3/2/2005	20 U	50 U	100 U								
M-GC-5	(1-1.5)	3/2/2005	20 U	50 U	100 U								
P-10	(2.5-3.5)	2/11/2004				5.0 U	10 U	6.6 UJ	33 UJ	33 UJ	33 UJ	66 UJ	33 UJ
TP-7		11/11/2004				**180**	**550**						

Box indicates exceedance of cleanup screening level
Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximat
concentration of the analyte in the sample

(a) See Table 8, Soil Screening Criteria Evaluation for Detected Constituents, for explanation of screening level criteria
(b) Cleanup screening level 30 mg/kg at locations with benzene present and 100 mg/kg at locations where benzene is not presen
(c) As indicated by the laboratory, the positive gasoline result for this sample does not match an identifiable gasoline patter
(d) Sample is a composite collected from boring locations SS-5, SS-12 and SS-14 from sampling intervals 1.2-5, 1.4-2.8, and 1.6-2.4, respectively.
(e) Sample is a composite collected from boring locations SS-5, SS-12, and SS-14 from sampling intervals 2.6-4.0, 2.8-4.0, and 2.4-4.0, respectively.

TABLE 25
PETROLEUM HYDROCARBON HAZARD INDEX IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

	D-FA-11c	D-FA-11n	D-GC-2	E-GC-4c	E-GC-4d	E-GC-4g	F-FA-6	F-FA-10
	(3.5-4.0)	(3-4)	(0.8-1.0)	(3.5-4.0)	(3.5-4.0)	(3.5-4.0)	(1-2)	(2-3)
	HQ85I	HQ85F	HQ85N/HT60A	HP10N	HP08Q	HP10P	HP32J	HP57F/HR95T
	1/27/2005	1/27/2005	1/27/2005	1/12/2005	1/12/2005	1/12/2005	1/13/2005	1/17/2005
EPH (µg/kg)								
EPH 8015B								
C8-C10 Aliphatics	**47,000**	**47,000**	**82000 J**	**3,300 U**	**130,000**	**2,600 U**	**2,200 U**	**10,000**
C10-C12 Aliphatics	**230,000**	**210,000**	**340000 J**	**12,000**	**680,000**	**2,600 U**	**9,500**	**38,000**
C12-C16 Aliphatics	**880,000**	**740,000**	**2100000 J**	**85,000**	**3,700,000**	**2,600 U**	**23,000**	**64,000**
C16-C21 Aliphatics	**560,000**	**530,000**	**2800000 J**	**33,000**	**1,400,000**	**2,600 U**	**21,000**	**48,000**
C21-C34 Aliphatics	**52,000**	**49,000**	**10000000 J**	**13,000**	**94,000**	**3,400**	**110,000**	**310,000**
C8-C10 Aromatics	**6,200**	**21,000**	**21000 UJ**	**3,300 U**	**16,000 U**	**2,600 U**	**2,200 U**	**2400 U**
C10-C12 Aromatics	**56,000**	**81,000**	**110000 J**	**3,300 U**	**94,000**	**2,600 U**	**2,200 U**	**2400 U**
C12-C16 Aromatics	**410,000**	**470,000**	**960000 J**	**33,000**	**1,300,000**	**2,600 U**	**2,400**	**5700**
C16-C21 Aromatics	**520,000**	**640,000**	**2100000 J**	**42,000**	**1,600,000**	**2,600 U**	**22,000**	**51,000**
C21-C34 Aromatics	**42,000**	**58,000**	**2000000 J**	**8,900**	**84,000**	**10,000**	**58,000**	**82,000**
NAPHTHALENES (µg/kg)								
8270-SIM								
Naphthalene	**730**	**3000**	**1400** J	**200**	**690** M	64 U	**240**	**660**
2-Methylnaphthalene	**6500**	**14000**	**23000** J	**560**	**1400**	64 U	74 U	**170**
1-Methylnaphthalene	**6700**	**11000**	**22000** J	**1100**	**2500**	64 U	74 U	**120**
BTEX (µg/kg)								
Method 8021								
Benzene	NA	NA	NA	29 U	33 U	11 U	NA	NA
Toluene	NA	NA	NA	59 U	67 U	22 U	NA	NA
Ethylbenzene	NA	NA	NA	59 U	67 U	22 U	NA	NA
m,p-Xylene	NA	NA	NA	**140**	130 U	44 U	NA	NA
o-Xylene	NA	NA	NA	**300**	**480**	22 U	NA	NA
Hazard Index (a)	**1.17**	**1.20**	**4.42 J**	**0.11**	**4.11**	**0.006**	**0.06**	**0.15**

Box indicates exceedance of hazard index
Bold indicates detected value.
U = Indicates the compound was undetected at the reported concentration
UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate
J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
NA = Not analyzed.

(a) A hazard index above 1 exceeds MTCA criteria for risk to human health based on direct contact

TABLE 26
CONVENTIONAL GROUNDWATER DATA
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

Well ID	pH	Conductivity (µs/cm)	Turbididty (NTU)	ORP (a) (mV)	Dissolved Oxygen (mg/L)	Alkalinity (mg/L CaCO3)	Carbonate (Alkalinity) (mg/L CaCO3)	Bicarbonate (Alkalinity) (mg/L CaCO3)	Ferrous Iron (mg/L)	N-Nitrate (mg N/L)	N-Nitrite (mg N/L)	Nitrate + Nitrite (NO3+NO2) (mg N/L)	Sulfate (mg/L)	TOC (mg/L)
Arsenic Affected Wells														
P-3	6.94	1230	20	(82.3)	1.4	565	1.0 U	565	46.6	0.010 U	0.079	0.010 U	23.7	13.5
P-13	6.54	930	17	(104.4)	1.0	420	1.0 U	420	41.1	0.010 U	0.076	0.010 U	25.0	13.3
P-14	6.44	1630	19	(68.7)	2.1	719	1.0 U	719	82.0	0.010 U	0.125	0.010 U	32.8	27.6
P-15	6.31	1260	8	(113.9)	1.6	499	1.0 U	499	56.5	0.010 U	0.087	0.010 U	37.6	16.6
P-16	7.16	622	24	(92.9)	0.2	346	1.0 U	346	20.0	0.010 U	0.023	0.010 U	24.2	9.17
Upgradient Wells														
P-2	6.08	186	12	49.8	0.74	56.5	1.0 U	56.5	9.42	0.018	0.010 U	0.018	33.1	1.50 U
P-5	6.41	236	17	(96.3)	0.58	140	1.0 U	140	5.4	0.010 U	0.010 U	0.010 U	3.0	5.04
P-26	6.57	639.0	22	32.0	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not Analyzed
U = Indicates the compound was undetected at the reported concentration.

(a) Parentheses denote negative number.

TABLE 27
CONCENTRATION RATIOS FOR METALS IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

		TOTAL METALS (mg/kg) SW6000-7000 Series								
Location	Depth (ft)	Arsenic	Copper	Cu/As Ratio		Lead	Pb/As Ratio	Zinc	Zn/As Ratio	
B-FA-1	(0-0.5)	40.0	343.0	8.6		205.0	5.1	533.0	13.3	
B-FA-2	(0-0.5)	22.0	1000.0	45.5		192.0	8.7	292.0	13.3	
B-FA-3	(0-0.5)	57.0	1600.0	28.1		237.0	4.2	606.0	10.6	
B-FA-9	(0-0.5)	35.0	84.7	2.4		61.0	1.7	212.0	6.1	
Average Area B		38.5	756.9	19.7		173.8	4.5	410.8	10.7	
C-4	(0-0.5)	21.0	11900.0	566.7		3080.0	146.7	827.0	39.4	
C-FA-2	(0-0.5)	30.0	12300.0	410.0		19700.0	656.7	878.0	29.3	
C-FA-3	(0-0.5)	40.0	9060.0	226.5		240.0	6.0	897.0	22.4	
C-FA-4	(0-0.5)	40.0	5750.0	143.8		176.0	4.4	482.0	12.1	
Average Area C		32.8	9752.5	297.8		5799.0	177.1	771.0	23.5	
D-7	(0-0.5)	42.00	45.50	1.08		13.00	0.31	89.00	2.12	
D-FA-10	(1-2)	47.60	13.10	0.28		4.30	0.09	40.40	0.85	
D-FA-10	(0-0.5)	38.80	138.00	3.56		153.00	3.94	404.00	10.41	
D-FA-15	(0-1)	40.00	72.10	1.80		65.00	1.63	340.00	8.50	
D-FA-2	(4-6)	63.00	98.10	1.56		57.00	0.90	299.00	4.75	
D-FA-2	(8-10)	55.00	97.70	1.78		51.00	0.93	266.00	4.84	
D-FA-2	(1-2)	40.00	78.60	1.97		47.00	1.18	174.00	4.35	
D-FA-3	(1-2)	80.00	57.10	0.71		21.00	0.26	155.00	1.94	
D-FA-3	(10-12)	80.00	105.00	1.31		56.00	0.70	202.00	2.53	
D-FA-3	(4-6)	51.00	77.70	1.52		61.00	1.20	157.00	3.08	
D-FA-3	(8-10)	50.00	78.30	1.57		42.00	0.84	202.00	4.04	
D-FA-4	(4-6)	57.00	78.70	1.38		44.00	0.77	185.00	3.25	
D-FA-4	(8-10)	57.00	76.90	1.35		58.00	1.02	155.00	2.72	
D-FA-4	(10-12)	24.00	38.60	1.61		11.00	0.46	68.50	2.85	
D-FA-5	(0-0.5)	100.00	57.10	0.57		23.00	0.23	158.00	1.58	
D-FA-5	(1-2)	60.00	79.50	1.33		21.00	0.35	154.00	2.57	
D-FA-5	(3-5)	58.00	88.20	1.52		45.00	0.78	175.00	3.02	
D-FA-5	(11-14)	58.00	79.50	1.37		56.00	0.97	0.06	0.00	
D-FA-5	(9-11)	37.00	60.50	1.64		78.00	2.11	196.00	5.30	
D-FA-5	(7-9)	34.00	56.60	1.66		27.00	0.79	111.00	3.26	
D-FA-6	(0-0.5)	50.00	69.10	1.38		21.00	0.42	234.00	4.68	
D-FA-6	(1-2)	36.00	60.20	1.67		27.00	0.75	113.00	3.14	
D-FA-6	(8-10)	22.00	45.40	2.06		15.00	0.68	82.70	3.76	
D-FA-7	(3-5)	250.00	494.00	1.98		172.00	0.69	535.00	2.14	
D-FA-7	(1-2)	30.00	41.30	1.38		12.00	0.40	80.00	2.67	
D-FA-7	(7-9)	22.00	40.50	1.84		44.00	2.00	99.00	4.50	
D-GC-12	(0-0.5)	30.00	59.70	1.99		53.00	1.77	137.00	4.57	
D-GC-12	(1-2)	29.00	32.70	1.13		5.00	0.17	73.60	2.54	
D-GC-2	(0-0.5)	30.00	78.10	2.60		61.00	2.03	164.00	5.47	
D-GC-3	(0-0.5)	20.10	114.00	5.67		79.70	3.97	164.00	8.16	
D-GC-5	(0-0.5)	157.00	36.60	0.23		41.20	0.26	76.90	0.49	
D-GC-6	(2-3)	90.00	125.00	1.39		88.00	0.98	656.00	7.29	
D-GC-6	(1-2)	88.00	92.80	1.05		64.00	0.73	442.00	5.02	
D-GC-6	(0-0.5)	22.00	36.90	1.68		13.00	0.59	132.00	6.00	
P-9	(2.5-3.5)	60.00	87.90	1.47		54.00	0.90	188.00	3.13	
P-9	(5.5-6.5)	57.00	91.30	1.60		56.00	0.98	201.00	3.53	
Average Area D		57.4	82.8	1.4		48.3	0.8	191.9	3.3	
E-GC-1	(0-0.5)	29.0	35.7	1.2		15.0	0.5	65.9	2.3	
E-GC-1	(1-2)	23.0	18.4	0.8		7.0	0.3	41.2	1.8	
E-GC-1c	(0-0.5)	48.0	23.4	0.5		7.0	0.1	47.5	1.0	
E-GC-5	(1.5-2.0)	90.0	20.1	0.2		6.0	0.1	52.5	0.6	
Average Area E		47.5	24.4	0.5		8.8	0.2	51.8	1.1	
F-4	(0-0.5)	57.0	190.0	3.3		115.0	2.0	810.0	14.2	
F-5	(0-0.5)	53.0	1190.0	22.5	J	241.0	4.5	1790.0	33.8	
F-FA-10	(0-1)	30.0	91.3	3.0	J	27.0	0.9	180.0	6.0	
F-GC-13	(1-2)	410.0	775.0	1.9		351.0	0.9	2970.0	7.2	J

TABLE 27
CONCENTRATION RATIOS FOR METALS IN SOIL
NORTH MARINA REDEVELOPMENT SITE
EVERETT, WASHINGTON

		TOTAL METALS (mg/kg) SW6000-7000 Series						
Location	Depth (ft)	Arsenic	Copper	Cu/As Ratio	Lead	Pb/As Ratio	Zinc	Zn/As Ratio
F-GC-13	(0-1)	**200.0**	**420.0**	**2.1**	**246.0**	**1.2**	**1570.0**	**7.9** J
F-GC-13	(2-3)	**50.0**	**297.0**	**5.9**	**78.0**	**1.6**	**1840.0**	**36.8**
F-GC-13b	(0-0.5)	**28.0**	**97.8**	**3.5**	**36.0**	**1.3**	**370.0**	**13.2**
F-GC-13c	(0-0.5)	**90.0**	**607.0**	**6.7**	**194.0**	**2.2**	**1990.0**	**22.1**
F-GC-13c	(1-2)	**54.0**	**62.7**	**1.2**	**223.0**	**4.1**	**7770.0**	**143.9**
F-GC-13c	(2-3)	**48.0**	**62.5**	**1.3**	**286.0**	**6.0**	**6500.0**	**135.4**
Average Area F		**102.0**	**379.3**	**3.7**	**179.7**	**1.8**	**2579.0**	**25.3**
F-Pink	(0-1)	**440.0**	**971.0**	**2.2**	**919.0**	**2.1**	**7530.0**	**17.1**
F-Pink	(1.2-1.5)	**110.0**	**230.0**	**2.1**	**376.0**	**3.4**	**2770.0**	**25.2**
Average Pink Material		**275.0**	**600.5**	**2.2**	**647.5**	**2.4**	**5150.0**	**18.7**
H-GC-1	(0.8-1.3)	**21.0**	**23.3**	**1.1**	**5.0**	**0.2**	**37.4**	**1.8**
H-GC-5	(0.8-1.3)	**24.0**	**23.1**	**1.0**	**7.0**	**0.3**	**49.1**	**2.0**
Average Area H		**22.5**	**23.2**	**1.0**	**6.0**	**0.3**	**43.3**	**1.9**
I-Z	(0-0.5)	**240.0**	**868.0**	**3.6**	**280.0**	**1.2**	**863.0**	**3.6**
J-GC-4	(1.5-2)	**30.0**	**31.8**	**1.1**	**42.0**	**1.4**	**77.0**	**2.6**
L-GC-4	(0-0.5)	**34.0**	**90.5**	**2.7**	**66.0**	**1.9**	**315.0**	**9.3**
L-GC-4b	(1.7-2.2)	**270.0**	**838.0**	**3.1**	**330.0**	**1.2**	**3130.0**	**11.6**
L-GC-5	(0.5-1)	**70.0**	**201.0**	**2.9**	**190.0**	**2.7**	**728.0**	**10.4**
Average Area L		**124.7**	**376.5**	**3.0**	**195.3**	**1.6**	**1391.0**	**11.2**

J = Data validation flag indicating the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.