Remedial Investigation/Feasibility (RI/FS) Work Plan
Industrial Container Services/Former NW Cooperage Site
Seattle, Washington

Prepared for:
ICS/Former NW Cooperage

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February 2012

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INTRODUCTION

This Remedial Investigation/Feasibility Study (RI/FS) Work Plan (RI/FS WP) was prepared by Dalton, Olmsted & Fuglevand, Inc. (DOF) for the PLPs pursuant to Task 1 of Exhibit B to Agreed Order DE 6720 between the Washington State Department of Ecology (Ecology), and the Trotskys and Industrial Container Services - WA, LLC. The ICS/Trotsky facility (herein referred to as the "Site") is located along a small embayment to the Lower Duwamish Waterway that is referred to as Early Action Area 2 or EAA-2 (Figures 1 and 2).

The original draft RI/FS work plan was submitted to Ecology in July 2010 and comments were received in an Ecology letter dated November 22, 2010. A revised draft work plan was submitted to Ecology in late January 2011. Additional Ecology comments and proposed revisions were outlined in the following documents:

- Ecology letter to Matt Dalton (DOF) dated June 20, 2011.
- DOF Memorandum to Ecology (Vicki Sutton) entitled "*Revisions to January 2011 Draft RI/FS Work Plan, ICS/NW Cooperage Site*" dated July 22, 2011.
- Ecology letter to Matt Dalton (DOF) dated August 15, 2011.
- DOF Memorandum to Ecology (Vicki Sutton entitled "*Responses to Ecology Comments/Proposed Revisions to RI/FS Work Plan*", ICS/NW Cooperage Property, Seattle, Washington, dated October 13, 2011.
- DOF e-mail to Ecology with Revised Table 9 – Sample Analyses – November 10, 2011.

With submittal of revised Table 9, a consensus was reached as to the final scope of the RI/FS work plan. The revisions are incorporated into this final draft work plan and the revised plan is being submitted to Ecology for final review and approval.

BACKGROUND

Location and Current Description. The Site is located at 7152 1st. Avenue South, Seattle, Washington and consists of three King County tax parcels including 2924049108, 2924049030 and 2924049004 (Figures 3 and 5). The property has been used for drum reconditioning since at least the 1930s, prior to the Trotsky family presence at the Site. Members of the Trotsky family operated the facility on portions of the site from approximately 1953 to 1995 as Northwest Cooperage Inc. From 1995 to 2002 Consolidated Drum Reconditioning Company, Inc., Palex Container Systems and IFCO ICS-Washington, Inc., successively, operated the facility. In 2002 Industrial Container Services - WA, LLC (ICS - WA) purchased the business and began operating the facility and is the current operator of the Site. The Site property is still owned by the Trotsky family.

The Site is approximately 7.1 acres in size. The upland parcels comprise approximately 6.3 acres and the embayment parcel is approximately 0.8 acre in size. The Site's land surface slopes gently downward in a northerly direction from an elevation of approximately 20 feet Mean Lower Low Water (MLLW) at the southern property line to approximately 15 feet MLLW adjacent to the embayment (Figures 5 and 6)[i].

A number of buildings are located on the upland where barrels are cleaned, reconditioned, and stored (Figures 4 and 5). The facility's EPA I.D. number is WAD000066084 (SAIC 2007a). The facility operates under a King County (Metro) wastewater discharge permit (No. 7130-04) and PSCAA Air Permit No. 11683.

Site Operations. New barrel manufacturing and barrel refurbishing are completed in three buildings as shown on Figure 5 and summarized below.

- **New Drum Plant**. New barrels are manufactured in the New Drum Plant located within the southwestern portion of the site. Drum stock is welded and cleaned in this building. Painting of new drums occurs within the southern portion of the Upstairs Reconditioning Plant. Wastewater is produced by the cleaning of the new drums with a solution of mildly alkaline (pH 10.5 to 11.3) cleaner followed by a mildly acidic (pH 2 to 3) rinse. Spent washing solution is pumped through overhead piping to the water pre-treatment plant.

- **Upstairs Reconditioning Plant**. Used barrels are reconditioned in this plant that is located within the central portion of the facility. Activities that occur in this plant include removing the tops of closed top drums and "*burning*" open-topped drums in the drum reclamation furnace plus re-shaping and painting open topped and closed top drums. To prepare the drums for painting, drums are shot-blasted. The drum furnace is located on the east side of the plant while shot blasting occurs in an area north of the burner. Paint storage and painting operations occur within the southern portion of the plant.

  Wastes produced in this plant include drum furnace ash, shot blast dust, and paint filters. The PSCAA permit requires that there be no visible emissions from the permitted facilities including a paint curing oven and drum furnace. Emissions from the paint curing oven are controlled by a Regenerative Thermal Oxidizer (RTO) while emissions from the drum furnace are controlled by a secondary combustion chamber (thermal oxidizer). Both of these control units have passed source tests and are operated within the parameters of their respective operating permits. Blasting occurs in a closed chamber and emissions are controlled by two bag houses located north of the drum furnace as shown on Figure 5. No wastewater is generated in this portion of the facility.

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[i] Property lines were surveyed in December 2009 by Continental Survey Company and site topography was determined from aerial photogrammetric mapping by David C. Smith Associates in March 2010.

Drum furnace ash and bag house blaster dust need to be periodically removed. The drum furnace generates a coarse granular ash residue and is not likely to produce fugitive emissions during handling. Blaster dust is discharged into drums by gravity. Drums are periodically emptied into roll-off boxes for disposal.

- **Inside Wash Plant (also known as Downstairs Building)**. The primary activity that occurs in this plant is the flushing and washing of closed top (tight head) drums. Petroleum drums are flushed with a 8% caustic solution followed by washing and rinsing with water and hot water. Other drums are flushed and rinsed with water and hot water. Hard to clean drums may be washed with muriatic acid and rinsed with a caustic solution. After cleaning, the closed topped drums go to the Upstairs Reconditioning Plant for testing, blasting, painting etc. Some drums may be converted into open topped drums.

  Wastes produced in the Inside Wash Plant include flushing, cleaning and rinsing wastewaters. Wastewater is directed to the water pre-treatment facility via above ground pipes.

Tank Storage. There are twenty-eight above ground tanks on the facility that store a variety of materials including acid, caustic, diesel, propane and waters (Figure 7). Acidic and caustic fluids are stored in plastic tote tanks with integral secondary containment. Paints are also stored in an area located on the south side of the Upstairs Drum Reconditioning Plant. All the tanks are located on paved surfaces and any spillage would flow to sumps that ultimately flow to the pre-treatment water system via overhead piping.

Wastewater Treatment and Disposal. Wastewater generated at the facility includes spent wash water and rinse solutions (SAIC 2007a). The facility maintains a permitted wastewater treatment system. Sources of wastewater include cleaning, manufacturing, or reconditioning of steel drums, plastic drums, and intermediate bulk containers. There is also stormwater when it rains.

Up to 25,000 gallons per day (gpd) of treated wastewater may be discharged to Metro, although typical discharges are approximately 5,000 to 7,000 gpd. In addition, the facility discharges up to 1,542 gpd of stormwater and 420 gpd of sanitary waste to the sanitary sewer.

The water pre-treatment system is located within the northeastern portion of the facility (Figure 5). Wastewater flows from the three barrel and tote cleaning operations to the primary settling tank where the pH is lowered and a coagulant injected (Metro 2009). From there the wastewater enters an oil skimmer. The wastewater then flows into the mix tank where the pH is raised and a flocculent injected. Wastewater then flows into one of two 10,000-gallon holding tanks where further solid settling takes place. Finally, wastewater flows through a 4,000-gallon, 7,500-gallon, and an 8,000-gallon tank before being discharged to the sewer. The pre-treatment system is connected to the Metro sanitary sewer line by a buried sewer line that runs in a westward direction to the discharge point near the facility's main gate (Figure 5).

The Metro discharge permit includes "*self-monitoring*" requirements. In addition, Metro collects and analyzes periodic discharge samples for confirmation purposes. Analyses are made for pH, metals (As, Cd, Cr, Cu, Pb, Ni and Zn), Hem (oil, total), volatile organic compounds (VOCs), including common solvents and semivolatile organic compounds (SVOCs). ICS is in compliance with the discharge limits. Constituent detections for samples collected and analyzed by Metro in February and October 2010 are summarized below.

Discharge From Pre-Treatment System

Detected Constituent	**Units**	**Feb. 2010 (Grab)**	**Oct. 2010 (Composite)**
pH	SU	10.2	8.65
Chromium	ug/l	7.9	16.5
Copper	ug/l	131	27.2
Lead	ug/l	nd	38
Zinc	ug/l	554	460
2-Butanone (MEK)	ug/l	nd	653
Acetone	ug/l	23	498
Chloroform	ug/l	nd	6.2
Ethylbenzene	ug/l	5.8	12.6
Tetrachloroethene	ug/l	13.4	7.6
Toluene	ug/l	30.4	89.4
Xylenes	ug/l	37.3	70.1
Bis(2-Ethylhexyl)phthalate	ug/l	9.2	617
Di-N-Butylphthalate	ug/l	3.26	nd
Hem (oil,total)	mg/l	31.4	11

Notes: nd - Not detected; analyses by Metro

The Ecology Source Control Action Plan for EAA-2 (Ecology 2007) indicates that EPA, Ecology and Seattle Public Utilities (SPU) inspected this site in February 2003. The plan reports that "*No significant concerns were noted. Wastewater and runoff from the site are collected and routed through a pretreatment system before discharge to the sanitary/combined sewer in accordance with a discharge permit from the King County Industrial Waste (KCIW) Program (Permit No. 7130). KCIW conducts routine inspections of this facility."* The 2009 Metro permit indicates that *"The only exceedence in the last five years was a screening violation for MEK, toluene, and total xylenes during King County monitoring in November 2008.*"

Solid Wastes. Solid wastes generated at the facility include drum furnace ash, shot blast dust, wastewater treatment sludge, oils, scrap metal and plastic drums (SAIC 2007a). Tank solids (sludges) are collected periodically, dewatered and comingled with ash from the drum furnace and dust from the facility's blasting operation. Testing of these solids indicate that they do not designate as a dangerous or hazardous waste under State and

Federal regulations. These solid wastes are transported offsite and disposed in a Subtitle D, non-hazardous waste landfill. Skimmed oils are transported off-site by a recycler.

Former Lagoon. Available documents (Parametrix et al 1991) refer to a "*lagoon*" that was present along a portion of the eastern property line. The property owner indicates to the best of his knowledge there was never a lagoon-like feature on the site, however a 1963 survey drawing (Horton Dennis 1963) indicates the presence of a former lagoon and slough, the locations of which are shown on Figure 13. The trend of these features indicates that they were most likely the visual remnants of the filled in drainage ditch which now flows in a buried stormwater drainage pipe to the 2nd Avenue Outfall (DOF 2010).

The property owner suggested that a concrete tank may have been present in the general area of the former drainage ditch. However, this feature is not shown on the 1963 survey map and there is no physical evidence that a buried concrete tank actually existed. Long-standing current ICS employees (going back to the early 1970s) have no recollection of a buried concrete tank. The 1991 hazard ranking summary score sheet (Ecology 1991) indicates that prior to about 1970 wastewaters were discharged to an impoundment that was filled following installation of a pretreatment system with subsequent discharge to Metro. The score sheets indicates sludges were likely not removed from the impoundment prior to filling. The hazard ranking summary score sheet does indicate the use of an on-site settling tank after the impoundment was filled.

ICS Storm Water. In 1973, NW Cooperage bermed the facility with concrete and a large portion of the facility was paved beginning in 1988 (SAIC 2007a). Most of the site storm water is currently collected, treated on-site and disposed in the sanitary sewer under a Metro discharge permit. Some storm water is used in facility washing operations. Current facility personnel indicate that there is no overflow from the on-site pretreatment system during periods of heavy rainfall.

Storm water is collected by seven sumps designated A to G on Figure 5. Except for a small buried pipe between the water tanks and the southeast corner of the Upstairs Reconditioning Plan, all water flows in overhead pipes to the pre-treatment system.

The roofs of a number of small sheds located on the west side of the site drain off-site (Figure 13)(DOF 2010a). The small amount of roof drainage is to surrounding paved areas, outside of where barrels are (or were) recycled, along the northwest upland site periphery where infiltration likely occurs. The roofs of these small buildings are constructed of typical commercial composite rolled roofing.

Embayment Outfalls. Two public outfalls discharge into the embayment (Ecology 2007a). The outfall locations are shown on Figures 5, 6 and 13. A City of Seattle storm water outfall (2nd. Ave. stormdrain) discharges to the embayment within the central portion of the southern shoreline. The outfall drains an area generally south and east of ICS and is served by a system of ditches and culverts, with a piped outfall to the embayment. The approximate drainage area for the 2nd Ave. outfall is shown on Figure 8. A tide gate was installed in the drainage system in 2000. There are no catch basins or other drainage features connected to the 2nd Ave. Outfall on the ICS site.

A second public outfall is present near the head of the embayment. SPU operates an overflow from the West Seattle reservoir that discharges excess potable water to the embayment. It is not known whether storm water also discharges through this outfall.

Embayment. The embayment consists of approximately 1.0 to 1.2 acres as measured from the top of slope (approximate elevation 15 feet MLLW). Elevations in the embayment range from approximately 15 feet MLLW along the top of slope to less than 0 feet MLLW near the eastern mouth. Bottom elevations at the head of the embayment range between an elevation of approximately 4 and 5 feet MLLW. The mudline elevation at the location of sediment core (LDW-SC40) at the mouth of the embayment was noted as -1 foot MLLW. Most of the bottom of the embayment is exposed during periods of relatively low tide.

The remains of piling and other features ("*ruins*") are visible in the embayment during periods of low tide (Figure 6). A shallow 50 to 70-foot wide shelf extends offshore from the north bank of the embayment that lies within the intertidal zone (SAIC 2008). Field observations by SAIC (2009) indicate that nearly the entire north bank is protected by bulkheads or concrete in various forms. Concrete was found poured over the bank surface and as stacked slab fragments. The bulkheads and concrete prevented sampling of north bank soils by SAIC in 2008 to assess recontamination potential by bank erosion. The north bank is further discussed below based on site reconnaissance information collected in September 2010 (DOF 2010b).

The north-south lineal features evident on the 2010 air photograph (Figure 4) are large, pile supported, milled timbers that were likely associated with the former Seabell Shipbuilding Company operations (SAIC 2008). The shipbuilding company engaged in construction of large wooden vessels. The timbers are at the same location of the raft-like structure shown on the 1960 historic aerial photograph (Figure 10).

The south bank includes rip-rap, old piling and an aged platform that is pile supported and extends over the intertidal portion of the embayment. Blackberries and other vegetation obscure the upper portions of the southern embayment bank. The remains of drum tops and metal debris are exposed at the intertidal mudline surface. During a past site visit by SAIC, a petroleum sheen was observed near the south and west portions of the area where the milled timbers are present (SAIC 2007a).

A survey of seeps was conducted as part of the Phase 2 RI for the Lower Duwamish Waterway (Ecology 2007). Four seeps were identified; three from the south bank and one from the north bank. Pertinent details are summarized in the following table.

Seep No.	Easting (x)	Northing (y)	Location Description	Observations
Seep 53	122°19.988	47°32.357	South side of inlet; near old yellow building	Seep within very black muck; chemical sulfide odor; located bottom of channel, adjacent to horizontal timber/ties within channel
Seep 54	122°20.013	47°32.358	South side inlet near dock	Grey, foamy, very small seep; embankment has moderate slope with pier columns and construction/metal debris; seep located mid-bank, below decayed pier/platform; trace very light flow
Seep 55	122°20.035	47°32.360	North side of inlet; near cement truck barrel	No odor, no sheen; trace fine brown sediments located mid-bank at base of former cement truck tumbler, in asphalt concrete rubble with gravel; steep riprap and construction debris bank adjacent to pier/dock with structure.
Seep 56	122°19.959	47°32.364	South side of inlet; near mouth	No odor, no sheen; located mid-bank in steep riprap in Trotsky channel; below vegetation and stacked drums.

In 2007 and 2008, SAIC sampled three seeps within the embayment (SAIC 2009). These include two seeps emanating from the south bank (Seep 1 and Seep 2) and one seep from the north bank (SP-1). Approximate seep sample locations are shown on Figure 13. Seep 2 is reportedly the same seep as Seep 56 described above.

Historical Site Development. Historical aerial photographs were reviewed to generally assess how the site was developed. Aerial photographs for the following years were reviewed:

1936	1969	1985	2004
1946	1974	1990	2010
1956	1977	1995	
1960	1980	2002	

- **1936** (Figure 9). The site consisted of a single building and a wharf. Most of the surrounding area was undeveloped and filling to create the north side of the embayment (current Douglas property) had not been completed. A ditch channel that flowed into the Duwamish Waterway was present to the southeast of the 1936 facility.

- **1936 to 1960**. The site expanded to the current foot-print by the mid-1950s. A wrecking yard was established south of the Site between 1946 and 1956, the eastern edge of which was located along the ditch. General area features by June 1960 are shown on Figure 10. Filling of the Douglas property area had not yet been completed and the eastern portion of the wharf had been removed.

- **1960 to present**. Filling to create the Douglas property and embayment appears to have been accomplished during the late 1960s. Filling of the mouth and northern portion of the ditch channel and some filling along the Site shoreline had also been completed by 1969. The approximate position of the 1936 shoreline and wharf are superimposed on the April 2004 air photograph shown on Figure 11. The current site layout and property lines are illustrated on the March 2010 photograph presented as Figure 4.

PAST INVESTIGATIONS

A number of past studies completed on the Site included soil, sediment, seep, off-site stormwater and groundwater sampling/analysis. Each of the studies is briefly summarized below. The results of the analyses are summarized in Tables 1 to 7. Sample locations are presented on Figures 12 and 13. The logs of the borings/wells/cores are included in Appendix A and B.

In the tables, where appropriate and possible, the analytical results are compared to Lower Duwamish Waterway (LDW) screening levels that are presented in an Excel spreadsheet provided by Ecology to the project team (Ecology 2010a). The most stringent screening levels protective of potable groundwater and non-potable surface water were used. Screening levels are used to identify contaminants of potential concern (COPCs) and to assist in setting Data Quality Objectives (DQOs) associated with the laboratory analytical program. They are not cleanup levels (CULs). In addition to the LDW screening levels, the analytical results are compared to metal background concentrations for Puget Sound (Ecology 1994). For screening purposes, the maximum detected concentrations are compared to the screening levels and metal background concentrations.

Each of the tables include the LDW screening criteria and sample concentrations that exceed screening levels and background concentrations (for soil) are highlighted. Analytical constituents that exceed screening levels for all media are summarized in Table 8 and discussed later in this plan.

- ***Ecology Preliminary Assessment (1985)***

  A preliminary assessment (PA) was completed by SAIC for Ecology in 1985 (Ecology 1985). The PA noted that much of the site was unpaved and in the past there had been heavy metal exceedances of discharge criteria to the Metro sewer and that oil and grease limits were still being exceeded. Air emissions were judged to potentially contain heavy-metals. It was recommended that soil sampling be conducted and that the process area should be paved. Based on this assessment, NW Cooperage retained Hart Crowser to complete a soil and groundwater quality evaluation of the drum re-conditioning site. No sampling was performed as part of the 1985 assessment.

- ***Groundwater and Soil Quality Assessments - mid-1980s***

In 1986 and 1987, Hart Crowser completed an assessment of the environmental conditions beneath the Northwest Cooperage site. The assessment work was completed in two phases that included the following:

1st. Quarter 1986

- Sampling surface soils (0 to 2 feet) at 30 locations. The samples were composited into six samples representative of various areas within the NW Cooperage site, for laboratory analysis.
- Drilling and sampling of three soil borings. Subsurface soil samples were obtained and analyzed from two of the borings (HC-B-1 and HC-B-2).
- Installing monitoring wells in the three borings.
- Assessing groundwater flow directions.
- Analyzing soil and groundwater samples for metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and PCBs.

3rd. Quarter 1986 and 1st Quarter 1987

- Installed two additional monitoring wells (HC-B4 and HC-B5).
- Conducted a tidal fluctuation study to assess possible impacts on groundwater flow directions.
- Conducted in-situ hydraulic conductivity tests in the five monitoring wells (HC-B1 to HC-B5)..
- Collected groundwater samples from the five wells and measured pH, electrical conductivity and temperature. The groundwater sample from well HC-B-2 was submitted for laboratory analysis.
- During the drilling, representatives of EPA collected soil samples from four borings and had selected samples analyzed for metals, VOCs, SVOCs, pesticides and PCBs. The results of EPA's testing are summarized in a table included with the 1987 Hart Crowser report.

The results of the 1986 soil analyses, along with screening levels and metal background concentrations are summarized in Table 3. Sample locations are shown on Figure 13.

- ***Site Hazard Assessment (1991)***

In 1991 Parametrix and SAIC completed a Site Hazard Assessment for Ecology. As part of the assessment, four surface soil samples and sediment from a manhole were collected from within the southeastern portion of the Site. The soil samples were mixed into one sample (SC-1) and analyzed for PAHs, VOCs, organochlorine pesticides, PCBs, cyanide, total metals and polychlorinated dioxin/furan compounds. The results of these analyses are summarized in Table 4. Sample locations are shown on Figure 13.

In addition, three sediment samples were collected from the embayment (SS-1 to SS-3). Analyses were completed for PAHs, VOCs, organochlorine pesticides, PCBs, cyanide and total metals. The analytical results are summarized in Table 1 and sample locations are shown on Figure 13.

Based on the hazard assessment, Ecology assigned a hazard ranking of 4 for this site in 1991. The ranking scale is from 1 to 5, where a ranking of 1 indicates the greatest risk to human health and the environment relative to other sites in Washington State (SAIC 2007a).

- ***Additional Groundwater Sampling (1991)***

In June 1991, NW Cooperage collected a groundwater sample from Well B-2 (SAIC 2007a). The sample was analyzed for dissolved metals, VOCs and SVOCs. The results are summarized in Table 6. The location of well B-2 is shown on Figure 13.

- ***Embayment Sediment Sampling 1998 to 2006***

As part of planning for and completing the Lower Duwamish Waterway RI, sediment samples were obtained and analyzed from within and near the mouth of the embayment (Windward 2007a,b). Surface sediment samples DR138, DR139 and DR157 were collected in August 1998 as part of EPA's site investigation (SI). Sample B5a-2 was collected in September 2004 as part of benthic studies while sample LDW-SS84 was collected in January 2005 as part of the Round 1 sampling. The samples were analyzed for metals, SVOCs, PCBs, and total organic carbon. Samples LDW SS84, DR139 and B5a-2 were also analyzed for pesticides while sample DR139 was analyzed for VOCs and sample LDW-SS84 was analyzed for dioxin/furans. The results are summarized in Table 1. Sample locations are shown on Figure 13.

No sediment cores have been completed within the embayment. However, core LDW-SC40 located near the mouth of the embayment, was sampled in February 2006. The core was advanced to a depth below mudline of approximately 13 feet. The upper portion of the sediment core (0 to 4 feet) was divided into three samples and the samples were analyzed for metals, SVOCs, pesticides, PCBs and polychlorinated dioxin/furans. The core sample analytical data are summarized in Table 2. The core location is shown on Figure 13.

- ***Data Compilation and Identification of Data Gaps - February 2007***

SAIC for Ecology compiled available information to identify data gaps for EAA-2. The results of the compilation and analysis are summarized in SAIC (2007a). This report provides a summary of the regulatory and sampling history of sites potentially associated with EAA-2. Available embayment sediment, upland soil, groundwater, embayment seep and stormwater sediment data are summarized.

- ***Soil, Sediment, Seep and Groundwater Assessment - April and May 2007***

  As part of the Lower Duwamish Waterway source control work, Ecology contracted SAIC to complete sampling on the upland and in the embayment adjacent to the upland (SAIC 2007b). The work consisted of the following:

  - Three soil borings (MW-1, MW-2 and MW-3) were drilled and sampled adjacent to the embayment along the northern boundary of the upland. Monitoring wells were installed in the three borings.
  - The new wells and four existing wells (HC-B1, HC-B2, HC-B4 and HC-B5) were surveyed to a common elevation datum.
  - Groundwater flow directions and the effects of tidal fluctuations were assessed.
  - Collected/analyzed the following samples:
    - Four intertidal surface (0 to 10 cm) sediment samples (SED1 to SED 4) from the embayment.
    - One outfall sediment sample (SED 5) from one foot inside the outfall pipe.
    - Two seep samples emanating from the south shore of the embayment at low tide.
    - Five groundwater samples from wells MW-1 to MW-3, HC-B1 and HC-B2.
    - One outfall water sample.
  - Compared the analytical results with potential environmental (cleanup) criteria.

  Data collected by SAIC are summarized in Tables 1 (sediment), 5 (soil), 6 (groundwater) and 7 (outfall and seep water samples). Sample locations are shown on Figure 13.

- ***EAA-2 Source Control Action Plan - June 2007***

  Using the results of the SAIC data compilation report (SAIC 2007a), Ecology prepared a "Source Control Action Plan for Early Action Area 2". This plan summarizes potential sources and contaminants of concern (as of 2007). The results of some previous sample analyses are described and "Source Control Actions" for properties with the potential to contribute contamination to EAA-2 are outlined.

  PCBs, bis(2-ethylhexyl)phthalate[BEHP], mercury, lead, zinc, DDT and dieldrin were considered to be the major COCs in EAA-2 sediments. Sources of contaminants to EAA-2 were identified to potentially be associated with historic and/or on-going activities and included the ICS/Trotsky Property, Douglas Management Co. property, Second Ave. Outfall, Boyer properties and atmospheric deposition (via direct deposition or migration in stormwater). Inline sediment samples from the 2nd Ave.

outfall system indicated the presence of arsenic, zinc, phthalates, PAHs and other contaminants.

- ***Soil Probe Sampling - July 2008***

  In July 2008, DOF completed ten soil probes on the upland portion of the Trotsky property to depths of generally twenty feet. Soil conditions encountered by the probes were logged and soil samples were obtained for laboratory analysis of petroleum hydrocarbons, lead and PCBs[ii]. The results of the analyses are summarized in Table 5 and sample locations are shown on Figure 13.

- ***Douglas Management Co. Property - Supplemental Data Gaps Report - December 2008***

  SAIC for Ecology compiled available historic and testing data on the Douglas Property. Available surface and subsurface sediment data in the Lower Duwamish Waterway (LDW) adjacent to the property, and upland soil and groundwater data were summarized. No data on sediment quality in the embayment were presented in the report.

  The results of a number of sediment samples collected from the LDW near and northwest of the mouth of the embayment were compared to sediment criteria contained in the Washington State Sediment Management Standards (SMS). Two PAHs (benzo[ghi]perylene and indeno[1,2,3-cd]pyrene) were found to marginally exceed sediment quality standards (SQS) in a sample collected in the waterway northwest of the embayment mouth (DR136) and PCBs were found to exceed the SQS by a factor of less than 2 except at a location northwest of the embayment mouth (LDW-SC39) where the SQS was exceeded by 5.8 times and the cleanup screening level (CSL) was exceeded by 1.1 times.

  Data presented for upland soils exceeded Method A or B cleanup levels established by the Washington State Model Toxics Control Act (MTCA) for benzene, methylene chloride (dichloromethane) and total petroleum hydrocarbons. Groundwater samples were found to exceed MTCA Method A or B CUL for benzene, and diesel range hydrocarbons.

- ***Summary of Additional Site Characterization Activities - Trotsky and Douglas Management Co. Properties - May 2009***

  This report summarizes the results of testing completed on the Trotsky and Douglas properties in 2007 and 2009. The results of soil, sediment, outfall solids, groundwater, seep water and outfall water sample analyses are summarized in tables. Some data

[ii] A report has not yet been prepared to document this sampling. Field procedures, laboratory data sheets etc. will be included in the RI report.

interpretation and discussion of migration pathways is presented in the report. No new field data is presented in this report.

CONDITIONS IN THE EMBAYMENT

No sediment cores have been completed in the embayment. Based on review of historic air photographs, it does not appear that significant sediment deposition has occurred over the past thirty or more years. The milled timbers shown on the 2010 air photograph (Figure 4), are evident on air photographs taken in 1944 and 1977.

At the mouth of the embayment, the log of LDW-SC-40, shows a recent sediment thickness of approximately 1.3 feet. The recent sediment was logged as a dark gray organic silt that overlies a brown, medium to coarse sand. The brown sand is natural alluvial material deposited by the Duwamish River.

An embayment site reconnaissance was made in early September 2010 as part of completing Task EB-1 discussed further below. Early approval of this task was requested by the project team to take advantage of daylight low tides. The results of the reconnaissance are documented in a technical memorandum prepared by DOF (2010b).

The primary findings of the reconnaissance were as follows:

- A relatively hard "*cap*" covers sediment along the northern bank of the embayment (Figure 14). Near the mouth, it appears that waste concrete was deposited from the upland shoreline. Within the central and upper portions of the embayment the relatively harder surface appears to be a precipitate that has cemented sand and other particulates.

- Asphalt like solid deposits were observed at two locations.

- Outside of the harder capping layer described above, the soft sediment thickness is greater than three feet based on probing with a steel rod. When the rod was extracted, petroleum sheens were observed at some locations within the central portion of the embayment.

- Heavy, pile-supported timbers are present in the central portion of the embayment. These timbers appear to be the remnants of the ship way shown on Figure 10.

HYDROGEOLOGY

The Site lies within the Duwamish River Valley (Figure 1). Glaciated uplands form the east and west walls of the valley. In general, the uplands are recharge areas were groundwater flow is generally in a downward direction and towards the valley. The Duwamish Valley is a groundwater discharge area where groundwater generally flows in an upward direction with discharge to the waterway.

Upland Site Geology. By 1936 most of the site was above river level (Figure 9). The logs of HC-B-3, HC-B4, HC-B5 and DOF-P4 indicate the following geologic sequence for most of the site (starting at the ground surface):

- Six to nine feet of slightly silty to silty fine sand. Some to most of this material may be fill.
- Underlying the fine sand, five to seven feet of very fine sandy silt with decomposed grass like plants, roots and pieces of wood is indicated on the logs. The bottom of this unit was encountered eleven to fourteen feet below ground surface.
- The silt unit is underlain by a coarser grained, slightly silty fine sand to clean, fine to coarse sand. This latter unit was encountered to the final drilling depth of approximately twenty-five feet.

As illustrated on Figure 11, filling occurred within the northern portion of the ditch channel and in the area where the ditch discharged to the waterway. Using the logs of SA-MW-2 and DOF-P8 as examples, fills consisting of gravelly sand, fine to medium sand , silty sandy gravel with occasional cobbles and debris (metal parts, brick, wood, and glass) underlie the area of the formerly open ditch. The fills appear to be on the order of ten to fifteen feet thick.

Aquifer Hydraulic Conductivity. Hart Crowser completed five in-situ hydraulic conductivity tests in 1986 (Hart Crowser 1987). Test values ranged between 2 and 113 feet per day (ft/day). Based on field observations, well recovery rates and site hydrogeology, they concluded that a representative value for the Site conditions was on the order of 15 ft/day (5.3×10^{-3} cm/sec). This estimated value is typical for a silty sand (Freeze and Cherry 1979).

Depth to Water. In early May 2007 (SAIC 2007b), the depth to water in the five available wells ranged between approximately 5 to 13 feet below ground surface, depending on tidal stage. During a tidal change of approximately 11. 2 feet, water levels fluctuated between approximately 0.24 feet and 7.26 feet. The greatest fluctuation (5.7 to 7.3 feet) was measured in wells SA-MW-2, SA-MW-3 and HC-B1. These wells are closest to the embayment shore line. Lower fluctuations (0.2 to 1.5 feet) were measured in wells SA-MW-1, HC-B2, HC-B4 and HC-B5. With the exception of well SA-MW-1, these wells are located within the interior of the site. Water levels in well SA-MW-1 showed the lowest water level change with tide, yet the well is located along the embayment shoreline.

Groundwater Flow Directions. Based on water level measurements and a tidal study by Hart Crowser in 1986, groundwater flow beneath the site is generally towards the embayment (Figure 12). Hart Crowser concluded that significant tidal influence only occurred within approximately 100 feet of the embayment shoreline. They also concluded that the ditch (now filled) along the eastern boundary of the site was a recharge source to the site.

Based on measurements made in 2007, SAIC (2007b) also concluded that the overall groundwater flow direction was towards the embayment from the Site. Groundwater flow reversals caused by tidal fluctuations occurred along the shoreline.

EMBAYMENT SEDIMENT QUALITY

Thirteen surface (0 to 8 cm to 0 to 15 cm) sediment samples have been collected from within and at the mouth of the embayment since 1991. Sample locations are shown on Figure 13 and the sample results are summarized in Table 1. Sediment quality data were screened to identify COPCs using LDW screening levels. These criteria are listed on Table 1 and exceedances are highlighted. Table 8 presents a summary of the screening results where the screening criteria were compared to the maximum detected concentration. Using this screening approach, the following COPCs were identified:

- Metals (antimony, cadmium, chromium, cobalt, copper, lead, mercury, selenium, silver, vanadium and zinc)
- Petroleum hydrocarbons
- PCBs
- DDD, DDE and DDT
- Polycyclic aromatic hydrocarbons (PAHs)
- Phthalates
- Chlorobenzenes
- Pentachlorophenol
- Phenol and 4-methylphenol
- Polychlorinated dioxin/furans

The highest constituent concentrations were detected in samples located near the head of the waterway (SED1 and SED2) in the vicinity of the wharf that was formerly located adjacent to the Site. As discussed above, the wharf was originally "L" shaped with access from the upland portion of the site (Figure 9). Later the eastward extension of the dock was removed and replaced by what appears to have been a shipway (Figure 10). Sediment sample locations SED1 and SED2 were located beneath the portion of the wharf adjacent to the upland access area as shown on Figure 11. Significantly lower concentrations were detected within the middle and eastern portions of the embayment.

PCBs, DDT, lead, mercury and zinc concentrations in surface sediment exceeded the criteria by the greatest margins. The concentration pattern for total PCBs, lead, mercury and zinc in surface sediment within the embayment are illustrated on Figures 15 to 18.

Relatively high concentrations of petroleum range organic compounds were detected in sediment (SED-1 and SED-2) near the former wharf structure. The high concentrations appear related to the petroleum sheen observed by SAIC (2007a), in this general area.

Concentrations in the recent sediment at core location LDW-40C were much lower as compared to the head of the embayment. Total PCB concentrations were 0.16 mg/kg in recent sediment (Table 2). No PCBs were detected in two samples of the underlying alluvial sediment.

Four sediment samples were analyzed for dioxin/furans. The surface sample at location LDW-SS84 had a 2,3,7,8-TCDD TEQ concentration of 412 ng/kg (Table 1) while the TEQ concentrations of three samples analyzed from sediment core LDW-SC40 ranged between 0.36 and 6.7 ng/kg (Table 2). To provide perspective on these results, 4 ng/kg is considered to be a background concentration for non-urban areas of Puget Sound (DMMP 2010).

UPLAND SOIL QUALITY

Approximately sixty soil samples have been collected and analyzed since 1986 on the upland portion of the site. Twenty-eight of the discrete surface soil samples collected in 1986 and four of the discrete samples collected in 1991 were composited to form seven samples that were submitted for laboratory analysis. Sample locations are shown on Figures 12 and 13 and the sample results are summarized in Tables 3, 4 and 5, along with conservative LDW screening criteria. Most of the samples were collected within the northern portion of the Site.

The soil quality data were screened to identify contaminants of potential concern COPCs using LDW soil screening levels to protect potable groundwater and non-potable surface water, and background metal concentrations in Puget Sound soil (Ecology 1994). These criteria are listed on Tables 3 to 5 and exceedances are highlighted with yellow shading. Table 8 presents a summary of the screening results where the screening criteria were compared to the maximum detected concentration. The following COPCs were identified:

- Metals (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc)
- Petroleum hydrocarbons
- Volatile Organic Compounds (acetone, dichloromethane, tetrachloroethene, trichloroethene, vinyl chloride)
- PAHs
- Phthalates
- Chlorobenzenes
- Other SVOCs (2,4-dimethylphenol, 4-methylphenol, dibenzofuran, phenol)
- Pesticides (DDD, DDE, DDT, chlordane, dieldrin, endrin)
- PCBs

The highest concentrations of the COPCs were detected in samples from the northern portion of the Site. Petroleum sheens and relatively high concentrations of petroleum hydrocarbons (up to 64,000 mg/kg) were detected in samples collected from depths generally less than ten to fifteen feet deep (Figure 19). As summarized in Table 5, the GC-FID patterns of samples collected in 2008 generally were similar to diesel fuel and motor oil products, although the patterns for some samples did not match typical petroleum hydrocarbon products. At one probe location, DOF-P9, an odor similar to stoddard solvent was observed.

Total PCB concentrations up to 90 mg/kg were detected in a shallow soil sample from probe P-1 (Figure 20). Lead was detected at a maximum concentration of 3,570 mg/kg in a sample from probe P2 (Figure 21), although most other samples were significantly lower than this highest value.

GROUNDWATER, SEEP AND OUTFALL WATER QUALITY

Water samples have been obtained from five wells, three seeps and discharge from the 2nd. Ave. outfall. Sample locations are shown on Figure 13 and the results are summarized in Tables 6 and 7. The water quality data were screened to identify COPCs using LDW soil screening levels to protect potable groundwater and non-potable surface water. These criteria are listed on Tables 5 and 6 and the exceedances are highlighted with yellow shading. Table 8 presents a summary of the screening results where the screening criteria were compared to the maximum detected concentration. Using this approach, the following COPCs were identified:

- Metals (arsenic, cadmium, copper, lead, mercury, nickel, silver, zinc)
- Petroleum hydrocarbons
- VOCs (1,1-dichloroethane, benzene, dibromomethane, vinyl chloride)
- PAHs
- Phthalates
- Pesticides (DDD, DDE, DDT, aldrin, chlordane)
- PCBs
- Other SVOCs (pentachlorophenol, 2-4-dimethylphenol, 2-methylphenol, N-nitrosodimethylamine and N-nitrosodiphenylamine)
- Hexachlorobenzene
- Chlorobenzenes

The majority of samples have been obtained from within the northern portion of the upland site in the area where the highest contaminant concentrations were detected.

Concentrations, detection frequency and frequency of exceeding screening criteria were much lower in the seep and outfall samples as compared to the groundwater samples. Seep samples may be more reflective of actual groundwater discharges from the Site to the embayment.

VOCs were not analyzed during the most recent (2007) water sampling round. Data collected in the mid-1980s and 1991 (Table 5), suggested the presence of common solvents (tetrachloroethene and trichloroethene) and breakdown product (e.g. vinyl chloride) and VOCs associated with petroleum hydrocarbon mixtures (benzene, toluene, ethylbenzene and xylene).

CONCEPTUAL MODEL

The following conceptual model was developed based on available data:

- The site was developed on fills placed over alluvial sediments deposited by the Duwamish River. The embayment was created in the late 1960s by placement of dredge fills in the area now known as the Douglas property.

- A drainage ditch flowed along the eastern Site boundary that likely received discharge from a wrecking yard formerly located to the south of the site. The northern portion of the ditch was filled in the 1960s. Upstream drainage is now discharged via the 2nd Ave. stormdrain.

- Groundwater beneath the site generally flows in a northward direction towards the embayment. Infiltration of water from the ditch near the southeastern Site property line provided, in the past, recharge water to the site and effected groundwater flow directions. The entire ditch was filled in when the 2nd Ave. outfall drainage system was installed.

- Tidal fluctuations effect groundwater levels near the embayment shoreline. Flow reversal occurs during periods of high tide. Data collected in 1987 (Hart Crowser 1987) indicated that reversals only occur within approximately 100 feet of the northern shoreline.

- Concentrations of PCBs, lead, mercury, pesticides and a number of other constituents exceed screening levels in sediment within the embayment adjacent to the Site. It is likely that PCBs will be the primary remediation driver.

- The log of a sediment core near the eastern mouth of the embayment indicates a thickness of recent fine grained sediment of approximately one foot that is underlain by alluvial sand. Sediment contamination within the embayment is likely associated with sediment that lies above the natural alluvial (river) sands that underlie the embayment.

- The highest sediment COPC concentrations are present within the upper portion of the embayment where a former wharf structure was present. The location of the highest sediment concentrations in the immediate vicinity of the former wharf suggests that sediments were contaminated from direct releases from the wharf. Erosion of bank soils may also be a secondary source of sediment contamination.

- Groundwater migration does not appear to be a significant source of sediment contamination (or potential recontamination). Sediment COPCs are generally hydrophobic in nature and seep concentrations and groundwater flow volumes are relatively low. This migration pathway will be further evaluated as part of the RI work plan.

- The highest upland soil concentrations of COPCs are present within the northern portion of the Site. Elsewhere on the site, concentrations of COPCs are likely lower and mostly confined to previously uncovered surface soils where drums were stored.

- The site is currently paved and stormwater, other than a small amount of roof drainage, is being collected, treated and disposed off-site. Site paving limits the potential for worker contact with underlying site soils and the leaching of contaminants by precipitation recharge. However, portions of the paving are cracked which potentially would allow stormwater to migrate into underlying soils and potentially contaminate groundwater.

DATA GAPS

Embayment

- The primary embayment data gap is the thickness and extent of contaminated sediment that covers the embayment.

- The quality of bank soils and the potential for their erosion to cause sediment recontamination.

- The extent and severity of sediment contamination near the head, north bank and mouth of the embayment.

Upland Portion of Site

- The geology and general groundwater flow pattern has been reasonably established. However, data on the hydrogeologic conditions within the interior portion of the site are limited.

- The wrecking yard formerly located south of the Site may have released contaminated material to the ditch that could have migrated northward to the Site and embayment. No data is available on the quality of soil/sediment in the formerly open portion of the drainage ditch.

- Most of the site soil and groundwater testing has been conducted within the northern portion of the site. No groundwater quality testing has been completed within the interior and southern portions of the site.

- The nature of sludges that may have been left in the filled-in "*lagoon*" located east of the drum furnace at the approximate location shown on Figure 13.

PROJECT ORGANIZATION

The project organization to complete the work outlined in this Work Plan is described below.

- **Matt Dalton LG/LHG – Sr. Consulting Hydrogeologist (DOF)** is the ICS/NW Cooperage Project Coordinator and is the technical project manager for completion of the RI. He will have overall responsibility for managing the work, compiling and analyzing the site investigation data, and coordinating with the Department of Ecology (Ecology).

- **Raleigh Farlow – DMD Inc.** is the project geochemist. Mr. Farlow will coordinate the laboratory activities, review the analytical data for quality assurance /quality control (QA/QC) purposes. He will also provide input on the fate and transport of Site COPCs.

- **Dave Cooper LG/LEG – Project Geologist (DOF)** will be responsible for coordinating/competing the field sampling, developing geologic logs and delivering samples to the analytical laboratory. He will also be responsible for preparing and implementing the health and safety plan.

- **Paul Fuglevand PE - Sr. Consulting Engineer (DOF)** is the project engineer and will be responsible for providing engineering input and insight into completion of the RI/FS, especially with regard to the embayment.

- **Sediment Sampling Contractor** - To be determined

- **Cascade Drilling Inc.** – will drill and install the new monitoring wells and complete the soil probes.

- **Analytical Resources Inc. (ARI)** will complete the laboratory chemical analyses.

DESCRIPTION OF WORK PROGRAM

The following section describes the work that will be done to fill the identified data gaps and complete the RI/FS. Field sampling and sample analyses will be done using the procedures and methods presented in the Sampling and Analysis Plan (SAP). As new data becomes available and is validated, interim data reports will be prepared and submitted to Ecology for review, as appropriate.

The description of the field sampling work is generally divided between the embayment and upland portions of the site.

RI Embayment Work Program

Task EB-1 - Site Reconnaissance. [*Note: This task was completed in September 2010 with Ecology approval. The results of the embayment reconnaissance are summarized in a technical memorandum prepared by DOF (2010b). The results of the reconnaissance have been incorporated into this work plan.*]

The site would be visited during daylight low tides. The objective of the site reconnaissance is to document the surface conditions within the embayment and to provide data to fine tune the sediment sampling program outlined in later tasks. The following reconnaissance work would be performed:

- Detailed mapping of the embayment shoreline would be completed. Significant features (such as the presence of concrete paving) would be described, photographed and located using a DGPS. The locations of any seeps would be identified, any visual indications of contaminated bank soils would be noted and possible areas where seeps and bank soils could be sampled for laboratory analysis would be identified.

- A hand auger and/or post-hole digger would be used to assess the possible thickness of fine grained sediment that likely overlies alluvial sands beneath the intertidal portion of the site. Representative locations throughout the embayment would be selected. Sediments encountered using hand equipment would logged and DGPS coordinates would be determined.

- Observations made during the site reconnaissance will be used to fine tune the embayment sediment sampling program described below. Prior to completing this sampling, a technical memorandum will be submitted to Ecology for review and approval that summarizes the observations, identifies specific locations and provides the rational for the final selected locations.

Task EB-2 - Sample Bank and Intertidal Surface Sediments. The objective of this task is to refine the extent of surface sediment contamination and identify areas where erosion of bank soils could represent a recontamination potential. A surface sediment sample program layout was developed based on the results of Task EB-1 and the results of previous surface sediment analyses. The surface sediment sampling program is described below.

- Thirty surface (0 to 10 cm) bottom and bank sediment samples would be collected, from the approximate locations shown on Figure 22. During the field sampling some the sampling locations may be shifted based on site observations and access. It is anticipated that most of the locations can be sampled with hand equipment. The balance of proposed locations would be sampled from a boat using a VanVeen sampler. The sample locations include two locations where asphalt-like solids were observed.

- At three locations (surface sample locations A, B and C), samples of the precipitate cap material and sediment directly underlying the harder material would also be collected and analyzed, as well as samples of overlying sediment.

- All samples will be logged as to material type using ASTM D2488 as a general guide and a DGPS will be used to determine sample location coordinates. Field evidence of contamination (e.g. sheens) will be recorded on the logs.

Task EB-3 - Sample Deeper Sediments. The objective of EB-3 is to assess the thickness of contaminated sediment within the embayment and determine the bottom of the contaminated layer.

- Thirteen cores will be advanced and sampled within the embayment at the approximate locations shown on Figure 23. Locations may shift depending on site access.

- It is anticipated that soft recent sediment overlies natural alluvial (river sand) sediments. The target core bottom interval is one to two feet below the contact between the soft recent sediments and underlying (assumed denser) alluvial sediment.

- Access to the embayment is very difficult. Collection of the core samples will likely be accomplished using vbibracore and hand sampling methods. Vibracore equipment will likely be deployed from the shoreline using a crane and from a boat at periods of higher tide levels. At locations where vibracoring equipment cannot be deployed, hand equipment will be used in an attempt to reach the bottom of the soft sediment layer.

- Thirteen feet long cores would be obtained.

- The cores would be segmented into one foot long intervals for sampling purposes. This general guideline would be altered depending on observation of core materials. The intent is for the samples to represent discrete materials. To a practical extent, collecting samples across obvious contacts will be avoided. All samples will be placed in laboratory supplied containers for possible chemical analysis.

- Three samples from each core would be chemically analyzed. The target intervals will be the middle and bottom portions of the soft sediment layer and the top portion of the underlying alluvial sands. These analyses will supplement the surface sample analyses. Samples not submitted for analysis will be archived for possible later analysis. The primary factor that would be considered in completing analyses of archived samples is related to defining the bottom of the contaminated sediment layer.

- All cores will be logged as to material type using ASTM D2488 as a general guide. Evidence of contamination, such as color and sheens will be noted and logged. A DGPS will be used to determine sample location coordinates.

Task EB-4 - Seep Sampling. In 2007, SAIC identified and sampled two seeps originating from the southern bank of the embayment. These seeps represent the quality of water discharging into the embayment.

- Two to three seeps would be sampled if they are observed during the sediment sampling field work.

- The sample location coordinates would be determined using a DGPS.

Task EB-5 - Sediment and Seep Laboratory Sample Analyses. This task includes the analysis of surface and deeper sediment samples. The primary objective of the embayment sampling is to collect and develop sufficient information to select a cleanup action (WAC 173-340-350). Within the embayment, the primary data gap that needs to be filled is the extent and thickness of sediment that exceeds cleanup levels.

- The general sediment analytical program is outlined in Table 9. Thirty-six surface sediment samples and thirty-nine deeper sediment samples will be analyzed for metals, PCBs, petroleum hydrocarbons and total organic carbon. These samples will include the surface sediment locations and three samples from each of the thirteen cores (including recent soft sediment and underlying alluvial sand). A total of forty samples would also be analyzed for SVOCs, pesticides[iii] (including DDD, DDE, and DDT). Thirteen of the samples would include analysis of the bottom sample from each of the cores. Other sediment samples will be archived for possible later analysis.

- Eight sediment samples will be analyzed for organotin as follows:

[iii] See Table SAP-3 presented in the Sampling and Analysis Plan for list of pesticide compounds that will be analyzed.

- Two samples will be analyzed from within the head of the embayment (including the area where high PCB concentrations were detected),
- Two samples from exposed sediment beneath the large visible timbers,
- Two samples from beneath the "*capping material*" on the north side of the large timbers, and
- Two samples from the mouth of the embayment (from east side of the "neck").

- Three surface and three deeper sediment samples will be analyzed for polychlorinated dioxin furans. The samples will be selected based on the results of the analyses described above. A representative range of contaminated and uncontaminated material would be analyzed including at least two samples of uncontaminated underlying alluvial sediment.

- Six representative samples of recent soft sediment and three underlying alluvial sediment sample will analyzed for physical properties. These include grain size with hydrometer, Atterberg limits, water content, and bulk unit weight.

- Seep field measurements will be made for pH, electrical conductivity, temperature, turbidity and ferrous iron.

- The seep samples will be analyzed for dissolved metals, petroleum hydrocarbons, VOCs, SVOCs, PAHs, pesticides, PCBs, and a number of conventional parameters.

RI Upland Work Program

Task UP-1 - Site Reconnaissance. [*Note: This task was largely completed in September 2010 with Ecology approval. The results of the upland reconnaissance are summarized in a technical memorandum prepared by DOF (2010a). The results of the reconnaissance have been incorporated into this work plan. The following tasks were completed, with the exception of field marking sampling locations and making utility checks. This work will be done as part of the upcoming field sampling program. Based on the site reconnaissance two additional site reconnaissance tasks were added to Task UP-1*]

A site reconnaissance will be performed of the upland portion of the site. The objective of this work is to:

- Assess the condition of the ditch or unpaved area within the southeastern portion of the Site,

- Determine the likely location of the former settling tank.

- Assess the discharge location of the roof drains that do not discharge to the sanitary sewer,

- Research and complete reconnaissance of possible stormwater contributions to the public outfall at the head of the embayment,

- Determine location coordinates using a DGPS for previously installed wells and probes (to the extent possible), and

- Field mark final upland sampling locations and complete utility checks.

Based on the work completed to date, two additional site reconnaissance tasks will be completed as follows:

- The condition of pavement on the site will be mapped. The purpose of the mapping is to identify areas were substantial stormwater infiltration could occur.

- The horizontal coordinates and construction features of the upstream stormwater system man-holes will be determined/assessed.

Task UP-2 - Install Monitoring Wells. As discussed earlier, additional data is required to confirm previous analyses and to characterize current water quality conditions beneath the site. It is anticipated that it will likely be required to complete this work in two phases. The first phase is to confirm the groundwater flow directions and general water quality conditions. Based on these evaluations, the need for additional wells and/or borings, including any that might be appropriate in building areas, would be assessed and accomplished, as necessary, to complete the RI.

Eight new wells will be installed and sampled. The objective of this task is to provide data to further assess upland geology, groundwater flow directions, soil quality and groundwater quality. The task would include the following:

- Install eight new monitoring wells at the locations shown on Figure 24. The target drilling depth is approximately 25 feet below ground surface. The wells will be installed using a dual-tube probe rig or hollow-stem auger.

- Wells HC-B4 and HC-B5 are likely not suitable for sampling because of damaged well monuments that allowed surface water to enter the well. These wells will be abandoned by a licensed drilling contractor. In addition, the condition of well HC-B1 would be assessed and if necessary, the well would be replaced.

- At each new well location collect soil samples for laboratory analysis. Soil samples will be collected on approximately 2.0 feet intervals. The samples will be described and placed in containers for possible laboratory analysis (summarized below). The samples will be collected of representative materials encountered in the borings. Where obvious material changes are encountered, samples would be collected above and below the contact. Field measurements for sheen and organic vapors (using a PID) will be made during the drilling. Portions of analyzed samples and samples not initially analyzed, will be archived for possible later analysis.

- The target well screening interval is 20 to 25 feet below ground surface based on the logs of the existing wells. The wells will consist of two-inch diameter screen and riser pipe. Screens would be placed across the water table encountered at the time of drilling.

- The wells will be developed by pumping and/or bailing. Development will proceed until the water visually clears.

Task UP-3 - Refine Analysis of Groundwater Flow Directions

- The location coordinates for the well locations will be determined using DGPS and the well head elevations will be surveyed, by a licensed surveyor, to the same datum as the existing wells.

- Two discrete sets of water level measurements in the new and existing wells will be made; one at low and a second set at a high tide to generally assess how tidal fluctuations effect flow directions.

- Water level measurements will be converted to elevations and two water table elevation maps will be prepared.

Task UP-4 - Collect Groundwater Samples

- Groundwater samples will be collected from the eight new wells and the existing four wells.

- The samples will be collected using low flow sampling procedures. Depending on well yields, a small battery powered submersible pump or peristaltic pump will be used to collect the samples. The samples will be placed in containers provided by the receiving laboratory and will be analyzed for the constituents summarized below.

- Field measurements will be made for pH, electrical conductivity, temperature, turbidity, ferrous iron and dissolved oxygen.

Task UP-5 - "Lagoon" Sampling

- Based on information collected as part of the upland reconnaissance, the approximate position of the former lagoon was determined. Four push-probes will be used to sample soils within and at the bottom of the filled in ditch/lagoon as shown on Figure 24. The purpose of the sampling is to assess the chemical quality of lagoon sludge that may still be in the area and the possibility of past off-site migration of contaminants via the former ditch.

- The push-probes will be drilled to a depth of approximately 20 feet below existing grade. Soil samples will be collected on a continuous basis. Representative samples will be collected in a similar manner as described in Task UP-2.

- Three samples from each probe will be analyzed based on observation of the collected samples. Any obvious sludge and soils from the bottom of the ditch will be selected for analysis. If no obvious sludge is encountered, samples of the interpreted former ditch bottom will be analyzed for the "*sludge spls*." listed in Table 9 Other samples not selected for analysis will be archived for possible future analysis.

Task UP-6 - Off-Site Stormwater System Sampling

- The volume of water flow will be visually observed during the drier period of the year (summer 2012). This observation will provide insight on the possibility of groundwater infiltration into the stormwater system. Observations will be made in the man-holes and at the outfall.

- Samples of water flowing in the stormwater system will be collected from one of the man-holes and from the outfall. A comparison of the two stormwater samples, along with the groundwater sample analyses should provide insight as to whether groundwater from the site is infiltrating into the stormwater pipe.

- A stormwater solids sample will be collected from one of the manholes located within the southeast portion of the Trotsky property. Samples from this manhole should represent particulate material flowing into and out of the 2nd Ave. Outfall system. A portion of the sample will be archived, if enough sample can be collected, for possible additional analyses.

Task UP-7 - Laboratory Soil and Groundwater Analyses

- Three soil samples from each well location (24 samples plus one field duplicate) will be analyzed for the constituents listed in Table 9. The samples will be selected based on field observations of the materials encountered and any visual evidence of contamination. It is anticipated that at least one soil sample collected from just above the water table will be analyzed.

- Three soil samples from each probe drilled in the former lagoon area (12 samples plus one field duplicate) will be analyzed for the constituents listed in Table 9. The samples will be selected based on field observations of the materials encountered and any visual evidence of contamination. The pH of obvious sludge samples will be determined.

- Twelve groundwater samples plus one duplicate will be analyzed for the constituents listed in Table 9.

- Two stormwater samples will be analyzed for the same constituents as for the ground water samples, as summarized in Table 9.

Task **UP-8 – Baghouse Dust/Drum Furnance Ash**

Samples of baghouse dust and drum furnance ash will be collected. The samples will be analyzed for the constituents listed in Table 9.

Task RPT-1 - Prepare Site RI Report

- A draft RI report will be prepared consistent with WAC 173-340-350(7) and WAC 173-204-560 and submitted to Ecology for review and comment. The primary objective of the report is to characterize the nature and extent of contamination.

- The report will include the following:

    - Site background and history
    - Summary of previous site investigations and data
    - Site plan showing sample locations
    - Sample location coordinates
    - Geologic logs of probes, wells and material descriptions of other samples obtained for laboratory analysis
    - Description of the field procedures
    - Analytical data summarized in spread sheets
    - Data quality reviews
    - Laboratory data (on CD).
    - General discussion of the subsurface conditions and field observations
    - Geologic Section(s)
    - Estimated groundwater flow directions
    - Comparison of the analytical data with LDW screening levels, MTCA and SMS cleanup levels
    - List of potential COCs
    - Site areas where constituent concentrations exceed cleanup levels

- Data gaps with an evaluation of their possible impact on completing the Feasibility Study.

- Two hard copies will be submitted and electronic copies will be submitted in Word (.doc) and Adobe (.pdf) formats.

- Once any Ecology comments are resolved, the draft RI report will be revised accordingly and a final RI report will be submitted to Ecology. Five hard copies of the final report and electronic copies in Word (.doc) and Adobe (.pdf) formats will be submitted.

  - Data will uploaded into Ecology's EIM database consistent with WAC 173-340-840(5).

Feasibility Study

Task FS-1 - Complete Preliminary Alternatives Analysis. The objective of this task is define the remedial goals and to identify and screen remedial technologies that might be applied to the Site. The technologies will be formed into a set of alternatives that will be carried forward for detailed evaluation. Prior to completing the detailed evaluations, a technical memorandum that describes the results of the technology screening and selected alternatives proposed for detailed evaluation will be submitted to Ecology for review and comment. Task FS-1 will generally consist of the following work:

- The list of potential receptors will be refined. Potential receptors include site workers, and marine aquatic life that reside (in sediment or water column) within the embayment.

- The list of potential exposure pathways will be refined. These include, but not necessarily are limited to, direct soil/sediment contact (worker or aquatic life), drinking water ingestion, vapor intrusion into buildings, potential for aquatic life exposure via groundwater discharge to the water column or by erosion of bank soils.

- Potential cleanup levels for each media and exposure pathway of concern will be identified and the list of soil, vapor, sediment and groundwater COPCs will be refined.

- Based on the evaluations listed above, Points of Compliance (POCs) and Preliminary Remedial Action Objectives (RAOs) will be identified and proposed.

- Using the conceptual model of site conditions presented in the RI report, the identified COPCs, the likely points of compliance, and remedial action objectives, possible remedial technologies will be identified and evaluated using criteria in the MTCA and the Washington State Sediment Management Standards (SMS).

The primary focus with respect to groundwater migration and bank erosion issues will be protection of water and sediment quality in the embayment. Based on a screening evaluation, applicable technologies will be screened and formed into a set of preliminary remedial alternatives. Screening will be conducted using the criteria presented in WAC 173-340-360.

- The results of the screening level comparisons (discussed in the RI) will be used to complete a screening of applicable technologies., technology and alternative screening, and preliminary remedial alternatives evaluation will be presented in a technical memorandum that will be submitted to Ecology for review and comment. The memorandum will form a basis to discuss possible remedial approaches to mitigate site conditions and assist in completing the Feasibility Study.

Task FS-2 - Prepare FS Report

- Based on comments and discussion with Ecology, the preliminary remedial alternatives identified in Task FS-1 will be refined and a detailed evaluation consistent with WAC-173-340-350, WAC 173-340-360, and WAC -173-204-560 will be completed including evaluation of the identified alternatives relative to the following criteria:

  - Compliance with cleanup standards and applicable laws
  - Protection of human health
  - Protection of the environment
  - Provision for reasonable restoration time frame
  - Use of permanent solutions tothe maximum extent practicable
  - The degree to which recycling, reuse and waste minimization are employed.
  - Short-term effectiveness
  - Long-term effectiveness
  - Net environmental benefit
  - Implementability
  - Provision for compliance monitoring
  - Cost-effectiveness
  - Prospective community acceptance

- A draft FS report will be prepared consistent with WAC 173-340-350 and WAC 173-204-560 and submitted to Ecology for review and comment. Two hard copies will be submitted and electronic copies will be submitted in Word (.doc) and Adobe (.pdf) formats. The draft FS report will present a preferred remedial alternative that is judged to best satisfy the evaluation criteria. Justification for the preferred alternative will be provided and the alternative will be further developed, to a practical extent.

- Once any Ecology comments are resolved, the draft FS report will be revised accordingly and a final FS report will be submitted to Ecology. Five hard copies of the final report and electronic copies in Word (.doc) and Adobe (.pdf) formats will be submitted.

SCHEDULE

The overall schedule is outlined in Exhibit C to the AO. Once the final work plan is approved by Ecology, a field sampling schedule will be prepared.

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TABLE 1 - Summary of Surface Sediment Quality Data

Location	SS-1	SS-2	SS-3	Sed. 1	Sed. 2	Sed. 3	Sed. 4	Sed. 4 FD	Sed. 5 (d)
Date	1991	1991	1991	May-07	May-07	May-07	May-07	May-07	May-07
Source	(i)	(i)	(i)	(c)	(c)	(c)	(c)	(c)	(c)
Coordinate X	-----	-----	-----	-----	-----	-----	-----	-----	-----
Coordinate Y	-----	-----	-----	-----	-----	-----	-----	-----	-----
Depth (cm)	<8	<8	<8	<10	<10	<10	<10	<10	-----
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Total Solids (%)	-----	-----	-----	57.7	48.6	85.5	84.1	80.7	71.7
Total Organic Carbon (%)	-----	-----	-----	12	6.45	1.07	0.95	1.02	1.88
Petroleum Hydrocarbons									
Gasoline Range Organics	-----	-----	-----	<20	**200**	<20	<20	<20	<20
Diesel Range Organics	-----	-----	-----	**10000**	**6800**	**100**	**380**	**210**	**280**
Residual Range Organics	-----	-----	-----	**20000**	**15000**	**400**	**1500**	**650**	**1200**
Total Metals									
Aluminum	-----	-----	-----	-----	-----	-----	-----	-----	-----
Antimony	-----	-----	-----	-----	-----	-----	-----	-----	-----
Arsenic	<16	<22	<18	**48.7**	**20.1**	**2.6**	**3.7**	**2.3**	**7.8**
Barium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Beryllium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	<0.78	**2.1**	**1.5**	**36.3**	**6.69**	**0.153**	**0.714**	**0.603**	**1.13**
Calcium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Chromium	**60.2**	**103**	**89.9**	**1680**	**507**	**15.1**	**28.5**	**22.6**	**48.8**
Cobalt	-----	-----	-----	-----	-----	-----	-----	-----	-----
Copper	**370**	**211**	**289**	**1090**	**157**	**19.6**	**34.4**	**28.5**	**146**
Iron	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lead	**247**	**529**	**422**	**10400**	**4280**	**35.9**	**137**	**115**	**225**
Magnesium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Manganese	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mercury	**0.22**	**0.29**	**1.8**	**247**	**59.5**	**0.21**	**0.203**	**0.179**	**0.296**
Molybdenum	-----	-----	-----	-----	-----	-----	-----	-----	-----
Nickel	**17.4**	**26.2**	**23.6**	-----	-----	-----	-----	-----	-----
Potassium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Selenium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	**19**	**0.676**	**0.174**	**0.13**	**0.231**	**0.918**
Sodium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Thallium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Tin	-----	-----	-----	-----	-----	-----	-----	-----	-----
Vanadium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Zinc	**287**	**362**	**280**	**4580**	**2140**	**43.5**	**175**	**141**	**255**
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,1,1-Trichloroethane	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
1,1,2,2-Tetrachloroethane	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
1,1,2-Trichloroethane	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
1,1,2-Trichlorotrifluoroethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,1-Dichloroethane	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
1,1-Dichloroethene	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
1,1-Dichloropropene	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3-Trichlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3-Trichloropropane	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,4-Trimethylbenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2-Dibromo-3-chloropropane	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2-Dibromoethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2-Dichloroethane	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
1,2-Dichloropropane	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
1,3,5-Trimethylbenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,3-Dichloropropane	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,Chlorobutane	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,2-Dichloropropane	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Chlorotoluene	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Hexanone	<0.016	<0.022	<0.018	-----	-----	-----	-----	-----	-----
2-Nitropropane	-----	-----	-----	-----	-----	-----	-----	-----	-----
4-Chlorotoluene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acetone	0.075	0.53	<0.018	-----	-----	-----	-----	-----	-----
Allyl chloride	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzene	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Bromobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----

TABLE 1 - Summary of Surface Sediment Quality Data

Location	SS-1	SS-2	SS-3	Sed. 1	Sed. 2	Sed. 3	Sed. 4	Sed. 4 FD	Sed. 5 (d)
Date	1991	1991	1991	May-07	May-07	May-07	May-07	May-07	May-07
Source	(i)	(i)	(i)	(c)	(c)	(c)	(c)	(c)	(c)
Coordinate X	-----	-----	-----	-----	-----	-----	-----	-----	-----
Coordinate Y	-----	-----	-----	-----	-----	-----	-----	-----	-----
Depth (cm)	<8	<8	<8	<10	<10	<10	<10	<10	-----
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Bromochloromethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bromodichloromethane	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Bromoform	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Bromomethane	<0.016	<0.022	<0.018	-----	-----	-----	-----	-----	-----
Carbon disulfide	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Carbon Tetrachloride	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Chlorobenzene	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Chloroethane	<0.016	<0.022	<0.018	-----	-----	-----	-----	-----	-----
Chloroform	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Chloromethane	<0.016	<0.022	<0.018	-----	-----	-----	-----	-----	-----
cis-1,2-Dichloroethene	-----	-----	-----	-----	-----	-----	-----	-----	-----
cis-1,3-Dichloropropene	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Dibromochloromethane	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Dibromomethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
Dichlorodifluoromethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
Dichloromethane	<0.0078	0.011	<0.009	-----	-----	-----	-----	-----	-----
Diethyl ether	-----	-----	-----	-----	-----	-----	-----	-----	-----
Ethy Methacrylate	-----	-----	-----	-----	-----	-----	-----	-----	-----
Ethylbenzene	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Iodomethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
Isopropylbenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Methacrylonitrile	-----	-----	-----	-----	-----	-----	-----	-----	-----
Methyl Acrylate	-----	-----	-----	-----	-----	-----	-----	-----	-----
Methyl ethyl ketone	<0.016	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Methyl isobutyl ketone	-----	-----	-----	-----	-----	-----	-----	-----	-----
Methyl methacrylate	-----	-----	-----	-----	-----	-----	-----	-----	-----
n-Butylbenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
n-Propylbenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
p-Cymene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pentachloroethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
sec-Butlybenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Styrene	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Tert-butyl methyl ether	-----	-----	-----	-----	-----	-----	-----	-----	-----
tert-Butylbenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Tetrachloroehtene	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Toluene	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
trans-1,2-Dichloroethene	-----	-----	-----	-----	-----	-----	-----	-----	-----
trans-1,3-Dichloropropene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Trichloroethene	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Trichlorofluoromethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
Vinyl chloride	<0.016	<0.022	<0.018	-----	-----	-----	-----	-----	-----
Xylene (m &p)	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Xylene (o)	<0.0078	<0.011	<0.009	-----	-----	-----	-----	-----	-----
Semivolatile Organic Compounds									
1,2,4-Trichlorobenzene	-----	-----	-----	**0.94**	<2.1	<0.049	<0.1	<0.1	<0.1
1,2-Dichlorobenzene	-----	-----	-----	**0.67**	<2.1	<0.049	<0.1	<0.1	<0.1
1,3-Dichlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,4-Dichlorobenzene	-----	-----	-----	<2	**1.1**	<0.049	<0.1	<0.1	<0.1
1-Methylnaphthalene	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,4-Dichlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,4-Dinitrophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,4-Dinitrotoluene	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,6-Dinitrotoluene	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,4-Dimethylphenol	-----	-----	-----	<10	<11	<0.25	<0.5	<0.5	<0.5
2,4,5-Trichlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,4,6-Trichlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Chloronaphthalene	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Chlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Methylnaphthalene	-----	-----	-----	**1.6**	**0.49**	<0.049	**0.028**	**0.032**	**0.035**
2-Methylphenol	-----	-----	-----	<2	<2.1	<0.049	<0.1	<0.1	<0.1

TABLE 1 - Summary of Surface Sediment Quality Data

Location	**SS-1**	**SS-2**	**SS-3**	**Sed. 1**	**Sed. 2**	**Sed. 3**	**Sed. 4**	**Sed. 4 FD**	**Sed. 5 (d)**
Date	**1991**	**1991**	**1991**	**May-07**	**May-07**	**May-07**	**May-07**	**May-07**	**May-07**
Source	**(i)**	**(i)**	**(i)**	**(c)**	**(c)**	**(c)**	**(c)**	**(c)**	**(c)**
Coordinate X	-----	-----	-----	-----	-----	-----	-----	-----	-----
Coordinate Y	-----	-----	-----	-----	-----	-----	-----	-----	-----
Depth (cm)	<8	<8	<8	<10	<10	<10	<10	<10	-----
Units	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
2-Nitroaniline	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Nitrophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----
3,3-Dchlorobenzidine	-----	-----	-----	-----	-----	-----	-----	-----	-----
3-Nitroaniline	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,6-Dinitro-o-cresol	-----	-----	-----	-----	-----	-----	-----	-----	-----
4-Bromophenyl phenyl ether	-----	-----	-----	-----	-----	-----	-----	-----	-----
4-Chloro-3-methylphenol	-----	-----	-----	-----	-----	-----	-----	-----	-----
4-Chloroaniline	-----	-----	-----	-----	-----	-----	-----	-----	-----
4-Chlorophenyl phenyl ether	-----	-----	-----	-----	-----	-----	-----	-----	-----
4-Methylphenol	-----	-----	-----	**0.51**	<2.1	**0.03**	<0.1	<0.1	<0.1
4-Nitroaniline	-----	-----	-----	-----	-----	-----	-----	-----	-----
4-Nitrophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acenaphthene	<0.51	<0.73	<0.60	**0.47**	<2.1	**0.012**	<0.1	**0.041**	<0.1
Acenaphthylene	<0.51	<0.73	<0.60	**0.48**	<2.1	<0.049	<0.1	<0.1	<0.1
Aniline	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anthracene	<0.51	<0.73	<0.60	**0.63**	**0.75**	**0.012**	**0.023**	**0.15**	**0.035**
Benzo(a)anthracene	<0.51	<0.73	<0.60	**0.53**	**4.2**	**0.019**	**0.087**	**0.34**	**0.067**
Benzo(a)pyrene	<0.51	<0.73	<0.60	**0.94**	**3.3**	**0.019**	**0.09**	**0.26**	**0.07**
Benzo(b)fluoranthene	<0.51	<0.73	<0.60	**1.1**	**4.5**	**0.031**	**0.14**	**0.42**	**0.13**
Benzo(e)pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(ghi)perylene	<0.51	<0.73	<0.60	**0.91**	**2.2**	**0.02**	**0.088**	**0.21**	**0.098**
Benzo(k)fluoranthene	<0.51	<0.73	<0.60	**0.38**	**2**	**0.012**	**0.053**	**0.15**	**0.036**
Total Benzofluoranthenes	<0.51	<0.73	<0.60	**1.29**	**4.2**	**0.032**	**0.141**	**0.36**	**0.134**
Benzoic Acid	-----	-----	-----	<40	<42	<0.98	<2	<2	<2
Benzyl Alcohol	-----	-----	-----	<4	<4.2	<0.098	<0.2	<0.2	<0.2
Biphenyl	-----	-----	-----	-----	-----	-----	-----	-----	-----
bis(2-chloroethoxy)methane	-----	-----	-----	-----	-----	-----	-----	-----	-----
bis(2-chlorethyl)ether	-----	-----	-----	-----	-----	-----	-----	-----	-----
bis(2-chloroisopropyl)ether	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bis(2-ethylhexyl)phthalate	-----	-----	-----	**6.5**	**17**	**0.14**	**0.76**	**0.42**	**2.2**
Butylbenzylphthalate	-----	-----	-----	**3.3**	<2.1	<0.049	<0.1	<0.1	**0.88**
Carbozole	-----	-----	-----	-----	-----	-----	-----	-----	-----
Chrysene	<0.51	<0.73	<0.60	**0.92**	**4.8**	**0.022**	**0.098**	**0.29**	**0.074**
Dibenzo(ah)anthracene	<0.51	<0.73	<0.60	**0.32**	**0.57**	<0.049	**0.02**	**0.042**	<0.1
Dibenzofuran	-----	-----	-----	<2	<2.1	**0.0083**	<0.1	0.035	<0.1
Diethylphthalate	-----	-----	-----	<2	<2.1	<0.049	<0.1	<0.1	<0.1
Dimethylphthalate	-----	-----	-----	**0.44**	<2.1	<0.049	**0.013**	<0.1	**0.13**
Di-N-Butylphthalate	-----	-----	-----	<2	<2.1	<0.049	<0.1	<0.1	<0.12
Di-n-octyl phthalate	-----	-----	-----	<2	<2.1	<0.049	<0.1	<0.1	<0.1
Fluoranthene	<0.51	<0.73	<0.60	**1.1**	**7.3**	**0.054**	**0.17**	**1**	**0.17**
Fluorene	<0.51	<0.73	<0.60	**0.44**	<2.1	**0.0098**	<0.1	**0.081**	**0.019**
Hexachlorobenzene	-----	-----	-----	<2	<2.1	<0.049	<0.1	<0.1	<0.1
Hexachlorobutadiene	-----	-----	-----	<2	<2.1	<0.049	<0.1	<0.1	<0.1
Hexachlorocyclopentadiene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Hexachloroethane	-----	-----	-----	-----	-----	-----	-----	-----	-----
Indeno(123-cd)pyrene	<0.51	<0.73	<0.60	**0.77**	**1.9**	**0.02**	**0.085**	**0.21**	**0.069**
Isophorone	-----	-----	-----	-----	-----	-----	-----	-----	-----
Naphthalene	<0.51	<0.73	<0.60	**0.84**	<2.1	**0.017**	**0.034**	<0.1	**0.035**
Nitrobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
N-Nitrosodimethylamine	-----	-----	-----	<2	<2.1	<0.049	<0.1	<0.1	<0.1
N-Nitroso-di-n-propylamine	-----	-----	-----	-----	-----	-----	-----	-----	-----
N-Nitrosodiphenylamine	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pentachlorophenol	-----	-----	-----	**14**	<21	<0.49	<1	<1	<1
Phenanthrene	<0.51	<0.73	<0.60	**1.4**	**0.72**	**0.032**	**0.057**	**0.8**	**0.097**
Phenol	-----	-----	-----	**0.74**	<6.2	**0.024**	<0.3	<0.3	<0.3
Pyrene	<0.51	-----	-----	**1.5**	**7.7**	**0.053**	**0.19**	**0.82**	**0.22**
Pesticides/PCBs									
2,4'-DDD	-----	-----	-----	<22	<1.8	<0.0099	<0.015	<0.028	**0.11**
2,4'-DDE	-----	-----	-----	<10	<1	<0.0099	<0.0098	<0.0098	<0.0086
2,4'-DDT	-----	-----	-----	<45	**5.9**	**0.021**	**0.032**	**0.044**	**0.15**

TABLE 1 - Summary of Surface Sediment Quality Data

Location	SS-1	SS-2	SS-3	Sed. 1	Sed. 2	Sed. 3	Sed. 4	Sed. 4 FD	Sed. 5 (d)
Date	1991	1991	1991	May-07	May-07	May-07	May-07	May-07	May-07
Source	(i)	(i)	(i)	(c)	(c)	(c)	(c)	(c)	(c)
Coordinate X	-----	-----	-----	-----	-----	-----	-----	-----	-----
Coordinate Y	-----	-----	-----	-----	-----	-----	-----	-----	-----
Depth (cm)	<8	<8	<8	<10	<10	<10	<10	<10	-----
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
4,4'-DDD	<0.011	<0.380	<0.310	**15**	**2**	**0.0066**	**0.022**	**0.034**	**0.035**
4,4'-DDE	<0.011	<0.380	<0.310	**16**	**3.6**	**0.02**	**0.042**	**0.06**	**0.21**
4,4'-DDT	<0.011	<0.380	<0.310	**46**	**5.8**	**0.022**	**0.047**	**0.051**	<0.00099
Aldrin	<0.0053	<0.090	<0.150	<10	<1	<0.0099	<0.0098	<0.0098	<0.00099
alpha-BHC	<0.0053	<0.090	<0.150	-----	-----	-----	-----	-----	-----
alpha-Chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----
alpha-Endosulfan	-----	-----	-----	-----	-----	-----	-----	-----	-----
beta-BHC	<0.0053	<0.090	<0.150	-----	-----	-----	-----	-----	-----
beta-Endosulfan	-----	-----	-----	-----	-----	-----	-----	-----	-----
delta-BHC	<0.0053	<0.090	<0.150	-----	-----	-----	-----	-----	-----
Chlordane	-----	-----	-----	<100	<12	<0.099	<0.098	<0.11	<0.16
Cis-Nonachlor	-----	-----	-----	-----	-----	-----	-----	-----	-----
Dieldrin	<0.011	<0.380	<0.310	<10	<1	<0.0099	<0.0098	<0.0099	<0.0025
Endosulfan sulfate	<0.011	<0.380	<0.310	-----	-----	-----	-----	-----	-----
Endrin	<0.011	<0.380	<0.310	-----	-----	-----	-----	-----	-----
Endrin aldehyde	<0.011	<0.380	<0.310	-----	-----	-----	-----	-----	-----
Endrin ketone	-----	-----	-----	-----	-----	-----	-----	-----	-----
gamma-BHC	-----	-----	-----	-----	-----	-----	-----	-----	-----
gamma-chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----
Heptachlor	<0.0053	<0.090	<0.150	<10	<1	<0.0099	<0.0098	<0.0098	<0.00099
Heptachlor epoxide	<0.0053	<0.090	<0.150	-----	-----	-----	-----	-----	-----
Lindane	<0.0053	<0.090	<0.150	<10	<1	<0.0099	<0.0098	<0.0098	0.0017
Methoxychlor	<0.053	<3.800	<1.500	-----	-----	-----	-----	-----	-----
Mirex	-----	-----	-----	-----	-----	-----	-----	-----	-----
Oxychlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----
Toxaphene	<0.110	<3.800	<3.100	-----	-----	-----	-----	-----	-----
Trans-Nonachlor	-----	-----	-----	-----	-----	-----	-----	-----	-----
PCB 1016	<0.0053	<1.900	<1.500	<100	<10	<0.099	<0.098	<0.98	<0.99
PCB 1221	<0.0053	<1.900	<1.500	<200	<20	<0.2	<0.2	<2.0	<2
PCB 1232	<0.0053	<1.900	<1.500	<100	<10	<0.099	<0.098	<0.98	<0.99
PCB 1242	<0.0053	<1.900	<1.500	**850**	**70**	**0.21**	**0.89**	**2.7**	**0.6**
PCB 1248	<0.0053	<1.900	<1.500	<100	<10	<0.099	<0.098	<0.98	<0.99
PCB 1254	<0.0053	<1.900	<1.500	**1500**	**120**	**0.36**	**0.74**	**2**	**1.3**
PCB 1260	**0.22**	**4.2**	**0.94**	**580**	**41**	**0.22**	**0.3**	<0.98	**1.7**
Total PCBs	**0.22**	**4.2**	**0.94**	**2930**	**231**	**0.79**	**1.93**	**4.7**	**3.6**
Dioxin/Furans (ng/kg)									
1,2,3,4,6,7,8-HpCDD	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,4,6,7,8-HpCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,4,7,8,9-HpCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,4,7,8-HxCDD	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,4,7,8-HxCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,6,7,8-HxCDD	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,6,7,8-HxCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,7,8,9-HxCDD	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,7,8,9-HxCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,7,8-PeCDD	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,3,7,8-PeCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,4,6,7,8-HxCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,4,7,8-PeCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,7,8-TCDD	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,7,8-TCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
OCDD	-----	-----	-----	-----	-----	-----	-----	-----	-----
OCDF	-----	-----	-----	-----	-----	-----	-----	-----	-----
TEQ (h)	-----	-----	-----	-----	-----	-----	-----	-----	-----

TABLE 1 - Summary of Surface Sediment Quality Data

ICS/NW Cooperage Site
Seattle, WA

Location	SS-1	SS-2	SS-3	Sed. 1	Sed. 2	Sed. 3	Sed. 4	Sed. 4 FD	Sed. 5 (d)
Date	1991	1991	1991	May-07	May-07	May-07	May-07	May-07	May-07
Source	(i)	(i)	(i)	(c)	(c)	(c)	(c)	(c)	(c)
Coordinate X	-----	-----	-----	-----	-----	-----	-----	-----	-----
Coordinate Y	-----	-----	-----	-----	-----	-----	-----	-----	-----
Depth (cm)	<8	<8	<8	<10	<10	<10	<10	<10	-----
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Other Compounds									
Dibutyltin as ion	-----	-----	-----	-----	-----	-----	-----	-----	-----
Monobutlytin as ion	-----	-----	-----	-----	-----	-----	-----	-----	-----
Tetrabutyltin as ion	-----	-----	-----	-----	-----	-----	-----	-----	-----
Tributyltin as ion	-----	-----	-----	-----	-----	-----	-----	-----	-----

Notes: nd - Not detected
TR - Trace
(a) - Hart Crowser 1986
(b) - Hart Crowser 1987
(c) - SAIC July 2007
(d) - Outfall sediment
(e) - LDW Round 1 RI
(f) - EPA SI
(g) - LDW RI - Benthic
(h) WHO 2005 (mammal)
(i) - SAIC Feb. 2007
(j) - Lower Duwamish Waterway (LDW) - most stringent sediment screening level.
(k) - Total petroleum hydrocarbons
(l) - Carbon normalized SQS available

- Shading indicates exceedance of screening level, SQS or background concentrations.

TABLE 1 - Summary of Surface Sediment Quality Data

Location	LDW SS84	DR139	B5a-2	DR157	DR138	Max. Detected Conc.	LDW Sediment Screening Levels (j)	Sediment Quality Standards (SQS) WAC 173-204-320	Soil Background Puget Sound (Ecology 1994)
Date	Jan-05	Sep-98	Sep-04	Aug-98	Aug-98				
Source	(e)	(f)	(g)	(f)	(f)				
Coordinate X	1269997	1270186	1270183	1270346	1270354				
Coordinate Y	200324	200341	200299	200349	200326				
Depth (cm)	<15	<15	<15	<15	<15				
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Total Solids (%)	56.6	-----	66.2	-----	-----	-----	-----	-----	-----
Total Organic Carbon (%)	4.12	2.96	1.4	5.47	0.47	-----	-----	-----	-----
Petroleum Hydrocarbons									
Gasoline Range Organics	-----	-----	-----	-----	-----	200	5.7(k)	-----	-----
Diesel Range Organics	-----	-----	-----	-----	-----	10000	5.7(k)	-----	-----
Residual Range Organics	-----	-----	-----	-----	-----	20000	5.7(k)	-----	-----
Total Metals									
Aluminum	-----	21000	-----	18000	8700	21000	7700	-----	32600
Antimony	0.3	6	0.74	<10	<10	6	3.1	-----	-----
Arsenic	12.3	9.9	7.4	10	5.2	48.7	0.000023	57	7
Barium	-----	74	-----	81	23	81	1500	-----	-----
Beryllium	-----	0.38	-----	0.32	0.14	0.38	-----	-----	0.6
Cadmium	2	0.9	0.296	1.2	<0.2	36.3	0.33	5.1	1
Calcium	-----	5.9	-----	6100	3900	6100	-----	-----	-----
Chromium	122	52	27	55	16	1680	39	260	48
Cobalt	13.1	10	7.7	9	4	13.1	10	-----	-----
Copper	117	86	36.7	83	20	1090	35	390	36
Iron	-----	32000	-----	27000	16000	32000	5500	-----	58700
Lead	615	180	74.7	250	23	10400	10	450	24
Magnesium	-----	8100	-----	7700	3300	8100	-----	-----	-----
Manganese	-----	250	-----	200	280	280	180	-----	1200
Mercury	2.46	0.82	0.16	1.6	0.05	247	0.41	0.41	0.07
Molybdenum	5.1	-----	1.7	-----	-----	5.1	39	-----	-----
Nickel	39	24	16	19	9.7	39	28	-----	48
Potassium	-----	2200	-----	2300	920	2300	-----	-----	-----
Selenium	8	1	0.3	14	8	14	1	-----	-----
Silver	1.7	1.1	0.168	1.1	0.11	19	0.56	6.1	-----
Sodium	-----	9600	-----	17000	5300	17000	-----	-----	-----
Thallium	<0.30	0.11	0.068	0.1	0.03	0.11	0.51	-----	-----
Tin	-----	10	-----	9	<4	10	-----	-----	-----
Vanadium	55.1	71	46.5	67	50	71	39	-----	-----
Zinc	417	240	121	250	57	4580	260	410	85
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
1,1,1-Trichloroethane	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
1,1,2,2-Tetrachloroethane	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
1,1,2-Trichloroethane	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
1,1,2-Trichlorotrifluoroethane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
1,1-Dichloroethane	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
1,1-Dichloroethene	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
1,1-Dichloropropene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
1,2,3-Trichlorobenzene	-----	<0.0065	-----	-----	-----	<0.0065	-----	-----	-----
1,2,3-Trichloropropane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
1,2,4-Trimethylbenzene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
1,2-Dibromo-3-chloropropane	-----	<0.016	-----	-----	-----	<0.0160	-----	-----	-----
1,2-Dibromoethane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
1,2-Dichloroethane	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
1,2-Dichloropropane	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
1,3,5-Trimethylbenzene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
1,3-Dichloropropane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
1,Chlorobutane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
2,2-Dichloropropane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
2-Chlorotoluene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
2-Hexanone	-----	<0.0065	-----	-----	-----	<0.0220	-----	-----	-----
2-Nitropropane	-----	<0.016	-----	-----	-----	<0.0160	-----	-----	-----
4-Chlorotoluene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Acetone	-----	<0.033	-----	-----	-----	<0.5300	-----	-----	-----
Allyl chloride	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Benzene	-----	<0.0033	-----	-----	-----	<0.0110	0.04	-----	-----
Bromobenzene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----

TABLE 1 - Summary of Surface Sediment Quality Data

Location Date Source Coordinate X Coordinate Y Depth (cm) Units	LDW SS84 Jan-05 (e) 1269997 200324 <15 (mg/kg)	DR139 Sep-98 (f) 1270186 200341 <15 (mg/kg)	B5a-2 Sep-04 (g) 1270183 200299 <15 (mg/kg)	DR157 Aug-98 (f) 1270346 200349 <15 (mg/kg)	DR138 Aug-98 (f) 1270354 200326 <15 (mg/kg)	Max. Detected Conc. (mg/kg)	LDW Sediment Screening Levels (j) (mg/kg)	Sediment Quality Standards (SQS) WAC 173-204-320 (mg/kg)	Soil Background Puget Sound (Ecology 1994) (mg/kg)
Bromochloromethane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Bromodichloromethane	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
Bromoform	-----	<0.0065	-----	-----	-----	<0.0110	-----	-----	-----
Bromomethane	-----	<0.016	-----	-----	-----	<0.0220	-----	-----	-----
Carbon disulfide	-----	<0.0065	-----	-----	-----	<0.0110	-----	-----	-----
Carbon Tetrachloride	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
Chlorobenzene	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
Chloroethane	-----	<0.0065	-----	-----	-----	<0.0220	-----	-----	-----
Chloroform	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
Chloromethane	-----	<0.0033	-----	-----	-----	<0.0220	-----	-----	-----
cis-1,2-Dichloroethene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
cis-1,3-Dichloropropene	-----	<0.0035	-----	-----	-----	<0.0110	-----	-----	-----
Dibromochloromethane	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
Dibromomethane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Dichlorodifluoromethane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Dichloromethane	-----	<0.016	-----	-----	-----	<0.0160	-----	-----	-----
Diethyl ether	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Ethy Methacrylate	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Ethylbenzene	-----	<0.0033	-----	-----	-----	<0.0110	0.01	-----	-----
Iodomethane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Isopropylbenzene	-----	<0.016	-----	-----	-----	<0.0160	-----	-----	-----
Methacrylonitrile	-----	<0.016	-----	-----	-----	<0.0160	-----	-----	-----
Methyl Acrylate	-----	<0.016	-----	-----	-----	<0.0160	-----	-----	-----
Methyl ethyl ketone	-----	<0.0065	-----	-----	-----	<0.0160	-----	-----	-----
Methyl isobutyl ketone	-----	<0.0065	-----	-----	-----	<0.0065	-----	-----	-----
Methyl methacrylate	-----	<0.0065	-----	-----	-----	<0.0065	-----	-----	-----
n-Butylbenzene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
n-Propylbenzene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
p-Cymene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Pentachloroethane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
sec-Butlybenzene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Styrene	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
Tert-butyl methyl ether	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
tert-Butylbenzene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Tetrachloroehtene	-----	<0.0033	-----	-----	-----	<0.0110	0.057	-----	-----
Toluene	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
trans-1,2-Dichloroethene	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
trans-1,3-Dichloropropene	-----	<0.0061	-----	-----	-----	<0.0061	-----	-----	-----
Trichloroethene	-----	<0.0033	-----	-----	-----	<0.0110	160	-----	-----
Trichlorofluoromethane	-----	<0.0033	-----	-----	-----	<0.0033	-----	-----	-----
Vinyl chloride	-----	<0.0033	-----	-----	-----	<0.0220	-----	-----	-----
Xylene (m &p)	-----	<0.0065	-----	-----	-----	<0.0110	0.04	-----	-----
Xylene (o)	-----	<0.0033	-----	-----	-----	<0.0110	-----	-----	-----
Semivolatile Organic Compound									
1,2,4-Trichlorobenzene	<0.29	<0.02	<0.0086	<0.02	<0.02	**0.94**	0.013	(l)	-----
1,2-Dichlorobenzene	<0.29	<0.02	<0.0086	<0.02	<0.02	**0.67**	0.035	(l)	-----
1,3-Dichlorobenzene	<0.29	<0.02	<0.0086	<0.02	<0.02	nd	0.021	-----	-----
1,4-Dichlorobenzene	<0.29	<0.02	<0.0086	<0.02	<0.02	**1.1**	0.048	(l)	-----
1-Methylnaphthalene	-----	-----	0.01	-----	-----	**0.01**	-----	-----	-----
2,4-Dichlorophenol	<1.4	<0.06	<0.0086	<0.06	<0.06	nd	-----	-----	-----
2,4-Dinitrophenol	<2.9	<0.20	<0.180	<0.20	<0.20	nd	-----	-----	-----
2,4-Dinitrotoluene	<1.4	<0.20	<0.0086	<0.20	<0.20	nd	-----	-----	-----
2,6-Dinitrotoluene	<1.4	<0.20	<0.0086	<0.20	<0.20	nd	-----	-----	-----
2,4-Dimethylphenol	<0.29	<0.02	<0.043	<0.02	<0.02	nd	0.029	0.029	-----
2,4,5-Trichlorophenol	<1.4	<0.20	<0.0086	<0.20	<0.20	nd	-----	-----	-----
2,4,6-Trichlorophenol	<1.4	<0.20	<0.0086	<0.20	<0.20	nd	-----	-----	-----
2-Chloronaphthalene	<0.29	<0.02	<0.0086	<0.02	<0.02	nd	-----	-----	-----
2-Chlorophenol	<0.29	<0.02	<0.0086	<0.02	<0.02	nd	-----	-----	-----
2-Methylnaphthalene	<0.29	**0.07**	**0.014**	**0.10**	<0.02	**1.6**	0.59	(l)	-----
2-Methylphenol	<0.29	<0.02	<0.0086	<0.02	<0.02	nd	0.055	0.063	-----

TABLE 1 - Summary of Surface Sediment Quality Data

Location	LDW SS84	DR139	B5a-2	DR157	DR138	Max. Detected Conc.	LDW Sediment Screening Levels	Sediment Quality Standards (SQS)	Soil Background Puget Sound
Date	Jan-05	Sep-98	Sep-04	Aug-98	Aug-98				
Source	(e)	(f)	(g)	(f)	(f)		(j)	WAC 173-204-320	(Ecology 1994)
Coordinate X	1269997	1270186	1270183	1270346	1270354				
Coordinate Y	200324	200341	200299	200349	200326				
Depth (cm)	<15	<15	<15	<15	<15				
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
2-Nitroaniline	<1.4	<0.10	<0.018	<0.10	<0.10	nd	-----	-----	-----
2-Nitrophenol	<1.4	<0.10	<0.0086	<0.10	<0.10	nd	-----	-----	-----
3,3-Dchlorobenzidine	<1.4	<0.20	<0.086	<0.20	<0.20	nd	-----	-----	-----
3-Nitroaniline	<1.4	<0.20	<0.018	<0.20	<0.20	nd	-----	-----	-----
4,6-Dinitro-o-cresol	<2.9	<0.20	<0.086	<0.20	<0.20	nd	-----	-----	-----
4-Bromophenyl phenyl ether	<0.29	<0.04	<0.0086	<0.04	<0.04	nd	-----	-----	-----
4-Chloro-3-methylphenol	<1.4	<0.04	<0.0086	<0.04	<0.04	nd	-----	-----	-----
4-Chloroaniline	<1.4	<0.06	<0.0086	<0.06	<0.06	nd	-----	-----	-----
4-Chlorophenyl phenyl ether	<0.29	<0.02	<0.0086	<0.02	<0.02	nd	-----	-----	-----
4-Methylphenol	<0.29	**0.03**	<0.0086	**0.03**	<0.02	**0.51**	0.11	0.67	-----
4-Nitroaniline	<1.4	<0.10	<0.018	<0.10	<0.10	nd	-----	-----	-----
4-Nitrophenol	<1.4	<0.10	<0.086	<0.10	<0.10	nd	-----	-----	-----
Acenaphthene	<0.29	**0.18**	**0.0041**	**0.05**	<0.02	**0.47**	0.25	(l)	-----
Acenaphthylene	<0.29	<0.02	**0.0046**	<0.02	<0.02	**0.48**	0.56	(l)	-----
Aniline	<0.29	-----	<0.018	-----	-----	nd	-----	-----	-----
Anthracene	<0.29	**0.46**	**0.015**	**0.16**	<0.02	**0.75**	0.96	(l)	-----
Benzo(a)anthracene	**0.4**	**0.33**	**0.041**	**0.44**	<0.02	**4.2**	0.00022	(l)	-----
Benzo(a)pyrene	**0.51**	**0.31**	**0.037**	**0.32**	<0.02	**3.3**	0.00022	(l)	-----
Benzo(b)fluoranthene	**0.69**	**0.51**	**0.054**	**0.48**	0.02	**4.5**	0.00022	-----	-----
Benzo(e)pyrene	**-----**	-----	**0.044**	-----	-----	**0.044**	-----	-----	-----
Benzo(ghi)perylene	**0.23**	**0.22**	**0.041**	**0.18**	<0.02	**2.2**	0.48	(l)	-----
Benzo(k)fluoranthene	**0.44**	**0.29**	**0.046**	**0.36**	<0.02	**2**	0.00022	-----	-----
Total Benzofluoranthenes	**0.67**	**0.51**	**0.087**	**0.54**	<0.02	**4.2**	0.00022	(l)	-----
Benzoic Acid	<2.9	<0.20	<0.180	<0.20	<0.20	nd	0.65	0.65	-----
Benzyl Alcohol	<0.29	<0.050	0.0082	<0.05	<0.05	nd	0.057	0.057	-----
Biphenyl	-----	-----	0.0041	-----	-----	**0.0041**	-----	-----	-----
bis(2-chloroethoxy)methane	<0.29	<0.040	<0.0086	<0.04	<0.04	nd	-----	-----	-----
bis(2-chlorethyl)ether	<0.29	<0.040	<0.0086	<0.04	<0.04	nd	-----	-----	-----
bis(2-chloroisopropyl)ether	<0.29	<0.040	<0.0086	<0.04	<0.04	nd	-----	-----	-----
Bis(2-ethylhexyl)phthalate	**4.2**	**2.5**	**0.052**	**2.3**	**0.03**	**17**	0.73	(l)	-----
Butylbenzylphthalate	<0.29	**0.11**	**0.0074**	**0.09**	<0.02	**3.3**	0.063	(l)	-----
Carbozole	<0.29	**0.21**	**0.0076**	**0.07**	<0.02	**0.21**	-----	-----	-----
Chrysene	**0.7**	**0.48**	**0.081**	**0.68**	**0.03**	**4.8**	0.00022	(l)	-----
Dibenzo(ah)anthracene	<0.29	**0.08**	**0.0086**	<0.02	<0.02	**0.57**	0.00022	(l)	-----
Dibenzofuran	<0.29	**0.06**	**0.0058**	**0.03**	<0.02	**0.0083**	0.23	(l)	-----
Diethylphthalate	<0.29	<0.020	<0.0086	<0.02	<0.02	nd	0.006	(l)	-----
Dimethylphthalate	<0.29	**0.04**	**0.0034**	0.03	<0.02	**0.44**	0.071	(l)	-----
Di-N-Butylphthalate	**0.38**	**0.07**	**0.0072**	**0.3**	<0.02	**0.38**	1.4	(l)	-----
Di-n-octyl phthalate	<0.29	<0.020	<0.018	<0.02	<0.02	nd	0.061	(l)	-----
Fluoranthene	**1.1**	**0.82**	**0.16**	**0.68**	**0.03**	**7.3**	1.7	(l)	-----
Fluorene	**<0.29**	**0.14**	**0.0065**	**0.05**	<0.02	**0.44**	0.36	(l)	-----
Hexachlorobenzene	<0.017	<0.020	**0.0006**	<0.02	<0.02	**0.0006**	0.0059	(l)	-----
Hexachlorobutadiene	<0.017	<0.020	<0.0086	<0.02	<0.02	nd	0.011	(l)	-----
Hexachlorocyclopentadiene	<1.4	<0.100	<0.043	**0.1**	<0.10	**0.1**	-----	-----	-----
Hexachloroethane	<0.29	<0.020	<0.0086	<0.02	<0.02	nd	-----	-----	-----
Indeno(123-cd)pyrene	**0.22**	**0.22**	**0.0036**	**0.18**	<0.02	**1.9**	0.00022	(l)	-----
Isophorone	<0.29	<0.020	<0.0086	<0.02	<0.02	nd	-----	-----	-----
Naphthalene	<0.29	**0.06**	**0.01**	**0.05**	<0.02	**0.84**	1.5	(l)	-----
Nitrobenzene	<0.29	<0.020	<0.0086	<0.02	<0.02	nd	-----	-----	-----
N-Nitrosodimethylamine	<0.29	-----	<0.0043	-----	-----	nd	-----	-----	-----
N-Nitroso-di-n-propylamine	<1.4	<0.040	<0.0086	<0.04	<0.04	nd	-----	-----	-----
N-Nitrosodiphenylamine	<0.29	<0.040	<0.0086	<0.04	<0.04	nd	0.028	(l)	-----
Pentachlorophenol	<1.4	**0.1**	**0.014**	**0.3**	**<0.10**	**14**	0.012	0.36	-----
Phenanthrene	**0.33**	**0.36**	**0.031**	**0.32**	**<0.02**	**1.4**	1.5	(l)	-----
Phenol	<0.29	**0.04**	**0.024**	**0.05**	<0.02	**0.74**	0.18	0.42	-----
Pyrene	**0.98**	**0.87**	**0.13**	**1.4**	**0.03**	**7.7**	2.6	(l)	-----
Pesticides/PCBs									
2,4'-DDD	<0.034	-----	<0.014	-----	-----	**0.11**	-----	-----	-----
2,4'-DDE	<0.034	-----	**0.0028**	-----	-----	**0.0028**	-----	-----	-----
2,4'-DDT	<0.46	-----	**0.0055**	-----	-----	**5.9**	-----	-----	-----

TABLE 1 - Summary of Surface Sediment Quality Data

Location	LDW SS84	DR139	B5a-2	DR157	DR138	Max. Detected Conc.	LDW Sediment Screening Levels	Sediment Quality Standards (SQS)	Soil Background Puget Sound
Date	Jan-05	Sep-98	Sep-04	Aug-98	Aug-98				
Source	(e)	(f)	(g)	(f)	(f)		(j)	WAC 173-204-320	(Ecology 1994)
Coordinate X	1269997	1270186	1270183	1270346	1270354				
Coordinate Y	200324	200341	200299	200349	200326				
Depth (cm)	<15	<15	<15	<15	<15				
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
4,4'-DDD	<0.54	**0.033**	**0.022**	-----	-----	**15**	-----	-----	-----
4,4'-DDE	<0.80	**0.14**	**0.031**	-----	-----	**16**	-----	-----	-----
4,4'-DDT	<0.034	<0.011	**0.016**	-----	-----	**46**	-----	-----	-----
Aldrin	<0.017	<0.010	<0.001	-----	-----	nd	-----	-----	-----
alpha-BHC	<0.017	<0.010	<0.001	-----	-----	nd	-----	-----	-----
alpha-Chlordane	<0.017	<0.010	**0.0016**	-----	-----	**0.0016**	-----	-----	-----
alpha-Endosulfan	<0.017	<0.010	<0.001	-----	-----	nd	-----	-----	-----
beta-BHC	<0.017	<0.010	<0.0011	-----	-----	nd	-----	-----	-----
beta-Endosulfan	<0.034	<0.010	**0.01**	-----	-----	**0.01**	-----	-----	-----
delta-BHC	<0.017	-----	<0.0015	-----	-----	nd	-----	-----	-----
Chlordane	-----	-----	-----	-----	-----	nd	-----	-----	-----
Cis-Nonachlor	<0.33	-----	-----	-----	-----	nd	-----	-----	-----
Dieldrin	<0.034	0.017	<0.001	-----	-----	nd	-----	-----	-----
Endosulfan sulfate	<0.034	<0.010	<0.001	-----	-----	nd	-----	-----	-----
Endrin	<0.034	<0.010	0.0015	-----	-----	nd	-----	-----	-----
Endrin aldehyde	<0.25	<0.050	<0.0047	-----	-----	nd	-----	-----	-----
Endrin ketone	<0.034	<0.010	**0.006**	-----	-----	**0.006**	-----	-----	-----
gamma-BHC	<0.017	<0.010	**0.0013**	-----	-----	**0.0013**	-----	-----	-----
gamma-chlordane	<0.017	<0.011	**0.016**	-----	-----	**0.016**	-----	-----	-----
Heptachlor	<0.070	<0.010	<0.001	-----	-----	nd	-----	-----	-----
Heptachlor epoxide	<0.510	<0.011	<0.0062	-----	-----	nd	-----	-----	-----
Lindane	-----	-----	-----	-----	-----	nd	-----	-----	-----
Methoxychlor	<0.170	<0.010	<0.0031	-----	-----	nd	-----	-----	-----
Mirex	<0.034	-----	<0.001	-----	-----	nd	-----	-----	-----
Oxychlordane	<0.034	-----	-----	-----	-----	nd	-----	-----	-----
Toxaphene	<1.7	<0.10	<0.054	-----	-----	nd	-----	-----	-----
Trans-Nonachlor	<0.034	-----	-----	-----	-----	nd	-----	-----	-----
PCB 1016	<0.69	<0.020	<0.010	<0.02	<0.02	nd	0.24	-----	-----
PCB 1221	<0.69	<0.040	<0.020	<0.04	<0.02	nd	-----	-----	-----
PCB 1232	<0.69	<0.020	<0.010	<0.02	<0.02	nd	-----	-----	-----
PCB 1242	<0.69	**0.61**	<0.010	**2.4**	0.092	**850**	-----	-----	-----
PCB 1248	**12**	<0.020	0.60	<0.02	<0.02	**12**	0.24	-----	-----
PCB 1254	**6.8**	**1.1**	**0.63**	**1.3**	**0.063**	**1500**	0.24	-----	-----
PCB 1260	**4.3**	**1.2**	**0.50**	**0.98**	**0.032**	**580**	0.24	-----	-----
Total PCBs	**23.1**	**2.91**	**1.73**	**4.68**	**0.187**	**2930**	0.00011	(l)	-----
Dioxin/Furans (ng/kg)									
1,2,3,4,6,7,8-HpCDD	**11400**	-----	-----	-----	-----	**11400**	-----	-----	-----
1,2,3,4,6,7,8-HpCDF	**2360**	-----	-----	-----	-----	**2360**	-----	-----	-----
1,2,3,4,7,8,9-HpCDF	**147**	-----	-----	-----	-----	**147**	-----	-----	-----
1,2,3,4,7,8-HxCDD	**66.7**	-----	-----	-----	-----	**66.7**	-----	-----	-----
1,2,3,4,7,8-HxCDF	**382**	-----	-----	-----	-----	**382**	-----	-----	-----
1,2,3,6,7,8-HxCDD	**401**	-----	-----	-----	-----	**401**	-----	-----	-----
1,2,3,6,7,8-HxCDF	**85.8**	-----	-----	-----	-----	**85.8**	-----	-----	-----
1,2,3,7,8,9-HxCDD	**308**	-----	-----	-----	-----	**308**	-----	-----	-----
1,2,3,7,8,9-HxCDF	**5.74**	-----	-----	-----	-----	**5.74**	-----	-----	-----
1,2,3,7,8-PeCDD	**57.1**	-----	-----	-----	-----	**57.1**	-----	-----	-----
1,2,3,7,8-PeCDF	**16.5**	-----	-----	-----	-----	**16.5**	-----	-----	-----
2,3,4,6,7,8-HxCDF	**50.9**	-----	-----	-----	-----	**50.9**	-----	-----	-----
2,3,4,7,8-PeCDF	**56**	-----	-----	-----	-----	**56**	-----	-----	-----
2,3,7,8-TCDD	**30.6**	-----	-----	-----	-----	**30.6**	-----	-----	-----
2,3,7,8-TCDF	**46.6**	-----	-----	-----	-----	**46.6**	-----	-----	-----
OCDD	**103000**	-----	-----	-----	-----	**103000**	-----	-----	-----
OCDF	**7320**	-----	-----	-----	-----	**7320**	-----	-----	-----
TEQ (h)	**412**	-----	-----	-----	-----	**412**	0.141	-----	-----

TABLE 1 - Summary of Surface Sediment Quality Data

Location	LDW SS84	DR139	B5a-2	DR157	DR138	Max. Detected Conc.	LDW Sediment Screening Levels (j)	Sediment Quality Standards (SQS) WAC 173-204-320	Soil Background Puget Sound (Ecology 1994)
Date	Jan-05	Sep-98	Sep-04	Aug-98	Aug-98				
Source	(e)	(f)	(g)	(f)	(f)				
Coordinate X	1269997	1270186	1270183	1270346	1270354				
Coordinate Y	200324	200341	200299	200349	200326				
Depth (cm)	<15	<15	<15	<15	<15				
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Other Compounds									
Dibutyltin as ion	-----	-----	**0.01**	-----	-----	**0.01**	-----	-----	-----
Monobutlytin as ion	-----	-----	**0.0052**	-----	-----	**0.0052**	-----	-----	-----
Tetrabutyltin as ion	-----	-----	<0.0016	-----	-----	nd	-----	-----	-----
Tributyltin as ion	-----	-----	**0.0064**	-----	-----	**0.0064**	0.017	-----	-----

Notes: nd - Not detected
TR - Trace
(a) - Hart Crowser 1986
(b) - Hart Crowser 1987
(c) - SAIC July 2007
(d) - Outfall sediment
(e) - LDW Round 1 RI
(f) - EPA SI
(g) - LDW RI - Benthic
(h) WHO 2005 (mammal)
(i) - SAIC Feb. 2007
(j) - Lower Duwamish Waterway (LDW) - most stringent sediment screening level.
(k) - Total petroleum hydrocarbons
(l) - Carbon normalized SQS available

[yellow box] - Shading indicates exceedance of screening level, SQS or background concentrations.

TABLE 2 - Summary of Subsurface Sediment Quality Data

Location	LDW-SC40	LDW-SC40	LDW-SC40	Max. Detected Conc.	LDW Sediment Screening Levels (c)	Sediment Quality Standards WAC 173-204-320	Soil Background Puget Sound (Ecology 1994)
Date	Feb-06	Feb-06	Feb-06				
Source	(a)	(a)	(a)				
Coordinate X	1270303	1270303	1270303				
Coordinate Y	200332	200332	200332				
Depth (feet))	0 to 1.3	1.3-2	2-4				
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Total Solids (%)	73.2	80.6	81.95	-----	-----	-----	-----
Total Organic Carbon (%)	0.747	0.328	0.211	-----	-----	-----	-----
Total Metals							
Antimony	<7	<6	<6	nd	3.1	-----	-----
Arsenic	**7**	<6	<6	**7**	0.000023	57	7
Cadmium	<0.3	<0.2	<0.2	nd	1500	-----	-----
Chromium	**14.4**	**17**	**11.9**	**14.4**	39	260	48
Cobalt	**4.3**	**4.6**	**3.7**	**4.6**	10	-----	-----
Copper	20.9	13.8	8.3	**20.9**	35	390	36
Lead	**18**	**44**	<2	**44**	10	450	24
Mercury	**0.05**	<0.05	<0.05	**0.05**	0.41	0.41	0.07
Molybdenum	**1.0**	**0.9**	<0.6	**1.0**	39	-----	-----
Nickel	**10**	**15**	**8**	**15**	28	-----	48
Selenium	<7	<6	<6	nd	1	-----	-----
Silver	<0.4	<0.4	<0.4	nd	0.56	6.1	-----
Thallium	<7	<6	<6	nd	0.51	-----	-----
Vanadium	**45.5**	**45.5**	**43.3**	**45.5**	39	-----	-----
Zinc	**47.4**	**27.4**	**24.5**	**47.4**	260	410	85
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	<0.0060	<0.0059	<0.0060	nd	0.013	(d)	-----
1,2-Dichlorobenzene	<0.0060	<0.0059	<0.0060	nd	0.035	(d)	-----
1,3-Dichlorobenzene	<0.020	<0.020	<0.020	nd	0.021	-----	-----
1,4-Dichlorobenzene	<0.0060	<0.0059	<0.0060	nd	0.048	(d)	-----
1-Methylnaphthalene	<0.020	<0.020	<0.020	nd	-----	-----	-----
2,4-Dichlorophenol	<0.100	<0.099	<0.100	nd	-----	-----	-----
2,4-Dinitrophenol	<0.200	<0.200	<0.200	nd	-----	-----	-----
2,4-Dinitrotoluene	<0.100	<0.099	<0.100	nd	-----	-----	-----
2,6-Dinitrotoluene	<0.100	<0.099	<0.100	nd	-----	-----	-----
2,4-Dimethylphenol	<0.0060	<0.0059	<0.0060	nd	0.029	0.029	-----
2,4,5-Trichlorophenol	<0.100	<0.099	<0.100	nd	-----	-----	-----
2,4,6-Trichlorophenol	<0.100	<0.099	<0.100	nd	-----	-----	-----
2-Chloronaphthalene	<0.020	<0.020	<0.020	nd	-----	-----	-----
2-Chlorophenol	<0.020	<0.020	<0.020	nd	-----	-----	-----
2-Methylnaphthalene	<0.020	<0.020	<0.020	nd	0.59	(d)	-----
2-Methylphenol	<0.0060	<0.0059	<0.0060	nd	0.055	0.063	-----
2-Nitroaniline	<0.100	<0.099	<0.100	nd	-----	-----	-----
2-Nitrophenol	<0.100	<0.099	<0.100	nd	-----	-----	-----
3,3-Dchlorobenzidine	<0.100	<0.099	<0.100	nd	-----	-----	-----
3-Nitroaniline	<0.100	<0.099	<0.100	nd	-----	-----	-----
4,6-Dinitro-o-cresol	<0.200	<0.200	<0.200	nd	-----	-----	-----
4-Bromophenyl phenyl ether	<0.020	<0.020	<0.020	nd	-----	-----	-----
4-Chloro-3-methylphenol	<0.100	<0.099	<0.100	nd	-----	-----	-----
4-Chloroaniline	<0.100	<0.099	<0.100	nd	-----	-----	-----
4-Chlorophenyl phenyl ether	<0.020	<0.020	<0.020	nd	-----	-----	-----
4-Methylphenol	<0.020	<0.020	<0.020	nd	0.11	0.67	-----
4-Nitroaniline	<0.100	<0.099	<0.100	nd	-----	-----	-----
4-Nitrophenol	<0.100	<0.099	<0.100	nd	-----	-----	-----
Acenaphthene	<0.020	<0.020	<0.020	nd	0.25	(d)	-----
Acenaphthylene	<0.020	<0.020	<0.020	nd	0.56	(d)	-----
Aniline	<0.036	<0.020	<0.020	nd	-----	-----	-----
Anthracene	**0.032**	<0.020	<0.020	**0.032**	0.96	(d)	-----
Benzo(a)anthracene	**0.054**	<0.020	<0.020	**0.054**	0.00022	(d)	-----
Benzo(a)pyrene	**0.030**	<0.020	<0.020	**0.030**	0.00022	(d)	-----
Benzo(b)fluoranthene	**0.041**	<0.020	<0.020	**0.041**	0.00022	-----	-----
Benzo(ghi)perylene	**0.018**	<0.020	<0.020	**0.018**	0.48	(d)	-----
Benzo(k)fluoranthene	**0.044**	<0.020	<0.020	**0.044**	0.00022	-----	-----
Total Benzofluoranthenes	**0.085**	<0.020	<0.020	**0.085**	0.00022	(d)	-----
Benzoic Acid	<0.080	<0.071	<0.067	nd	0.65	0.65	-----
Benzyl Alcohol	<0.030	<0.030	<0.030	nd	0.057	0.057	-----
bis(2-chloroethoxy)methane	<0.020	<0.020	<0.020	nd	-----	-----	-----

TABLE 2 - Summary of Subsurface Sediment Quality Data

Location Date Source Coordinate X Coordinate Y Depth (feet)) Units	LDW-SC40 Feb-06 (a) 1270303 200332 0 to 1.3 (mg/kg)	LDW-SC40 Feb-06 (a) 1270303 200332 1.3-2 (mg/kg)	LDW-SC40 Feb-06 (a) 1270303 200332 2-4 (mg/kg)	Max. Detected Conc. (mg/kg)	LDW Sediment Screening Levels (c) (mg/kg)	Sediment Quality Standards WAC 173-204 -320 (mg/kg)	Soil Background Puget Sound (Ecology 1994) (mg/kg)
bis(2-chlorethyl)ether	<0.020	<0.020	<0.020	nd	-----	-----	-----
bis(2-chloroisopropyl)ether	<0.020	<0.020	<0.020	nd	-----	-----	-----
Bis(2-ethylhexyl)phthalate	**0.048**	<0.020	<0.020	**0.048**	0.73	(d)	-----
Butylbenzylphthalate	**0.01**	<0.0059	<0.0060	**0.01**	0.063	(d)	-----
Chrysene	**0.085**	<0.020	<0.020	**0.085**	0.00022	(d)	-----
Dibenzo(ah)anthracene	<0.020	<0.020	<0.020	nd	0.00022	(d)	-----
Dibenzofuran	<0.020	<0.020	<0.020	nd	0.23	(d)	-----
Diethylphthalate	<0.020	<0.020	<0.020	nd	0.006	(d)	-----
Dimethylphthalate	<0.020	<0.020	<0.020	nd	0.071	(d)	-----
Di-N-Butylphthalate	<0.026	<0.020	<0.020	nd	1.4	(d)	-----
Di-n-octyl phthalate	<0.020	<0.020	<0.020	nd	0.061	(d)	-----
Fluoranthene	**0.32**	<0.020	<0.020	**0.32**	1.7	(d)	-----
Fluorene	<0.020	<0.020	<0.020	nd	0.36	(d)	-----
Hexachlorobenzene	<0.0010	<0.0010	<0.0010	nd	0.0059	(d)	-----
Hexachlorobutadiene	<0.0010	<0.0010	<0.0010	nd	0.011	(d)	-----
Hexachlorocyclopentadiene	<0.100	<0.099	<0.100	nd	-----	-----	-----
Hexachloroethane	<0.020	<0.020	<0.020	nd	-----	-----	-----
Indeno(123-cd)pyrene	**0.02**	<0.020	<0.020	**0.02**	0.00022	(d)	-----
Isophorone	<0.020	<0.020	<0.020	nd	-----	-----	-----
Naphthalene	<0.020	<0.020	<0.020	nd	1.5	(d)	-----
Nitrobenzene	<0.020	<0.020	<0.020	nd	-----	-----	-----
N-Nitrosodimethylamine	<0.030	<0.030	<0.030	nd	-----	-----	-----
N-Nitroso-di-n-propylamine	<0.030	<0.030	<0.030	nd	-----	-----	-----
N-Nitrosodiphenylamine	<0.011	<0.006	<0.006	nd	0.028	(d)	-----
Pentachlorophenol	<0.030	<0.030	<0.030	nd	0.012	0.36	-----
Phenanthrene	**0.130**	<0.020	<0.020	**0.130**	1.5	(l)	-----
Phenol	<0.020	<0.020	<0.020	nd	0.18	0.42	-----
Pyrene	**0.240**	<0.020	<0.020	**0.240**	2.6	(l)	-----
Pesticides/PCBs							
2,4'-DDD	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
2,4'-DDE	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
2,4'-DDT	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
4,4'-DDD	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
4,4'-DDE	<0.0047	<0.0020	<0.0020	nd	-----	-----	-----
4,4'-DDT	<0.0072	<0.0020	<0.0020	nd	-----	-----	-----
Total DDTs	<0.0072	<0.0020	<0.0020	nd	-----	-----	-----
Aldrin	<0.0010	<0.0010	<0.0010	nd	-----	-----	-----
alpha-BHC	<0.0010	<0.0010	<0.0010	nd	-----	-----	-----
alpha-Chlordane	<0.0010	<0.0010	<0.0010	nd	-----	-----	-----
alpha-Endosulfan	<0.0010	<0.0010	<0.0010	nd	-----	-----	-----
beta-BHC	<0.0010	<0.0010	<0.0010	nd	-----	-----	-----
beta-Endosulfan	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
delta-BHC	<0.0010	<0.0010	<0.0010	nd	-----	-----	-----
Total chlordane	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
Cis-Nonachlor	<0.0033	<0.0020	<0.0020	nd	-----	-----	-----
Dieldrin	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
Endosulfan sulfate	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
Endrin	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
Endrin aldehyde	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
Endrin ketone	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
gamma-BHC	<0.0010	<0.0010	<0.0010	nd	-----	-----	-----
gamma-chlordane	<0.0010	<0.0010	<0.0010	nd	-----	-----	-----
Heptachlor	<0.0018	<0.0010	<0.0010	nd	-----	-----	-----
Heptachlor epoxide	<0.0010	<0.0010	<0.0010	nd	-----	-----	-----
Lindane	-----	-----	-----	-----	-----	-----	-----
Methoxychlor	<0.010	<0.0099	<0.0098	nd	-----	-----	-----
Mirex	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
Oxychlordane	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----
Toxaphene	<0.1000	<0.0990	<0.0980	nd	-----	-----	-----
Trans-Nonachlor	<0.0020	<0.0020	<0.0020	nd	-----	-----	-----

TABLE 2 - Summary of Subsurface Sediment Quality Data

Location Date Source Coordinate X Coordinate Y Depth (feet)) Units	LDW-SC40 Feb-06 (a) 1270303 200332 0 to 1.3 (mg/kg)	LDW-SC40 Feb-06 (a) 1270303 200332 1.3-2 (mg/kg)	LDW-SC40 Feb-06 (a) 1270303 200332 2-4 (mg/kg)	Max. Detected Conc. (mg/kg)	LDW Sediment Screening Levels (c) (mg/kg)	Sediment Quality Standards WAC 173-204 -320 (mg/kg)	Soil Background Puget Sound (Ecology 1994) (mg/kg)
PCB 1016	<0.020	<0.0040	<0.0039	nd	0.24	-----	-----
PCB 1221	<0.020	<0.0040	<0.0039	nd	-----	-----	-----
PCB 1232	<0.020	<0.0040	<0.0039	nd	-----	-----	-----
PCB 1242	<0.020	<0.0040	<0.0039	nd	-----	-----	-----
PCB 1248	**0.061**	<0.0040	<0.0039	**0.061**	0.24	-----	-----
PCB 1254	**0.100**	<0.0040	<0.0039	**0.100**	0.24	-----	-----
PCB 1260	<0.040	<0.0040	<0.0039	nd	0.24	-----	-----
Total PCBs	**0.16**	<0.0040	<0.0039	**0.16**	0.00011	(d)	-----
Dioxin/Furans (ng/kg)							
1,2,3,4,6,7,8-HpCDD	186	12.9	<0.307	186	-----	-----	-----
1,2,3,4,6,7,8-HpCDF	35.1	2.16	<0.0471	35.1	-----	-----	-----
1,2,3,4,7,8,9-HpCDF	2.26	0.127	<0.0471	2.26	-----	-----	-----
1,2,3,4,7,8-HxCDD	1.43	0.171	<0.0471	1.43	-----	-----	-----
1,2,3,4,7,8-HxCDF	5.24	0.205	<0.0471	5.24	-----	-----	-----
1,2,3,6,7,8-HxCDD	6.56	0.430	<0.0471	6.56	-----	-----	-----
1,2,3,6,7,8-HxCDF	1.46	0.135	<0.0471	1.46	-----	-----	-----
1,2,3,7,8,9-HxCDD	5.28	0.471	<0.0471	5.28	-----	-----	-----
1,2,3,7,8,9-HxCDF	<0.113	<0.0467	<0.0471	nd	-----	-----	-----
1,2,3,7,8-PeCDD	1.01	0.0850	<0.0471	1.01	-----	-----	-----
1,2,3,7,8-PeCDF	0.41	<0.0467	<0.0471	0.41	-----	-----	-----
2,3,4,6,7,8-HxCDF	1.01	0.146	<0.0471	1.01	-----	-----	-----
2,3,4,7,8-PeCDF	1.10	0.109	<0.0471	1.1	-----	-----	-----
2,3,7,8-TCDD	0.398	<0.0467	0.302	0.398	-----	-----	-----
2,3,7,8-TCDF	0.451	<0.0467	<0.0471	0.451	-----	-----	-----
OCDD	1830	100	2.92	1830	-----	-----	-----
OCDF	99.8	3.51	0.0875	99.8	-----	-----	-----
TEQ (b)	6.71	0.485	0.355	6.71	0.141	-----	-----

Notes: (a) - LDW RI (2007)
(b) - WHO 2005 (mammal)
(c) - Lower Duwamish Waterway (LDW) - most stringent sediment screening level.
(d) - Carbon normalized SQS available

- Shading indicates exceedance of screening level, SQS or background concentrations

TABLE 3 - Summary of 1986 Soil Quality Data

Location	HC-B-1	HC-B-2	1 (b)	2(b)	3(b)	4(b)	5(b)	6(b)	EPA-B1A	EPA-B1A	EPA-B1A	EPA-B1A	EPA-B2A
Date	May-86	May-86	Feb-86	Feb-86	Feb-86	Feb-86	Feb-86	Feb-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86
Source	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(c)	(c)	(c)	(c)	(c)
Coordinate X	pending	pending	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Coordinate Y	pending	pending	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Depth (feet)	2.5-12	2.5-9	0-2	0-2	0-2	0-2	0-2	0-2	Spl. D	Spl. C1	Spl. C2	Spl. C3	Spl. D
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Total Metals													
Anitmony	5	nd	nd	nd	nd	nd	nd	nd	0.3	nd	0.6	0.4	nd
Arsenic	5.1	6.2	5	5.5	4.5	4.5	4	7.8	7.8	2.9	3.4	7.6	1.2
Beryllium	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	3.5	2.9	2.7	3.6	1.1
Cadmium	nd	nd	0.5	1.4	0.5	nd	nd	3.5	0.72	0.74	0.84	0.66	0.04
Chromium	35	120	27	200	20	37	22	200	22.6	50.5	55.1	22.5	7.6
Copper	35	72	26	28	13	15	13	100	40.6	49.5	50.7	48	14.1
Lead	63	170	1400	640	48	160	60	1400	56.9	157.8	171.3	51.5	7.4
Mercury	0.2	0.4	0.5	1	0.3	0.6	0.2	6.7	0.05	0.19	0.22	0.06	0.02
Nickel	28	61	22	21	11	15	12	47	14.4	31.9	26.6	13.9	5.9
Silver	0.5	0.9	nd	1.2	0.2	0.1	nd	0.2	0.11	0.1	0.14	0.13	nd
Zinc	81	290	130	440	91	120	70	640	91	140	141	87	19
Volatile Organic Compounds													
Vinyl chloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Methylene chloride	0.13	0.35	0.06	0.04	TR	0.051	0.053	0.33	nd	nd	nd	nd	nd
Acetone	0.41	1.7	nd	nd	TR	0.04	0.044	0.092	nd	nd	nd	nd	nd
Chloroform	nd	nd	TR	TR	nd	TR	nd	TR	nd	nd	nd	nd	nd
1,1-Dichloroethylene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
trans 1,2-dichloroethylene	nd	TR	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	TR	TR	nd	nd	nd	nd	nd	TR	nd	nd	nd	nd	nd
Trichloroethylene	nd	TR	nd	TR	nd	nd	nd	0.039	nd	nd	nd	nd	nd
Tetrachloroethylene	TR	0.13	TR	TR	nd	nd	nd	0.87	nd	0.42	0.35	nd	nd
Benzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4,-Methyl-2-pentanone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Toluene	nd	0.035	nd	nd	nd	nd	nd	TR	nd	nd	nd	nd	nd
Ethylbenzene	TR	0.19	nd	nd	nd	nd	nd	0.11	0.12	nd	nd	nd	nd
Total Xylene	0.028	0.36	nd	nd	nd	nd	nd	0.32	nd	1.3	nd	nd	nd
Semivolatile Organic Compounds													
Phenol	nd	0.32	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	0.66	nd	nd	nd	nd	nd
2,4-Dimethylphenol	nd	0.93	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Naphthalene	1.9	1.9	nd	nd	nd	nd	nd	nd	nd	2.8	2.9	nd	nd
4-Chloro-m-cresol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Acenaphthylene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Acenaphthene	0.68	0.33	nd	nd	nd	nd	nd	nd	nd	0.72	nd	nd	nd
Fluorene	0.43	0.34	nd	nd	nd	nd	nd	nd	nd	0.6	nd	nd	nd
Pentachlorophenol	nd	nd	0.07	0.48	nd	nd	nd	0.81	nd	nd	nd	nd	nd
Phenanthrene	0.93	0.98	0.086	0.64	nd	nd	nd	0.66	nd	1.8	nd	nd	nd
Anthracene	0.25	1.3	nd	nd	nd	nd	nd	nd	nd	0.36	nd	nd	nd
Dibutylphthalate	nd	0.53	0.057	0.68	nd	nd	nd	0.6	nd	nd	nd	nd	nd
Fluoranthene	0.75	0.39	0.072	0.84	nd	nd	nd	nd	nd	1.1	nd	nd	nd

TABLE 3 - Summary of 1986 Soil Quality Data

Location	HC-B-1	HC-B-2	1 (b)	2(b)	3(b)	4(b)	5(b)	6(b)	EPA-B1A	EPA-B1A	EPA-B1A	EPA-B1A	EPA-B2A
Date	May-86	May-86	Feb-86	Feb-86	Feb-86	Feb-86	Feb-86	Feb-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86
Source	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(c)	(c)	(c)	(c)	(c)
Coordinate X	pending	pending	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Coordinate Y	pending	pending	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Depth (feet)	2.5-12	2.5-9	0-2	0-2	0-2	0-2	0-2	0-2	Spl. D	Spl. C1	Spl. C2	Spl. C3	Spl. D
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Pyrene	0.47	0.37	nd	0.51	nd	nd	nd	0.5	nd	nd	0.97	nd	nd
Butyl benzyl phthalate	nd	nd	nd	nd	nd	nd	0.15	nd	nd	nd	nd	nd	nd
bis(2-ethylhexyl)phthalate	2.63	1.8	5.8	6.9	0.32	nd	0.36	4.8	nd	nd	nd	nd	nd
Di-n-octyl phthalate	0.38	0.13	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzofuran	0.42	0.16	nd	nd	nd	nd	nd	nd	nd	0.63	nd	nd	nd
2-Methylnaphthalene	0.77	1.5	nd	nd	nd	nd	nd	1.26	nd	1.1	nd	nd	nd
2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4-Methylphenol	0.51	0.53	nd	nd	nd	nd	nd	nd	nd	0.5	nd	nd	nd
Pesticides/PCBs													
Dieldrin	nd	nd	nd	nd	nd	0.029	0.016	nd	nd	nd	nd	nd	nd
4,4'-DDD	nd	nd	nd	0.046	nd	nd	nd	0.427	nd	nd	nd	nd	nd
4,4'-DDE	nd	nd	nd	0.11	nd	0.219	0.019	nd	nd	nd	nd	nd	nd
4,4'-DDT	nd	nd	nd	nd	nd	0.246	0.199	0.684	nd	nd	nd	nd	nd
Endrin	nd	nd	0.104	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
PCB 1248	1.8	1.7	nd	nd	nd	nd	nd	nd	1.93	4.37	3.48	3.42	1.05
PCB 1260	0.95	1.2	nd	nd	0.398	0.435	nd	nd	1.1	2.21	2.04	1.65	0.62
Other Compounds													
Total Cyanide	0.7	8.3	0.6	3.6	1.9	9.8	3.6	4.5	-----	-----	-----	-----	-----
Total Phenol	0.7	1.6	nd	0.6	nd	nd	nd	nd	-----	-----	-----	-----	-----

Notes: nd - Not detected
TR - Trace
(a) - Hart Crowser 1986
(b) - Surface composite sample
(c) - Hart Crowser 1987
(d) - Lower Duwamish Waterway (LDW) Soil Screening Level to protect potable groundwater and non-potable surface water.
(e) - Ecology 1994

[yellow box] - Shading indicates exceedance of screening level, SQS or background concentrations

TABLE 3 - Summary of 1986 Soil Quality Data

Location	EPA-B2A	EPA-B2A	EPA-B2A	EPA-B4	EPA-B4	EPA-B4	EPA-B5	EPA-B5	EPA-B5	EPA-B5	Max. Conc.	LDW Soil Screening Level (d)	Back-ground (Puget Sound) (e)
Date	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86			
Source	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)			
Coordinate X	-----	-----	-----	pending	pending	pending	pending	pending	pending	pending			
Coordinate Y	-----	-----	-----	pending	pending	pending	pending	pending	pending	pending			
Depth (feet)	Spl. C1	Spl. C2	Spl. C3	Spl. C1	Spl. C2	Spl. C3	Spl. D	Spl. C1	Spl. C2	Spl. C3			
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/lg)	(mg/lg)	(mg/kg)
Total Metals													
Anitmony	0.2	0.1	0.2	0.2	0.2	0.5	nd	nd	0.3	0.1	5	0.175	-----
Arsenic	3.3	6.4	1.6	1.9	4.1	2.1	4.8	2.4	3.9	1.8	7.8	0.00016	7
Beryllium	1.5	2.9	1.4	1.7	3	1.2	3.9	1.7	3.6	2.3	3.9	3.2	0.6
Cadmium	0.72	1.53	0.15	0.22	0.15	0.05	0.06	nd	0.07	0.03	3.5	0.0015	1
Chromium	32.6	38.6	12.4	12.2	11.6	10.6	14.6	7.6	14	10.4	200	42	48
Copper	21.5	41.6	12.8	33.1	26.8	10.9	35.5	12.3	35.3	18.3	100	0.029	36
Lead	444	158.2	28.3	22.6	1	0.5	0.8	0.8	1.7	nd	1400	5.4	24
Mercury	0.26	2.18	0.06	0.12	0.02	0.01	0.02	0.03	0.02	0.02	6.7	0.0003	0.07
Nickel	9.9	14	6.4	7.8	10.1	5	10.3	6.7	11.2	8.5	61	0.326	48
Silver	0.03	0.17	nd	nd	nd	nd	nd	nd	nd	nd	1.2	0.013	-----
Zinc	149	217	35	37	34	22	35	23	35	29	640	2	85
Volatile Organic Compounds													
Vinyl chloride	nd	0.015	nd	nd	nd	nd	nd	nd	nd	nd	0.015	0.000008	-----
Methylene chloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.35	0.0014	-----
Acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.7	0.231	-----
Chloroform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	TR	0.0014	-----
1,1-Dichloroethylene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.00002	-----
1,1-Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.0005	-----
trans 1,2-dichloroethylene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	TR	-----	-----
1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	TR	0.096	-----
Trichloroethylene	0.023	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.039	0.00005	-----
Tetrachloroethylene	nd	0.072	nd	nd	nd	nd	nd	nd	nd	nd	0.87	0.000008	-----
Benzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.0005	-----
4,-Methyl-2-pentanone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5300	-----
Toluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.035	0.698	-----
Ethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.19	0.0019	-----
Total Xylene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.3	0.873	-----
Semivolatile Organic Compound													
Phenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.32	-----	-----
1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.66	0.0038	-----
2,4-Dimethylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.93	0.002	-----
Naphthalene	1.7	nd	nd	nd	nd	nd	nd	nd	nd	nd	2.9	0.114	-----
4-Chloro-m-cresol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	----	-----
Acenaphthylene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.069	-----
Acenaphthene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.72	0.017	-----
Fluorene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.6	0.024	-----
Pentachlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.81	0.001	-----
Phenanthrene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.8	0.101	-----
Anthracene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.3	0.223	-----
Dibutylphthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.68	0.081	-----
Fluoranthene	0.5	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.1	0.161	-----

TABLE 3 - Summary of 1986 Soil Quality Data

Location	EPA-B2A	EPA-B2A	EPA-B2A	EPA-B4	EPA-B4	EPA-B4	EPA-B5	EPA-B5	EPA-B5	EPA-B5	Max. Conc.	LDW Soil Screening Level (d)	Back-ground (Puget Sound) (e)
Date	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86	Sep-86			
Source	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)			
Coordinate X	-----	-----	-----	pending	pending	pending	pending	pending	pending	pending			
Coordinate Y	-----	-----	-----	pending	pending	pending	pending	pending	pending	pending			
Depth (feet)	Spl. C1	Spl. C2	Spl. C3	Spl. C1	Spl. C2	Spl. C3	Spl. D	Spl. C1	Spl. C2	Spl. C3			
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/lg)	(mg/lg)	(mg/kg)
Pyrene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.97**	0.684	-----
Butyl benzyl phthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.15**	0.004	-----
bis(2-ethylhexyl)phthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**6.9**	0.047	-----
Di-n-octyl phthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.38**	0.0005	-----
Dibenzofuran	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.63**	0.015	-----
2-Methylnaphthalene	**2**	nd	nd	nd	nd	nd	nd	nd	nd	nd	**2**	0.043	-----
2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.003	-----
4-Methylphenol	**0.6**	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.6**	0.022	-----
Pesticides/PCBs													
Dieldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.029**	0.0000003	-----
4,4'-DDD	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.427**	0.0000035	-----
4,4'-DDE	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.219**	0.0000047	-----
4,4'-DDT	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.684**	0.0000367	-----
Endrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0.104**	0.0000222	-----
PCB 1248	**12.4**	**1.67**	**2.31**	**0.42**	nd	nd	nd	nd	nd	nd	**12.4**	0.000001	-----
PCB 1260	**2.9**	**4.32**	**0.76**	**0.32**	nd	nd	nd	nd	nd	nd	**4.32**	0.0000048	-----
Other Compounds													
Total Cyanide	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	9.8	-----	-----
Total Phenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**1.6**	0.024	-----

Notes: nd - Not detected
TR - Trace
(a) - Hart Crowser 1986
(b) - Surface composite sample
(c) - Hart Crowser 1987
(d) - Lower Duwamish Waterway (LDW) Soil Screening Level to protect potable groundwater and non-potable surface water.
(e) - Ecology 1994

[shaded box] - Shading indicates exceedance of screening level, SQS or background concentrations

TABLE 4 - Summary of 1991 - Surface Soil and Manhole Sediment Data

Location	SC-1 (b)	LDW	Puget	Manhole	LDW	Sediment
Date	1991	Soil	Sound	1991	Sediment	Quality
Source	(a)	Screening	Back-	(a)	Screening	Standards
Coordinate X	-----	Level	ground	-----	Levels	(SQS)
Coordinate Y	-----	(c)	(d)	-----	(c)	WAC 173-204
Depth (cm)	<15			-----		-320
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Total Solids (%)	-----	-----	-----	-----	-----	-----
Total Organic Carbon (%)	-----	-----	-----	-----	-----	-----
Petroleum Hydrocarbons						
Gasoline Range Organics	-----	0.344	-----	-----	-----	-----
Diesel Range Organics	-----	0.215	-----	-----	-----	-----
Residual Range Organics	-----	0.215	-----	-----	-----	-----
Total Metals						
Aluminum	-----	0.022	32600	-----	7700	-----
Antimony	-----	0.175	-----	-----	3.1	-----
Arsenic	<11	0.00016	7	<12	0.000023	57
Barium	-----	0.08	-----	-----	1500	-----
Beryllium	-----	3.2	0.6	-----	-----	-----
Cadmium	<0.57	0.0015	1	<0.6	0.33	5.1
Calcium	-----	-----	-----	-----	-----	-----
Chromium	**15.9**	42	48	**27.7**	39	260
Cobalt	-----	-----	-----	**-----**	10	-----
Copper	**22**	0.029	36	**40**	35	390
Iron	**-----**	0.086	58700	**-----**	5500	-----
Lead	**49.2**	5.4	24	**93.3**	10	450
Magnesium	-----	-----	-----	-----	-----	-----
Manganese	-----	0.014	1200	-----	180	-----
Mercury	<0.11	0.0003	0.07	<0.12	0.41	0.41
Molybdenum	-----	0.017	-----	-----	39	-----
Nickel	**15.8**	0.326	48	**26.6**	28	-----
Potassium	-----	-----	-----	-----	-----	-----
Selenium	-----	0.026	-----	-----	1	-----
Silver	-----	0.013	-----	-----	0.56	6.1
Sodium	-----	-----	-----	-----	-----	-----
Thallium	-----	0.017	-----	-----	0.51	-----
Tin	-----	50	-----	-----	-----	-----
Vanadium	-----	0.105	-----	-----	39	-----
Zinc	**58.1**	2	85	**90.6**	260	410
Volatile Organic Compounds						
1,1,1,2-Tetrachloroethane	-----	-----	-----	-----	-----	-----
1,1,1-Trichloroethane	<0.057	0.096	-----	<0.006	-----	-----
1,1,2,2-Tetrachloroethane	<0.057	-----	-----	<0.006	-----	-----
1,1,2-Trichloroethane	<0.057	0.00021	-----	<0.006	-----	-----
1,1,2-Trichlorotrifluoroethane	-----	-----	-----	-----	-----	-----
1,1-Dichloroethane	<0.057	0.0005	-----	<0.006	-----	-----
1,1-Dichloroethene	<0.057	0.00002	-----	<0.006	-----	-----
1,1-Dichloropropene	-----	-----	-----	-----	-----	-----
1,2,3-Trichlorobenzene	-----	-----	-----	-----	-----	-----
1,2,3-Trichloropropane	-----	-----	-----	-----	-----	-----
1,2,4-Trimethylbenzene	-----	-----	-----	-----	-----	-----
1,2-Dibromo-3-chloropropane	-----	-----	-----	-----	-----	-----
1,2-Dibromoethane	-----	-----	-----	-----	-----	-----
1,2-Dichloroethane	<0.057	0.0001	-----	<0.006	-----	-----
1,2-Dichloropropane	<0.057	-----	-----	<0.006	-----	-----
1,3,5-Trimethylbenzene	-----	0.051	-----	-----	-----	-----
1,3-Dichloropropane	-----	-----	-----	-----	-----	-----
1,Chlorobutane	-----	-----	-----	-----	-----	-----
2,2-Dichloropropane	-----	-----	-----	-----	-----	-----
2-Chlorotoluene	-----	-----	-----	-----	-----	-----
2-Hexanone	<0.011	-----	-----	<0.012	-----	-----
2-Nitropropane	-----	-----	-----	-----	-----	-----
4-Chlorotoluene	-----	-----	-----	-----	-----	-----
Acetone	<0.011	0.231	-----	<0.012	-----	-----
Allyl chloride	-----	-----	-----	-----	-----	-----
Benzene	<0.057	0.0005	-----	<0.006	0.04	-----
Bromobenzene	-----	-----	-----	-----	-----	-----

TABLE 4 - Summary of 1991 - Surface Soil and Manhole Sediment Data

Location Date Source Coordinate X Coordinate Y Depth (cm) Units	SC-1 (b) 1991 (a) ----- ----- <15 (mg/kg)	LDW Soil Screening Level (c) (mg/kg)	Puget Sound Back- ground (d) (mg/kg)	Manhole 1991 (a) ----- ----- ----- (mg/kg)	LDW Sediment Screening Levels (c) (mg/kg)	Sediment Quality Standards (SQS) WAC 173-204 -320 (mg/kg)
Bromochloromethane	-----	-----	-----	-----	-----	-----
Bromodichloromethane	<0.057	-----	-----	<0.006	-----	-----
Bromoform	<0.057	-----	-----	<0.006	-----	-----
Bromomethane	<0.011	-----	-----	<0.012	-----	-----
Carbon disulfide	<0.057	-----	-----	<0.006	-----	-----
Carbon Tetrachloride	<0.057	0.0001	-----	<0.006	-----	-----
Chlorobenzene	<0.057	0.011	-----	<0.006	-----	-----
Chloroethane	<0.011	0.00013	-----	<0.012	-----	-----
Chloroform	<0.057	0.0014	-----	<0.006	-----	-----
Chloromethane	<0.011	0.0015	-----	<0.012	-----	-----
cis-1,2-Dichloroethene	-----	-----	-----	-----	-----	-----
cis-1,3-Dichloropropene	<0.057	-----	-----	<0.006	-----	-----
Dibromochloromethane	<0.057	-----	-----	<0.006	-----	-----
Dibromomethane	-----	-----	-----	-----	-----	-----
Dichlorodifluoromethane	-----	-----	-----	-----	-----	-----
Dichloromethane	<0.057	0.0014	-----	<0.0066	-----	-----
Diethyl ether	-----	-----	-----	-----	-----	-----
Ethy Methacrylate	-----	-----	-----	-----	-----	-----
Ethylbenzene	<0.057	0.0019	-----	<0.006	0.01	-----
Iodomethane	-----	-----	-----	-----	-----	-----
Isopropylbenzene	-----	-----	-----	-----	-----	-----
Methacrylonitrile	-----	-----	-----	-----	-----	-----
Methyl Acrylate	-----	-----	-----	-----	-----	-----
Methyl ethyl ketone	<0.011	28000	-----	<0.012	-----	-----
Methyl isobutyl ketone	-----	-----	-----	-----	-----	-----
Methyl methacrylate	-----	-----	-----	-----	-----	-----
n-Butylbenzene	-----	-----	-----	-----	-----	-----
n-Propylbenzene	-----	-----	-----	-----	-----	-----
p-Cymene	-----	-----	-----	-----	-----	-----
Pentachloroethane	-----	-----	-----	-----	-----	-----
sec-Butlybenzene	-----	-----	-----	-----	-----	-----
Styrene	<0.057	0.0014	-----	<0.006	-----	-----
Tert-butyl methyl ether	-----	-----	-----	-----	-----	-----
tert-Butylbenzene	-----	-----	-----	-----	-----	-----
Tetrachloroehtene	<0.057	0.000008	-----	<0.006	0.057	-----
Toluene	<0.057	0.698	-----	<0.006	-----	-----
trans-1,2-Dichloroethene	-----	-----	-----	-----	-----	-----
trans-1,3-Dichloropropene	-----	-----	-----	-----	-----	-----
Trichloroethene	<0.057	0.00005	-----	<0.006	160	-----
Trichlorofluoromethane	-----	-----	-----	-----	-----	-----
Vinyl chloride	<0.011	0.000008	-----	<0.012	-----	-----
Xylene (m &p)	<0.057	0.873	-----	<0.006	0.04	-----
Xylene (o)	<0.057	0.873	-----	<0.006	-----	-----
Semivolatile Organic Compounds			-----			
1,2,4-Trichlorobenzene	-----	0.0004	-----	-----	0.013	-----
1,2-Dichlorobenzene	-----	0.0038	-----	-----	0.035	-----
1,3-Dichlorobenzene	-----	0.092	-----	-----	0.021	-----
1,4-Dichlorobenzene	-----	0.0005	-----	-----	0.048	-----
1-Methylnaphthalene	-----	-----	-----	-----	-----	-----
2,4-Dichlorophenol	-----	-----	-----	-----	-----	-----
2,4-Dinitrophenol	-----	-----	-----	-----	-----	-----
2,4-Dinitrotoluene	-----	-----	-----	-----	-----	-----
2,6-Dinitrotoluene	-----	-----	-----	-----	-----	-----
2,4-Dimethylphenol	-----	0.002	-----	-----	0.029	-----
2,4,5-Trichlorophenol	-----	-----	-----	-----	-----	-----
2,4,6-Trichlorophenol	-----	0.0008	-----	-----	-----	-----
2-Chloronaphthalene	-----	-----	-----	-----	-----	-----
2-Chlorophenol	-----	-----	-----	-----	-----	-----
2-Methylnaphthalene	-----	0.043	-----	-----	0.59	-----
2-Methylphenol	-----	0.003	-----	-----	0.055	-----

TABLE 4 - Summary of 1991 - Surface Soil and Manhole Sediment Data

Location / Date / Source / Coordinate X / Coordinate Y / Depth (cm) / Units	SC-1 (b) 1991 (a) ----- ----- <15 (mg/kg)	LDW Soil Screening Level (c) (mg/kg)	Puget Sound Back-ground (d) (mg/kg)	Manhole 1991 (a) ----- ----- ----- (mg/kg)	LDW Sediment Screening Levels (c) (mg/kg)	Sediment Quality Standards (SQS) WAC 173-204 -320 (mg/kg)
2-Nitroaniline	-----	-----	-----	-----	-----	-----
2-Nitrophenol	-----	-----	-----	-----	-----	-----
3,3-Dchlorobenzidine	-----	-----	-----	-----	-----	-----
3-Nitroaniline	-----	-----	-----	-----	-----	-----
4,6-Dinitro-o-cresol	-----	-----	-----	-----	-----	-----
4-Bromophenyl phenyl ether	-----	-----	-----	-----	-----	-----
4-Chloro-3-methylphenol	-----	-----	-----	-----	-----	-----
4-Chloroaniline	-----	-----	-----	-----	-----	-----
4-Chlorophenyl phenyl ether	-----	-----	-----	-----	-----	-----
4-Methylphenol	-----	0.022	-----	-----	0.11	-----
4-Nitroaniline	-----	-----	-----	-----	-----	-----
4-Nitrophenol	-----	-----	-----	-----	-----	-----
Acenaphthene	<0.38	0.017	-----	<0.40	0.25	-----
Acenaphthylene	<0.38	0.069	-----	<0.40	0.56	-----
Aniline	-----	-----	-----	-----	-----	-----
Anthracene	<0.38	0.223	-----	<0.40	0.96	-----
Benzo(a)anthracene	<0.38	0.000048	-----	<0.40	0.00022	-----
Benzo(a)pyrene	<0.38	0.000005	-----	<0.40	0.00022	-----
Benzo(b)fluoranthene	<0.38	0.000042	-----	<0.40	0.00022	-----
Benzo(e)pyrene	-----	-----	-----	-----	-----	-----
Benzo(ghi)perylene	<0.38	0.031	-----	<0.40	0.48	-----
Benzo(k)fluoranthene	<0.38	0.000043	-----	<0.40	0.00022	-----
Total Benzofluoranthenes	<0.38	-----	-----	<0.40	0.00022	-----
Benzoic Acid	-----	0.644	-----	-----	0.65	-----
Benzyl Alcohol	-----	0.055	-----	-----	0.057	-----
Biphenyl	-----	-----	-----	-----	-----	-----
bis(2-chloroethoxy)methane	-----	-----	-----	-----	-----	-----
bis(2-chlorethyl)ether	-----	-----	-----	-----	-----	-----
bis(2-chloroisopropyl)ether	-----	-----	-----	-----	-----	-----
Bis(2-ethylhexyl)phthalate	-----	0.047	-----	-----	0.73	-----
Butylbenzylphthalate	-----	0.004	-----	-----	0.063	-----
Carbozole	-----	-----	-----	-----	-----	-----
Chrysene	<0.38	0.0003	-----	<0.40	0.00022	-----
Dibenzo(ah)anthracene	<0.38	0.0001	-----	<0.40	0.00022	-----
Dibenzofuran	-----	0.015	-----	-----	0.23	-----
Diethylphthalate	-----	0.2	-----	-----	0.006	-----
Dimethylphthalate	-----	0.041	-----	-----	0.071	-----
Di-N-Butylphthalate	-----	0.081	-----	-----	1.4	-----
Di-n-octyl phthalate	-----	0.0005	-----	-----	0.061	-----
Fluoranthene	<0.38	0.161	-----	<0.40	1.7	-----
Fluorene	<0.38	0.024	-----	<0.40	0.36	-----
Hexachlorobenzene	-----	2.4E-07	-----	-----	0.0059	-----
Hexachlorobutadiene	-----	0.0005633	-----	-----	0.011	-----
Hexachlorocyclopentadiene	-----	-----	-----	-----	-----	-----
Hexachloroethane	-----	-----	-----	-----	-----	-----
Indeno(123-cd)pyrene	<0.38	0.000061	-----	<0.40	0.00022	-----
Isophorone	-----	-----	-----	-----	-----	-----
Naphthalene	<0.38	0.114	-----	<0.40	1.5	-----
Nitrobenzene	-----	-----	-----	-----	-----	-----
N-Nitrosodimethylamine	-----	-----	-----	-----	-----	-----
N-Nitroso-di-n-propylamine	-----	-----	-----	-----	-----	-----
N-Nitrosodiphenylamine	-----	0.0014	-----	-----	0.028	-----
Pentachlorophenol	-----	0.001	-----	-----	0.012	-----
Phenanthrene	<0.38	0.101	-----	<0.40	1.5	-----
Phenol	-----	0.024	-----	-----	0.18	-----
Pyrene	<0.38	0.684	-----	<0.40	2.6	-----
Pesticides/PCBs						
2,4'-DDD	-----	-----	-----	-----	-----	-----
2,4'-DDE	-----	-----	-----	-----	-----	-----
2,4'-DDT	-----	-----	-----	-----	-----	-----

TABLE 4 - Summary of 1991 - Surface Soil and Manhole Sediment Data

Location Date Source Coordinate X Coordinate Y Depth (cm) Units	SC-1 (b) 1991 (a) ----- ----- <15 (mg/kg)	LDW Soil Screening Level (c) (mg/kg)	Puget Sound Back-ground (d) (mg/kg)	Manhole 1991 (a) ----- ----- ----- (mg/kg)	LDW Sediment Screening Levels (c) (mg/kg)	Sediment Quality Standards (SQS) WAC 173-204 -320 (mg/kg)
4,4'-DDD	<0.039	0.0000035	-----	<0.0082	-----	-----
4,4'-DDE	<0.039	0.0000047	-----	<0.0082	-----	-----
4,4'-DDT	<0.039	0.0000367	-----	<0.0082	-----	-----
Aldrin	<0.019	0.0000006	-----	<0.0041	-----	-----
alpha-BHC	<0.019	0.0000025	-----	<0.0041	-----	-----
alpha-Chlordane	-----	-----	-----	-----	-----	-----
alpha-Endosulfan	-----	0.0000202	-----	-----	-----	-----
beta-BHC	<0.019	0.0000102	-----	<0.0041	-----	-----
beta-Endosulfan	-----	0.0000202	-----	-----	-----	-----
delta-BHC	<0.019	-----	-----	<0.0041	-----	-----
Chlordane	-----	0.0000103	-----	-----	-----	-----
Cis-Nonachlor	-----	-----	-----	-----	-----	-----
Dieldrin	<0.039	0.0000003	-----	<0.0082	-----	-----
Endosulfan sulfate	<0.039	0.0000202	-----	<0.0082	-----	-----
Endrin	<0.039	0.0000222	-----	<0.0082	-----	-----
Endrin aldehyde	<0.039	0.0000222	-----	<0.0082	-----	-----
Endrin ketone	-----	-----	-----	-----	-----	-----
gamma-BHC	-----	0.0000003	-----	-----	-----	-----
gamma-chlordane	-----	-----	-----	-----	-----	-----
Heptachlor	<0.019	0.0000002	-----	<0.0041	-----	-----
Heptachlor epoxide	<0.019	0.0000008	-----	<0.0041	-----	-----
Lindane	<0.019	-----	-----	<0.0041	-----	-----
Methoxychlor	<0.200	-----	-----	<0.041	-----	-----
Mirex	-----	-----	-----	-----	-----	-----
Oxychlordane	-----	-----	-----	-----	-----	-----
Toxaphene	<0.390	0.909	-----	<0.082	-----	-----
Trans-Nonachlor	-----	-----	-----	-----	-----	-----
PCB 1016	<0.200	0.0000018	-----	<0.041	0.24	-----
PCB 1221	<0.200	0.0000002	-----	<0.041	-----	-----
PCB 1232	<0.200	0.0001486	-----	<0.041	-----	-----
PCB 1242	<0.200	2E-08	-----	<0.041	-----	-----
PCB 1248	<0.200	0.000001	-----	<0.041	0.24	-----
PCB 1254	<0.200	0.0000004	-----	<0.041	0.24	-----
PCB 1260	<0.200	0.0000048	-----	<0.041	0.24	-----
Total PCBs	<0.200	0.0000007	-----	<0.041	0.00011	-----
Dioxin/Furans (ng/kg)						
1,2.3,4,6,7,8-HpCDD	**0.24**	-----	-----	-----	-----	-----
1,2.3,4,6,7,8-HpCDF	<0.019	-----	-----	-----	-----	-----
1,2.3,4,7,8,9-HpCDF	<0.019	-----	-----	-----	-----	-----
1,2.3,4,7,8-HxCDD	<0.023	-----	-----	-----	-----	-----
1,2.3,4,7,8-HxCDF	<0.021	-----	-----	-----	-----	-----
1,2.3,6,7,8-HxCDD	<0.023	-----	-----	-----	-----	-----
1,2.3,6,7,8-HxCDF	<0.021	-----	-----	-----	-----	-----
1,2.3,7,8,9-HxCDD	<0.023	-----	-----	-----	-----	-----
1,2.3,7,8,9-HxCDF	<0.021	-----	-----	-----	-----	-----
1,2.3,7,8-PeCDD	<0.027	-----	-----	-----	-----	-----
1,2.3,7,8-PeCDF	<0.0089	-----	-----	-----	-----	-----
2,3,4,6,7,8-HxCDF	<0.021	-----	-----	-----	-----	-----
2,3,4,7,8-PeCDF	<0.0089	-----	-----	-----	-----	-----
2,3,7,8-TCDD	<0.0082	-----	-----	-----	-----	-----
2,3,7,8-TCDF	<0.0053	-----	-----	-----	-----	-----
OCDD	**2.3**	-----	-----	-----	-----	-----
OCDF	<0.077	-----	-----	-----	-----	-----
TEQ (h)	**0.003**	0.00003	-----	-----	-----	-----

TABLE 4 - Summary of 1991 - Surface Soil and Manhole Sediment Data

Location Date Source Coordinate X Coordinate Y Depth (cm) Units	SC-1 (b) 1991 (a) ----- ----- <15 (mg/kg)	LDW Soil Screening Level (c) (mg/kg)	Puget Sound Back-ground (d) (mg/kg)	Manhole 1991 (a) ----- ----- ----- (mg/kg)	LDW Sediment Screening Levels (c) (mg/kg)	Sediment Quality Standards (SQS) WAC 173-204-320 (mg/kg)
Other Compounds						
Dibutyltin as ion	-----	-----	-----	-----	-----	-----
Monobutlytin as ion	-----	-----	-----	-----	-----	-----
Tetrabutyltin as ion	-----	-----	-----	-----	-----	-----
Tributyltin as ion	-----	-----	-----	-----	-----	-----

Notes: nd - Not detected
< - Not detected at indicated reporting limit
----- - Not analyzed
(a) - Parametrix 1991
(b) - Composite of four samples
(c) - Lower Duwamish Waterway (LDW) Soil Screening Level to protect potable groundwater and non-potable surface water.
(d) - Ecology 1994

[yellow box] - Shading indicates exceedance of screening level concentrations

TABLE 5 - Summary of 2007/2008 Soil Quality Data

Location	MW-1	MW-1	MW-2	MW-2	MW-2	MW-3	P1	P2	P2	P2	P3	P3
Date	Apr-07	Apr-07	Apr-07	Apr-07	Apr-07	Apr-07	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08
Source	(a)	(a)	(a)	(a)	(a)	(a)	(b)	(b)	(b)	(b)	(b)	(b)
Coordinate X	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending
Coordinate Y	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending
Depth (feet)	12.5-13.5	5-6.5	10-11.5	15-16.5	7.5-8	10-11.5	2.5-3	5-5.5	10-10.5	15-15.5	5-5.5	10-10.5
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Observations	sl sheen	heavy sheen	heavy sheen	heavy sheen	heavy sheen	No sheen	No sheen	mod. sheen	lt sheen	lt sheen	mod. sheen	mod. sheen
Total Solids (%)	74	76.3	86.3	80.4	80	77.6	-----	-----	-----	-----	-----	-----
Total Organic Carbon (%)	0.28	4.25	2.6	4.01	1.63	0.3	-----	-----	-----	-----	-----	-----
Petroleum Hydrocarbons												
Gasoline Range Organics	<20	260	<20	54	10	<20	-----	-----	-----	-----	-----	-----
Diesel Range Organics	<50	15000	61	1000	1000	<50	620	4500	47	23	6800	120
Residual Range Organics	<100	49000	210	2100	3000	<100	690	8700	74	34	18000	160
Type	-----	-----	-----	-----	-----	-----	D/MO	D/MO	D/MO	D/MO	D/MO	DRO/MO
Total Metals												
Arsenic	1.11	11.7	4.69	3.1	2.61	1.14	-----	-----	-----	-----	-----	-----
Cadmium	0.095	0.858	0.121	0.537	0.322	0.078	-----	-----	-----	-----	-----	-----
Chromium	18.2	56.6	14.6	55.3	22.9	8.7	-----	-----	-----	-----	-----	-----
Copper	20.8	284	18.9	41.2	18.8	13.1	-----	-----	-----	-----	-----	-----
Lead	6.44	836	25	204	76.8	1.82	50	3570	13	3	7	3
Mercury	0.771	2.01	0.055	0.318	0.019	0.019	-----	-----	-----	-----	-----	-----
Silver	0.11	0.44	0.04	0.13	0.45	0.03	-----	-----	-----	-----	-----	-----
Zinc	25.9	220	34.7	126	85.7	18.1	-----	-----	-----	-----	-----	-----
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	<0.05	<1	<0.04	0.058	<0.2	<0.01	-----	-----	-----	-----	-----	-----
1,2-Dichlorobenzene	<0.05	0.98	<0.04	0.048	<0.2	<0.01	-----	-----	-----	-----	-----	-----
1,4-Dichlorobenzene	<0.05	2.4	<0.04	0.15	<0.2	<0.01	-----	-----	-----	-----	-----	-----
2,4-Dimethylphenol	<0.25	<5	<0.20	<1	<1.0	<0.05	-----	-----	-----	-----	-----	-----
2-Methylnaphthalene	0.067	17	0.035	0.27	0.073	<0.01	-----	-----	-----	-----	-----	-----
2-Methylphenol	<0.05	<1	<0.04	<0.2	<0.2	<0.01	-----	-----	-----	-----	-----	-----
4-Methylphenol	<0.05	<1	<0.04	<0.2	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Acenaphthene	<0.05	0.82	0.0099	0.18	0.057	<0.01	-----	-----	-----	-----	-----	-----
Acenaphthylene	<0.05	<1	0.0085	0.063	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Anthracene	<0.05	0.91	0.022	0.2	0.06	<0.01	-----	-----	-----	-----	-----	-----
Benzo(a)anthracene	<0.05	0.45	0.046	0.26	0.038	<0.01	-----	-----	-----	-----	-----	-----
Benzo(a)pyrene	<0.05	<1	0.045	0.28	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Benzo(b)fluoranthene	<0.05	<1	0.051	0.3	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Benzo(ghi)perylene	<0.05	<1	0.035	0.22	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Benzo(k)fluoranthene	<0.05	<1	0.017	0.12	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Total Benzofluoranthenes	<0.05	<1	0.068	0.42	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Benzoic Acid	<1	<20	<0.80	<4	<4	<0.2	-----	-----	-----	-----	-----	-----
Benzyl Alcohol	<0.10	<2	<0.080	<0.4	<0.4	<0.02	-----	-----	-----	-----	-----	-----
Bis(2-ethylhexyl)phthalate	0.068	2.7	0.094	1.2	1.5	0.0051	-----	-----	-----	-----	-----	-----
Butylbenzylphthalate	<0.05	<1	<0.04	0.11	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Chrysene	0.01	0.78	0.054	0.31	0.066	<0.01	-----	-----	-----	-----	-----	-----
Dibenzo(ah)anthracene	<0.05	<1	<0.040	<0.2	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Dibenzofuran	<0.05	0.68	0.012	0.093	0.042	<0.01	-----	-----	-----	-----	-----	-----
Diethylphthalate	<0.05	<1	<0.04	<0.2	<0.2	<0.01	-----	-----	-----	-----	-----	-----

TABLE 5 - Summary of 2007/2008 Soil Quality Data

Location	**MW-1**	**MW-1**	**MW-2**	**MW-2**	**MW-2**	**MW-3**	**P1**	**P2**	**P2**	**P2**	**P3**	**P3**
Date	**Apr-07**	**Apr-07**	**Apr-07**	**Apr-07**	**Apr-07**	**Apr-07**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**
Source	**(a)**	**(a)**	**(a)**	**(a)**	**(a)**	**(a)**	**(b)**	**(b)**	**(b)**	**(b)**	**(b)**	**(b)**
Coordinate X	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**
Coordinate Y	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**
Depth (feet)	12.5-13.5	5-6.5	10-11.5	15-16.5	7.5-8	10-11.5	2.5-3	5-5.5	10-10.5	15-15.5	5-5.5	10-10.5
Units	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Dimethylphthalate	<0.05	<1	<0.04	<0.2	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Di-N-Butylphthalate	<0.05	<1	<0.04	**0.15**	**0.13**	<0.01	-----	-----	-----	-----	-----	-----
Di-n-octyl phthalate	<0.05	<1	<0.04	<0.2	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Fluoranthene	**0.021**	**1.9**	**0.1**	**0.89**	**0.12**	<0.01	-----	-----	-----	-----	-----	-----
Fluorene	**0.013**	**1.9**	**0.016**	**0.21**	**0.087**	<0.01	-----	-----	-----	-----	-----	-----
Hexachlorobenzene	<0.05	<1	<0.04	<0.2	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Hexachlorobutadiene	<0.05	<1	<0.04	<0.2	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Indeno(123-cd)pyrene	<0.05	<1	**0.033**	**0.2**	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Naphthalene	**0.02**	**3.6**	**0.095**	**1.1**	<0.068	<0.01	-----	-----	-----	-----	-----	-----
N-Nitrosodiphenylamine	<0.05	<1	<0.04	<0.2	<0.2	<0.01	-----	-----	-----	-----	-----	-----
Pentachlorophenol	<0.5	<10	<0.4	**0.37**	<2	<0.1	-----	-----	-----	-----	-----	-----
Phenanthrene	**0.054**	**7**	**0.079**	**0.98**	**0.24**	**0.0023**	-----	-----	-----	-----	-----	-----
Phenol	**0.038**	<3	<0.12	0.051	<0.59	<0.03	-----	-----	-----	-----	-----	-----
Pyrene	**0.023**	**2.7**	**0.11**	**0.79**	**0.11**	<0.01	-----	-----	-----	-----	-----	-----
Pesticides/PCBs												
2,4'-DDD	<0.0011	<0.19	**0.0082**	**0.19**	**0.0049**	<0.00049	-----	-----	-----	-----	-----	-----
2,4'-DDE	**0.0033**	<0.16	**0.00032**	<0.037	**0.0018**	<0.00049	-----	-----	-----	-----	-----	-----
2,4'-DDT	**0.0024**	**0.41**	**0.01**	**0.2**	<0.0022	<0.00049	-----	-----	-----	-----	-----	-----
4,4'-DDD	<0.0005	<0.017	**0.0049**	**0.19**	**0.0026**	<0.00049	-----	-----	-----	-----	-----	-----
4,4'-DDE	**0.0210**	**1.9**	**0.0081**	**0.34**	**0.0064**	<0.00049	-----	-----	-----	-----	-----	-----
4,4'-DDT	**0.0032**	**0.49**	**0.0073**	<0.2	**0.005**	<0.00049	-----	-----	-----	-----	-----	-----
Aldrin	<0.0012	<0.005	<0.0005	<0.025	<0.0005	<0.00049	-----	-----	-----	-----	-----	-----
Chlordane	<0.0240	<0.26	<0.011	<0.25	**0.032**	<0.0049	-----	-----	-----	-----	-----	-----
Dieldrin	<0.0005	<0.011	<0.0026	<0.065	<0.0005	<0.00049	-----	-----	-----	-----	-----	-----
Heptachlor	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.00049	-----	-----	-----	-----	-----	-----
Lindane	**0.0012**	<0.03	0.0016	<0.025	<0.0005	<0.00049	-----	-----	-----	-----	-----	-----
PCB 1016	<0.005	<5	<0.049	<0.5	<0.025	<0.0049	<9.2	<1.2	<0.032	<0.032	<3.5	<0.35
PCB 1221	<0.010	<10	<0.097	<0.99	<0.049	<0.0049	<9.2	<1.2	<0.032	<0.032	<3.5	<0.35
PCB 1232	<0.005	<5	<0.049	<0.5	<0.025	<0.0049	<9.2	<1.2	<0.032	<0.032	<3.5	<0.35
PCB 1242	**0.24**	**51**	**0.4**	**6.3**	**0.1**	<0.0049	**14**	<1.2	**0.064**	**0.049**	<3.5	<0.35
PCB 1248	<0.005	<5	<0.049	<0.5	<0.025	<0.0049	<9.2	**2.7**	<0.032	<0.032	**13**	**1.2**
PCB 1254	**0.081**	**18**	**0.16**	**2.8**	**0.065**	<0.0049	**28 Y**	**5.5**	0.038	<0.032	**6.2**	**0.5**
PCB 1260	**0.041**	**7.5**	**0.21**	**2.8**	**0.046**	<0.0049	**76**	**12**	<0.032	<0.032	**8.9**	**0.72**
Total PCBs	**0.362**	**76.5**	**0.77**	**11.9**	**0.211**	<0.0049	**90**	**20**	**0.1**	**0.05**	**28**	**2.4**

Notes: (a) - SAIC 2007
(b) - By DOF
D - Diesel fuel pattern
MO - Motor oil fuel pattern
DRO - Diesel range organics - pattern not match standard
RRO - Residual range organics - pattern not match standard
< - Not detected at indicated reporting level
[yellow shading] - Shading indicates exceedance of screening level concentrations

TABLE 5 - Summary of 2007/2008 Soil Quality Data

Location	P3	P4	P4	P4	P5	P5	P5	P6	P6	P6	P7	P7	P7
Date	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08
Source	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Coordinate X	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending
Coordinate Y	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending
Depth (feet)	15-15.5	5-5.5	10-10.5	15-15.5	6-6.5	10-10.5	15-15.5	5-5.5	10-10.5	15-15.5	5-5.5	10-10.5	15-15.5
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Observations	no sheen	no sheen	no sheen	no sheen	sheen	no sheen	no sheen	no sheen	sheen	no sheen	no sheen	no sheen	no sheen
Total Solids (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Petroleum Hydrocarbons													
Gasoline Range Organics	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Diesel Range Organics	67	190	<7.2	<6.7	2300	25	30	200	780	18	130	9.2	<6.4
Residual Range Organics	70	230	16	<13	5600	30	31	640	1200	66	460	30	15
Type	DRO/MO	DRO/MO	MO	-----	D/MO	DRO/MO	DRO/MO	D/MO	D/MO	DRO/RRO	DRO/MO	DRO/MO	MO
Total Metals													
Arsenic	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Chromium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Copper	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lead	<3	9	3	<3	8	4	3	219	150	3	178	4	3
Mercury	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Zinc	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Semivolatile Organic Compound													
1,2,4-Trichlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2-Dichlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,4-Dichlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,4-Dimethylphenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Methylnaphthalene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Methylphenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4-Methylphenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acenaphthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acenaphthylene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anthracene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(a)anthracene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(a)pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(b)fluoranthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(ghi)perylene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(k)fluoranthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Benzofluoranthenes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzoic Acid	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzyl Alcohol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bis(2-ethylhexyl)phthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Butylbenzylphthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Chrysene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Dibenzo(ah)anthracene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Dibenzofuran	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Diethylphthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

TABLE 5 - Summary of 2007/2008 Soil Quality Data

Location	P3	P4	P4	P4	P5	P5	P5	P6	P6	P6	P7	P7	P7
Date	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08
Source	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Coordinate X	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending
Coordinate Y	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending
Depth (feet)	15-15.5	5-5.5	10-10.5	15-15.5	6-6.5	10-10.5	15-15.5	5-5.5	10-10.5	15-15.5	5-5.5	10-10.5	15-15.5
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Dimethylphthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Di-N-Butylphthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Di-n-octyl phthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Fluoranthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Fluorene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Hexachlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Hexachlorobutadiene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Indeno(123-cd)pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Naphthalene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
N-Nitrosodiphenylamine	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pentachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Phenanthrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Phenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pesticides/PCBs													
2,4'-DDD	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,4'-DDE	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,4'-DDT	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDD	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDE	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDT	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aldrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Dieldrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Heptachlor	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lindane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
PCB 1016	<0.16	<0.032	<0.032	<0.032	<1.2	<0.033	<0.031	<0.031	<0.29	<0.032	<0.032	<0.032	<0.032
PCB 1221	<0.16	<0.032	<0.032	<0.032	<1.2	<0.033	<0.031	<0.031	<0.29	<0.032	<0.032	<0.032	<0.032
PCB 1232	<0.16	<0.032	<0.032	<0.032	<1.2	<0.033	<0.031	<0.031	<0.29	<0.032	<0.032	<0.032	<0.032
PCB 1242	<0.16	<0.032	<0.032	<0.032	**11**	**0.069**	<0.031	<0.031	<0.29	<0.032	<0.032	<0.032	<0.032
PCB 1248	**0.36**	<0.29 Y	<0.032	<0.032	<1.2	<0.033	<0.031	<0.076 Y	**1.7**	<0.032	<0.032	<0.032	<0.032
PCB 1254	**0.25**	<0.097	<0.032	<0.032	**1.7**	<0.033	<0.031	**0.13**	**1.2**	<0.032	**0.087**	<0.032	<0.032
PCB 1260	**0.28**	<0.065	<0.032	<0.032	<1.2	<0.033	<0.031	**0.062**	**0.52 P**	<0.032	**0.054**	<0.032	<0.032
Total PCBs	**0.89**	<0.032	<0.032	<0.032	**13**	**0.07**	<0.031	**0.19**	**3.4**	<0.032	**0.14**	<0.032	<0.032

Notes: (a) - SAIC 2007
(b) - By DOF
D - Diesel fuel pattern
MO - Motor oil fuel pattern
DRO - Diesel range organics - pattern not match standard
RRO - Residual range organics - pattern not match standard
< - Not detected at indicated reporting level
[yellow box] - Shading indicates exceedance of screening level concentrations

(c) - Lower Duwamish Waterway (LDW) Soil Screening Level to protect potable groundwater and non-potable surface water.

TABLE 5 - Summary of 2007/2008 Soil Quality Data

Location	P8	P8	P8	P8	P9	P9	P9	P9	P10	P10	P10	Max. Detected Conc.	LDW Soil Screening Level (c)	Back-ground Puget Sound (d)
Date	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08	Jul-08			
Source	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)			
Coordinate X	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending			
Coordinate Y	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending	pending			
Depth (feet)	0.5-1	5-5.5	10-10.5	15-15.5	2-2.5	6-6.5	10-10.5	12-12.5	5-5.5	10-10.5	17.5-18			
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
Observations	heavy sheen	no sheen	sl sheen	no sheen	no sheen	no sheen	no sheen	no sheen	no sheen	no sheen	no sheen	-----	-----	-----
Total Solids (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Petroleum Hydrocarbons														
Gasoline Range Organics	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**260**	0.344	-----
Diesel Range Organics	**11000**	**100**	**1500**	**29**	**22**	**58**	**940**	**310**	<6.1	<6.8	<6.8	**15000**	0.215	-----
Residual Range Organics	**24000**	**230**	**3400**	**80**	**34**	**240**	**3100**	**230**	**13**	**19**	**17**	**49000**	0.215	-----
Type	D/MO	D/MO	DRO/MO	DRO/MO	DRO/MO	DRO/MO	DRO/MO	DRO/MO	MO	MO	MO	-----	-----	-----
Total Metals														
Arsenic	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**11.7**	0.00016	7
Cadmium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.858	0.0015	1
Chromium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**56.6**	42	48
Copper	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**284**	0.029	36
Lead	**687**	**39**	**161**	**21**	**4**	**25**	**52**	**52**	**4**	**3**	**3**	**3570**	5.4	24
Mercury	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**2.01**	0.0003	0.07
Silver	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.45**	0.013	
Zinc	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**220**	2	85
Semivolatile Organic Compound														
1,2,4-Trichlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.058**	0.0004	-----
1,2-Dichlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.98**	0.0038	-----
1,4-Dichlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**2.4**	0.0005	-----
2,4-Dimethylphenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.002	-----
2-Methylnaphthalene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**17**	0.043	-----
2-Methylphenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.003	-----
4-Methylphenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.022	-----
Acenaphthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.82**	0.017	-----
Acenaphthylene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.063**	0.069	-----
Anthracene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.91**	0.223	-----
Benzo(a)anthracene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.45**	0.000048	-----
Benzo(a)pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.28**	0.000005	-----
Benzo(b)fluoranthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.3**	0.000042	-----
Benzo(ghi)perylene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.22**	0.031	-----
Benzo(k)fluoranthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.12**	0.000043	-----
Total Benzofluoranthenes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.42**	0.000043	-----
Benzoic Acid	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.644	-----
Benzyl Alcohol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.055	-----
Bis(2-ethylhexyl)phthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**2.7**	0.047	-----
Butylbenzylphthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.11**	0.004	-----
Chrysene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.78**	0.0003	-----
Dibenzo(ah)anthracene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.0001	-----
Dibenzofuran	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.68**	0.015	-----
Diethylphthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.2	-----

TABLE 5 - Summary of 2007/2008 Soil Quality Data

Location	**P8**	**P8**	**P8**	**P8**	**P9**	**P9**	**P9**	**P9**	**P10**	**P10**	**P10**	**Max. Detected Conc.**	**LDW Soil Screening Level (c)**	**Back-ground Puget Sound (d)**
Date	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**	**Jul-08**			
Source	**(b)**	**(b)**	**(b)**	**(b)**	**(b)**	**(b)**	**(b)**	**(b)**	**(b)**	**(b)**	**(b)**			
Coordinate X	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**			
Coordinate Y	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**	**pending**			
Depth (feet)	0.5-1	5-5.5	10-10.5	15-15.5	2-2.5	6-6.5	10-10.5	12-12.5	5-5.5	10-10.5	17.5-18			
Units	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	
Dimethylphthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.041	-----
Di-N-Butylphthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.15**	0.081	-----
Di-n-octyl phthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.0005	-----
Fluoranthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**1.9**	0.161	-----
Fluorene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**1.9**	0.024	-----
Hexachlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	2.4E-07	-----
Hexachlorobutadiene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.000563	-----
Indeno(123-cd)pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.2**	0.000061	-----
Naphthalene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**3.6**	0.114	-----
N-Nitrosodiphenylamine	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.0014	-----
Pentachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.37**	0.001	-----
Phenanthrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**7**	0.101	-----
Phenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.038**	0.024	-----
Pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**2.7**	0.684	-----
Pesticides/PCBs														
2,4'-DDD	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.19**	-----	-----
2,4'-DDE	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.0033**	-----	-----
2,4'-DDT	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.41**	-----	-----
4,4'-DDD	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.0049**	0.0000035	-----
4,4'-DDE	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**1.9**	0.0000047	-----
4,4'-DDT	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.49**	0.0000367	-----
Aldrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.0000006	-----
Chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.032**	0.0000103	-----
Dieldrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.0000003	-----
Heptachlor	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	nd	0.0000002	-----
Lindane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	**0.0012**	-----	-----
PCB 1016	<9	<0.033	<0.38	<0.032	<0.032	<0.033	<0.56	<0.032	<0.033	<0.031	<0.032	nd	0.0000018	-----
PCB 1221	<9	<0.033	<0.38	<0.032	<0.032	<0.033	<0.56	<0.032	<0.033	<0.031	<0.032	nd	0.0000002	-----
PCB 1232	<9	<0.033	<0.38	<0.032	<0.032	<0.033	<0.56	<0.032	<0.033	<0.031	<0.032	nd	0.0001486	-----
PCB 1242	**48**	<0.033	<0.38	<0.032	<0.032	<0.033	<0.56	<0.032	<0.033	<0.031	<0.032	**51**	2E-08	-----
PCB 1248	<9	<0.033	**0.93**	<0.032	<0.032	<0.033	**2.6**	<0.032	<0.033	<0.031	<0.032	**13**	0.000001	-----
PCB 1254	**36**	**0.057**	**1.0**	<0.032	<0.032	**0.071**	**2.4**	<0.032	<0.033	<0.031	<0.032	**36**	0.0000004	-----
PCB 1260	**35**	<0.033	**0.61**	<0.032	<0.032	**0.099**	**1.3**	<0.032	<0.033	<0.031	<0.032	**76**	0.0000048	-----
Total PCBs	**119**	**0.06**	**2.5**	<0.032	<0.032	**0.17**	**6.3**	<0.032	<0.033	<0.031	<0.032	**119**	0.0000007	-----

Notes: (a) - SAIC 2007
(b) - By DOF
D - Diesel fuel pattern
MO - Motor oil fuel pattern
DRO - Diesel range organics - pattern not match standard
RRO - Residual range organics - pattern not match standard
< - Not detected at indicated reporting level
- Shading indicates exceedance of screening level concentrations

(c) - Lower Duwamish Waterway (LDW) Soil Screening Level to protect potable groundwater and non-potable surface water.

TABLE 6 - Summary of Groundwater Quality Data

Location Date Source	HC-B-1 May-86 (a) (mg/l)	HC-B-1 May-07 (c) (mg/l)	HC-B-2 May-86 (a) (mg/l)	HC-B-2 Mar-87 (b) (mg/l)	HC-B-2 1991 (d) (mg/l)	HC-B-2 May-07 (c) (mg/l)	HC-B-3 May-86 (a) (mg/l)	MW-1 May-07 (c) (mg/l)	MW-2 May-07 (c) (mg/l)
Petroleum Hydrocarbons									
Gasoline Range Organics	-----	-----	-----	-----	-----	0.48	-----	6.3	-----
Diesel Range Organics	-----	0.027	-----	-----	-----	0.064	-----	0.9	0.16
Residual Range Organics	-----	0.019	-----	-----	-----	0.48	-----	0.52	0.28
Dissolved Metals									
Anitmony	nd	-----	0.015	nd	-----	-----	nd	-----	-----
Arsenic	nd	0.0039	0.017	0.01	0.0014	0.0047	nd	0.0257	0.00417
Beryllium	nd	-----	nd	nd	-----	-----	nd	-----	-----
Cadmium	0.006	<0.02	0.002	nd	-----	<0.02	0.002	0.000233	<0.02
Chromium	0.003	0.0026	0.007	0.005	0.0011	0.00216	0.014	0.043	0.00137
Copper	0.006	0.003	0.006	nd	-----	0.00022	0.004	0.0364	0.0123
Lead	nd	0.000065	0.027	nd	-----	0.000038	nd	0.0365	0.000252
Mercury	nd	0.00003	nd	nd	-----	<0.0002	nd	0.00012	0.00003
Nickel	0.026	-----	0.022	0.015	-----	-----	0.009	-----	-----
Silver	0.004	<0.0001	0.003	nd	-----	<0.0001	0.01	0.00022	0.00006
Zinc	0.11	0.00123	0.019	0.038	-----	0.00045	0.01	0.0251	0.00758
Total Metals									
Anitmony	-----	-----	-----	-----	-----	-----	-----	-----	-----
Arsenic	-----	0.009	-----	-----	-----	0.00478	-----	0.003	0.00506
Beryllium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	-----	0.0025	-----	-----	-----	0.00001	-----	0.000466	0.000109
Chromium	-----	0.0214	-----	-----	-----	0.00199	-----	0.0751	0.00658
Copper	-----	0.0231	-----	-----	-----	0.00072	-----	0.0706	0.0113
Lead	-----	0.0406	-----	-----	-----	0.000299	-----	0.0775	0.0262
Mercury	-----	0.00038	-----	-----	-----	0.00003	-----	0.00028	0.00012
Nickel	-----	-----	-----	-----	0.0054	-----	-----	-----	-----
Silver	-----	<0.0001	-----	-----	-----	<0.0001	-----	0.00038	0.00015
Zinc	-----	0.0946	-----	-----	0.029	0.00168	-----	0.0462	0.0344
Volatile Organic Compounds									
Vinyl chloride	nd	-----	0.11	0.25	0.025	-----	nd	-----	-----
Methylene chloride	TR	-----	0.011	TR	-----	-----	0.008	-----	-----
Acetone	0.016	-----	0.056	0.12	-----	-----	0.021	-----	-----
Chloroform	nd	-----	nd	nd	-----	-----	nd	-----	-----
1,1-Dichloroethylene	nd	-----	nd	nd	-----	-----	nd	-----	-----
1,1-Dichloroethane	nd	-----	TR	TR	0.0092	-----	nd	-----	-----
trans 1,2-dichloroethylene	nd	-----	0.19	0.033	0.02	-----	nd	-----	-----
1,1,1-Trichloroethane	nd	-----	nd	nd	-----	-----	nd	-----	-----
Trichloroethylene	nd	-----	TR	TR	-----	-----	nd	-----	-----
Tetrachloroethylene	nd	-----	nd	TR	-----	-----	nd	-----	-----
Benzene	nd	-----	0.017	0.016	0.013	-----	nd	-----	-----
4,-Methyl-2-pentanone	nd	-----	0.011	TR	-----	-----	nd	-----	-----
Toluene	nd	-----	0.27	0.29	0.14	-----	nd	-----	-----
Ethylbenzene	nd	-----	0.46	0.43	0.51	-----	nd	-----	-----
Total Xylene	TR	-----	0.15	TR	0.3	-----	nd	-----	-----
Semivolatile Organic Compounds									
1,2,4-Trichlorobenzene	-----	<0.0002	-----	-----	-----	0.00034	-----	0.0025	<0.0002
1,2-Dichlorobenzene	nd	0.000031	nd	0.19	-----	0.0019	nd	0.0045	0.00015
1,4-Dichlorobenzene	-----	0.00003	-----	-----	-----	0.0059	-----	0.0022	0.00048
2,4-Dimethylphenol	nd	<0.002	0.32	nd	0.1	<0.020	0.028	0.011	<0.002
2-Methylnaphthalene	nd	<0.0002	nd	nd	0.0074	0.00076	0.01	0.099	0.00017
2-Methylphenol	nd	<0.00048	0.026	0.011	-----	<0.0048	nd	0.011	<0.00048
4-Methylphenol	nd	0.000062	0.07	0.05	-----	<0.0048	nd	0.0079	<0.00048
Acenaphthene	nd	<0.0002	nd	nd	-----	0.00076	0.01	0.0015	0.00022
Acenaphthylene	nd	<0.0002	nd	nd	-----	0.00037	nd	0.00086	<0.0002
Anthracene	nd	0.000058	nd	nd	-----	0.0011	nd	0.00097	0.00018
Benzo(a)anthracene	-----	<0.0002	-----	-----	-----	0.00043	-----	0.00094	0.000039
Benzo(a)pyrene	-----	<0.0002	-----	-----	-----	0.00034	-----	0.00085	0.000027
Benzo(b)fluoranthene	-----	<0.0002	-----	-----	-----	0.0003	-----	0.00074	0.000033
Benzo(ghi)perylene	-----	<0.0002	-----	-----	-----	0.00029	-----	0.0007	<0.0002
Benzo(k)fluoranthene	-----	<0.0002	-----	-----	-----	0.00028	-----	0.00062	<0.0002
Benzoic Acid	-----	<0.0048	-----	-----	-----	<0.048	-----	<0.100	0.0072
Benzyl Alcohol	-----	<0.0048	-----	-----	-----	<0.048	-----	<0.096	<0.0048
Bis(2-ethylhexyl)phthalate	TR	<0.00096	TR	nd	-----	<0.0096	TR	0.020	0.00084

TABLE 6 - Summary of Groundwater Quality Data

Location Date Source	HC-B-1 May-86 (a) (mg/l)	HC-B-1 May-07 (c) (mg/l)	HC-B-2 May-86 (a) (mg/l)	HC-B-2 Mar-87 (b) (mg/l)	HC-B-2 1991 (d) (mg/l)	HC-B-2 May-07 (c) (mg/l)	HC-B-3 May-86 (a) (mg/l)	MW-1 May-07 (c) (mg/l)	MW-2 May-07 (c) (mg/l)
Butylbenzylphthalate	nd	<0.0002	nd	nd	-----	<0.002	nd	<0.0039	**0.000079**
Chrysene	-----	<0.0002	-----	-----	-----	**0.00035**	-----	**0.00088**	**0.000033**
Dibenzo(ah)anthracene	-----	<0.0002	-----	-----	-----	<0.002	-----	<0.0039	<0.0002
Dibenzofuran	nd	<0.0002	nd	nd	-----	**0.00047**	nd	**0.0011**	**0.000082**
Diethylphthalate	-----	<0.0002	-----	-----	-----	**0.0014**	-----	<0.0039	**0.000073**
Dimethylphthalate	-----	<0.0002	-----	-----	-----	<0.002	-----	<0.0039	<0.0002
Di-N-Butylphthalate	-----	<0.0002	-----	-----	-----	**0.00059**	-----	<0.0039	**0.000085**
Di-n-octyl phthalate	nd	<0.0002	nd	nd	-----	**0.00042**	nd	**0.001**	<0.0002
Fluoranthene	nd	<0.0002	nd	nd	-----	**0.00053**	nd	**0.00086**	**0.00013**
Fluorene	nd	<0.0002	nd	nd	-----	**0.00066**	nd	**0.0016**	**0.00018**
Hexachlorobenzene	-----	<0.0002	-----	-----	-----	**0.0003**	-----	**0.00066**	<0.0002
Hexachlorobutadiene	-----	<0.0002	-----	-----	-----	<0.002	-----	<0.0039	<0.0002
Indeno(123-cd)pyrene	-----	<0.0002	-----	-----	-----	**0.00028**	-----	**0.00063**	<0.0002
Naphthalene	TR	<0.0002	**0.018**	**0.028**	**0.037**	<0.002	**0.12**	**0.036**	**0.0011**
N-Nitrosodiphenylamine	-----	<0.0002	-----	-----	-----	**0.0012**	-----	**0.003**	<0.0002
Pentachlorophenol	nd	<0.002	nd	nd	-----	**0.0008**	nd	**0.023**	**0.00016**
Phenanthrene	nd	<0.0002	nd	nd	-----	**0.00046**	nd	**0.0019**	**0.00027**
Phenol	nd	<0.00048	**0.018**	nd	-----	<0.00048	nd	**0.00097**	<0.00048
Pyrene	nd	<0.0002	nd	nd	-----	**0.00048**	nd	**0.001**	**0.00012**
Dibutylphthalate	nd	-----	nd	nd	-----	-----	nd	-----	-----
4-Chloro-m-cresol	nd	-----	**0.13**	**0.049**	-----	-----	nd	-----	-----
Pesticides/PCBs									
2,4'-DDD	-----	<0.0000011	-----	-----	-----	<0.000022	-----	<0.0000049	**0.000051**
2,4'-DDE	-----	<0.0000005	-----	-----	-----	<0.000010	-----	**0.00002**	<0.000013
2,4'-DDT	-----	**0.000001**	-----	-----	-----	<0.000010	-----	**0.000046**	**0.000052**
4,4'-DDD	nd	**0.0000015**	nd	**0.037**	-----	<0.000010	nd	<0.0000048	**0.000026**
4,4'-DDE	nd	**0.0000018**	nd	**0.054**	-----	<0.000041	nd	**0.000067**	**0.00008**
4,4'-DDT	nd	**0.0000014**	nd	**0.032**	-----	<0.00001	nd	<0.000041	<0.00004
Aldrin	-----	**0.00000092**	-----	-----	-----	**0.00002**	-----	<0.0000048	<0.000010
Chlordane	-----	<0.000013	-----	-----	-----	<0.00022	-----	**0.00027**	<0.0002
cis-Chlordane	-----	**0.00000052**	-----	-----	-----	**0.000026**	-----	<0.0000086	<0.000010
Dieldrin	nd	<0.000002	nd	nd	-----	<0.000010	nd	<0.000022	<0.000010
gamma-Chlordane	-----	<0.0000015	-----	-----	-----	**0.000013**	-----	**0.000025**	<0.000022
Heptachlor	-----	<0.0000005	-----	-----	-----	<0.000010	-----	<0.000011	<0.000010
Lindane	-----	**0.0000014**	-----	-----	-----	**0.000012**	-----	**0.000019**	<0.000010
Endrin	nd	-----	nd	nd	-----	-----	nd	-----	-----
PCB 1016	-----	<0.00002	-----	-----	-----	<0.0002	-----	<0.0002	<0.0002
PCB 1221	-----	<0.000039	-----	-----	-----	<0.00039	-----	<0.00039	<0.00039
PCB 1232	-----	<0.00002	-----	-----	-----	<0.0002	-----	<0.0002	<0.0002
PCB 1242	-----	**0.00013**	-----	-----	-----	**0.0017**	-----	**0.0029**	**0.00075**
PCB 1248	nd	<0.00002	nd	nd	-----	<0.0002	nd	<0.0002	<0.0002
PCB 1254	-----	**0.000035**	-----	-----	-----	**0.00014**	-----	**0.0011**	**0.00047**
PCB 1260	nd	**0.000014**	nd	nd	-----	**0.000069**	nd	**0.00054**	**0.00042**
Other Compounds									
Total Cyanide	**0.018**	-----	**0.07**	**0.3**	**0.041**	-----	nd	-----	-----
Total Phenol	nd	-----	**0.18**	**0.12**	-----	-----	**0.009**	-----	-----

Notes: nd - Not detected
TR - Trace
(a) - Hart Crowser 1986
(b) - Hart Crowser 1987
(c) - SAIC July 2007
(d) - Lower Duwamish Waterway (LDW) Screening Level to protect potable groundwater and non-potable surface water

TABLE 6 - Summary of Groundwater Quality Data

Location Date Source	MW-3 May-07 (c) (mg/l)	Max. Detected Conc. (mg/l)	LDW Screening Level (d) (mg/l)
Petroleum Hydrocarbons			
Gasoline Range Organics	-----	6.3	0.8/1.0
Diesel Range Organics	-----	0.9	0.5
Residual Range Organics	-----	0.52	0.5
Dissolved Metals			
Anitmony	-----	0.015	0.0039
Arsenic	**0.00098**	0.0257	0.00005
Beryllium	-----	nd	0.004
Cadmium	**0.000026**	0.002	0.00021
Chromium	**0.00074**	0.043	0.05
Copper	**0.0049**	0.0364	0.0013
Lead	**0.000095**	0.0365	0.0025
Mercury	**0.00003**	0.00012	0.000005
Nickel	-----	0.026	0.0082
Silver	<0.0001	0.01	0.0015
Zinc	**0.0132**	0.11	0.033
Total Metals			
Anitmony	-----	-----	0.0039
Arsenic	**0.00117**	0.009	0.00005
Beryllium	**-----**	-----	0.004
Cadmium	**0.000018**	0.0025	0.00021
Chromium	**0.00075**	0.0751	0.05
Copper	**0.00353**	0.0706	0.0013
Lead	**0.000065**	0.0775	0.0025
Mercury	**0.00003**	0.00038	0.000005
Nickel	-----	0.0054	0.0082
Silver	<0.0001	0.00038	0.0015
Zinc	**0.0138**	0.0946	0.033
Volatile Organic Compounds			
Vinyl chloride	-----	0.25	0.00002
Methylene chloride	-----	0.011	0.005
Acetone	-----	0.12	0.8
Chloroform	-----	nd	0.0043
1,1-Dichloroethylene	-----	nd	0.00073
1,1-Dichloroethane	-----	0.0092	0.001
trans 1,2-dichloroethylene	-----	0.19	-----
1,1,1-Trichloroethane	-----	nd	0.2
Trichloroethylene	-----	TR	0.00011
Tetrachloroethylene	-----	TR	0.00002
Benzene	-----	0.017	0.0008
4,-Methyl-2-pentanone	-----	0.011	0.64
Toluene	-----	0.29	1.0
Ethylbenzene	-----	0.51	0.7
Total Xylene	-----	0.3	1.0
Semivolatile Organic Compound			
1,2,4-Trichlorobenzene	<0.0002	0.0025	0.0011
1,2-Dichlorobenzene	<0.0002	0.19	0.0052
1,4-Dichlorobenzene	<0.0002	0.0059	0.004
2,4-Dimethylphenol	<0.002	0.32	0.002
2-Methylnaphthalene	<0.0002	0.099	0.018
2-Methylphenol	<0.00048	0.026	0.0071
4-Methylphenol	<0.00048	0.07	0.077
Acenaphthene	<0.0002	0.01	0.0026
Acenaphthylene	<0.0002	0.00086	0.011
Anthracene	**0.000088**	0.0011	0.011
Benzo(a)anthracene	<0.0002	0.00094	0.0000001
Benzo(a)pyrene	<0.0002	0.00085	7E-09
Benzo(b)fluoranthene	<0.0002	0.00074	5.3E-08
Benzo(ghi)perylene	<0.0002	0.0007	0.0000116
Benzo(k)fluoranthene	<0.0002	0.00062	5.5E-08
Benzoic Acid	**0.0024**	0.1	2.243
Benzyl Alcohol	<0.0048	<0.096	0.182
Bis(2-ethylhexyl)phthalate	<0.00096	0.02	0.00028

TABLE 6 - Summary of Groundwater Quality Data

Location Date Source	MW-3 May-07 (c) (mg/l)	Max. Detected Conc. (mg/l)	LDW Screening Level (d) (mg/l)
Butylbenzylphthalate	<0.0002	0.000079	0.00052
Chrysene	<0.0002	0.00088	0.0000011
Dibenzo(ah)anthracene	<0.0002	0.0039	3E-08
Dibenzofuran	<0.0002	<0.0011	0.0013
Diethylphthalate	<0.0002	0.0039	0.484
Dimethylphthalate	<0.0002	<0.0039	0.143
Di-N-Butylphthalate	**0.000045**	0.0039	0.047
Di-n-octyl phthalate	<0.0002	0.001	0.0003
Fluoranthene	<0.0002	0.00086	0.0023
Fluorene	<0.0002	0.0016	0.002
Hexachlorobenzene	<0.0002	0.00066	0.00005
Hexachlorobutadiene	<0.0002	<0.0039	0.0009
Indeno(123-cd)pyrene	<0.0002	0.00063	2E-08
Naphthalene	<0.0002	0.12	0.054
N-Nitrosodiphenylamine	<0.0002	0.003	0.0016
Pentachlorophenol	<0.002	0.023	0.00073
Phenanthrene	<0.0002	0.0019	0.0048
Phenol	<0.00048	0.018	-----
Pyrene	<0.0002	0.001	0.0098
Dibutylphthalate	-----	nd	0.0047
4-Chloro-m-cresol	-----	0.13	-----
Pesticides/PCBs			
2,4'-DDD	<0.0000005	0.000051	-----
2,4'-DDE	**0.00000034**	0.00002	-----
2,4'-DDT	<0.0000005	0.000052	-----
4,4'-DDD	<0.0000005	0.037	0.0003646
4,4'-DDE	<0.0000006	0.054	0.0002574
4,4'-DDT	**0.0000013**	0.032	0.0002574
Aldrin	<0.0000005	0.00002	0.0000026
Chlordane	<0.0000096	0.00027	0.000002
cis-Chlordane	<0.0000005	0.000026	-----
Dieldrin	<0.0000005	nd	0.0000055
gamma-Chlordane	<0.0000005	0.000025	-----
Heptachlor	<0.0000005	nd	0.0000004
Lindane	**0.00000038**	0.000019	----
Endrin	-----	nd	0.000002
PCB 1016	<0.00002	nd	6E-08
PCB 1221	<0.000039	nd	2E-08
PCB 1232	<0.000024	nd	-----
PCB 1242	<0.00002	0.0029	2E-08
PCB 1248	<0.00002	nd	2E-08
PCB 1254	<0.00002	0.0011	1E-08
PCB 1260	<0.00002	0.00054	2E-08
Other Compounds			
Total Cyanide	-----	0.3	-----
Total Phenol	-----	0.18	0.078

Notes: nd - Not detected
TR - Trace
(a) - Hart Crowser 1986
(b) - Hart Crowser 1987
(c) - SAIC July 2007
(d) - Lower Duwamish Waterway (LDW) Screening Level to protect potable groundwater and non-potable surface water

TABLE 7 - Summary of Other Water Quality Data

Location Date Source	Outfall May-07 (a)	Seep 1 May-07 (a)	Seep 2 May-07 (a)	SP-01 Jul-08 (b)	Max. Detected Conc.	LDW Screening Level (c)
Petroleum Hydrocarbons (mg/l)						
Gasoline Range Organics	<250	<250	-----	-----	nd	0.8/1.0
Diesel Range Organics	<0.25	<630	-----	-----	nd	0.5
Residual Range Organics	<0.50	<630	-----	-----	nd	0.5
Dissolved Metals (ug/l)						
Arsenic	**9.07**	**6.62**	**6.66**	-----	9.07	0.05
Cadmium	**0.165**	**0.017**	**0.04**	-----	0.165	0.21
Chromium	**1.5**	**2.71**	**2.14**	-----	2.71	50
Copper	**8.91**	**1.81**	**1.65**	-----	8.91	1.3
Lead	**0.249**	**0.281**	**0.163**	-----	0.281	2.5
Mercury	<0.2	<0.2	<0.2	-----	nd	0.005
Silver	**0.006**	**0.01**	**0.008**	-----	0.01	1.5
Zinc	**70.5**	**6.3**	**23.2**	-----	70.5	33
Total Metals (ug/l)						
Arsenic	**8.77**	**7.51**	**7**	<5	8.77	0.05
Cadmium	**0.171**	**0.119**	**0.071**	<0.02	0.171	0.21
Chromium	**2.1**	**4.92**	**1.95**	**0.7**	4.92	50
Copper	**11.5**	**7.14**	**2.27**	**1.6**	11.5	1.3
Lead	**2.06**	**11.8**	**0.842**	**0.75**	11.8	2.5
Mercury	<0.2	**0.04**	<0.2	**0.0021**	0.04	0.005
Silver	**0.019**	**0.041**	**0.01**	<0.02	0.041	1.5
Zinc	**57.8**	**32.3**	**27**	**4.1**	57.8	33
Volatile Organic Compounds (ug/l)						
1,1-Dichloroethane	-----	-----	-----	<0.5	nd	0.001
1,3,5-Trimethylbenzene	-----	-----	-----	<2	nd	45
Acetone	-----	-----	-----	<20	nd	800
Benzene	-----	-----	-----	<0.5	nd	0.8
Chloroform	-----	-----	-----	**1.7**	1.7	4.3
Ethylbenzene	-----	-----	-----	<0.5	nd	700
m,p-Xylene	-----	-----	-----	<0.5	nd	1000
Naphthalene	-----	-----	-----	<2	nd	54
n-Butylbenzene	-----	-----	-----	<2	nd	-----
o-Xylene	-----	-----	-----	<0.5	nd	1000
Toluene	-----	-----	-----	<0.5	nd	1000
Semivolatile Organic Compounds (ug/l)						
1,2,4-Trichlorobenzene	<0.2	<0.23	<0.2	-----	nd	1.1
1,2-Dichlorobenzene	<0.2	<0.23	<0.2	-----	nd	5.2
1,4-Dichlorobenzene	<0.2	**1.3**	<0.2	-----	1.3	4
2,4-Dimethylphenol	<2	<2.3	<2	-----	nd	2
2-Methylnaphthalene	<0.2	<0.23	<0.2	<0.2	nd	1.8
2-Methylphenol	<0.5	<0.56	<0.49	-----	nd	7.1
4-Methylphenol	<0.5	<0.56	<0.49	-----	nd	77
Acenaphthene	<0.2	<0.23	<0.2	**0.35**	0.35	2.6
Acenaphthylene	**0.033**	<0.23	<0.2	-----	0.033	11
Anthracene	<0.2	<0.23	<0.2	-----	nd	11
Benzo(a)anthracene	<0.2	<0.23	**0.019**	-----	0.019	0.0001
Benzo(a)pyrene	<0.2	<0.23	<0.2	-----	nd	0.000007
Benzo(b)fluoranthene	<0.2	<0.23	<0.2	-----	nd	0.000053
Benzo(ghi)perylene	<0.2	<0.23	<0.2	-----	nd	0.0116
Benzo(k)fluoranthene	<0.2	<0.23	<0.2	-----	nd	0.000055
Benzoic Acid	<5	<5.6	<4.9	-----	nd	2243
Benzyl Alcohol	<5	<5.6	<4.9	-----	nd	182
Bis(2-ethylhexyl)phthalate	<3.7	<1.2	<0.98	-----	nd	0.28
Butylbenzylphthalate	**0.073**	<0.23	<0.2	-----	0.073	0.52
Chrysene	<0.2	<0.23	<0.2	-----	nd	0.0011
Dibenzo(ah)anthracene	<0.2	<0.23	<0.2	-----	nd	0.00003
Dibenzofuran	<0.2	<0.23	<0.2	-----	nd	1.3
Diethylphthalate	**0.16**	**0.049**	**0.028**	-----	0.16	484
Dimethylphthalate	**0.061**	<0.23	**0.014**	-----	0.061	143
Di-N-Butylphthalate	**0.13**	**0.11**	**0.069**	-----	0.13	0.047
Di-n-octyl phthalate	<4.6	<0.23	<0.2	-----	nd	0.3
Fluoranthene	**0.038**	**0.047**	**0.023**	-----	0.047	2.3
Fluorene	<0.2	<0.23	<0.2	-----	nd	2

TABLE 7 - Summary of Other Water Quality Data

Location / Date / Source	Outfall May-07 (a)	Seep 1 May-07 (a)	Seep 2 May-07 (a)	SP-01 Jul-08 (b)	Max. Detected Conc.	LDW Screening Level (c)
Hexachlorobenzene	<0.2	<0.23	<0.2	-----	nd	0.05
Hexachlorobutadiene	<0.2	<0.23	<0.2	-----	nd	0.9
Indeno(123-cd)pyrene	<0.2	<0.23	<0.2	-----	nd	0.00002
Naphthalene	<0.2	<0.23	**0.012**	<0.2	0.012	5.4
N-Nitrosodiphenylamine	<0.2	<0.23	<0.2	-----	nd	1.6
Pentachlorophenol	<0.99	**0.064**	<0.98	-----	0.064	0.73
Phenanthrene	**0.026**	<0.23	**0.017**	<0.2	0.026	4.8
Phenol	**1.2**	<0.56	<0.49	<0.50	1.2	-----
Pyrene	**0.038**	**0.045**	**0.021**	-----	0.045	9.8
Pesticides/PCBs (ug/l)						
2,4'-DDD	<0.0025	**0.016**	<0.00049	-----	0.016	-----
2,4'-DDE	<0.0025	<0.013	<0.00049	-----	nd	-----
2,4'-DDT	<0.0025	<0.011	0.00042	<0.0005	nd	-----
4,4'-DDD	**0.0067**	**0.013**	<0.00049	-----	0.013	0.365
4,4'-DDE	**0.0056**	**0.016**	**0.0015**	-----	0.016	0.257
4,4'-DDT	<0.0025	**0.09**	**0.002**	<0.0005	0.09	0.257
Aldrin	**0.0012**	<0.00053	<0.00049	-----	0.0012	0.0026
Chlordane	<0.05	<0.091	<0.011	-----	nd	0.002
cis-Chlordane	-----	-----	<0.00049	-----	nd	
Dieldrin	<0.0025	<0.00053	<0.00049	<0.0038	nd	0.0055
gamma-Chlordane	-----	-----	<0.00049	-----	nd	
Heptachlor	<0.0025	<0.00053	<0.00049	<0.00088	nd	0.0004
Lindane	<0.0025	<0.00053	**0.0011**	-----	0.0011	0.002
PCB 1016	<0.021	<0.021	<0.02	-----	nd	0.00006
PCB 1221	<0.055	<0.042	<0.039	-----	nd	0.00002
PCB 1232	<0.047	<0.021	<0.02	-----	nd	-----
PCB 1242	<0.029	<0.021	<0.02	<0.02	nd	0.00002
PCB 1248	<0.031	<0.021	**0.0094**	<0.02	0.0094	0.00002
PCB 1254	<0.021	<0.021	**0.016**	-----	0.016	0.00001
PCB 1260	<0.02	**0.5**	<0.02	-----	0.5	0.00002

Notes: < - Less than indicated value
(a) - SAIC July 2007
(b) - SAIC Dec. 2008

TABLE 8 - Summary of LDW Screening Criteria Exceedances

Media	Sediment		Upland Soil			Ground Water	Other Waters (c)
	Embay. Sediment	Manhole Sed. 1991	1986	SC-1 (a) 1991	2006-2008		
Petroleum Hydrocarbons							
Gasoline Range Organics	X	-----	-----	-----	X	X	O
Diesel Range Organics	X	-----	-----	-----	X	X	O
Residual Range Organics	X	-----	-----	-----	X	X	O
Metals							
Aluminum	O	-----	-----	-----	-----	-----	-----
Antimony	X	-----	X	-----	-----	O	-----
Arsenic	O	O	X	O	X	X	X
Barium	O	-----	-----	-----	-----	-----	-----
Beryllium	O	-----	X	-----	-----	O	-----
Cadmium	X	O	X	O	O	X	O
Calcium	O	-----	-----	-----	-----	-----	-----
Chromium	X	O	X	O	X	O	O
Cobalt	X	-----	-----	-----	-----		-----
Copper	X	O	X	O	X	X	X
Iron	O	-----	-----	-----	-----	-----	-----
Lead	X	O	X	X	X	X	O
Magnesium	O	-----	-----	-----	-----	-----	-----
Manganese	O	-----	-----	-----	-----	-----	-----
Mercury	X	O	X	O	X	X	O
Molybdenum	O	-----	-----	-----	-----	-----	-----
Nickel	O	O	X	O	-----	X	-----
Potassium	O	-----	-----	-----	-----	-----	-----
Selenium	X	-----	-----	-----	-----	-----	-----
Silver	X	-----	X	-----	X	X	O
Sodium	O	-----	-----	-----	-----	-----	-----
Thallium	O	-----	-----	-----	-----	-----	-----
Tin	O	-----	-----	-----	-----	-----	-----
Vanadium	X	-----	-----	-----	-----	-----	-----
Zinc	X	O	X	O	X	X	X
Volatile Organic Compounds					-----		
1,1,1,2-Tetrachloroethane	O	-----	-----	-----	-----	-----	-----
1,1,1-Trichloroethane	O	O	O	O	-----	O	-----
1,1,2,2-Tetrachloroethane	O	O	-----	O	-----	-----	-----
1,1,2-Trichloroethane	O	O	-----	O	-----	-----	-----
1,1,2-Trichlorotrifluoroethane	O	-----	-----	-----	-----	-----	-----
1,1-Dichloroethane	O	O	O	O	-----	X	O
1,1-Dichloroethene	O	O	O	O	-----	O	-----
1,1-Dichloropropene	O	-----	-----	-----	-----	-----	-----
1,2,3-Trichlorobenzene	O	-----	-----	-----	-----	-----	-----
1,2,3-Trichloropropane	O	-----	-----	-----	-----	-----	-----
1,2,4-Trimethylbenzene	O	-----	-----	-----	-----	-----	-----
1,2-Dibromo-3-chloropropane	O	-----	-----	-----	-----	O	-----
1,2-Dibromoethane	O	-----	-----	-----	-----	-----	-----
1,2-Dichloroethane	O	O	-----	O	-----	-----	-----
1,2-Dichloropropane	O	O	-----	O	-----	O	-----
1,3,5-Trimethylbenzene	O	-----	-----	-----	-----	-----	O
1,3-Dichloropropane	O	-----	-----	-----	-----	-----	-----
1,Chlorobutane	O	-----	-----	-----	-----	-----	-----
2,2-Dichloropropane	O	-----	-----	-----	-----	-----	-----
2-Chlorotoluene	O	-----	-----	-----	-----	-----	-----
2-Hexanone	O	O	-----	O	-----	-----	-----
2-Nitropropane	O	-----	-----	-----	-----	-----	-----
4-Chlorotoluene	O	-----	-----	-----	-----	-----	-----
Acetone	O	O	X	O	-----	O	O
Allyl chloride	O	-----	-----	-----	-----	-----	-----
Benzene	O	O	O	O	-----	X	O
Bromobenzene	O	-----	-----	-----	-----	-----	-----
Bromochloromethane	O	-----	-----	-----	-----	-----	-----
Bromodichloromethane	O	O	-----	O	-----	-----	-----
Bromoform	O	O	-----	O	-----	-----	-----
Bromomethane	O	O	-----	O	-----	-----	-----

TABLE 8 - Summary of LDW Screening Criteria Exceedances

Media	Sediment		Upland Soil			Ground Water	Other Waters (c)
	Embay. Sediment	Manhole Sed. 1991	1986	SC-1 (a) 1991	2006-2008		
Carbon disulfide	O	O	-----	O	-----	-----	-----
Carbon Tetrachloride	O	O	-----	O	-----	-----	-----
Chlorobenzene	O	O	-----	O	-----	-----	-----
Chloroethane	O	O	-----	O	-----	-----	-----
Chloroform	O	O	O	O	-----	O	O
Chloromethane	O	O	-----	O	-----	-----	-----
cis-1,2-Dichloroethene	O	-----	-----	-----	-----	-----	-----
cis-1,3-Dichloropropene	O	O	-----	O	-----	-----	-----
Dibromochloromethane	O	O	-----	O	-----	-----	-----
Dibromomethane	O	-----	-----	-----	-----	-----	-----
Dichlorodifluoromethane	O	-----	-----	-----	-----	-----	-----
Dichloromethane	O	O	X	O	-----	X	-----
Diethyl ether	O	-----	-----	-----	-----	-----	-----
Ethy Methacrylate	O	-----	-----	-----	-----	-----	-----
Ethylbenzene	O	O	O	O	-----	O	O
Iodomethane	O	-----	-----	-----	-----	-----	-----
Isopropylbenzene	O	-----	-----	-----	-----	-----	-----
Methacrylonitrile	O	-----	-----	-----	-----	-----	-----
Methyl Acrylate	O	-----	-----	-----	-----	-----	-----
Methyl ethyl ketone	O	O	-----	O	-----	-----	-----
Methyl isobutyl ketone	O	-----	-----	-----	-----	-----	-----
Methyl methacrylate	O	-----	-----	-----	-----	-----	-----
n-Butylbenzene	O	-----	-----	-----	-----	-----	O
n-Propylbenzene	O	-----	-----	-----	-----	-----	-----
p-Cymene	O	-----	-----	-----	-----	-----	-----
Pentachloroethane	O	-----	-----	-----	-----	-----	-----
sec-Butlybenzene	O	-----	-----	-----	-----	-----	-----
Styrene	O	O	-----	O	-----	-----	-----
Tert-butyl methyl ether	O	-----	-----	-----	-----	-----	-----
tert-Butylbenzene	O	-----	-----	-----	-----	-----	-----
Tetrachloroehtene	O	O	X	O	-----	O	-----
Toluene	O	O	O	O	-----	O	O
trans-1,2-Dichloroethene	O	-----	-----	-----	-----	-----	-----
trans-1,3-Dichloropropene	O	-----	-----	-----	-----	-----	-----
Trichloroethene	O	O	X	O	-----	O	-----
Trichlorofluoromethane	O	-----	-----	-----	-----	-----	-----
Vinyl chloride	O	O	X	O	-----	X	-----
Xylene (m &p)	O	O	O	O	-----	-----	O
Xylene (o)	O	O	-----	O	-----	-----	O
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	X	-----	-----	-----	X	X	O
1,2-Dichlorobenzene	X	-----	X	-----	X	X	O
1,3-Dichlorobenzene	O	-----	-----	-----	-----	-----	-----
1,4-Dichlorobenzene	X	-----	-----	-----	X	O	O
1-Methylnaphthalene	O	-----	-----	-----	-----	-----	-----
2,4-Dichlorophenol	O	-----	-----	-----	-----	-----	-----
2,4-Dinitrophenol	O	-----	-----	-----	-----	-----	-----
2,4-Dinitrotoluene	O	-----	-----	-----	-----	-----	-----
2,6-Dinitrotoluene	O	-----	-----	-----	-----	-----	-----
2,4-Dimethylphenol	O	-----	X	-----	O	X	O
2,4,5-Trichlorophenol	O	-----	-----	-----	-----	-----	-----
2,4,6-Trichlorophenol	O	-----	-----	-----	-----	-----	-----
2-Chloronaphthalene	O	-----	-----	-----	-----	-----	-----
2-Chlorophenol	O	-----	-----	-----	-----	-----	-----
2-Methylnaphthalene	X	-----	X	-----	X	X	O
2-Methylphenol	O	-----	O	-----	O	X	O
2-Nitroaniline	O	-----	-----	-----	-----	-----	-----
2-Nitrophenol	O	-----	-----	-----	-----	-----	-----
3,3-Dchlorobenzidine	O	-----	-----	-----	-----	-----	-----
3-Nitroaniline	O	-----	-----	-----	-----	-----	-----
4,6-Dinitro-o-cresol	O	-----	-----	-----	-----	-----	-----
4-Bromophenyl phenyl ether	O	-----	-----	-----	-----	-----	-----

TABLE 8 - Summary of LDW Screening Criteria Exceedances

Media	Sediment		Upland Soil			Ground Water	Other Waters (c)
	Embay. Sediment	Manhole Sed. 1991	1986	SC-1 (a) 1991	2006-2008		
4-Chloro-3-methylphenol	O	-----	-----	-----	-----	-----	-----
4-Chloroaniline	O	-----	-----	-----	-----	-----	-----
4-Chlorophenyl phenyl ether	O	-----	-----	-----	-----	-----	-----
4-Methylphenol	X	-----	X	-----	O	O	O
4-Nitroaniline	O	-----	-----	-----	-----	-----	-----
4-Nitrophenol	O	-----	-----	-----	-----	-----	-----
Acenaphthene	X	O	X	O	X	X	O
Acenaphthylene	O	O	O	O	O	O	O
Aniline	O	-----		-----	-----	-----	-----
Anthracene	X	O	X	O	X	O	O
Benzo(a)anthracene	X	O	-----	O	X	X	X
Benzo(a)pyrene	X	O	-----	O	X	X	O
Benzo(b)fluoranthene	X	O	-----	O	X	X	O
Benzo(e)pyrene	O	-----	-----	-----	-----	-----	-----
Benzo(ghi)perylene	X	O	-----	O	X	X	O
Benzo(k)fluoranthene	X	O	-----	O	X	X	O
Total Benzofluoranthenes	X	O	-----	O	X	-----	-----
Benzoic Acid	O	-----	-----	-----	O	O	O
Benzyl Alcohol	O	-----	-----	-----	O	O	O
Biphenyl	O	-----	-----	-----	-----	-----	-----
bis(2-chloroethoxy)methane	O	-----	-----	-----	-----	-----	-----
bis(2-chlorethyl)ether	O	-----	-----	-----	-----	-----	-----
bis(2-chloroisopropyl)ether	O	-----	-----	-----	-----	-----	-----
Bis(2-ethylhexyl)phthalate	X	-----	X	-----	X	X	O
Butylbenzylphthalate	X	-----	X	-----	X	O	O
Carbozole	O	-----	-----	-----	-----	-----	
Chrysene	X	O	-----	O	X	X	O
Dibenzo(ah)anthracene	X	O	-----	O	O	X	O
Dibenzofuran	O	-----	X	-----	X	O	O
Diethylphthalate	O	-----	-----	-----	O	O	O
Dimethylphthalate	X	-----	-----	-----	O	O	O
Di-N-Butylphthalate	O	-----	X	-----	X	O	X
Di-n-octyl phthalate	O	-----	X	-----	O	X	O
Fluoranthene	X	O	X	O	X	O	O
Fluorene	X	O	X	O	X	O	O
Hexachlorobenzene	O	-----	-----	-----	O	X	O
Hexachlorobutadiene	O	-----	-----	-----	O	O	O
Hexachlorocyclopentadiene	O	-----	-----	-----	-----	-----	-----
Hexachloroethane	O	-----	-----	-----	-----	-----	-----
Indeno(123-cd)pyrene	X	O	-----	O	X	X	O
Isophorone	O	-----	-----	-----	-----	-----	-----
Naphthalene	O	O	X	O	X	X	O
Nitrobenzene	O	-----	-----	-----	-----	-----	-----
N-Nitrosodimethylamine	O	-----	-----	-----	-----	X	-----
N-Nitroso-di-n-propylamine	O	-----	-----	-----	-----	-----	-----
N-Nitrosodiphenylamine	O	-----	-----	-----	O	X	O
Pentachlorophenol	X	-----	X	-----	X	X	O
Phenanthrene	O	O	X	O	X	O	O
Phenol	X	-----	0.32	-----	X	O	O
Pyrene	X	O	X	O	X	X	O
Pesticides/PCBs							
2,4'-DDD	O	-----	-----	-----	O	O	O
2,4'-DDE	O	-----	-----	-----	O	O	O
2,4'-DDT	O	-----	-----	-----	O	O	O
4,4'-DDD	X	O	X	O	X	X	O
4,4'-DDE	X	O	X	O	X	X	O
4,4'-DDT	X	O	X	O	X	X	O
Aldrin	O	O	-----	O	O	X	O
alpha-BHC	O	O	-----	O	-----	-----	-----
alpha-Chlordane	O	-----	-----	-----	-----	-----	-----
alpha-Endosulfan	O	-----	-----	-----	-----	-----	-----
beta-BHC	O	O	-----	O	-----	-----	-----

TABLE 8 - Summary of LDW Screening Criteria Exceedances

Media	Sediment		Upland Soil			Ground Water	Other Waters (c)
	Embay. Sediment	Manhole Sed. 1991	1986	SC-1 (a) 1991	2006-2008		
beta-Endosulfan	O	-----	-----	-----	-----	-----	-----
delta-BHC	O	O	-----	O	-----	-----	-----
Chlordane	O	-----	-----	-----	X	X	O
Cis-Nonachlor	O	-----	-----	-----	O	-----	-----
Dieldrin	O	O	X	O	O	-----	O
Endosulfan sulfate	O	O	-----	O	-----	-----	-----
Endrin	O	O	X	O	-----	-----	-----
Endrin aldehyde	O	O	-----	O	-----	-----	-----
Endrin ketone	O	-----	-----	-----	-----	-----	-----
gamma-BHC	O	-----	-----	-----	-----	-----	-----
gamma-chlordane	O	-----	-----	-----	-----	O	O
Heptachlor	O	O	-----	O	-----	-----	O
Heptachlor epoxide	O	O	-----	O	-----	-----	-----
Lindane	O	O	-----	O	O	O	O
Methoxychlor	O	O	-----	O	-----	-----	-----
Mirex	O	-----	-----	-----	-----	-----	-----
Oxychlordane	O	-----	-----	-----	-----	-----	-----
Toxaphene	O	O	-----	O	-----	-----	-----
Trans-Nonachlor	O	-----	-----	-----	-----	-----	-----
PCB 1016	O	O	-----	O	O	-----	O
PCB 1221	O	O	-----	O	O	-----	O
PCB 1232	O	O	-----	O	O	-----	O
PCB 1242	X	O	-----	O	X	X	O
PCB 1248	X	O	X	O	X	-----	X
PCB 1254	X	O	-----	O	X	X	X
PCB 1260	X	O	X	O	X	X	X
Total PCBs	X	O	-----	O	X	-----	-----
Dioxin/Furans (ng/kg)							
TEQ (h)	X	-----	-----	X	-----	-----	-----
Other Compounds							
Dibutyltin as ion	O	-----	-----	-----	-----	-----	-----
Monobutlytin as ion	O	-----	-----	-----	-----	-----	-----
Tetrabutyltin as ion	O	-----	-----	-----	-----	-----	-----
Tributyltin as ion	O	-----	-----	-----	-----	-----	-----
Total Cyanide	-----	-----	O	-----	-----	-----	-----
Total Phenol	-----	-----	X	-----	-----	X	-----

Notes: LDW - Lower Duwamish Waterway
(a) - Composit of surface soil samples
(b) - Outfall and seep samples

X	- Maximum value exceeds lowermost criteria
O	- Maximum value does not exceed lower most criteria
-----	- Not analyzed

TABLE 9 - Sample Analyses (d)

Surface Sediment Analyses (a)

Analyte	Number
Physical Analyses (Recent)	6
Total Metals (As,Cd, Cr, Cu, Pb, Hg, Ag, Zn, Sb, Ni, Be)	36
PCBs (Aroclors)	36
SVOCs	20
Pesticides	20
Dioxin/Furans (c)	3
NWWTPH-Dx	36
Organotin	6
Total Organic Carbon	36
Field Duplicate	2

Note: (a) - Includes three sample of the harder precipitate "cap" material and three samples of sediment directly underlying the precipitate material.

Deeper Sediment Aanalyses

Analyte	Number
Physical Analyses (Alluvium)	3
Total Metals (As,Cd, Cr, Cu, Pb, Hg, Ag, Zn, Sb, Ni, Be)	39
PCBs (Aroclors)	39
NWWTPH-Dx	39
SVOCs	20
Pesticides	20
Dioxin/Furans (c)	3
Organotin (b)	2
Total Organic Carbon	39
Field Duplicate	2

Note: (b) - Two samples from beneath the harder precipitate "cap" material adjacent to the large timbers.

Seep Aanalyses

Analyte	Number
NWWTPH-G	3
NWWTPH-Dx	3
Dissolved Metals (As, Pb, Cd, Cr, Cu, Pb, Hg, Ag, Zn, Sb, Ni, Be)	3
VOCs	3
SVOCs	3
PAHs (GCMS-SIM)	3
Pesticides	3
PCBs	3
Conventional (Cl, SO4, hardness, and DO)	3
Field Duplicate	1

TABLE 9 - Sample Analyses (d)

Soil Analyses

Analyte	Number
NWWTPH-G/BTEX	21
NWWTPH-Dx	21
Metals (As, Cd, Cr, Cu, Pb, Hg, Ag, Zn, Sb, Ni, Be)	21
VOCs	21
SVOCs	21
Pesticides	21
PCBs	21
Field Duplicate	1

Stormwater Solids Analyses

Analyte	Number
NWWTPH-G/BTEX	1
NWWTPH-Dx	1
Metals (As, Cd, Cr, Cu, Pb, Hg, Ag, Zn, Sb, Ni, Be)	1
SVOCs	1
Pesticides	1
PCBs	1
Dioxin/Furans (c)	1
Total Organic Carbon/Grain Size	1
Field Duplicate	0

"Lagoon" Aanalyses

Analyte	Number
NWWTPH-Dx	12
Metals (As, Cd, Cr, Cu, Pb, Hg, Ag, Zn, Sb, Ni, Be)	12
pH (lagoon sludge spls.)	3-6
VOCs (lagoon sludge spls.)	3-6
Pesticides (lagoon sludge spls.)	3-6
SVOCs	12
PCBs	12
Field Duplicate	1

Groundwater Analyses

Analyte	Well Samples
NWWTPH-G	12
NWWTPH-Dx	12
Total/Dissolved Metals (As, Pb, Cd, Cr, Cu, Pb, Hg, Ag, Zn, Sb, Ni, Be)	12
VOCs	12
SVOCs	12
PAHs (GCMS-SIM)	12
Pesticides	12
PCBs	12
Conventional (Cl, SO4, hardness, and DO)	12
Field Duplicate	1

TABLE 9 - Sample Analyses (d)

Stormwater Analyses

Analyte	Number
NWWTPH-G	2
NWWTPH-Dx	2
Total/Dissolved Metals (As, Pb, Cd, Cr, Cu, Pb, Hg, Ag, Zn, Sb, Ni, Be)	2
VOCs	2
SVOCs	2
PAHs (GCMS-SIM)	2
Pesticides	2
PCBs	2
Conventional (Cl, SO4, hardness, and DO)	2
Field Duplicate	0

Baghouse Dust/Drum Furnace Ash

Analyte	Number
Total Metals (As,Cd, Cr, Cu, Pb, Hg, Ag, Zn, Sb, Ni, Be)	2
SVOCs	2

Additional Notes:

(c) - Analyses for dioxin/furans will include those congeners listed in Table 708-1 of WAC 173-340-900. The concentrations will be converted to a 2,3,7,8-TCDD equivalent concentration derived using Toxicity Equivalency Factors (TEFs) consistent with Ecology guidance.

(d) See Table 10 for list of VOC, SVOC, PAH and Pesticide Analytes

TABLE 10 - List of VOC, SVOC, PAH and Pesticide Analytes

Volatile Organic Compounds (VOCs - SW8260C)

Compound
1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloro-1,2,2-trifluoroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,1-Dichloropropene
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3,5-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,4-Dichlorobenzene
2,2-Dichloropropane
2-Butanone
2-Chlorotoluene
2-Hexanone
4-Chlorotoluene
4-Isopropyltoluene
4-Methyl-2-Pentanone (MIBK)
Acetone
Acrolein
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoethane
Bromoform
Bromomethane
Carbon Disulfide
Carbon Tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
Dibromochloromethane

Compound
Dibromomethane
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Isopropylbenzene
m,p-Xylene
Methylene Chloride
Naphthalene
n-Butylbenzene
n-Propylbenzene
o-Xylene
sec-Butylbenzene
Styrene
tert-Butylbenzene
Tetrachloroethene
Toluene
trans-1,2-Dichloroethene
trans-1,3-Dichloropropene
trans-1,4-Dichloro-2-butene
Trichloroethene
Trichlorofluoromethane
Vinyl Chloride

Semivolatile Organic Compounds (SVOCs - SW8270D)

Compound
1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methylphenol
4-Chloro-3-methylphenol
4-Chlorophenyl-phenylether
4-Methylphenol
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(g,h,i)perylene
Benzofluoranthene(s) (Total)
Benzoic acid
Benzyl alcohol
bis(2-Ethylhexyl)phthalate
Butylbenzylphthalate
Carbazole
Chrysene
Dibenzo(a,h)anthracene
Dibenzofuran
Diethylphthalate
Dimethylphthalate

Compound
Di-n-butylphthalate
Di-n-octylphthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Indeno(1,2,3-cd)pyrene
Isophorone
Naphthalene
Nitrobenzene
N-Nitroso-di-n-propylamine
N-Nitrosodiphenylamine
Pentachlorophenol
Phenanthrene
Phenol
Pyrene

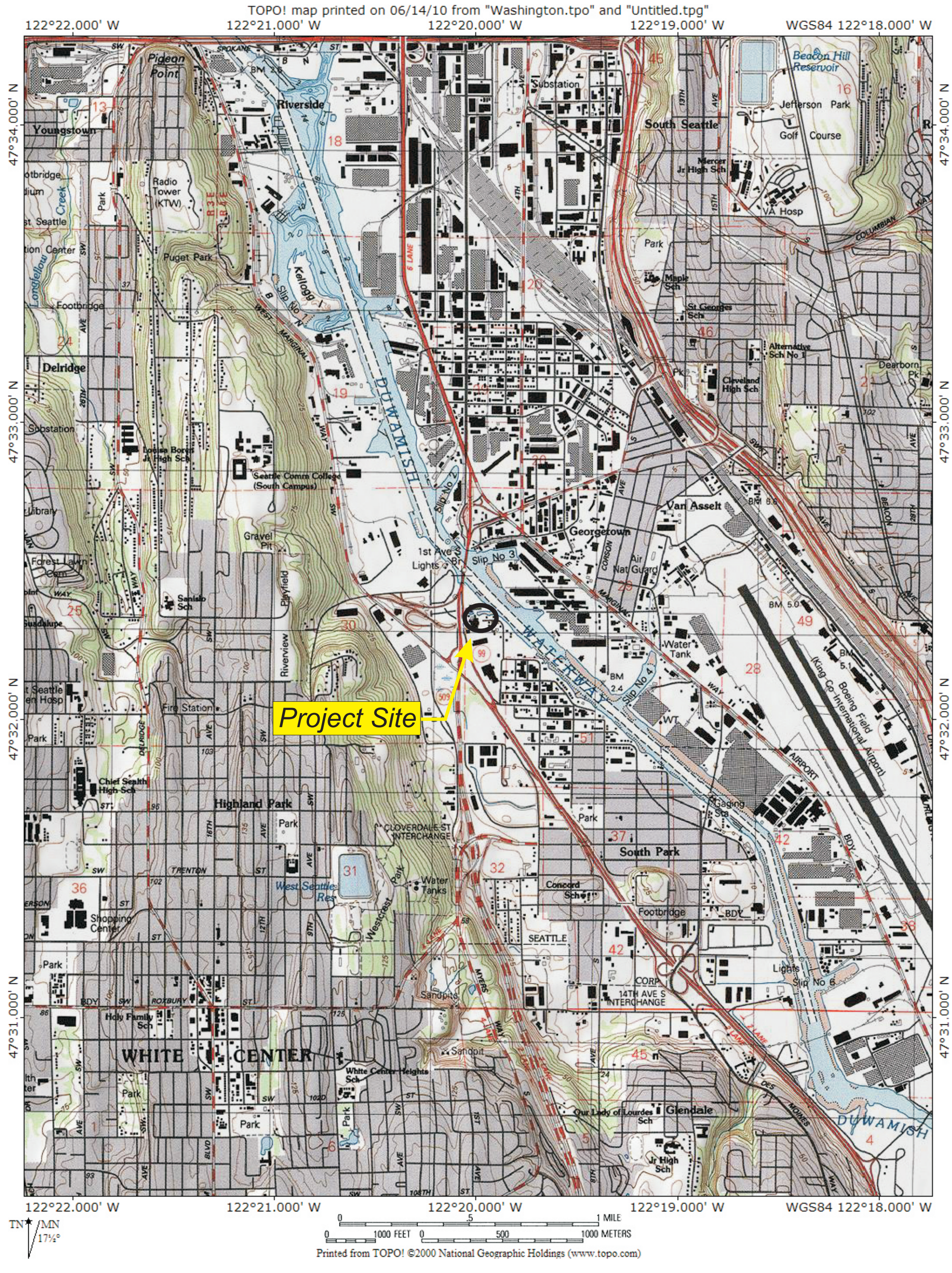
TABLE 10 - List of VOC, SVOC, PAH and Pesticide Analytes

PAHs (SW8270D - SIM)

Compound
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(g,h,i)perylene
Benzofluoranthene(s) (Total)
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
Naphthalene
Phenanthrene
Pyrene

Pesticides (SW8081)

Compound
alpha -BHC
beta -BHC
gamma -BHC (Lindane)
delta -BHC
Heptachlor
Aldrin
Heptachlor Epoxide
trans- Chlordane (*beta-* Chlordane, *gamma-* Chlordane)
cis- Chlordane (*alpha-* chlordane)
Endosulfan I
4,4'-DDE
Dieldrin
Endrin
Endosulfan II
4,4'-DDD
Endrin Aldehyde
4,4'-DDT
Endosulfan Sulfate
Endrin Ketone
Methoxychlor
Hexachlorobutadiene
Hexachlorobenzene



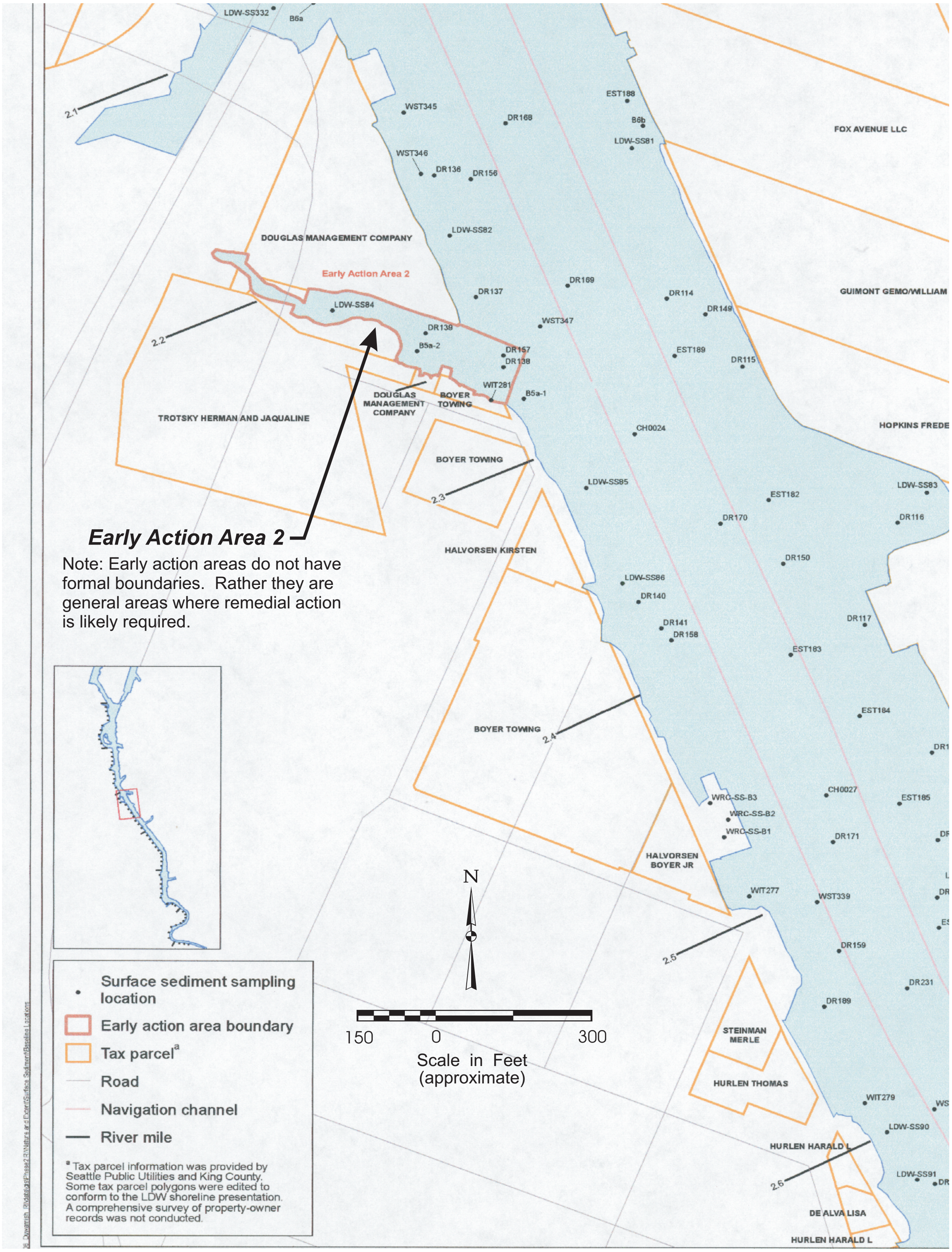
ICS/NW Cooperage Site

Vicinity Map

SUM-008-00 (ICS) *June 2010*

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 1



Note: From Windward Environmental Draft RI Map 4-4e

ICS/NW Cooperage Site

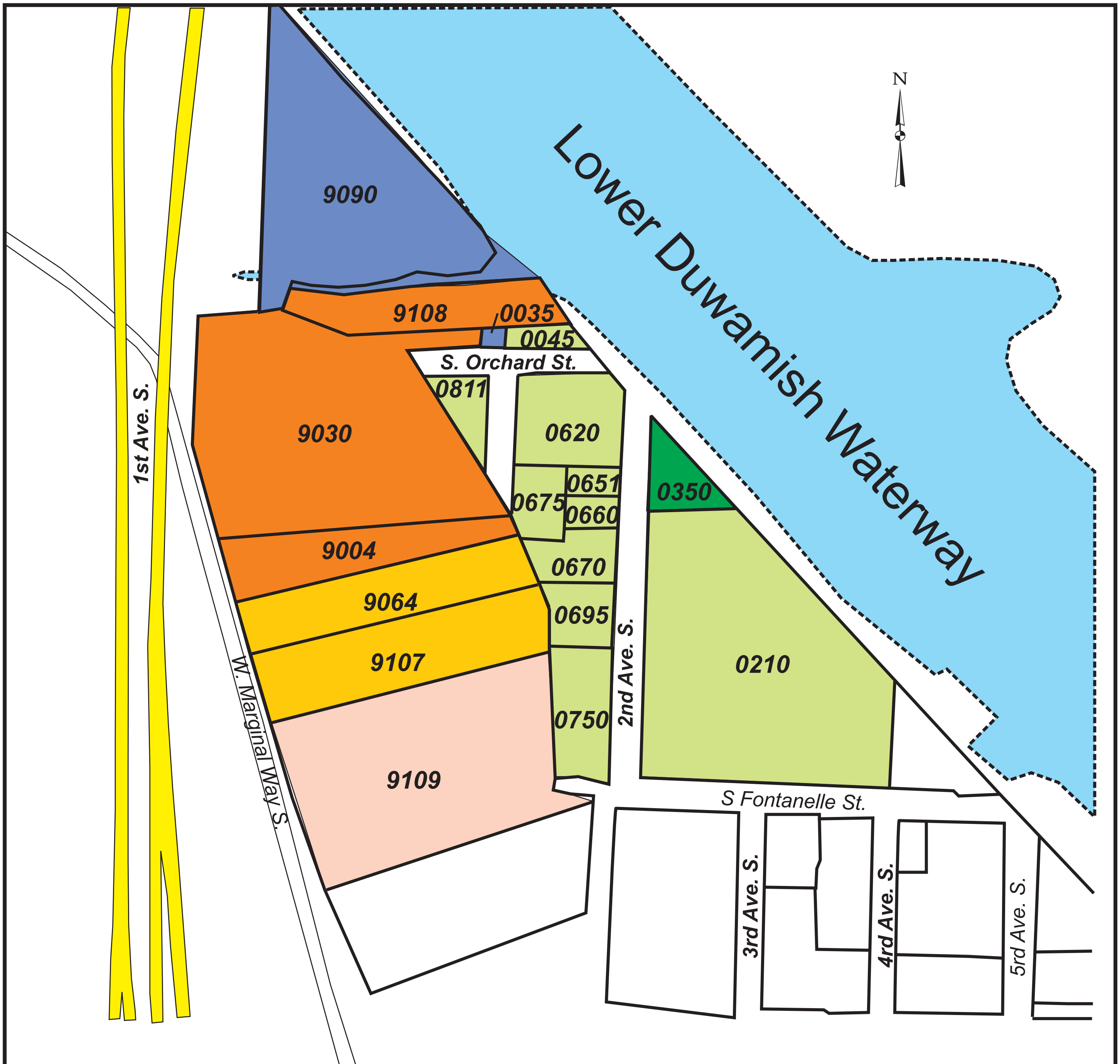
Early Action Area 2
Lower Duwamish Waterway

SUM-008-00 (ICS) ***June 2010***

FIGURE 2

Dalton, Olmsted & Fuglevand, Inc.

Ref: EAA2.cdr



Trotsky Property	Northwest Center Property
7100 1st. Ave. S. Seattle LLC (Douglas) Property	Halvorsen Property
Boyer Property	**9109** Tax No. (last 4 digits)
Waterman Property	

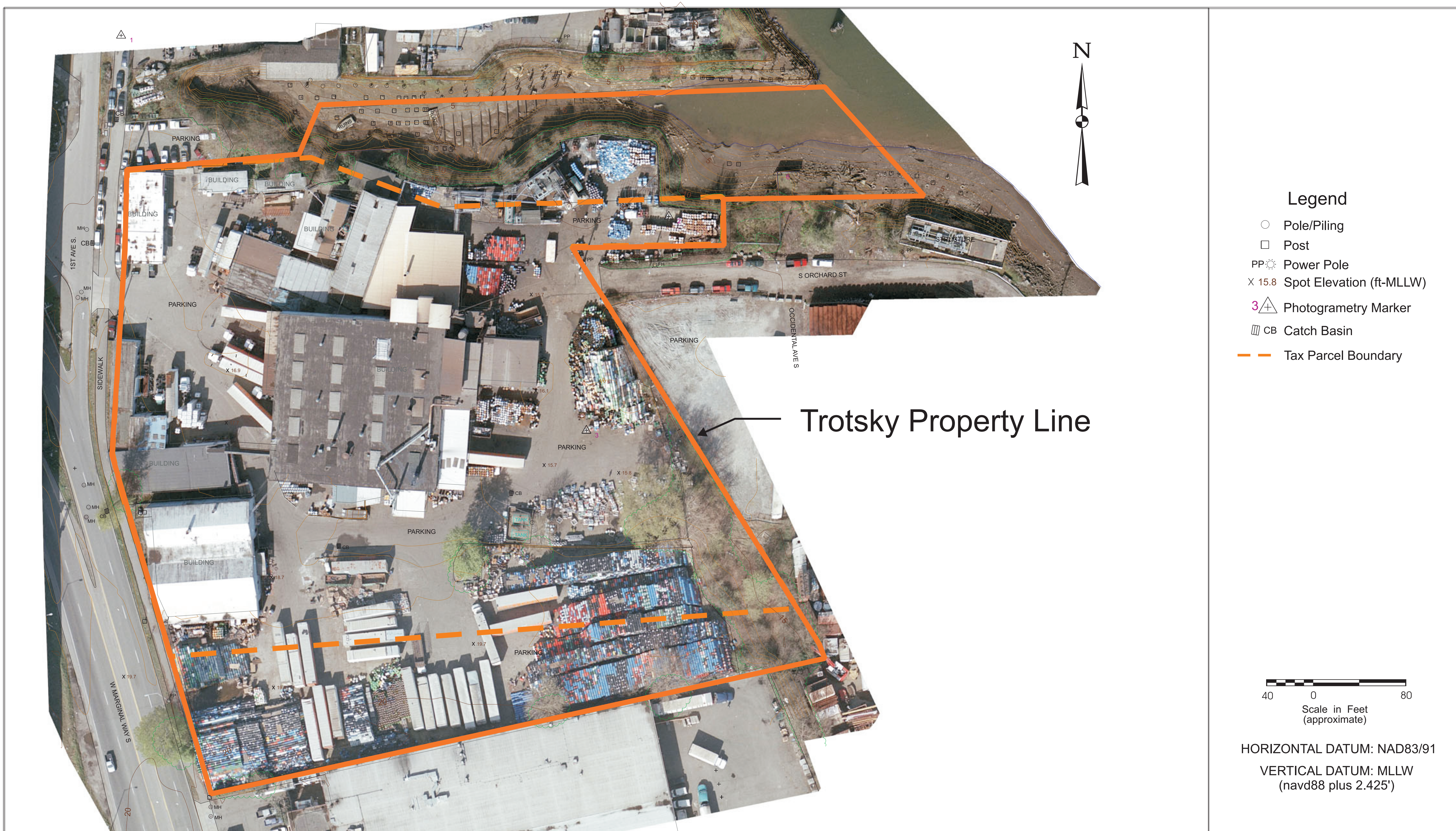
ICS/NW Cooperage Site
Seattle, WA

Tax Parcels and Property Ownership

SUM-008-00 **FIGURE 3** May 2010

Dalton, Olmsted & Fuglevand, Inc.

Ref: Tax Parcels.cdr



Notes:

1) Property Survey by Continental Survey Co. (12-15-09)
2) Topography by David C. Smith Associates (flown 3-18-10 @ 1412 PDT)

Ref: ICS-NW Cooperage Photo Topo.cdr

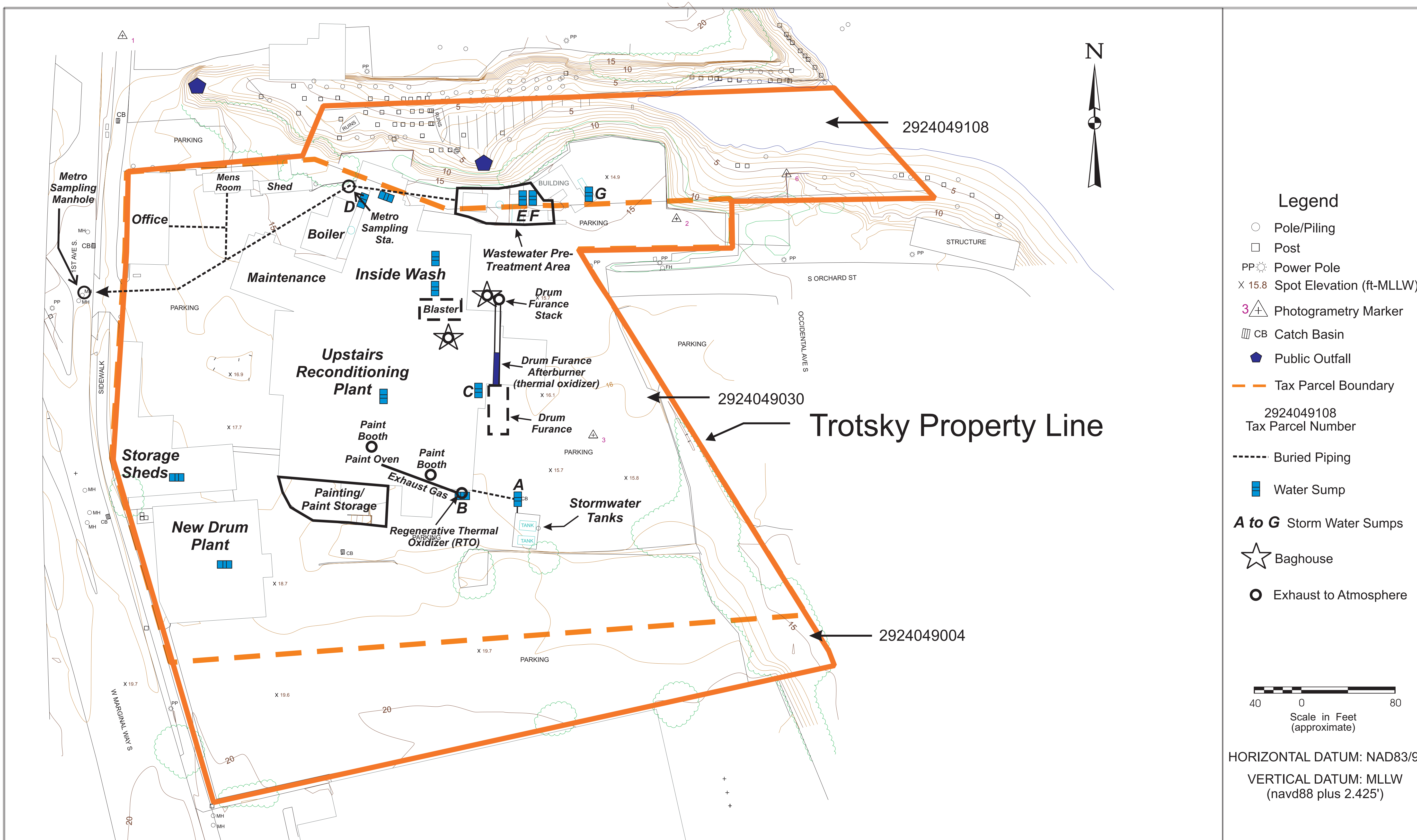
ICS/NW Cooperage Site

Air Photograph - March 18, 2010

SUM-008-00 (ICS) ***June 2010***

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 4



Notes:

1) Property Survey by Continental Survey Co. (12-15-09)
2) Topography by David C. Smith Associates (Flown 3-18-10)
3) Buried pipe, Metro sampling points, and sump locations have not been surveyed
4) All sump connections are above ground except near stormwater tanks

Ref: ICS-NW Cooperage Working Base rev.cdr

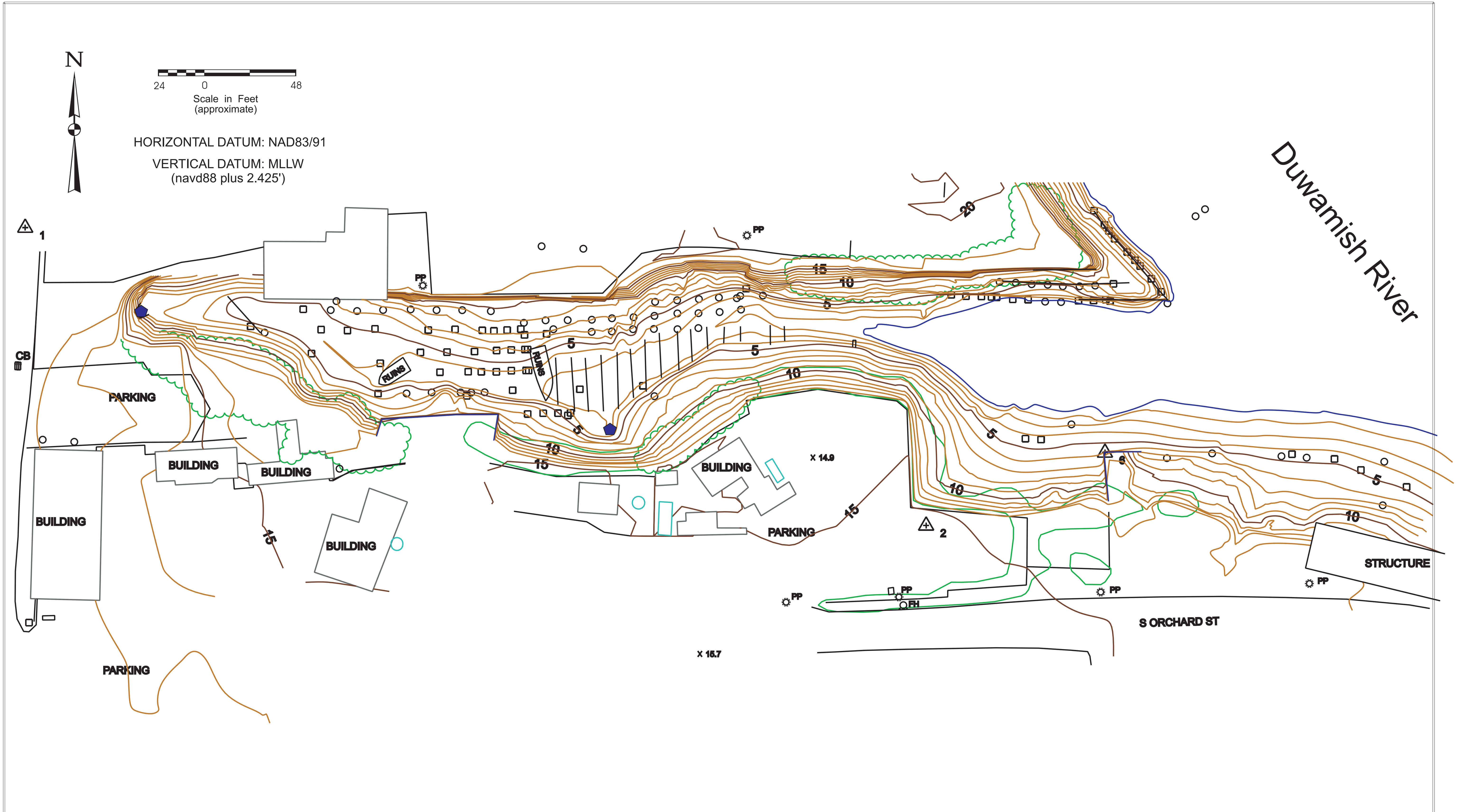
ICS/NW Cooperage Site

Site Layout and Topography

SUM-008 (ICS) *July 2011*

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 5



Legend

- ○ Pole/Piling
- □ Post
- PP Power Pole
- X 15.8 Spot Elevation (ft-MLLW)
- 3 Photogrammetry Marker
- CB Catch Basin
- Public Outfall
- Tax Parcel Boundary

Ref: ICS-NW Embay.cdr

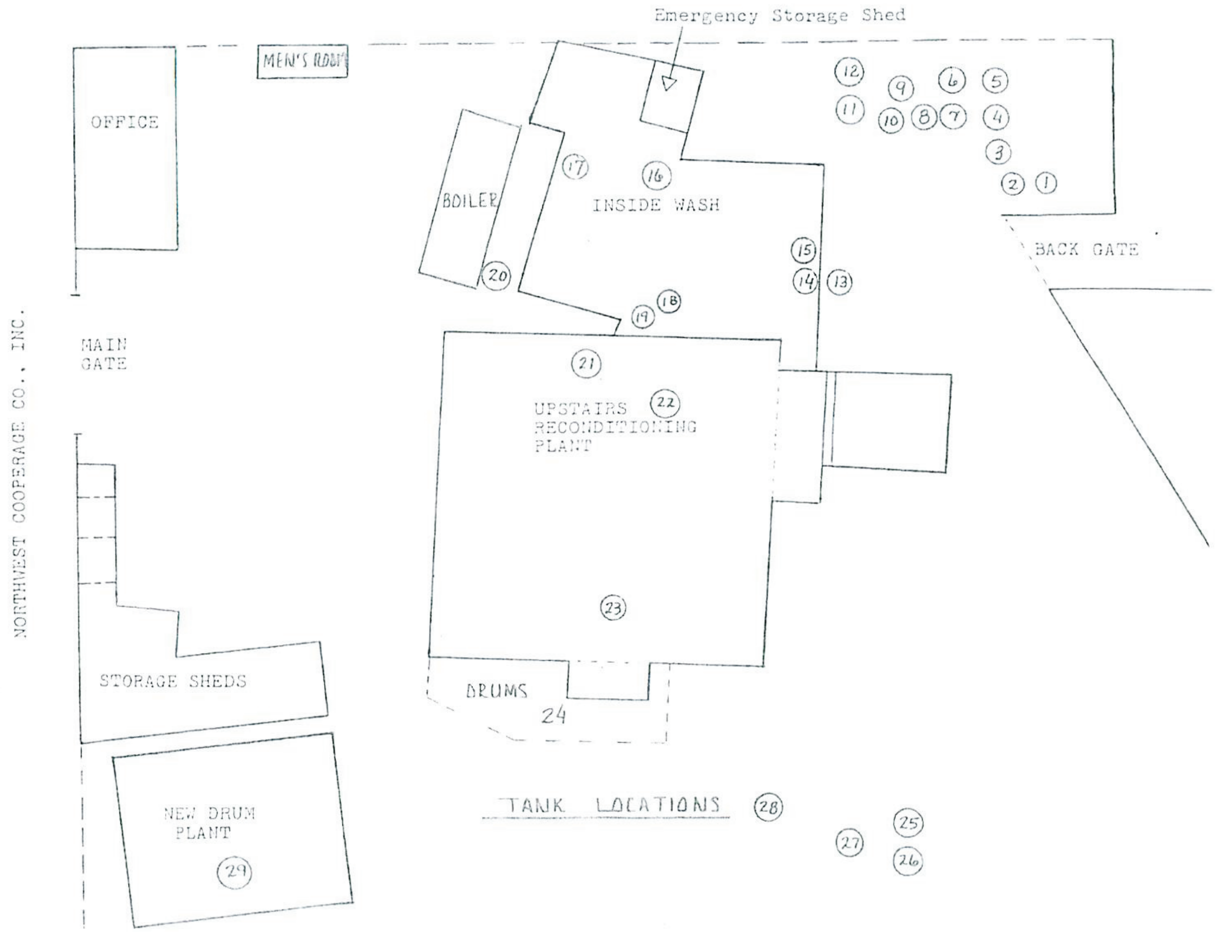
ICS/NW Cooperage Site

Embayment Topography

SUM-008 (ICS) *June 2010*

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 6



No./Contents	Volume (gal)
1. Sulfuric acid	475
2. Caustic	475
3. Water Holding	6500
4. Water Holding	500
5. Metro Water	500
6. Transfer Tank	4000
7. Metro Water	10000
8. Metro Water	10000
9. Metro Water	4000
10. Water/Oil Separator	3000
11. Metro Water	7500
12. Metro Water	8000
13. Hydrochloric Acid	250
14. Pre-Flush	1000
15. Flush	1000
16. Power Washer	2500
17. Inside Rinse	2400
18. Acid Work	250
19. Neutralizer	300
20. Diesel	1000
21. T.H. Tester	1000
22. OH Tester	550
23. Paint	20
24. Paint Storage	Limited
25. Storm water	8000
26. Storm water	8000
27. Propane	---------
28. Propane	---------
29. Wash/Rinse	2000

ICS/NW Cooperage Site

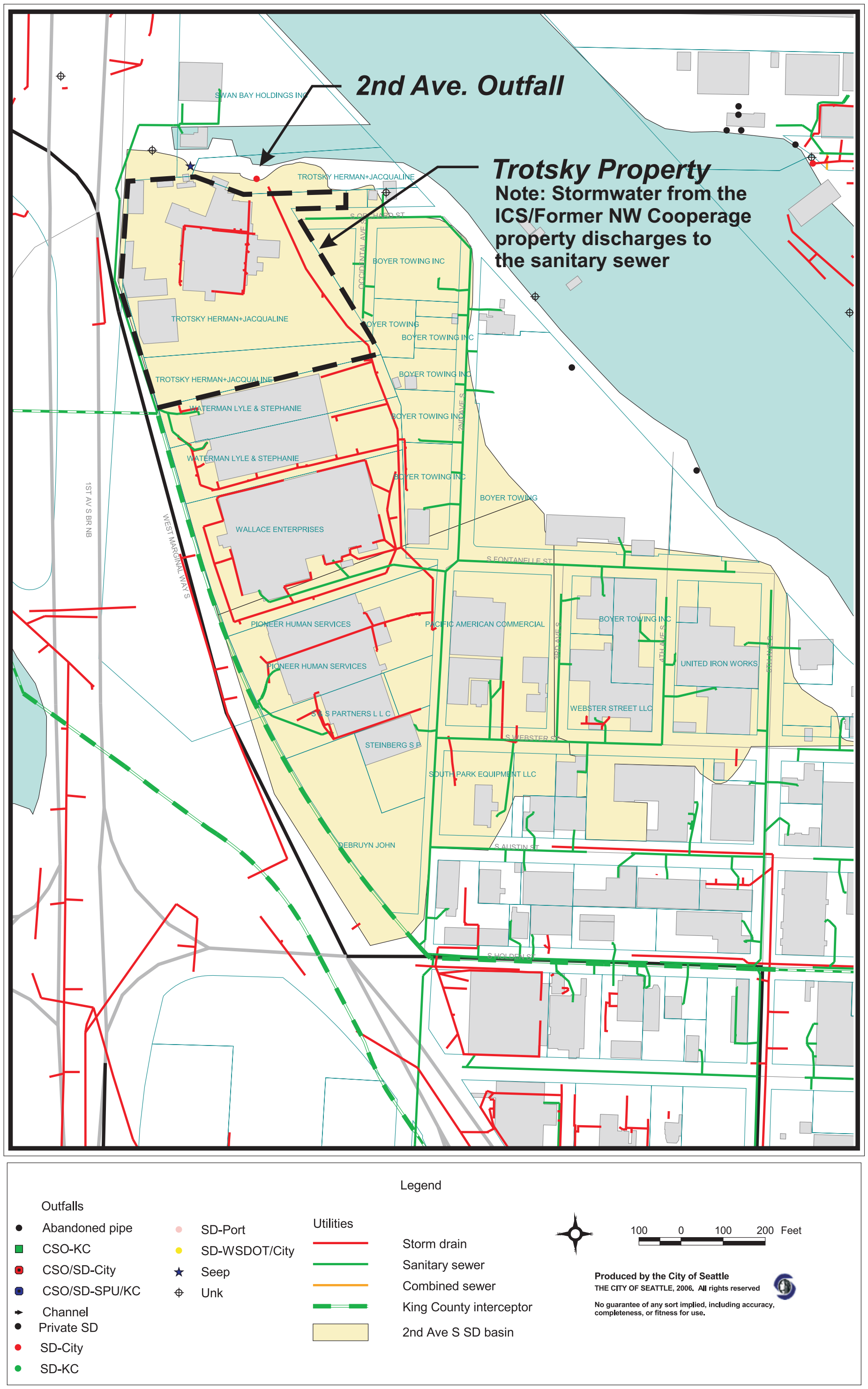
Tank Locations and Contents

SUM-008-ICS *Jan. 2011*

FIGURE 7

Ref: ICS Tanks.cdr

Dalton, Olmsted & Fuglevand, Inc.

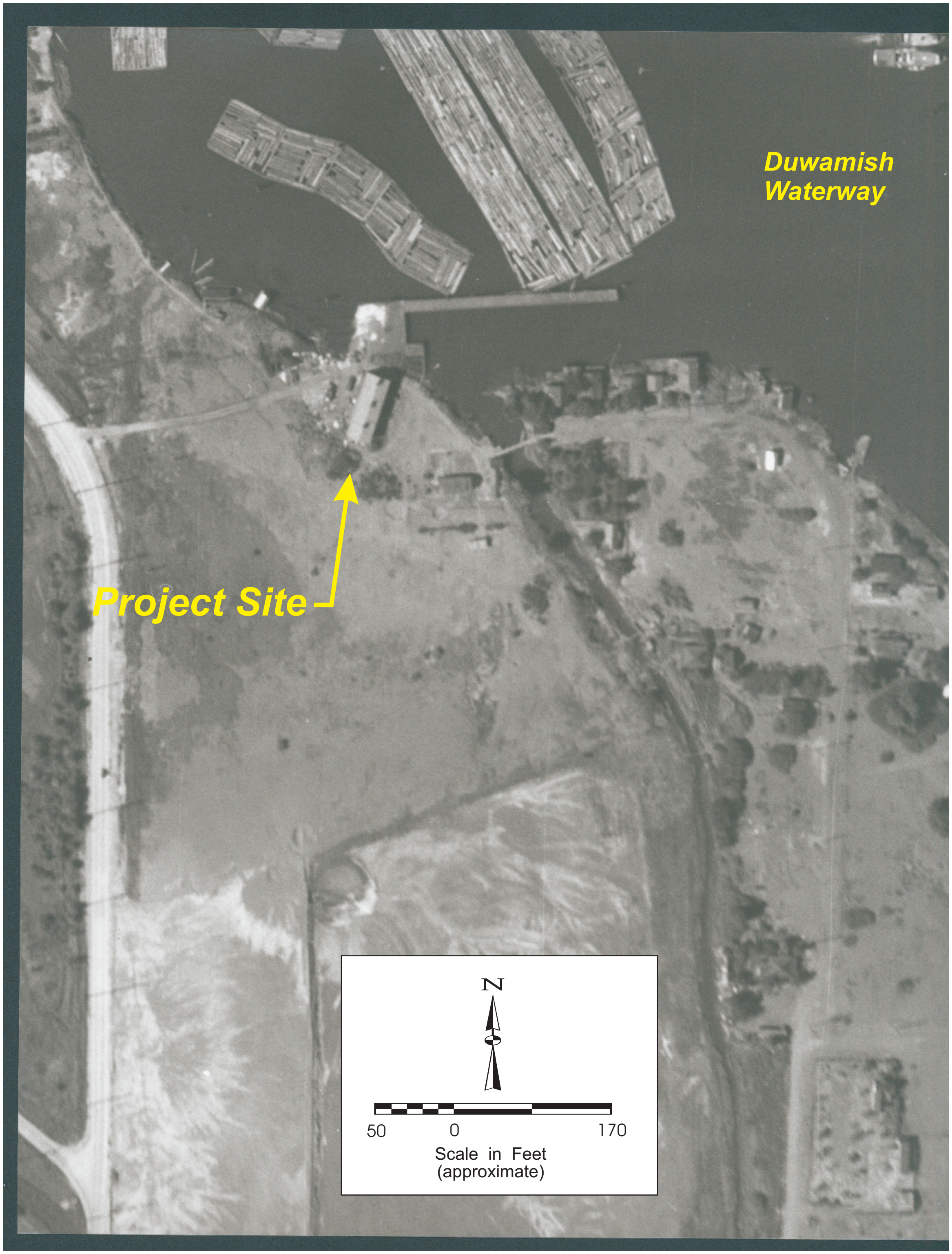


SAIC From Science to Solutions

Figure 6. Early Action Area 2 Drainage Basin

ICS/NW Cooperage Site	FIGURE 8
2nd Ave Drainage Basin	
SUM-008-00 (ICS) *June 2010*	
Dalton, Olmsted & Fuglevand, Inc.	

Source: Ecology 2007
Ref: 2nd Ave Drainage.cdr



ICS/NW Cooperage Site

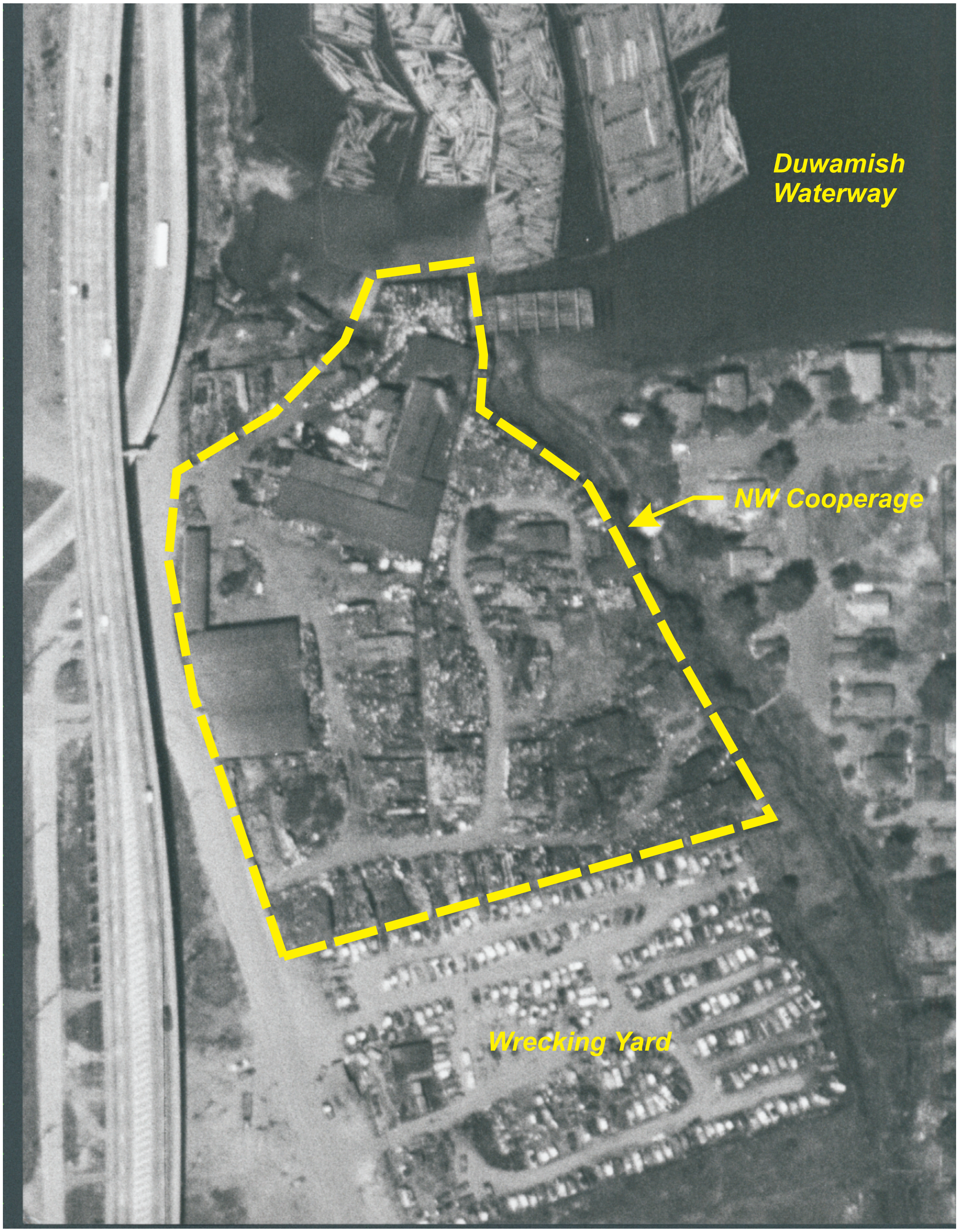
Historic Air Photograph - 1936

SUM-008-00 (ICS) *June 2010*

FIGURE
9

Ref: 1936 Photo.cdr Source: Aero-Metric

Dalton, Olmsted & Fuglevand, Inc.



N

50 0 140
Scale in Feet
(approximate)

Ref: 1960 Photo.cdr Source: Aero-Metric

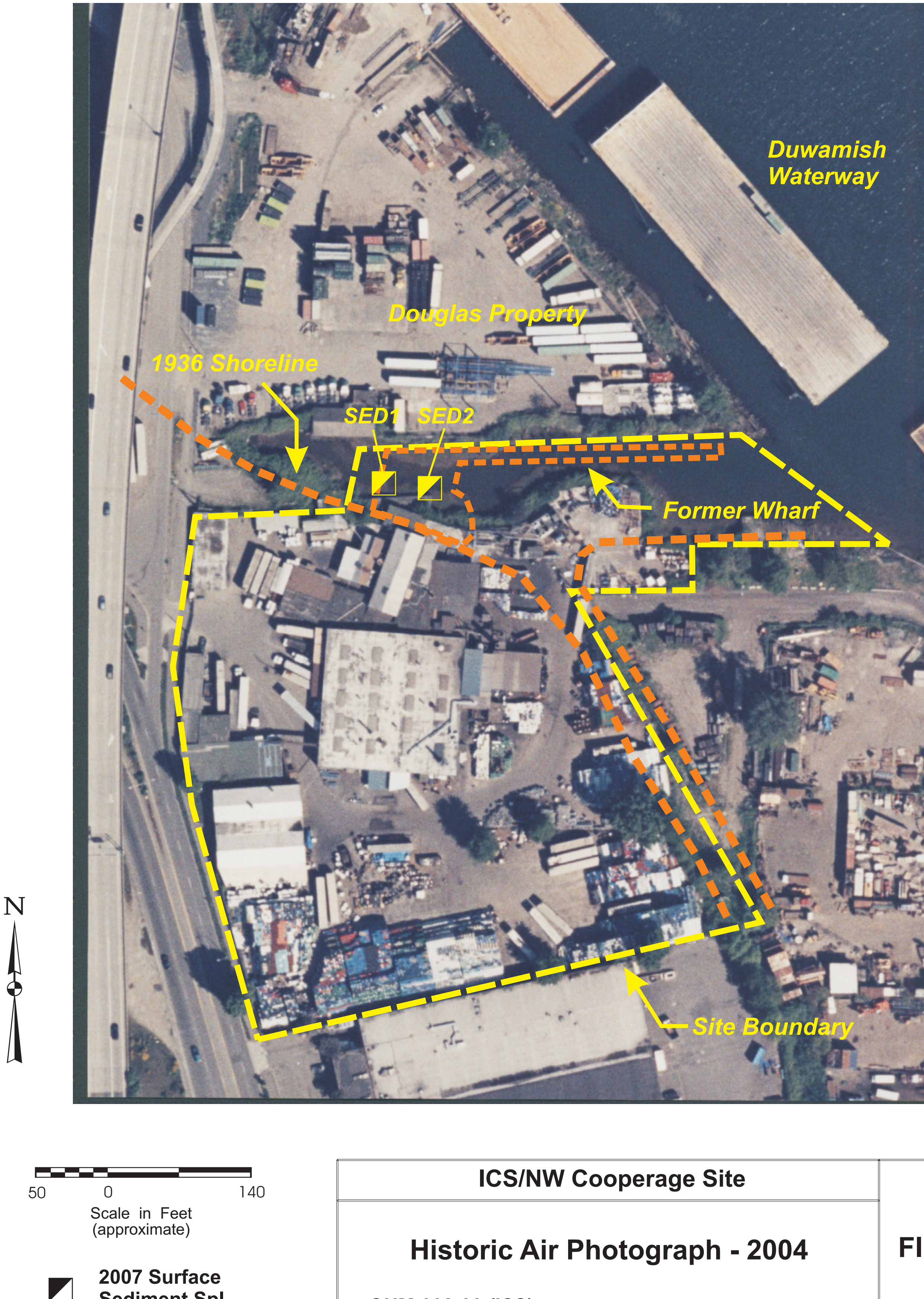
ICS/NW Cooperage Site

Historic Air Photograph - 1960

SUM-008-00 (ICS) *June 2010*

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 10



Ref: 2004 Photo.cdr Source: Aero-Metric

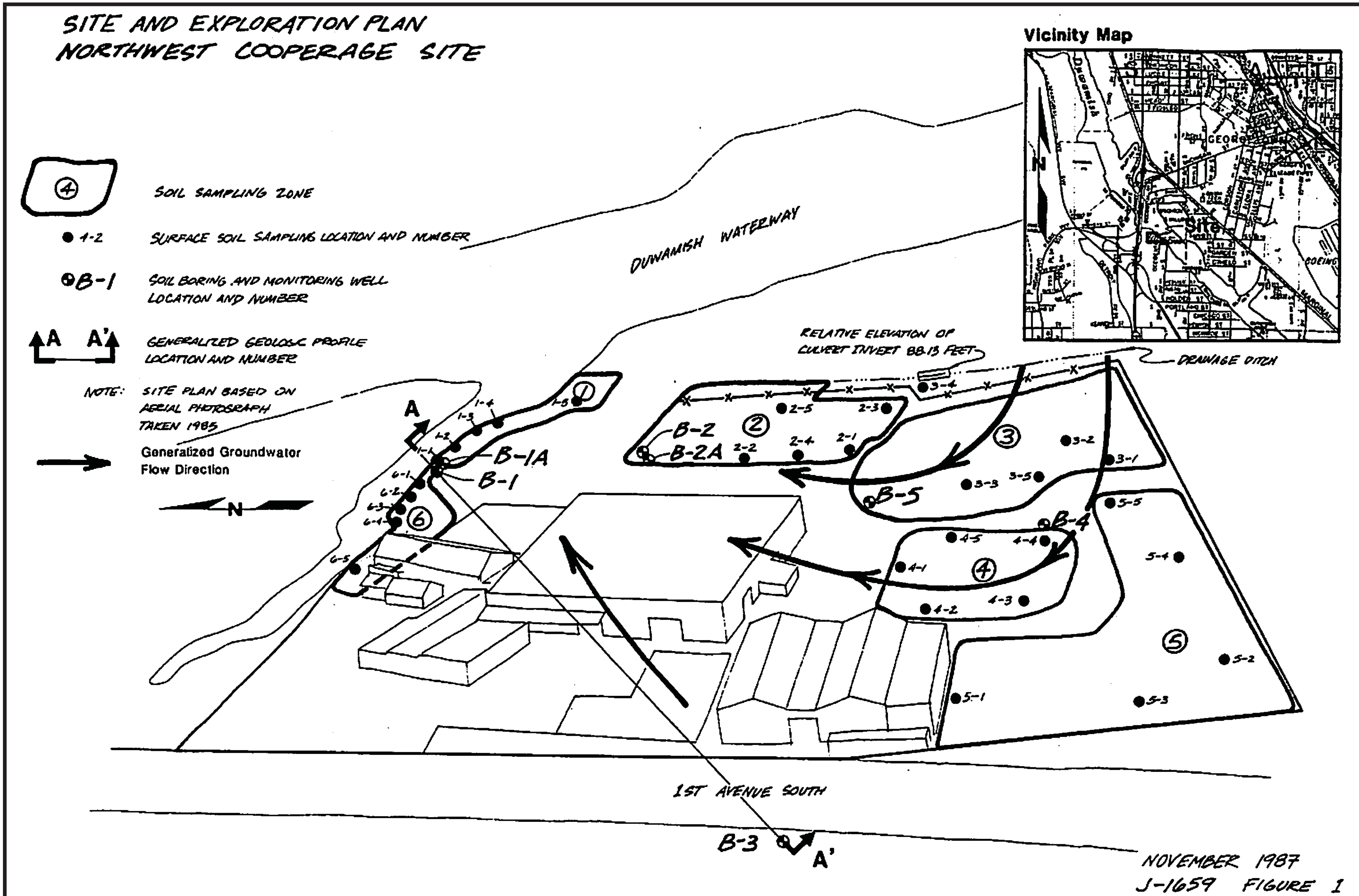
ICS/NW Cooperage Site

Historic Air Photograph - 2004

SUM-008-00 (ICS) ***June 2010***

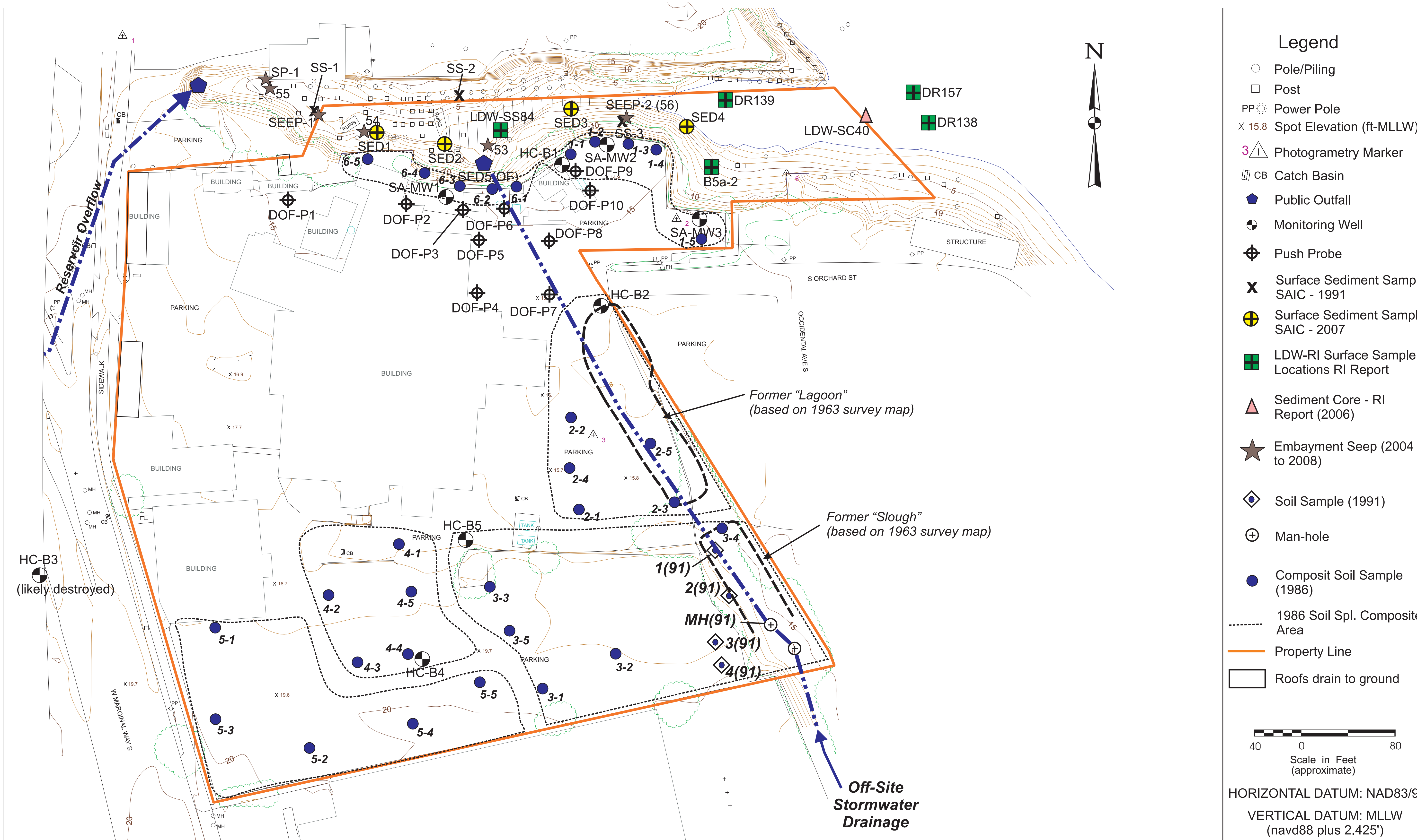
Dalton, Olmsted & Fuglevand, Inc.

FIGURE 11



Ref: 1987 Site Plan.cdr

ICS/NW Cooperage Site	FIGURE 12
1987 Site Plan	
SUM-008-00 (ICS) June 2010	
Dalton, Olmsted & Fuglevand, Inc.	



Notes:

1) Property Survey by Continental Survey Co. (12-15-09)
2) Topography by David C. Smith Associates (Flown 3-18-10)

ICS/NW Cooperage Site

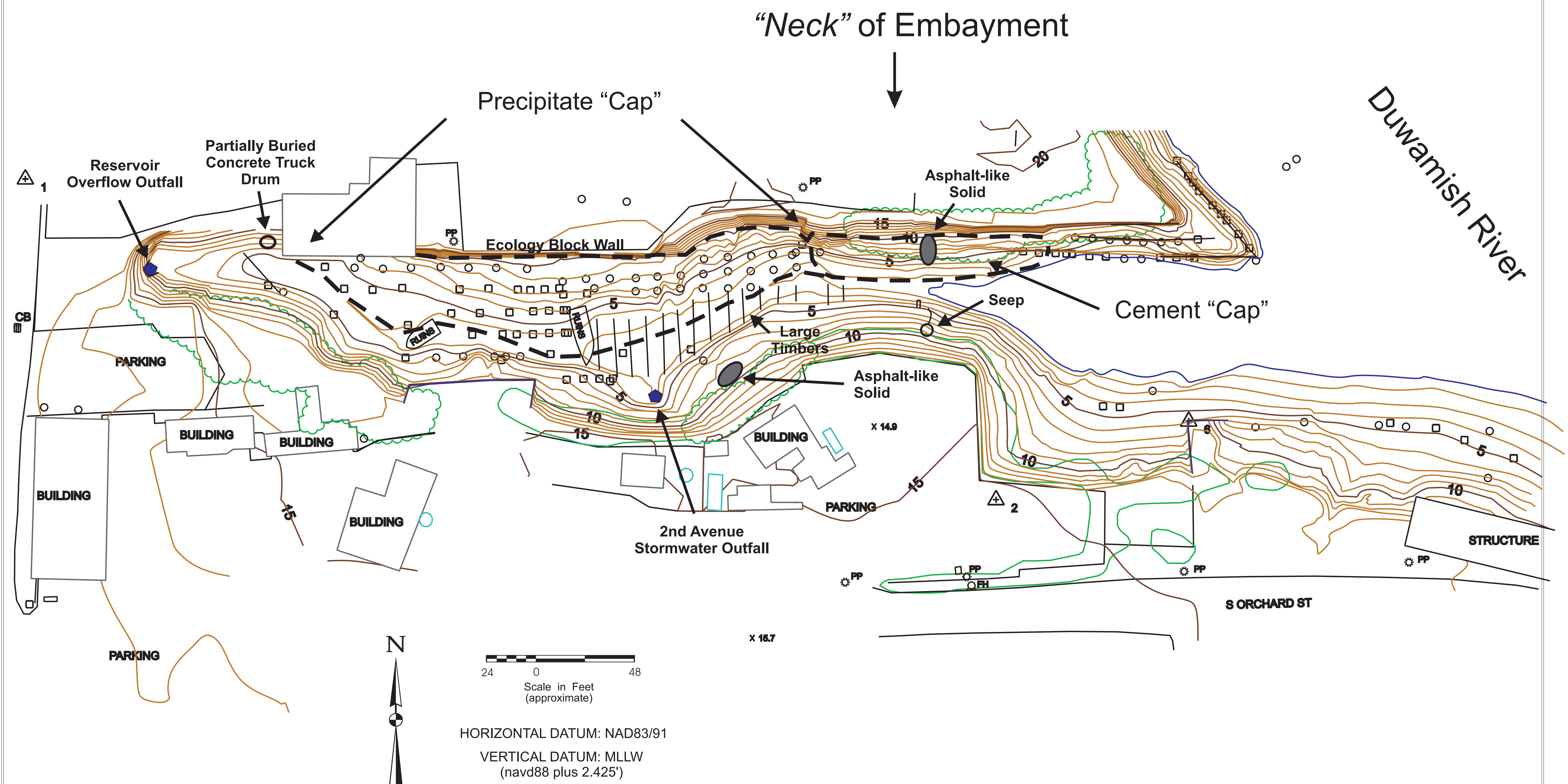
Previous Sampling Locations

SUM-008 (ICS) ***Nov. 2010***

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 13

Ref: ICS-NW Cooperage Sample Loc 12-8-10a.cdr



Legend

○ Pole/Piling	3 △ Photogrammetry Marker
□ Post	CB Catch Basin
PP Power Pole	Public Outfall
X 15.8 Spot Elevation (ft-MLLW)	Tax Parcel Boundary

Ref: ICS-NW Embay Site Recon 9-7-10.cdr

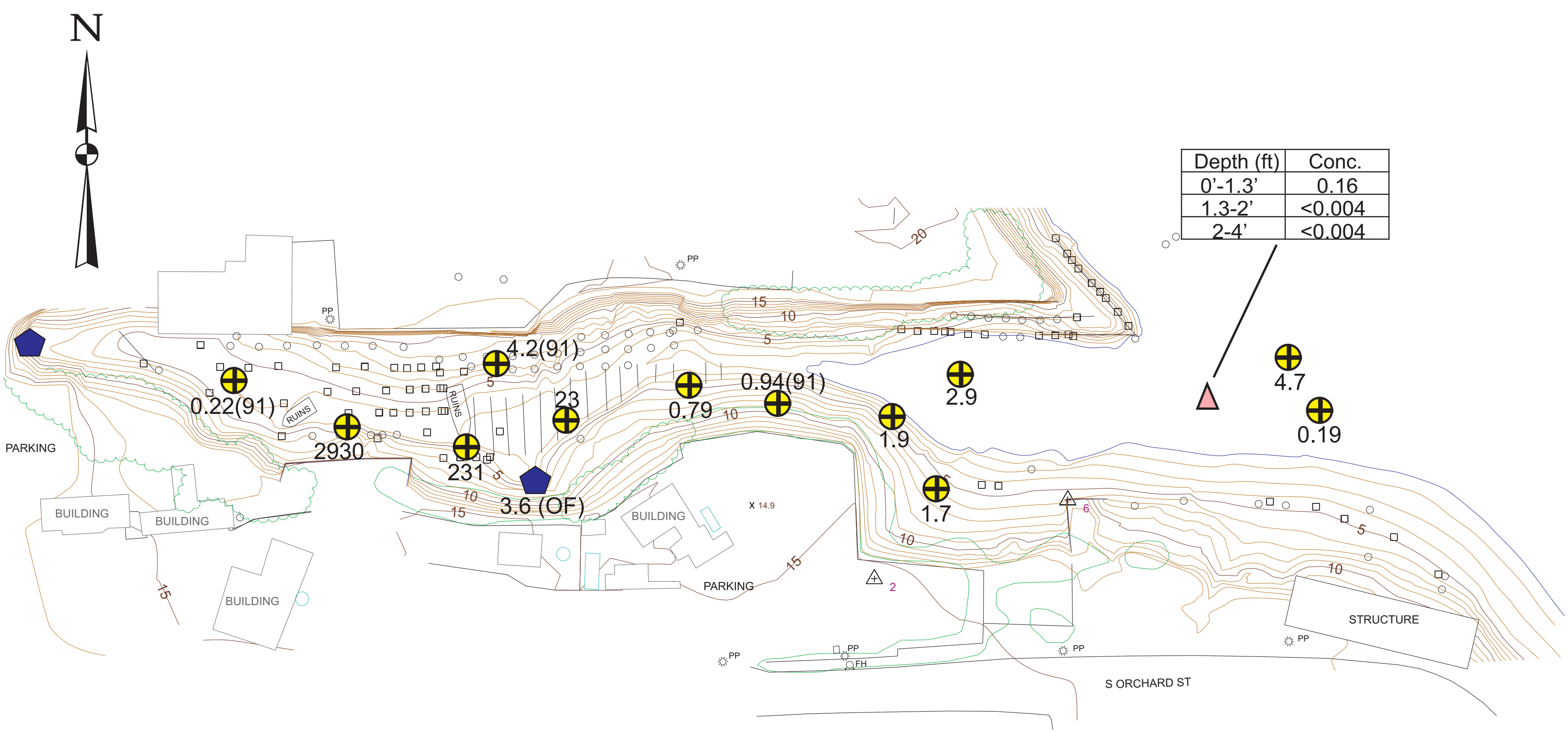
ICS/NW Cooperage Site

Embayment Reconnaissance Observations - Sept. 7, 2010

SUM-008 (ICS) *June 2010*

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 14



40 0 80

Scale in Feet
(approximate)

HORIZONTAL DATUM: NAD83/91

VERTICAL DATUM: MLLW
(navd88 plus 2.425')

Surface Sediment Sample (0 to 10 cm)

Sediment Core

Public Outfall (OF sample collected 1-foot from end of pipe)

2.9 Total Aroclor PCB Conc. (mg/kg-dw)

91 Sample Obtained in 1991

ICS/NW Cooperage Site

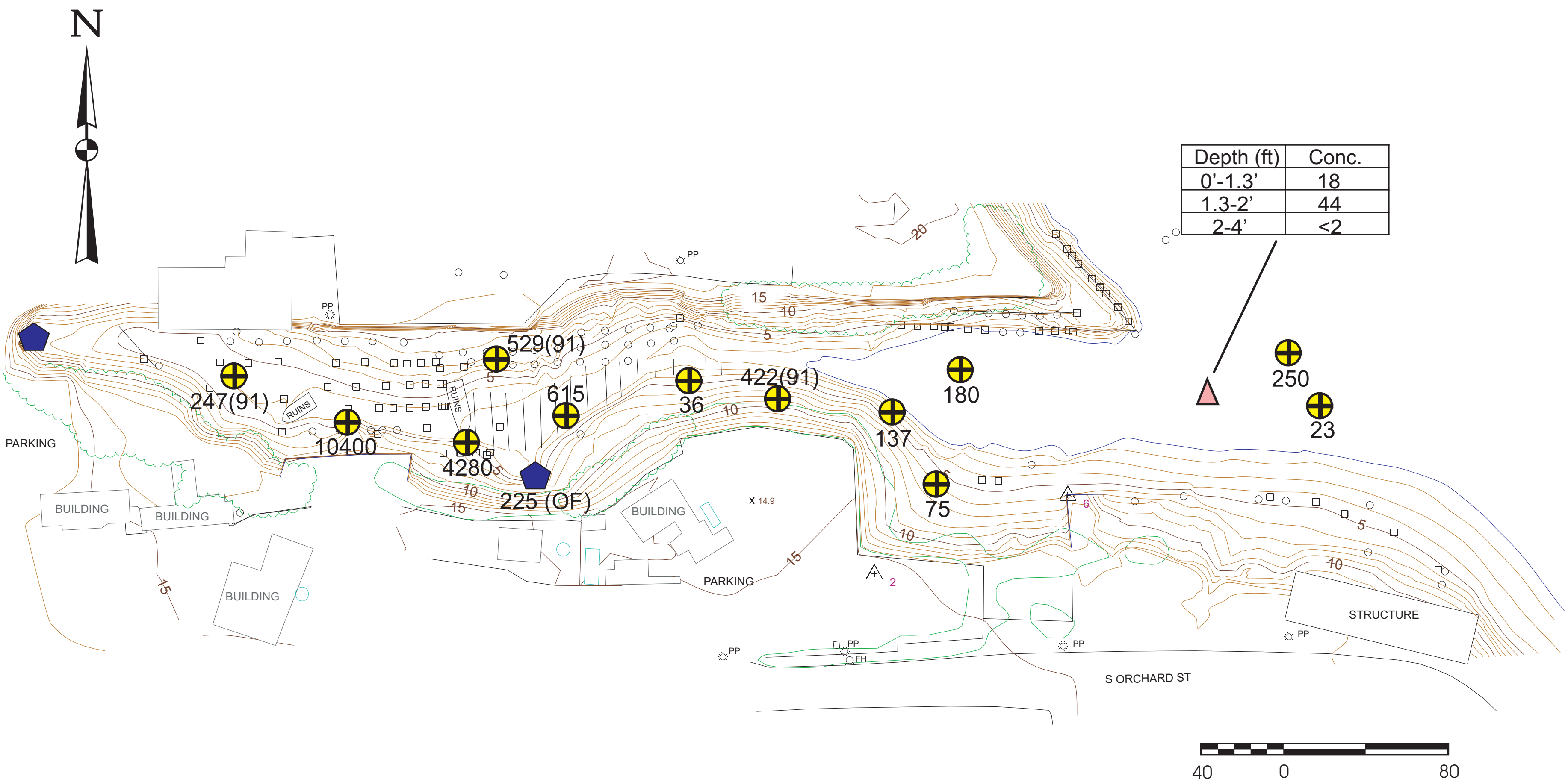
PCBs in Sediment

SUM-008-00 (ICS) *June 2010*

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 15

Embay PCB.cdr



Surface Sediment Sample (0 to 10 cm)

Sediment Core

Public Outfall (OF sample
collected 1-foot from end of pipe)

2.9 Lead Conc. (mg/kg-dw)

91 Sample Obtained in 1991

HORIZONTAL DATUM: NAD83/91

VERTICAL DATUM: MLLW
(navd88 plus 2.425')

ICS/NW Cooperage Site

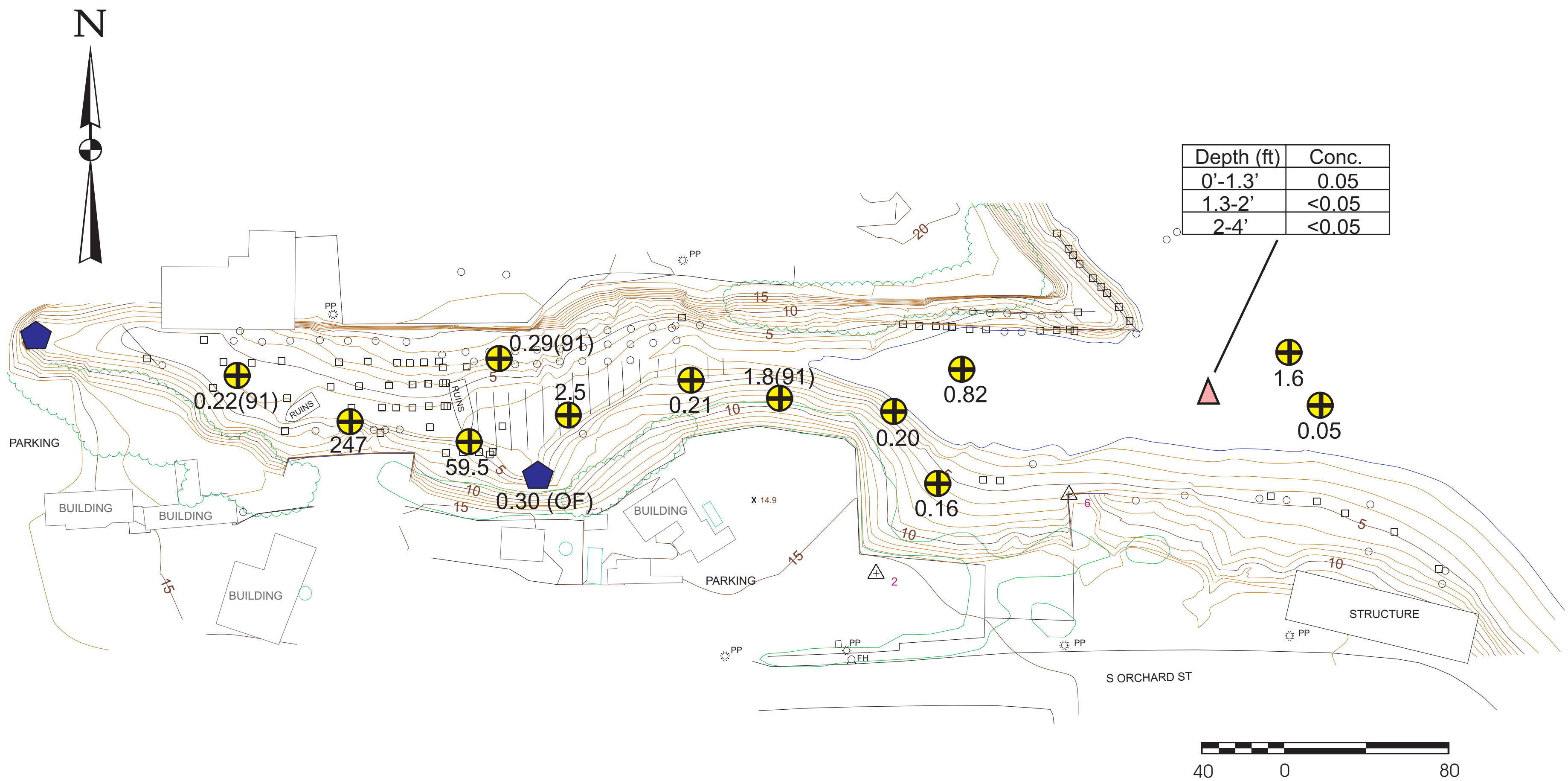
Lead in Sediment

SUM-008-00 (ICS) ***June 2010***

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 16

Embay Lead.cdr



HORIZONTAL DATUM: NAD83/91

VERTICAL DATUM: MLLW
(navd88 plus 2.425')

Surface Sediment Sample (0 to 10 cm)

Sediment Core

Public Outfall (OF sample collected 1-foot from end of pipe)

2.9 Lead Conc. (mg/kg-dw)

91 Sample Obtained in 1991

ICS/NW Cooperage Site

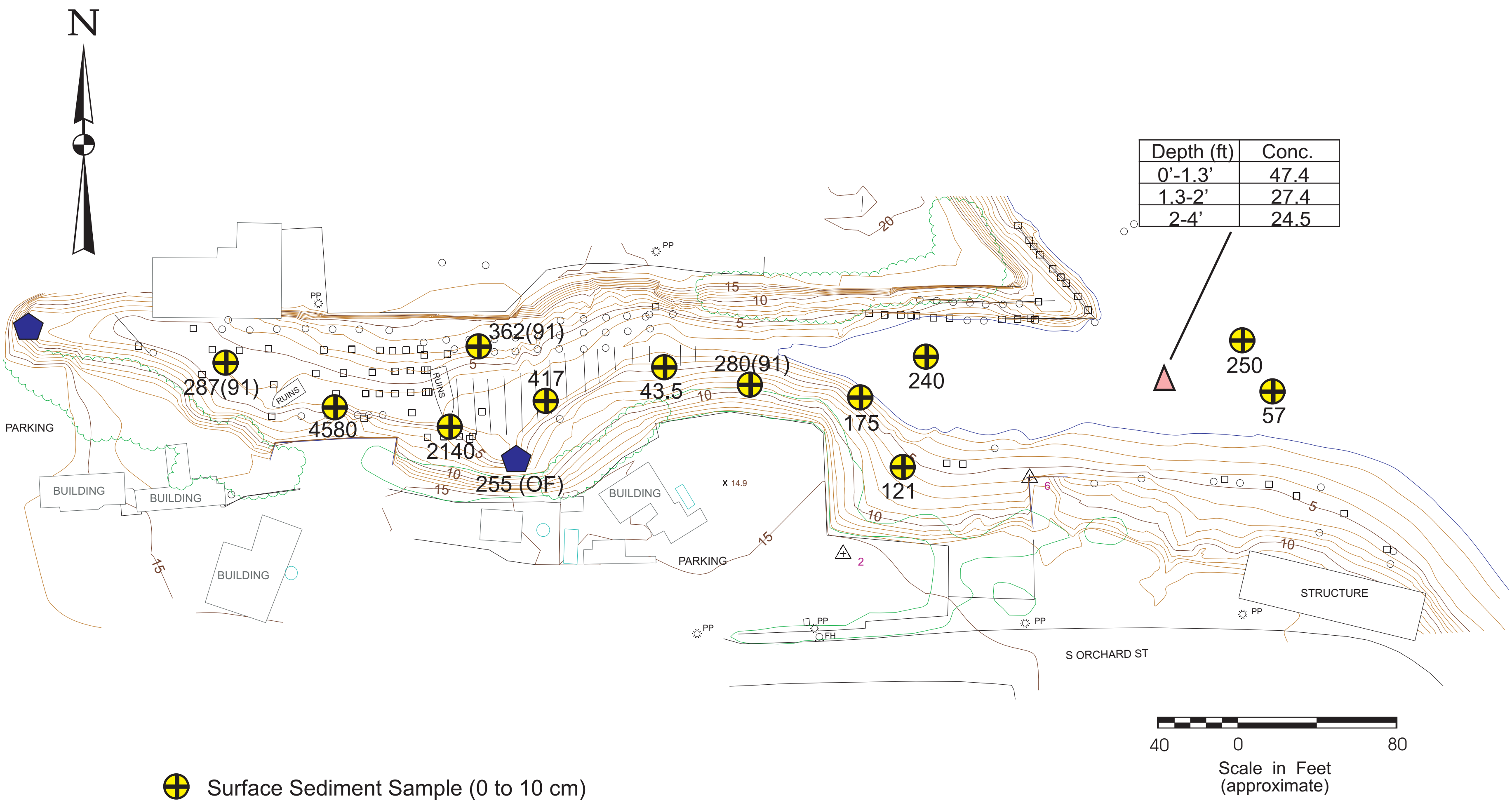
Mercury in Sediment

SUM-008-00 (ICS) ***June 2010***

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 17

Embay Mercury.cdr



Surface Sediment Sample (0 to 10 cm)

Sediment Core

Public Outfall (OF sample collected 1-foot from end of pipe)

2.9 Lead Conc. (mg/kg-dw)

91 Sample Obtained in 1991

ICS/NW Cooperage Site

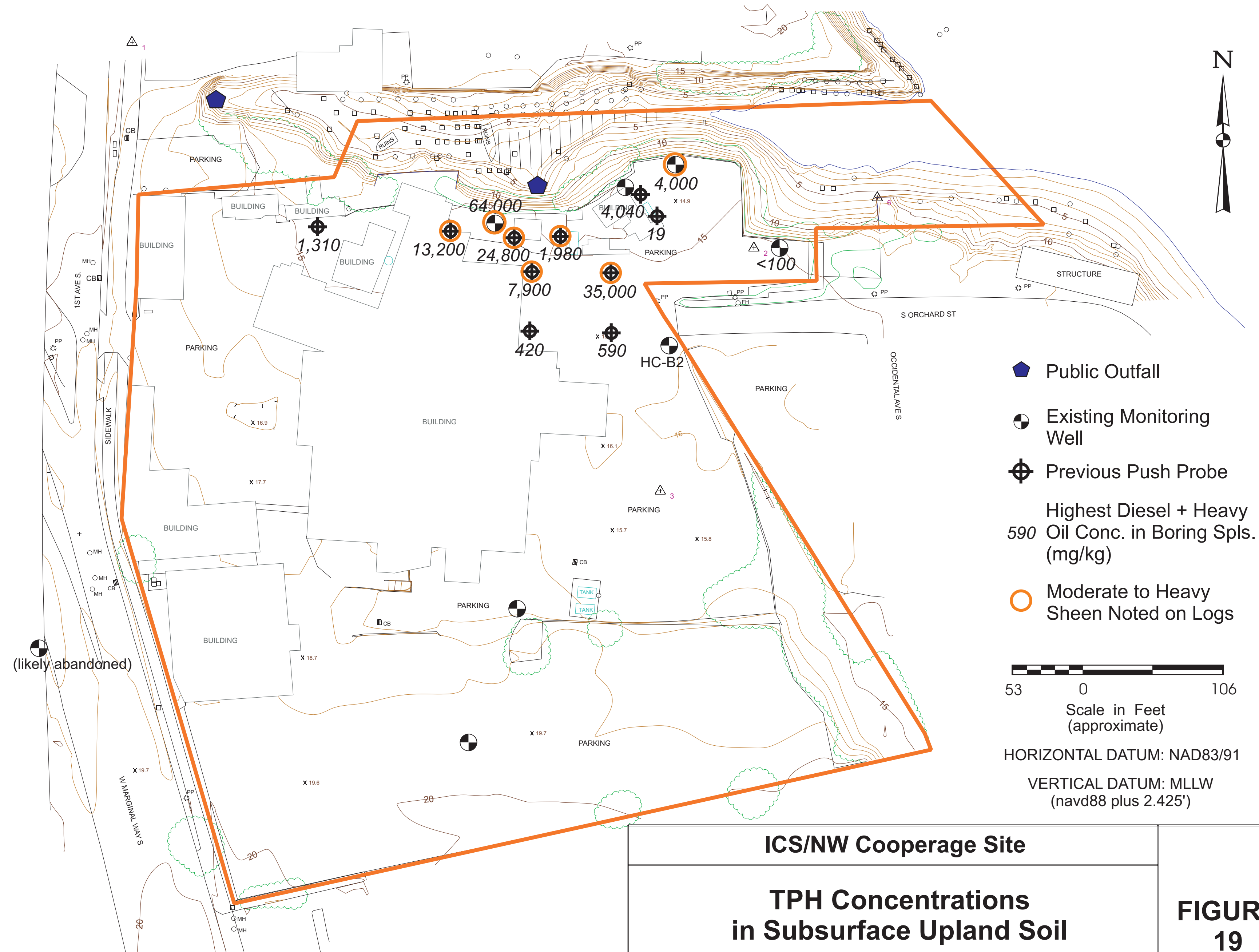
Zinc in Sediment

SUM-008-00 (ICS) ***June 2010***

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 18

Embay Zinc.cdr



ICS/NW Cooperage Site

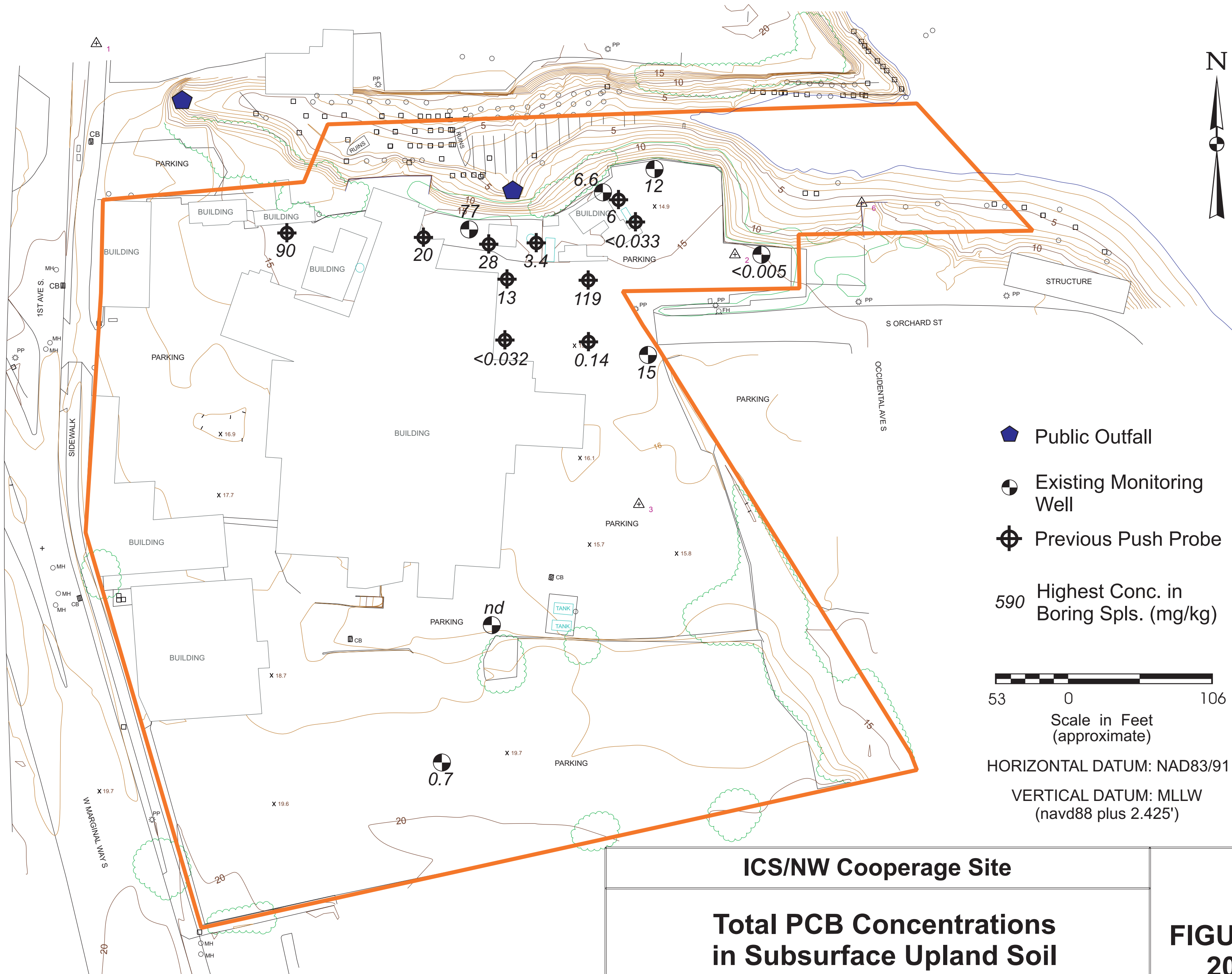
TPH Concentrations in Subsurface Upland Soil

SUM-008-00 (ICS) *June 2010*

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 19

Ref: Soil TPH Conc.cdr



ICS/NW Cooperage Site

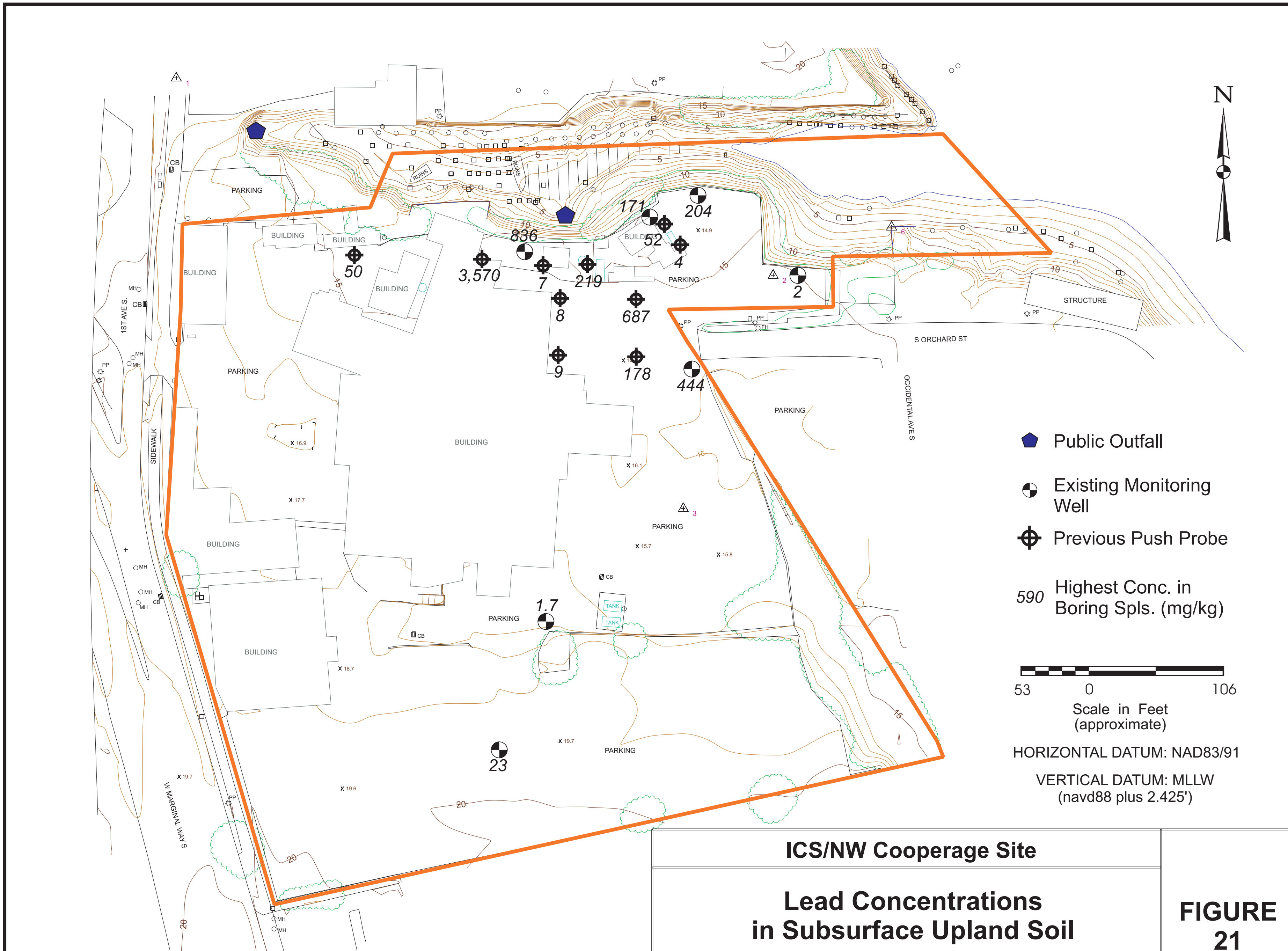
Total PCB Concentrations in Subsurface Upland Soil

SUM-008-00 (ICS) *June 2010*

FIGURE 20

Dalton, Olmsted & Fuglevand, Inc.

Ref: Soil PCB Conc.cdr



ICS/NW Cooperage Site

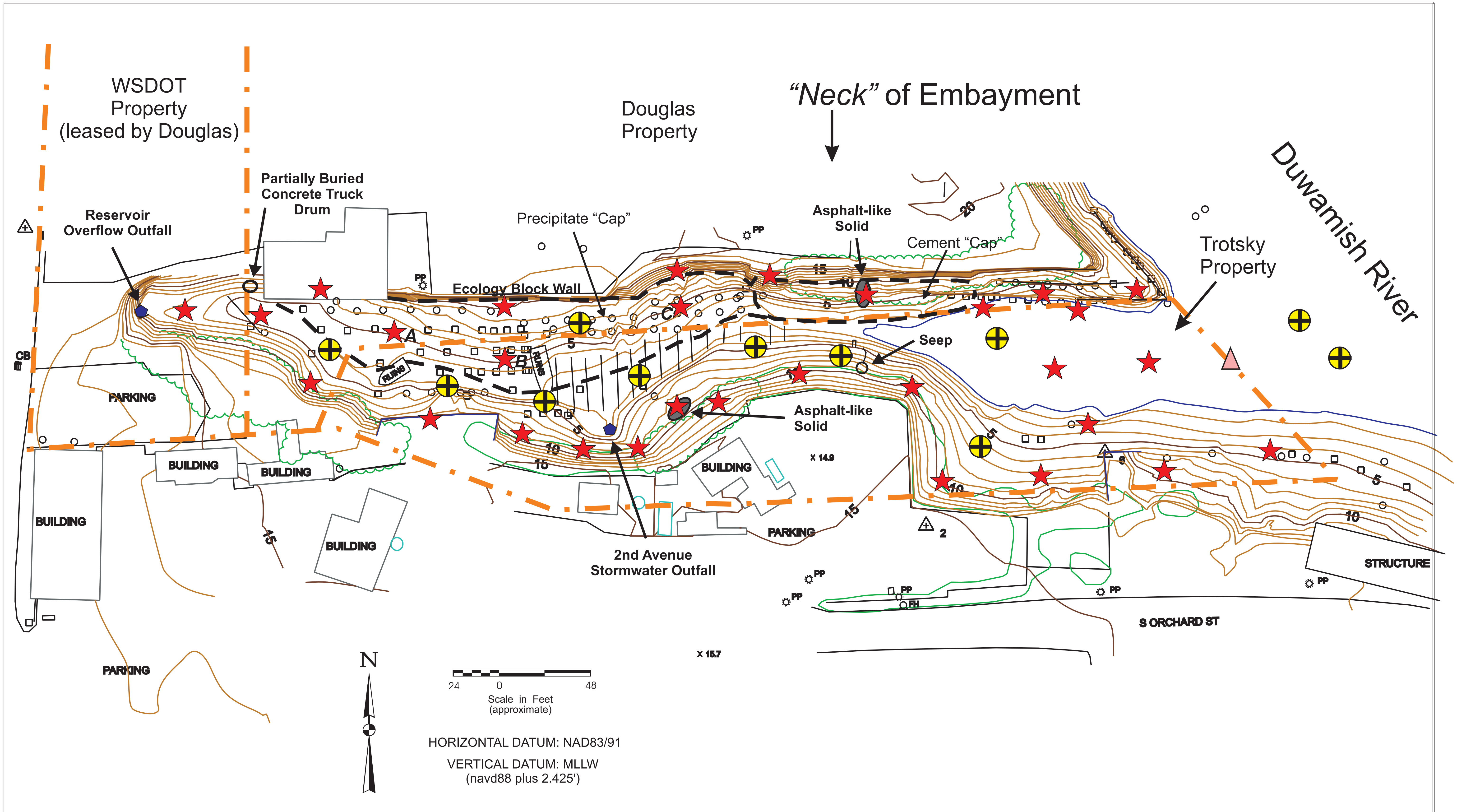
Lead Concentrations in Subsurface Upland Soil

SUM-008-00 (ICS) *June 2010*

FIGURE 21

Dalton, Olmsted & Fuglevand, Inc.

Ref: Soil Lead Conc.cdr



Legend

Note: WSDOT - Washington State Department of Transportation

- ○ Pole/Piling
- □ Post
- PP Power Pole
- X 15.8 Spot Elevation (ft-MLLW)
- 3 Photogrammetry Marker
- CB Catch Basin
- Public Outfall
- Tax Parcel Boundary
- Previous Surface Sediment Sample (0 to 10 cm)
- Previous Sediment Core
- Proposed Conceptual Surface Sediment Sample Location

ICS/NW Cooperage Site

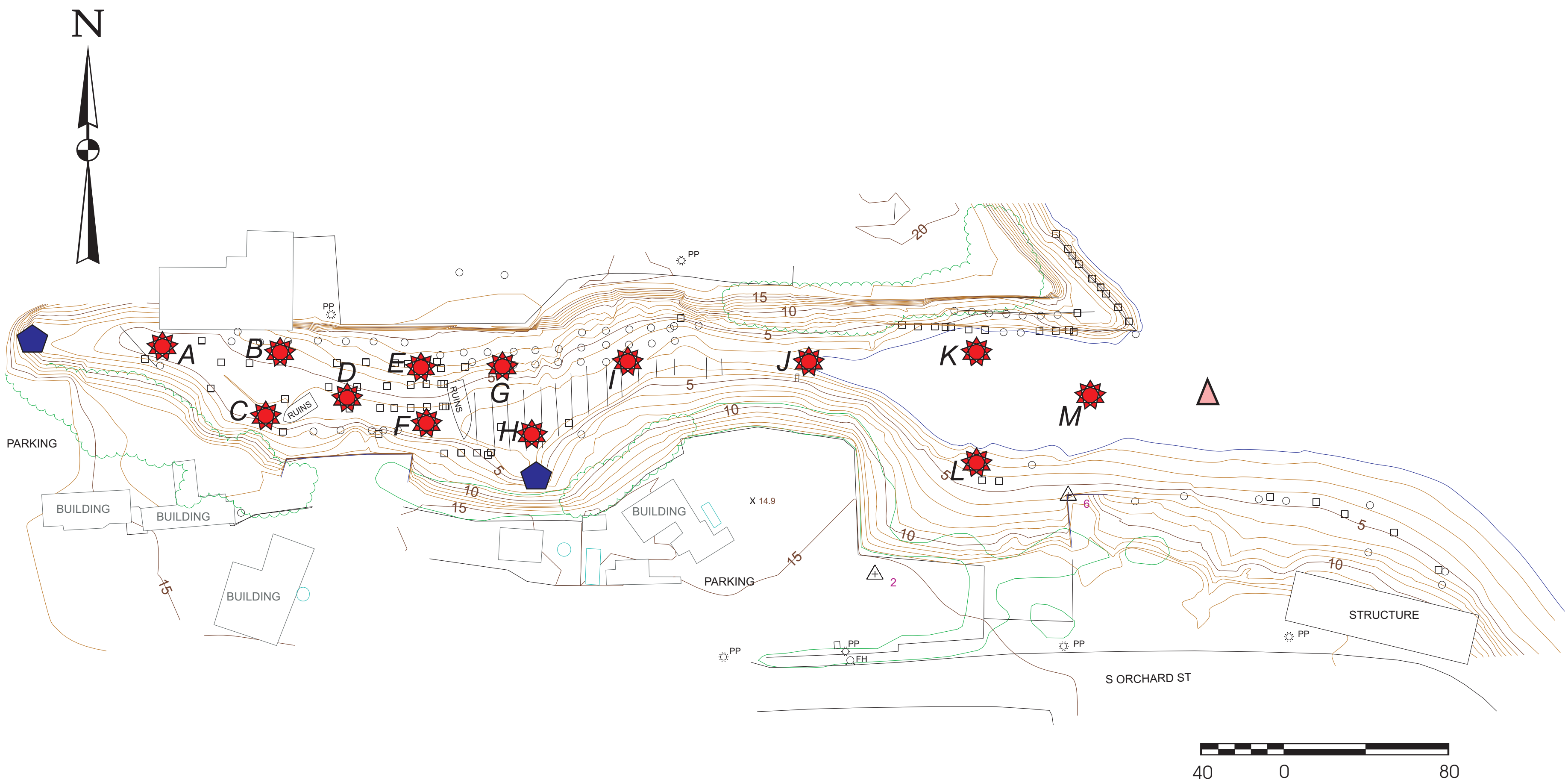
Embayment Proposed Surface Sediment Sampling Locations

SUM-008 (ICS) *Jan. 2011*

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 22

Ref: Embay Prop Sur Spls Reconn Base Rev 7-14-11.cdr



Previous Surface Sediment Sample (0 to 10 cm)

Previous Sediment Core

Public Outfall

Proposed Conceptual Sediment Core Location

HORIZONTAL DATUM: NAD83/91

VERTICAL DATUM: MLLW
(navd88 plus 2.425')

ICS/NW Cooperage Site

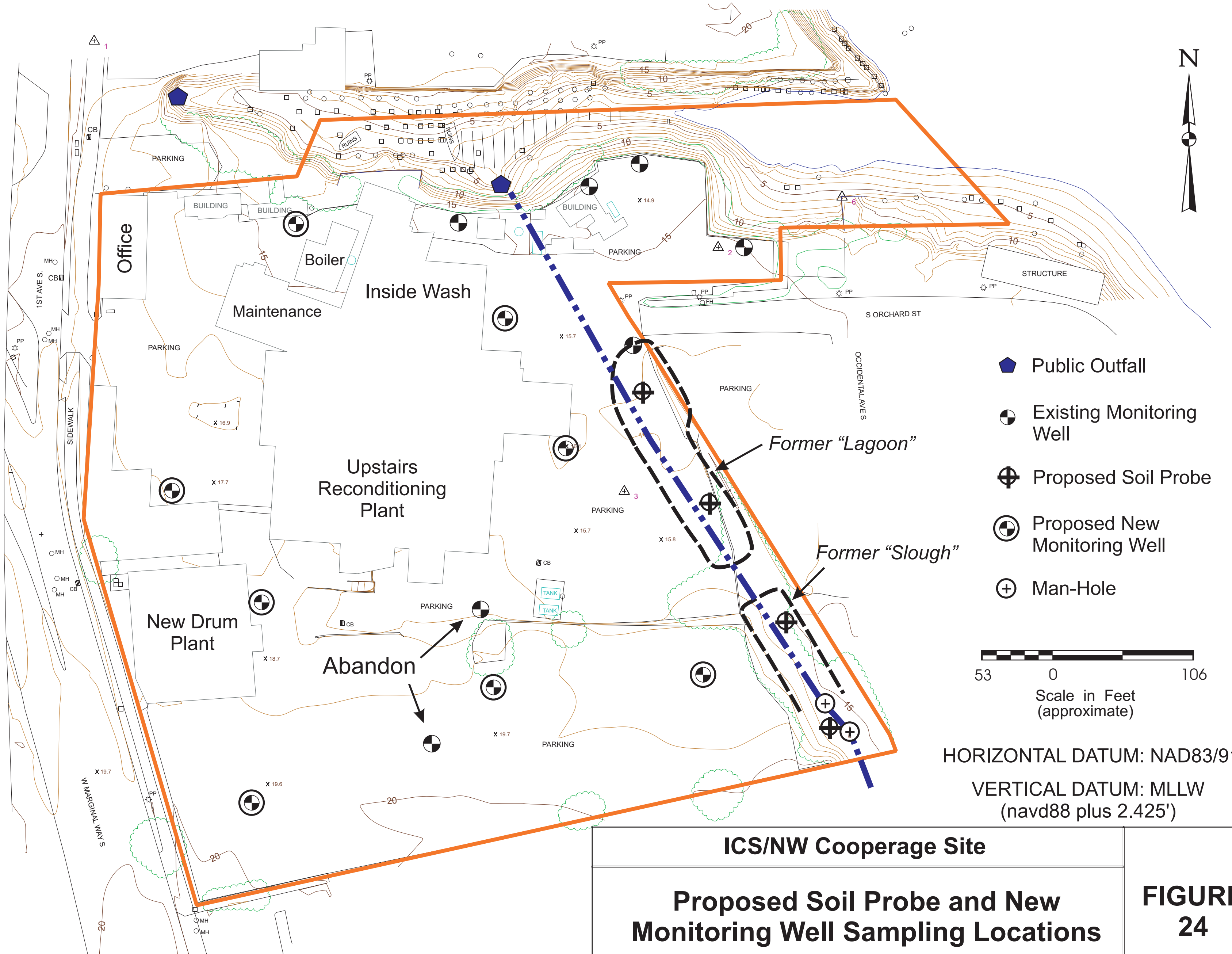
Proposed Sediment Core Locations

SUM-008-00 (ICS) ***June 2010***

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 23

Embay Prop Core Loc.cdr



ICS/NW Cooperage Site

Proposed Soil Probe and New Monitoring Well Sampling Locations

SUM-008-00 (ICS) ***July 2011***

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 24

Ref: Prop New Wells Rev 7-14-11 rpt.cdr

APPENDIX A
BORING AND WELL LOGS
ICS/NW Cooperage Site

Key to Exploration Logs

Sample Descriptions

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 - 4	Very soft	0 - 2	<0.125
Loose	4 - 10	Soft	2 - 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 - 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 - 15	0.5 - 1.0
Very dense	>50	Very stiff	15 - 30	1.0 - 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents

Minor Constituents	Estimated Percentage
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

Sampling

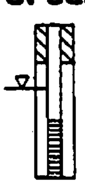
BORING SAMPLES

- ⊠ Split Spoon
- ⧅ Shelby Tube
- ▥ Cuttings
- ◫ Core Run
- * No Sample Recovery
- P Tube Pushed, Not Driven

TEST PIT SAMPLES

- ⊠ Grab (Jar)
- ⧄ Bag
- ⧅ Shelby Tube

Ground Water Observations



Surface Seal

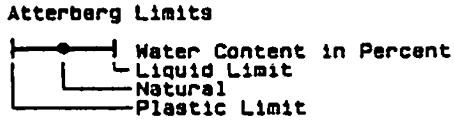
Ground Water Level on Date (ATD) At Time of Drilling

Observation Well Tip or Slotted Section

Ground Water Seepage (Test Pits)

Test Symbols

GS	Grain Size Classification
CN	Consolidation
TUU	Triaxial Unconsolidated Undrained
TCU	Triaxial Consolidated Undrained
TCD	Triaxial Consolidated Drained
QU	Unconfined Compression
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits



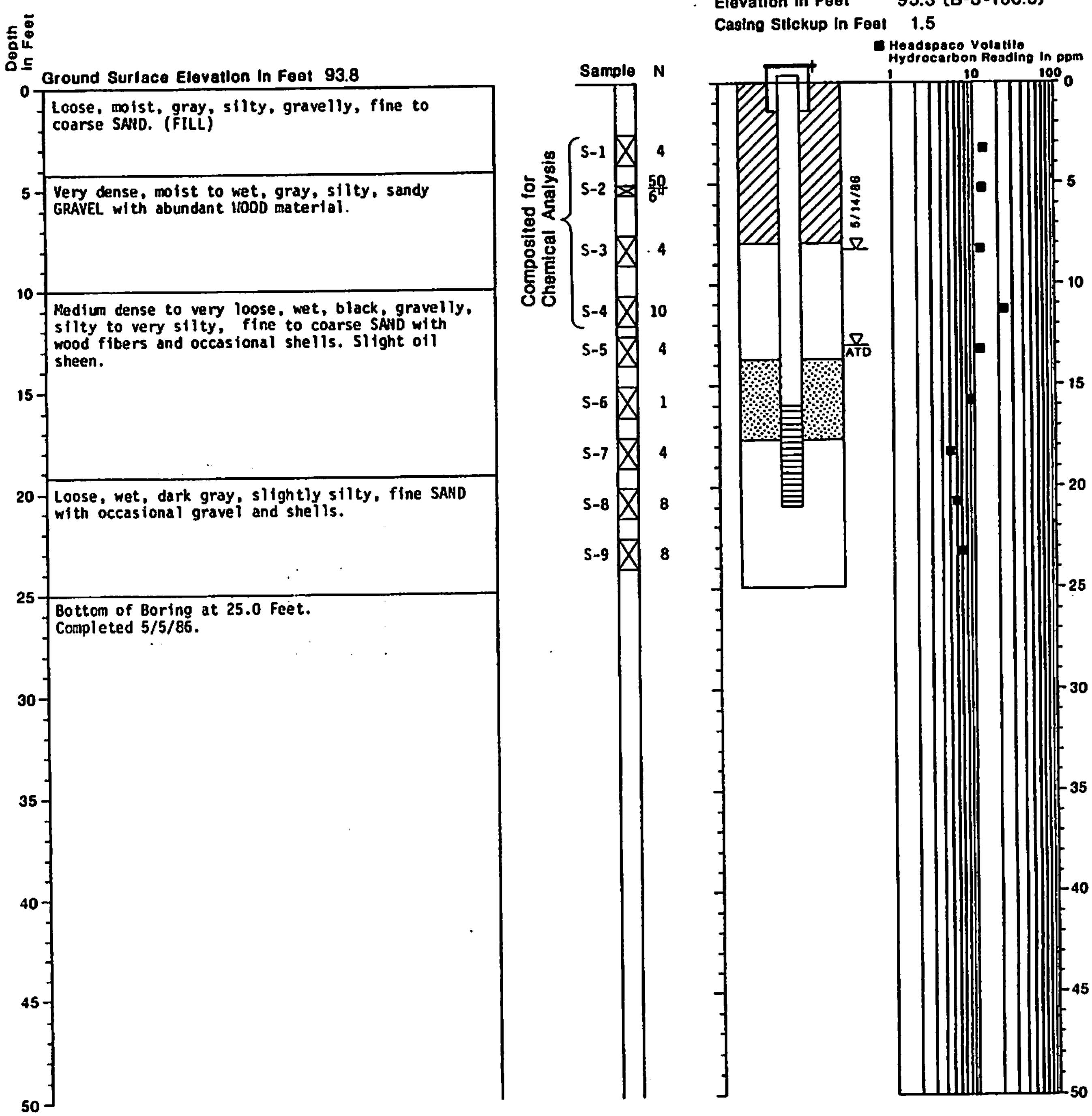
J-1659-03 September 1987

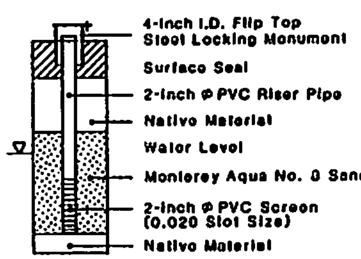
HART-CROWSER & associates, inc.

Figure A-1

HC-81

Boring Log and Construction Data for Well B-1





NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for date indicated and may vary with time of year.
   ATD: At time of drilling
3. Headspace Volatile Hydrocarbon Concentration as measured in jar samples using an H-Nu PI-101 Photoionization Meter with a 10.2 eV Lamp.

☒ 2-inch O.D. Split Spoon Sample Driven by 140-lb. Hammer 30-inch Fall

N Standard Penetration Resistance, Blows per Foot

J-1659 May 1986

HART-CROWSER & associates, inc.

Figure A-2

Boring Log and Construction Data for Well B-1A

HC-81A

Geologic Log

Ground Surface Elevation in Feet 93.8

Depth in Feet	
0–4	(Loose), damp to moist, brown to gray, silty, gravelly SAND and CONCRETE DEBRIS.
4–10.5	(Medium dense), wet, gray, silty, sandy GRAVEL with trace wood.
10.5–20	(Medium dense to loose), wet, gray to black, gravelly, silty, fine to coarse SAND with some wood fibers, with slight oil-like sheen and hydrocarbon-like odor.
20	Bottom of Boring at 20.0 Feet. Completed 9/19/86.

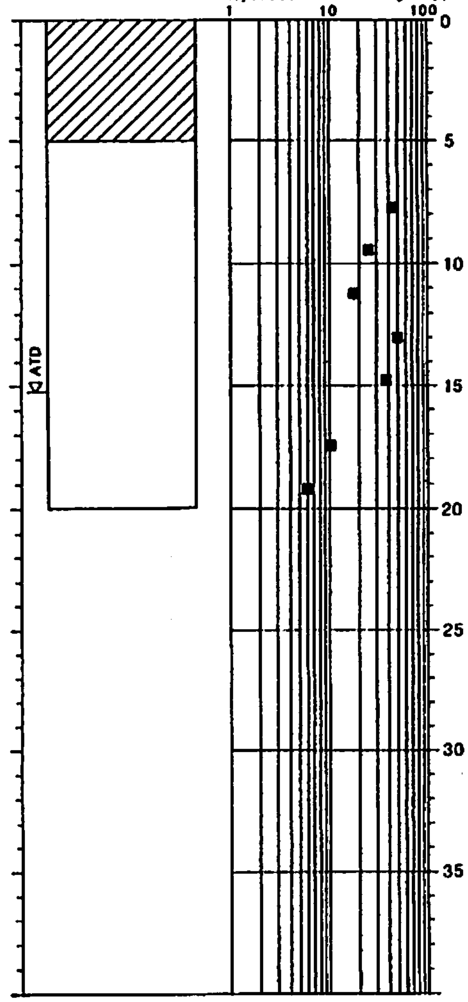
Note: Pulled auger, backfilled with bentonite quick gel powder.

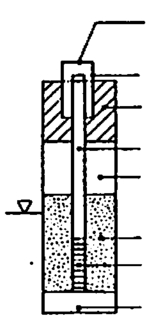
Sample	Blows per Foot
S-1	24
S-2	14
S-3	14
S-4	21
S-5	14
S-6	11
S-7	4
S-8	10

Well Design

Top Casing Relative Elevation in Feet

Casing Stickup in Feet





NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for date indicated and may vary with time of year. ATD: At time of drilling
3. Headspace Volatile Hydrocarbon Concentration as measured in jar samples using an H-Nu PI-101 Photoionization Meter with a 10.2 eV Lamp.

☒ 2-1/2 Inch I.D. Split Spoon Sample Driven by 140-lb. Hammer, 30-inch Fall

J-1659 September 1986

HART-CROWSER & associates, inc.

Figure A-3

Boring Log and Construction Data for Well B-2

HC-B2

Geologic Log

Ground Surface Elevation in Feet 94.4

Depth in Feet	
0	Loose to medium dense, wet to moist, brown to gray, gravelly, silty, fine to coarse SAND. (FILL)
5	Turning black with slight hydrocarbon-like odor.
	Slight oil sheen present.
10	Very loose, wet, black, slightly gravelly, silty to very silty, fine to coarse SAND with wood. Slight oil sheen present.
	Decomposed WOOD and charoal-like material.
16	Loose, wet, dark gray, silty SAND with wood fiber. (FILL?)
23.5	Very loose, wet, tan, very silty, fine SAND.
25	Bottom of Boring at 25.0 Feet. Completed 5/5/86.

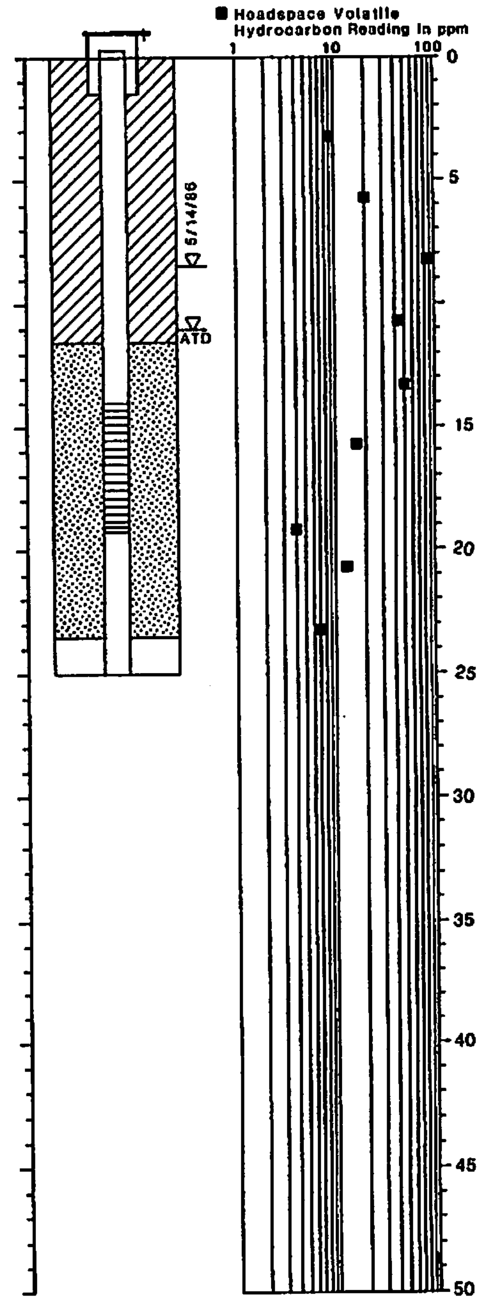
Sample	N
S-1	8
S-2	18
S-3	15
S-4	2
S-5	2
S-6	2
S-7	5
S-8	4
S-9	3

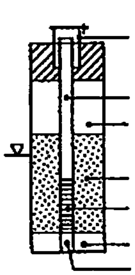
Composited for Chemical Analysis (S-1 to S-3)

Well Design

Top Casing Relative Elevation in Feet 95.4 (B-3 = 100.0)

Casing Stickup in Feet 1.0





NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for date indicated and may vary with time of year.
   ATD: At time of drilling
3. Headspace Volatile Hydrocarbon Concentration as measured in jar samples using an H-Nu PI-101 Photoionization Meter with a 10.2 eV Lamp.

⊠ 2-inch O.D. Split Spoon Sample Driven by 140-lb. Hammer 30-inch Fall

N Standard Penetration Resistance, Blows per Foot

J-1659 May 1986

HART-CROWSER & associates, inc.

Figure A-4

Boring Log and Construction Data for Well B-2A *HC-B2A*

Geologic Log

Depth In Feet

Ground Surface Elevation in Feet 94.4

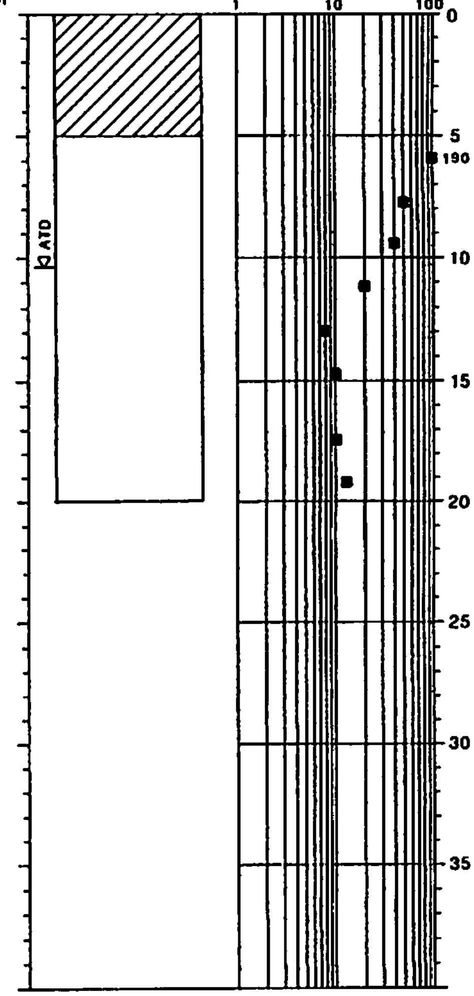
Depth (ft)	Description	Sample	Blows per Foot
0–10	(Medium dense to loose), damp to wet, brown to black, gravelly, silty, fine to coarse SAND with slight to moderate hydrocarbon-like odor. (FILL)	S-1 S-2 S-3	43 35 8
10–15.5	(Very loose to medium dense), wet, black, slightly silty to very silty, fine SAND with wood and trace plant material, with slight to moderate hydrocarbon-like odor and slight oil-like sheen. (FILL)	S-4 S-5 S-6	3 16 20
15.5–19	(Medium dense), wet, black to dark brown, silty, fine SAND with pieces of glass and wood. (FILL)	S-7	12
19–20	(Medium dense), wet, brown, silty, fine SAND.	S-8	14

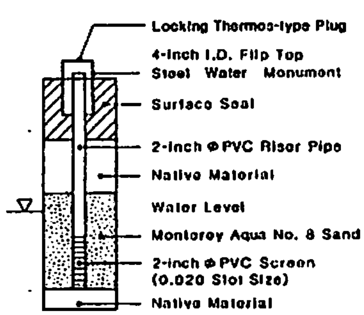
Bottom of Boring at 20.0 Feet.
Completed 9/19/86.

Well Design

Top Casing Relative Elevation in Feet

Casing Stickup in Feet





NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for date indicated and may vary with time of year. ATD: At time of drilling
3. Headspace Volatile Hydrocarbon Concentration as measured in jar samples using an H-Nu PI-101 Photoionization Meter with a 10.2 eV Lamp.

☒ 2-1/2 inch I.D. Split Spoon Sample Driven by 140-lb. Hammer, 30-inch Fall

J-1659 September 1986

HART-CROWSER & associates, inc.

Figure A-5

Boring Log and Construction Data for Well B-3

HCB-3

Geologic Log

Depth in Feet

Ground Surface Elevation in Feet 99.0

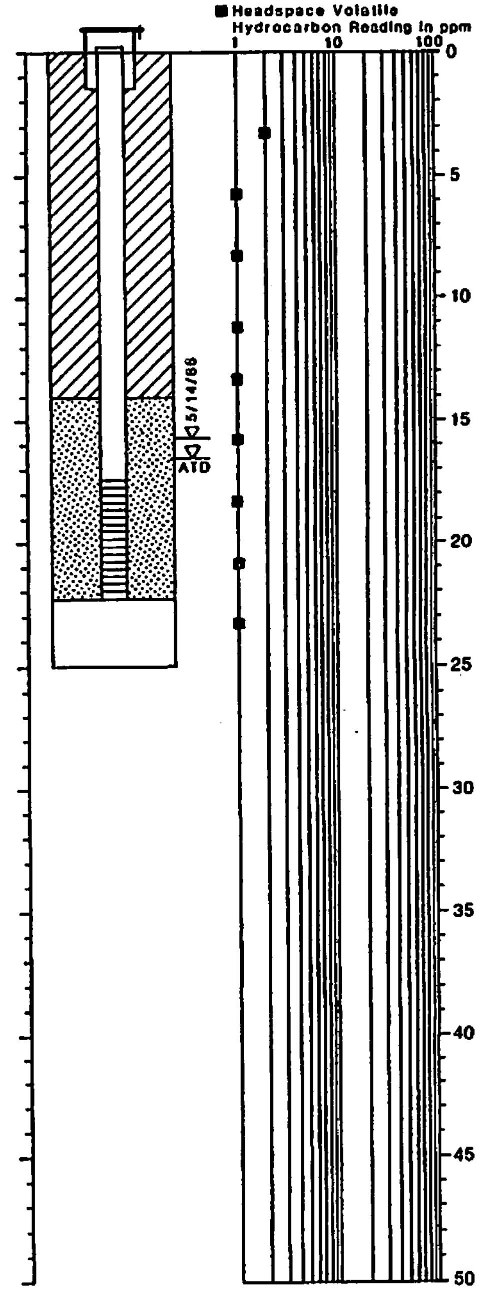
Depth (ft)	Description
0–7	Medium dense to loose, moist to wet, brown to gray, very silty to silty, fine SAND with occasional gravel. (FILL)
7–14.5	Soft, wet, gray, clayey, very fine sandy SILT with wood and plant material.
13	Abundant wood and plant material.
14.5–25	Medium dense to dense, wet, gray, slightly silty, fine SAND.
25	Bottom of Boring at 25.0 Feet. Completed 5/6/86.

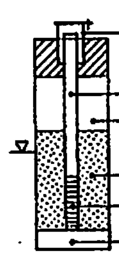
Sample	N
S-1	10
S-2	8
S-3	2
S-4	2
S-5	3
S-6	23
S-7	25
S-8	21
S-9	48

Well Design

Top Casing Relative Elevation in Feet 100.0 (Arbitrary)

Casing Stickup in Feet 1.5





NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for date indicated and may vary with time of year.
   ATD: At time of drilling
3. Headspace Volatile Hydrocarbon Concentration as measured in jar samples using an H-Nu PI-101 Photoionization Meter with a 10.2 eV Lamp.

☒ 2-inch O.D. Split Spoon Sample Driven by 140-lb. Hammer 30-inch Fall

N Standard Penetration Resistance, Blows per Foot

J-1659 May 1986

HART-CROWSER & associates, inc.

Figure A-6

Boring Log and Construction Data for Well B-4

HC-B4

Well Design

Top Casing Relative Elevation in Feet 99.0

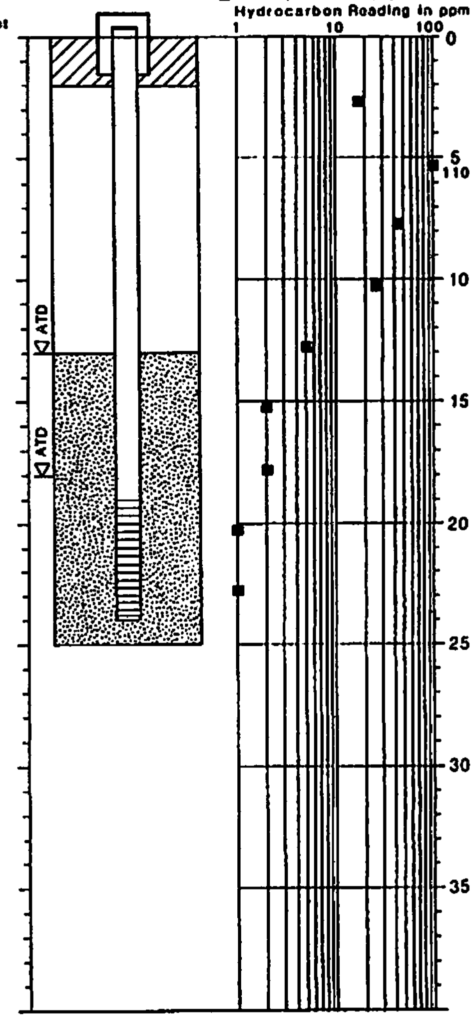
Casing Stickup in Feet 0.5

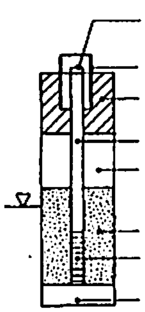
Geologic Log

Ground Surface Elevation in Feet 98.5

Depth in Feet	Description
0–9.5	(Medium dense), damp to moist, brown to gray, slightly silty, fine SAND.
9.5–13.5	(Medium stiff), wet, gray to brownish gray, very sandy SILT with some 1/2 to 2-inch layers of black decomposed to brown decomposed grass-like plant material and sandy SILT.
13.5–25	(Medium dense), wet, gray, slightly silty to clean, fine to medium SAND with trace grass-like plant material.
25	Bottom of Boring at 25.0 Feet. Completed 9/18/86.

Sample	Blows per Foot
S-1	22
S-2	16
S-3	15
S-4	5
S-5	4
S-6	22
S-7	33
S-8	24
S-9	20





NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for date indicated and may vary with time of year. ATD: At time of drilling
3. Headspace Volatile Hydrocarbon Concentration as measured in jar samples using an H-Nu PI-101 Photoionization Meter with a 10.2 eV Lamp.

☒ 2-1/2 inch I.D. Split Spoon Sample Driven by 140-lb. Hammer, 30-inch Fall

J-1659-03 September 1986

HART-CROWSER & associates, inc.

Figure A-7

Boring Log and Construction Data for Well B-5

HCB5

Geologic Log

Ground Surface Elevation in Feet 94.8

(Medium dense), damp, brown, silty, fine SAND with 1/2 to 4 inch wet, gray, very silty, fine SAND lenses.

(Medium stiff), wet, gray, clayey, very sandy SILT with some slightly decomposed grass-like plants, roots and occasional pieces of wood.

(Loose to medium dense), wet, brownish gray to gray, very silty to silty, fine SAND with 1/4 inch clay laminations with trace plant roots.

(Medium dense to dense), wet, gray, silty to clean, fine to coarse SAND.

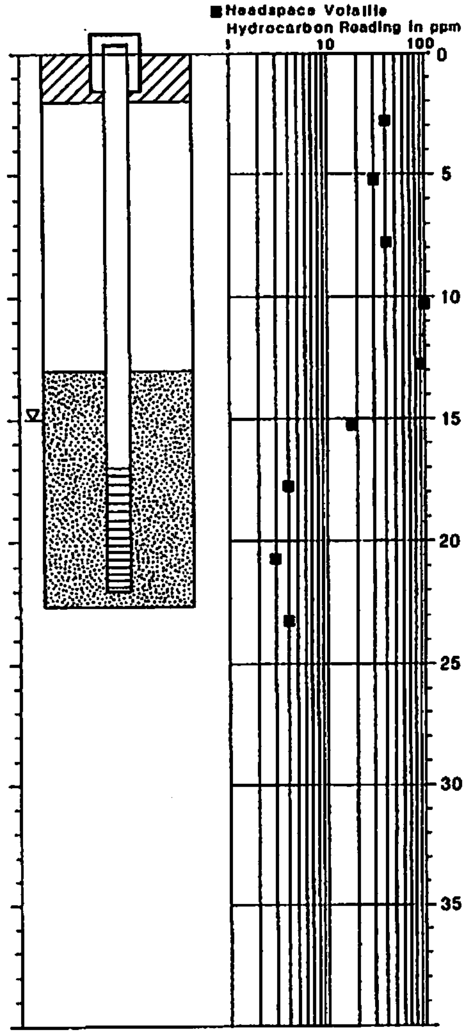
Bottom of Boring at 24.0 Feet.
Completed 9/18/86.

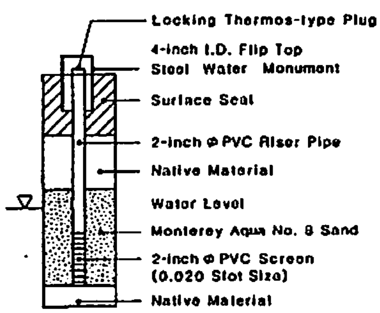
Sample	Blows per Foot
S-1	21
S-2	13
S-3	4
S-4	6
S-5	6
S-6	10
S-7	21
S-8	20
S-9	42

Well Design

Top Casing Relative Elevation in Feet 95.3

Casing Stickup in Feet 0.5





NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for date indicated and may vary with time of year. ATD: At time of drilling
3. Headspace Volatile Hydrocarbon Concentration as measured in jar samples using an H-Nu PI-101 Photoionization Meter with a 10.2 eV Lamp.

☒ 2-1/2 Inch I.D. Split Spoon Sample Driven by 140-lb. Hammer, 30-inch Fall

J-1659-03 September 1986

HART-CROWSER & associates, inc.

Figure A-8

SAIC

SOIL BORING LOG

BORING No: **MW-1**

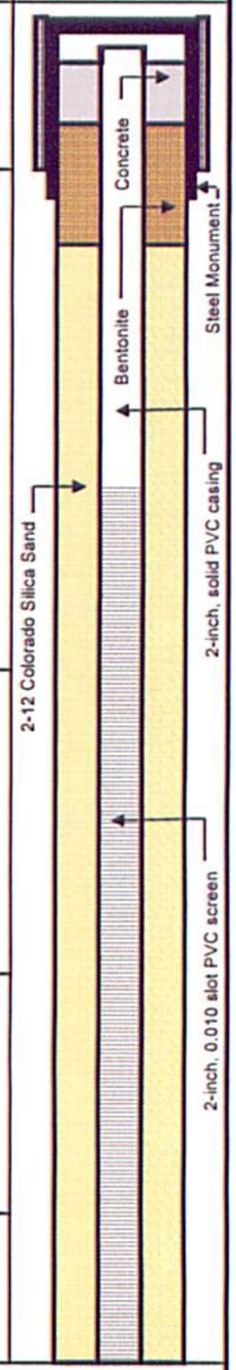
PROJECT: EAA-2
LOCATION: 7152 1st Ave S, Seattle, WA
CLIENT: Department of Ecology
DATE: 04/23/07
LOGGED BY: Tina King

DRILLER: Cascade Drilling, Inc.
DRILL METHOD: Concrete Core/Hollow-stem Auger
SAMPLE METHOD: Split Spoon
HOLE DIAMETER: 8.25 inches
HOLE DEPTH: 25.5

WELL DIAMETER: 2-inch
WELL DEPTH: 24 feet
WELL CASING: 2-inch PVC, Schedule 40
WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
FILTER PACK: 2-12 Colorado Silica Sand
CASING ELEVATION: 12.54'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
				0–1.4	Concrete	16 inches of Concrete
--	4.7	4 4 2		2.5–4	SM	Gray and brown silty fine to medium SAND with occassional coarse sand and fine gravel (dry, very loose), slight sheen, slight odor.
MW-1-5	131	9 11 23		5–6.5	CL	Black silty CLAY with medium to coarse sand and fine gravel (moist, Stiff), heavy sheen, strong odor.
--	202	14 20 29		7.5–9	CL	Grades to a moderate sheen.
				8–10	ML	Gray Sand SILT (moist, very stiff), slight sheen, strong odor.
--	50.1	32 30 39		10–11.5	SM/ML	Gray silty fine SAND (moist, very dense), slight sheen, slight odor.

Well Completion Details



SAIC

SOIL BORING LOG

BORING No: **MW-1**

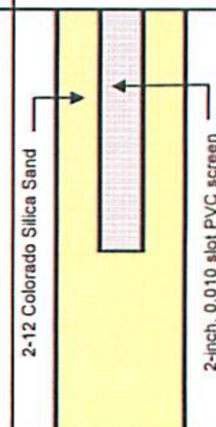
PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 25.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.54'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Well Completion Details
							SM/ ML	Gray silty fine SAND (moist, very dense), slight sheen, slight odor.	
			▽			12			
MW-1-12.5	52.4	39 50/ 5"				13		Gray fine sandy SILT, trace clay (wet, hard), slight sheen, slight odor.	
						14	ML		
--	50.8	22 29 26				15 16		As above, grading to no clay and increasing sand, no odor.	2-12 Colorado Silica Sand
--	2.6	30				17 18 19	SM	Dark gray silty fine SAND (moist, medium dense), no sheen, no odor.	2-inch, 0.010 slot PVC screen
--	6.5	27 50/4"				20 21 22	SP	Gray fine SAND with trace silt (wet, very dense), no sheen, no odor.	

SAIC	SOIL BORING LOG	BORING No: **MW-1**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 25.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.54'

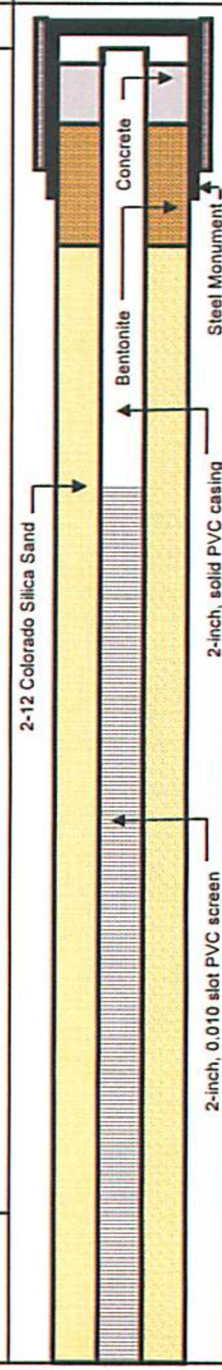
Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Well Completion Details
								Gray fine SAND with trace silt (wet, very dense), no sheen, no odor.	
--	55.6	50/5"				23			
						24	SP		
--	0	50/6"				25		Same as above.	
						26			
						27			
						28			
						29			
						30			
						31			
						32			
						33			



SAIC	SOIL BORING LOG	BORING No: **MW-2** PAGE 1 of 3
PROJECT: EAA-2 LOCATION: 7152 1st Ave S, Seattle, WA CLIENT: Department of Ecology DATE: 04/23/07 LOGGED BY: Tina King	DRILLER: Cascade Drilling, Inc. DRILL METHOD: Concrete Core/Hollow-stem Auger SAMPLE METHOD: Split Spoon HOLE DIAMETER: 8.25 inches HOLE DEPTH: 26.5	WELL DIAMETER: 2-inch WELL DEPTH: 24 feet WELL CASING: 2-inch PVC, Schedule 40 WELL SCREEN: 0.010-inch slot, 2-24 feet bgs FILTER PACK: 2-12 Colorado Silica Sand CASING ELEVATION: 12.01'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
						0	Con	5 inches of Concrete
						2		Slight petroleum odor at 2 feet.
--	37.2	47 50/6"		■	■	2.5–3.5		Black silty GRAVEL with sand (moist, very dense), slight sheen, slight odor.
--	71.1	50/2"		■	■	5	GM	Same as above, grades to with wood debris, little sand and occassional cobbles (moist, very dense), heavy sheen, strong odor.
MW-2-7.5	101	50/6"	▽	■	■	7.5–8		Dark brown and black silty GRAVEL: with shredded wood pieces and organics (wet, very dense), heavy sheen, strong odor.
MW-2-10	45.1	11 11 12		■	■	10–11	SM	Dark Brown silty fine to coarse SAND with occassional fine gravel. Top 6 inches is a chunk of wood (wet, loose), heavy sheen, strong odor.

Well Completion Details



SAIC

SOIL BORING LOG

BORING No: **MW-2**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 26.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.01'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Well Completion Details
--	102	12 12 17				12–14	SM	Black silty fine to coarse SAND with gravel and organics (wet, medium dense), slight sheen, slight odor.	2-12 Colorado Silica Sand
MW-2-15 FD-1-042407	50.8	8 8 10				15–17	SM	As above, grading to (wet, loose), heavy sheen, strong odor.	2-inch, 0.010 slot PVC screen
--	212	8 9 14				18–19	CL	Black silty CLAY (wet/moist, stiff), no sheen, no odor.	
--	--	17 20 22				20–22	SM	Black silty fine SAND (wet, dense), no sheen, no odor.	

SAIC

SOIL BORING LOG

BORING No: **MW-2**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 26.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.01'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Well Completion Details
--	1.7	7 10 10				23 24	SP/SM	Black silty fine sand with shredded wood pieces (wet, medium dense), slight sheen, slight odor.	2-12 Colorado Silica Sand; 2-inch, 0.010 slot PVC screen
--	2.9	15 20 22				25 26		Same as above grading to no sheen and some organics.	
						27 28 29 30 31 32 33			

SOIL BORING LOG

BORING No: **MW-3**

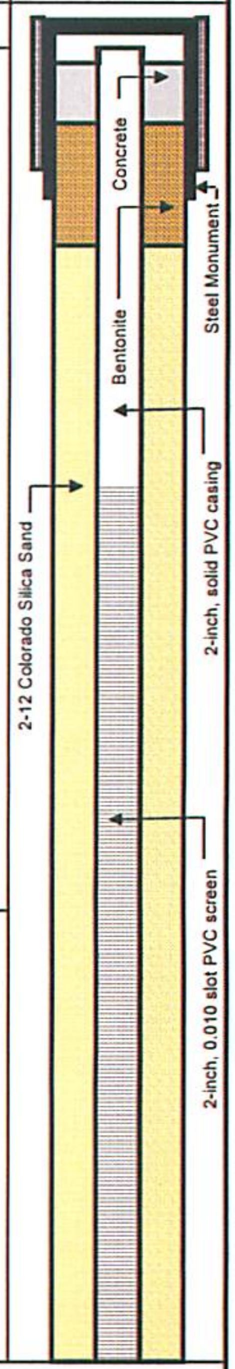
PROJECT: EAA-2
LOCATION: 7152 1st Ave S, Seattle, WA
CLIENT: Department of Ecology
DATE: 04/23/07
LOGGED BY: Tina King

DRILLER: Cascade Drilling, Inc.
DRILL METHOD: Concrete Core/Hollow-stem Auger
SAMPLE METHOD: Split Spoon
HOLE DIAMETER: 8.25 inches
HOLE DEPTH: 26

WELL DIAMETER: 2-inch
WELL DEPTH: 24 feet
WELL CASING: 2-inch PVC, Schedule 40
WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
FILTER PACK: 2-12 Colorado Silica Sand
CASING ELEVATION: 12.61'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
							Con	5 inches of Concrete
--	0.6	6 7 7					SM	Brown silty fine to medium SAND with occassional fine gravel grading to silty fine sand (moist, loose), no sheen, no odor.
--	0.3	11 7 10						Same as above, grading to trace of clay and increasing silt.
--	101	50/6"					SM/ ML	Brown silty fine SAND/fine sandy SILT (moist, loose/stiff), no sheen, no odor.
MW-3-10	0.4	3 5 5	▽					Same as above, grading to orange mottling (wet, very loose/soft).

Well Completion Details



SAIC

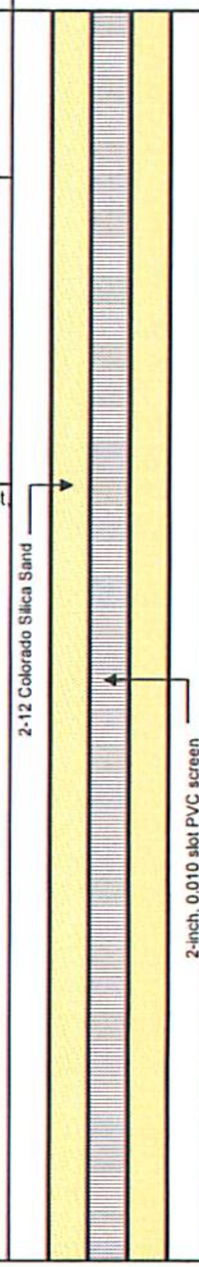
SOIL BORING LOG

BORING No: **MW-3**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 26	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.61'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
				11–12.5	SM/ ML	Same as above.
--	0.4	4 7 9		12.5–15	SM	Brown sitly fine SAND (wet, dense), no sheen , no odor.
--	0.9	10 10 15		15–17.5	SP/S M	Same as above. Brown sitly fine SAND with increasing fine sand (wet, dense), no sheen, no odor.
--	0.01	15 20 27		17.5–20		Same as above, grading to dark brown at 18.5 and medium dense.
--	7.1	50/6"		20–22		Grades to dark brown to black silty fine to medium sand (moist, very dense), no sheen, musty odor.

Well Completion Details



SAIC

SOIL BORING LOG

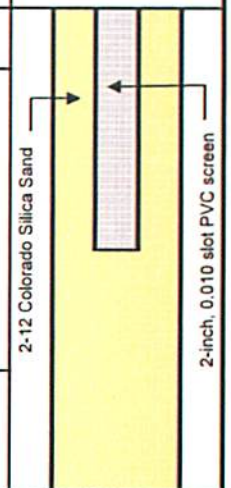
PROJECT: EAA-2
LOCATION: 7152 1st Ave S, Seattle, WA
CLIENT: Department of Ecology
DATE: 04/23/07
LOGGED BY: Tina King

DRILLER: Cascade Drilling, Inc.
DRILL METHOD: Concrete Core/Hollow-stem Auger
SAMPLE METHOD: Split Spoon
HOLE DIAMETER: 8.25 inches
HOLE DEPTH: 26

WELL DIAMETER: 2-inch
WELL DEPTH: 24 feet
WELL CASING: 2-inch PVC, Schedule 40
WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
FILTER PACK: 2-12 Colorado Silica Sand
CASING ELEVATION: 12.61'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
							SP/SM	Same as above.
--	1.7	7 10 10				23 24	SM	Dark Brown Silty fin SAND, occassional medium sand (wet, Medium dense), no sheen, no odor.
--	0.4	32 50/6"				25 26	SP	Same as above grading to no sheen and some organics.
						27 28 29 30 31 32 33		

Well Completion Details



BORING - DESCRIPTION OF SAMPLES & DATA

DOF-P1

Field Rep: DG Cooper	Location: 7152 1st Ave. S, Seattle, WA
Drilling Co.: Cascade	Elevation (Ft.): Ground Surface: Concrete Slab
Driller: Frank	Date Completed: 7/21/08
Drill Type: AMS 9630 Power Probe	Weather: Sunny 80F
Size/Type Casing: 2"	Hammer Type: Percussion Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	30		6" concrete
P1-A	grab @ 2.5'		A1, A2, A3			1605	0.5-1' moist, bwn, F-M SAND, w/some gravel, no odor no sheen
							1-3' moist, gray, gravelly, SAND, w/trace silt, mothball odor, no sheen
							Punctured facility drain line to King County Sewer
							Left hole open for repair
							Owner Rep. & facility manager present
							boring location previously screened for utilities and approved

Testing Notes: Analytical

A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

Depth(ft.)

SUMMARY LOG

0 — 4-inch concrete slab

Moist, brown, fine to medium SAND with some gravel
oily odor, no sheen

1

Moist, gray, gravelly SAND, with trace silt
mothball odor, no sheen

3 — penetrated upper flang of drain pipe
(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

BORING - DESCRIPTION OF SAMPLES & DATA

DOF-P2

Field Rep: DG Cooper	Location: 7152 1st Ave. S, Seattle, WA
Drilling Co.: Cascade	Elevation (Ft.): Ground Surface: Concrete Slab
Driller: Frank	Date Completed: 7/21/08
Drill Type: AMS 9630 Power Probe	Weather: Sunny 80F
Size/Type Casing: 2"	Hammer Type: Percussion Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	30		4" concrete, 1" clay
P2-A	grab @ 2'					1345	0.5-1.5' moist, gry, gravelly, SAND, no odor, no sheen
							1.5-4' moist, gry, F-M SAND, w/trace wood, fuel odor, no sheen
				4-8	48		4-8' moist, F sandy, SILT, oily odor, moderate sheen tapering with depth
P2-B	grab @ 5'		A1, A2, A3			1350	
P2-C	grab @7.5'					1355	
				8-12	48		8-9' as above
P2-D	grab @ 10'		A1, A2, A3			1400	9-12' wet-sat, gry, F sandy, SILT, w/occ 1-2" sand interbeds
							no odor, light sheen
				12-16	48		12-15' sat, gry, F sand, w/light sheen
P2-E	grab @ 15'		A1, A2, A3			1405	15-16' sat, gry, silty, F SAND, no odor, light sheen
				16-20	48		16-17' as above
P2-F	grab @ 17'				piston	1410	17-20' sat, dk gry, F-M SAND, w/trace gravel, no odor, no sheen
P2-G	grab @ 19.5'					1415	

Testing Notes: Analytical
A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

SUMMARY LOG

Depth(ft.)	
0	4-inch concrete atop 1-inch clay Moist, gray, gravelly, SAND (fill) no odor or sheen
1.5	Moist, gray, fine to medium SAND trace wood, fuel odor, no sheen
4	Moist, gray, fine sandy, SILT oily odor, moderate sheen tapering with depth becoming wet to saturated @ 9' 1-2" fine sand interbeund interbeds from 9-12'
12	Saturated, gray, Fine SAND no odor, light sheen to 15'
17	Saturated, dark gray, Fine to Medium SAND with trace gravel, no odor, no sheen
20	(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.
Completed boring backfilled with granular bentonite

BORING - DESCRIPTION OF SAMPLES & DATA

DOF-P3

Field Rep: DG Cooper	Location: 7152 1st Ave. S, Seattle, WA	
Drilling Co.: Cascade	Elevation (Ft.):	Ground Surface: Concrete Slab
Driller: Frank	Date Completed: 7/21/08	
Drill Type: AMS 9630 Power Probe	Weather: Sunny 80F	
Size/Type Casing: 2"	Hammer Type: Percussion	Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	24		2 x 4" concrete
P3-A	grab @ 2'					1300	1-2' Wet, mot gry, gravelly, SAND, slight odor, no sheen
							2-3' moist, gry, F-M SAND, no odor, no sheen
				4-8	48		4-5' as above
P3-B	grab @ 5'		A1, A2, A3			1305	5-7' Wet, blk, F-M SAND, w/moderate odor and sheen
P3-C	grab @7.5'					1310	7-8' Wet, blk, F sandy, SILT
				8-12	48		8-8.5' as above
P3-D	grab @ 10'		A1, A2, A3			1315	8.5-10' Wet-sat, blk, F SAND, w/some silt, moderate odor, sheen
							10-12' Sat, gry-bwn, interbedded F sandy SILT & F SAND, sl odor, no shn
				12-16	48		12-16' Sat, gry, silty, F SAND, no odr, no sheen
P3-E	grab @ 15'		A1, A2, A3			1320	
				16-20	48		16-20' Sat, gry, F SAND, w/ 6"silty F SAND interbeds, no odr, no shn
P3-F	grab @ 17'				piston	1325	
P3-G	grab @ 19.5'					1330	

Testing Notes: Analytical
A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

SUMMARY LOG

Depth(ft.)	
0	Two 4-inch concrete slabs Moist, gray, gravelly, SAND (fill) no odor or sheen
2	Moist, gray, fine to medium SAND no odor, no sheen to 5' Moderate odor & sheen 5-7'
7	Moist, gray, fine sandy, SILT oily odor, moderate sheen
8.5	becoming saturated @ 9' Wet to saturated , black Fine SAND, with some silt moderate odor and sheen
10	Saturated, gray, Fine SAND with silty Fine Sand interbeds no odor, no sheen
20	(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.
Completed boring backfilled with granular bentonite

BORING - DESCRIPTION OF SAMPLES & DATA

DOF-P4

Field Rep: DG Cooper	Location: 7152 1st Ave. S, Seattle, WA	
Drilling Co.: Cascade	Elevation (Ft.):	Ground Surface: Concrete Slab
Driller: Frank	Date Completed: 7/21/08	
Drill Type: AMS 9630 Power Probe	Weather: Sunny 80F	
Size/Type Casing: 2"	Hammer Type: Percussion	Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	48		4" concrete
P4-A	grab @ 2.5'					0815	1-1.5' Wet, dk gry, gravelly, silty, SAND, no odor, no sheen
							1.5-4' moist, gry, F-M SAND, no odor, no sheen
				4-8	40		4-5' as above
P4-B	grab @ 5'		A1, A2, A3			0820	5-6' Wet, gry, F sandy, SILT, w/thin roots, slight odor, no sheen
							6-8' Wet, gry, silty F SAND, no odor, no sheen
				8-12	48		8-10' wet to sat, gry, F sandy SILT, no sheen noodor
P4-C	grab @ 10'		A1, A2, A3			0825	10-10.5' Sat, gry, F-M SAND
							10.5-12' Sat, gry, silty, F SAND, no odor, no sheen
				12-16	48		12-14' as above
P4-D	grab @ 12.5'					0830	14-15' sat, gry, F SAND
P4-E	grab @ 15'		A1, A2, A3			0835	15-16' wet, gry silty, F SAND, no odor no sheen
				16-20	48		16-20' Sat, gry, silty, F SAND, no odor, no sheen
					piston		poor sample recovery, sleeve shattered

Testing Notes: Analytical
A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

SUMMARY LOG

Depth(ft.)	
0	4-inch concrete slab Moist, gray, gravelly, SAND (fill) no odor or sheen
1.5	Moist, gray, fine to medium SAND no odor, no sheen
5	slight odor @ 5' Moist, gray, fine sandy, SILT grading sandier with depth no odor, no sheen becomes saturated @ 9'
10	Saturated, gray, Fine SAND or silty Fine Sand no odor, no sheen
20	(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.
Completed boring backfilled with granular bentonite

BORING - DESCRIPTION OF SAMPLES & DATA

DOF-P5

Field Rep: DG Cooper
Drilling Co.: Cascade
Driller: Frank
Drill Type: AMS 9630 Power Probe
Size/Type Casing: 2"

Location: 7152 1st Ave. S, Seattle, WA
Elevation (Ft.):
Date Completed: 7/21/08
Weather: Sunny 80F
Hammer Type: Percussion

Ground Surface: Concrete Slab
Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	30		4" concrete, 1" clay
P5-A	grab @ 2'					1215	1-1.5' Wet, dk gry, gravelly, silty, SAND, no odor, no sheen
							1.5-4' moist to wet, gry, F-M SAND w/trace gravel, odor, no sheen
				4-8	18		4-8' as above, grading siltier, increasing sheen
P5-B	grab @ 6'		A1, A2, A3			1220	poor recovery
				8-12	40		8-9' as above, slight odor
P5-C	grab @ 10'		A1, A2, A3			1225	9-12' sat, gry-bwn, F sandy, SILT, w/thin sand interbeds
							no odor, no sheen
				12-16	48		12-16' as above with trace organics, no odor, no sheen
P5-D	grab @ 12.5'					1230	
P5-E	grab @ 15'		A1, A2, A3			1235	
				16-20	48	1240	16-20' sat, gry-bwn, F sandy SILT, with 6" F SAND interbeds
P5-F	grab @ 17.5'				piston	1245	no odr, no sheen
P5-G	grab @ 19.5'						

Testing Notes: Analytical
A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

SUMMARY LOG

Depth(ft.)	
0	4-inch concrete slab Wet, dark gray, gravelly, SAND (fill) no odor or sheen
1.5	Moist to wet, gray, fine to medium SAND With trace gravel Sheen @ 6'
9	becomes saturated @ 9' Saturated, gray, fine sandy, SILT with fine SAND interbeds no odor, no sheen
20	(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.
Completed boring backfilled with granular bentonite

DOF-P6

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper	Location: 7152 1st Ave. S, Seattle, WA
Drilling Co.: Cascade	Elevation (Ft.): Ground Surface: Concrete Slab
Driller: Frank	Date Completed: 7/21/08
Drill Type: AMS 9630 Power Probe	Weather: Sunny 80F
Size/Type Casing: 2"	Hammer Type: Percussion Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	36		4" concrete
P6-A	grab @ 0.5'					1135	0.5-1.5' moist, blk, gravelly, SAND, stained, moderate sheen, odor
P6-B	grab @ 2.5'					1140	1.5-3' moist, mot bwn, gravelly, silty SAND, slight oil odor
							3-4' moist, mot gry, F-M SAND, slight odor, no sheen
				4-8	36		4-6' as above
P6-C	grab @ 5'		A1, A2, A3			1145	6-8' moist to we, gry, F SAND, no odor, no sheen
P6-D	grab @ 7.5'					1150	
				8-12	48		8-10.5 as above becoming sat
P6-E	grab @ 10'		A1, A2, A3			1155	10.5-12' sat, gry-blk, F SAND, w/trace silt, organics
							moderate odor, sheen
				12-16	48		12-14' as above
P6-F	grab @ 12.5'					1200	14-16' wet, gry-bwn, F sandy, SILT, no odor, no sheen
P6-G	grab @ 15'		A1, A2, A3			1205	
				16-20	48	1210	16-18' as above w/trace organics
P6-H	grab @ 17.5'				piston	1220	19-10' sat, gry-bwn, F sandiy SILT w/ F SAND interbeds
P6-I	grab @ 19.5'						no odor, no sheen

Testing Notes: Analytical
A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

SUMMARY LOG

Depth(ft.)	
0	4-inch concrete slab Wet, dark gray, gravelly, SAND (fill) moderate sheen and oily odor decreasing with depth
3	Moist to saturated, gray, fine SAND becomes saturated @ 9' oily odor, slight sheen @ 10'
14	Saturated, gray, fine sandy, SILT with fine SAND interbeds no odor, no sheen
20	(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.
Completed boring backfilled with granular bentonite

BORING - DESCRIPTION OF SAMPLES & DATA

DOF-P7

Field Rep: DG Cooper	Location: 7152 1st Ave. S, Seattle, WA	
Drilling Co.: Cascade	Elevation (Ft.):	Ground Surface: Concrete Slab
Driller: Frank	Date Completed: 7/21/08	
Drill Type: AMS 9630 Power Probe	Weather: Sunny 80F	
Size/Type Casing: 2"	Hammer Type: Percussion	Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	40		4" concrete
P7-A	grab @ 0.5'					0900	0.5-2.0' moist, mot gry, gravelly, SAND w/some silty, oily sheen near slab contact
P7-B	grab @ 2.5'					0905	2-4' moist, gry, F-M SAND, no odor, no sheen
				4-8	48		4-7.5' as above
P7-C	grab @ 5'		A1, A2, A3			0910	7.5-8' wet gry, silty, F SAND, no odor, no sheen
P7-D	grab @ 7.5'					0915	
				8-12	48		8-11.5' as above becoming sat
P7-E	grab @ 10'		A1, A2, A3			0920	11.5-12' wet, gry, F sandy, SILT, no odor no sheen
				12-16	48		12-13' as above
P7-F	grab @ 12.5'					0925	13-16' wet to sat, gry, alternating layers of silty F SAND with F sandy SILT
P6-G	grab @ 15'		A1, A2, A3			0930	average thickness of beds 6", no odor, no sheen
				16-20	48	0935	16-20' as above, no odr, no sheen
P7-H	grab @ 17.5'				piston	0940	
P7-I	grab @ 19.5'						

Testing Notes: Analytical
A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

SUMMARY LOG

Depth(ft.)	
0	4-inch concrete slab Wet, mottled gray, gravelly, SAND (fill) with some silt, oily sheen near slab
2	Moist to saturated, gray, fine to medium SAND grading finer and siltier with depth no odor, no sheen becomes saturated @ 9'
11.5	Saturated, gray, fine sandy, SILT and silty fine SAND interbeds average thickness 6" no odor, no sheen
20	(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.
Completed boring backfilled with granular bentonite

DOF-P8

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper
Drilling Co.: Cascade
Driller: Frank
Drill Type: AMS 9630 Power Probe
Size/Type Casing: 2"

Location: 7152 1st Ave. S, Seattle, WA
Elevation (Ft.):
Ground Surface: Concrete Slab
Date Completed: 7/21/08
Weather: Sunny 80F
Hammer Type: Percussion
Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	40		4" concrete
P8-A	grab @ 0.5'		A1, A2, A3			1000	0.5-1.5' wet, mot gry, gravelly, SAND, w/metal parts, oily odor, heavy sheen
P8-B	grab @ 2.5'					1005	1.5-4' damp, gry, F-M SAND, no odor, no sheen
				4-8	48		4-8' moist-wet, gry, F-M SAND, w/trace silt, brick, gravel
P8-C	grab @ 5'		A1, A2, A3			1010	slight odor, no sheen
P8-D	grab @ 7.5'					1015	
				8-12	48		8-10' as above becoming sat
P8-E	grab @ 10'		A1, A2, A3			1020	10-12' sat gry, silty F SAND, w/wood debris, moderate odor, slight sheen
				12-16	48		12-14.5' as above with glass, wood debris, no odor, no sheen
P8-F	grab @ 12.5'					1025	14.5-16' sat, gry-blk, F sandy, SILT, w/trace organics, no sheen
P8-G	grab @ 15'		A1, A2, A3			1030	
				16-20	48	1035	16-18' as above, no odr, no sheen
P8-H	grab @ 17.5'				piston	1040	18-20' sat, gry, F SAND, w/thin silt interbeds, no odor, no sheen
P8-I	grab @ 19.5'						

Testing Notes: Analytical
A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

SUMMARY LOG

Depth(ft.)

0 — 4-inch concrete slab

Wet, mottled gray, gravelly, SAND (fill)
with metals parts, heavy oil sheen

1.5

Damp to Saturated, fine to medium SAND
with trace silt and scattered debris consisting
of brick, wood
slight odor, no sheen

becomes saturated @ 9'

10

moderate odor, slight sheen

saturated, gray-black, silty, Fine SAND
with wood debris and glass, no odor, no sheen

14.5

Saturated, gray, fine sandy, SILT
and silty fine SAND interbeds
no odor, no sheen

18

Saturated, gray, Fine SAND, with thin silt interbeds

20

(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.
Completed boring backfilled with granular bentonite

DOF-P9

BORING - DESCRIPTION OF SAMPLES & DATA

Field Rep: DG Cooper
Drilling Co.: Cascade
Driller: Frank
Drill Type: AMS 9630 Power Probe
Size/Type Casing: 2"

Location: 7152 1st Ave. S, Seattle, WA
Elevation (Ft.):
Date Completed: 7/21/08
Weather: Sunny 80F
Hammer Type: Percussion

Ground Surface: Concrete Slab
Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	30		4" concrete, 1" clay
P9-A	grab @ 2'		A1, A2, A3			1430	0.5-1.5' wet, mot gry, gravelly, SAND, oily odor, no sheen
							1.5-4' moist, gry, F SAND, w/trace gravel, coal, no odor, no sheen
				4-8	30		4-8' as above becoming wet
P9-B	grab @ 6'		A1, A2, A3			1435	stoddard solvent odor from 6.5-8'
				8-12	48		8-9' as above becoming sat
P9-C	grab @ 10'		A1, A2, A3			1440	9-12' sat, gry, F SAND, with some silt, no odor, no sheen
P9-D	grab @ 12'		A1, A2, A3			1445	refusal on cobble, debris blocking boring.

Testing Notes: Analytical
A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

SUMMARY LOG

Depth(ft.)	
0	4-inch concrete slab Wet, mottled gray, gravelly, SAND (fill) oily odor, no sheen
1.5	Wet to saturated, gray, Fine SAND with some silt, trace gravel no odor, no sheen
7	stoddard solvent-like odor from 7-9' becomes saturated @ 9'
16	refusal on cobble

(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.
Completed boring backfilled with granular bentonite

BORING - DESCRIPTION OF SAMPLES & DATA

DOF-P10

Field Rep: DG Cooper	Location: 7152 1st Ave. S, Seattle, WA
Drilling Co.: Cascade	Elevation (Ft.): — Ground Surface: Concrete Slab
Driller: Frank	Date Completed: 7/21/08
Drill Type: AMS 9630 Power Probe	Weather: Sunny 80F
Size/Type Casing: 2"	Hammer Type: Percussion — Sampler Type: 4' long x 2" dia. Macro Core w/ acrylic sleeve

Spl.No.	Type sample saved	Drill Action	Testing	Spl Depth (Ft.) From - To	Spl length inches	Time	Sample Description
		smooth		0-4	30		6" concrete
P10-A	grab @ 2'					1515	0.5-2.0' moist, mot gry-bwn, gravelly, SAND, no odor, no sheen
							2.0-4' damp, gry, F-M SAND, no odor, no sheen
				4-8	48		4-5' as above,thin gravel layer @ 5', no odor, no sheeen
P10-B	grab @ 5'		A1, A2, A3			1520	5-8' moist to wet, bwn, silty, F SAND
P10-C	grab @ 7.55'					1525	
				8-12	48		8-12' wet to sat, bwn, silty F SAND, w/oxidation banding, no odor sheen
P10-D	grab @ 10'		A1, A2, A3			1530	
				12-16	0		no recovery, gravel blocking cutter head
				16-20	48		16-20' sat, gry, F SAND, with 6" silty F SAND interbeds below 18'
P10-E			A1, A2, A3		piston	1535	no odor, no sheen
P10-F						1540	

Testing Notes: Analytical
A1 - NWTPH-DX
A2 - PCBs
A3 - Lead

SUMMARY LOG

Depth(ft.)	
0	4-inch concrete slab Wet, mottled gray, gravelly, SAND (fill) no odor, no sheen
2	Damp, gray, fine to medium SAND no odor, no sheen
5	Wet to saturated, brown, silty, Fine SAND with oxidation banding no odor, no sheen becomes saturated @ 9' becomming gray Fine SAND with 6-inch silty fine SAND interbeds below 18'
20	refusal on cobble

(Bottom of Boring)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.
Completed boring backfilled with granular bentonite

APPENDIX B
CORE LOG - LDW-SC-40
EAA-2

RETEC

Sediment Core Log
LDW-SC-40 (R3)

Project: LDW RI/FS	Water Body Type: Lower Duwamish Waterway	Tube Length (ft): 14.0
Project #: PORS5-18220-511	Water Elevation (ft)/Tide: NA	Penetration Depth (ft): 13.0
Client: LDWG	Water Depth (ft): 10.4	Sample Quality: Good
Collection Date: 2/23/06	Mudline Elevation (ft): -1.0	Recovery in ft (%): 10.0 (77)
Contractor: MSS	N./LAT: 200339 E./LONG: 1270298	Process Date: 2/24/06
Vessel: R/V Nancy Anne	Horiz. Datum: NAD 83 N Vert. Datum: MLLW	Process Method: Cut tube
Operator: Bill Jaworski	Method/Tube ID: Vibracore/3.5" round Al	Logged By: L.McKee, C.Brackett

Recovered Depth (ft)	Recov. Interval & Sample	% Recovery (interval)	Chemical Analysis	PID Measurement	Sediment Description Classification Scheme: USCS Contacts are recovered depth (In-situ depth interval in feet with parentheses)	Comments for Recovered Depths	*In-situ* Depth (ft) & Graphic Log
0–1.3	LDW-SC40-0-1.3	77% (0-13)	PCB, SVOC, Metals, Hg, Pesticides, Dioxins/Furans	0	SP: (0.0-0.5) damp, medium dense, brown (7.5YR, 4/2) medium SAND. Sand grains are multicolored (orange, red, white).	@ 0.2' TV = 0 kg/cm2 Tranistional Contact	upper alluvium
					OL: (0.5-1.7) moist, soft, black (2.5YR, 2.5/1) ORGANIC SILT, little sand layers (2") alternating with layers (3") of moist, medium stiff, dark gray (GLEY 1, 4/N) SILT, few sand. Organic silt has scattered shell and wood fragments up to 1/2" L. Grades to sand at basal contact.	@ 0.7' TV = 0.3 kg/cm2 GT @ 1.2' Sharp Contact	
1.3–2	1.3-2		PCB, SVOC, Metals, Hg, Pesticides, Dioxins/Furans	0	SW: (1.7-13.0) moist, medium dense, brown (7.5Y,R, 4/2) medium to coarse SAND. Sand grains are multicolored (orange, red, white) and coarsen towards basal contact (from 6.0' to 10.0'). Slight H2S-like odor from 4' to 8'. @ 1.5' to 1.9': layer of SAND, little subrounded gravel up to 1" L. Scattered brick fragments up to 1" L.	@ 2.2' TV = 0 kg/cm2 GT @ 2.5'	
2–4	LDW-SC40-2-4		PCB, SVOC, Metals, Hg, Pesticides, Dioxins/Furans	0		@ 3.0' TV = 0.1 kg/cm2 Oxidation @ 0.0' to 4.0'.	
4–6	LDW-SC40-4-6			0	@ 4.4' color changes to very dark gray sand		
6–	LDW-						

The RETEC Group, Inc.
1011 SW Klickitat Way, Suite 207
Seattle, WA 98134-1162
Phone: (206) 624-9349
Fax: (206) 624-2839

Remarks: Drive Notes: no freefall, easy (13.0'), penetration goal reached. Three drive attempts made at station. Station re-occupied with vibracore after MCS drives. Core catcher was empty (0.5' sediment loss).

Calculated Recovery
Sample Length/Penetration Length:
10.0/13.0 = 77 %

Note: Stratigraphic interpretations are preliminary and subject to change during the Remedial Investigation.

RETEC

Sediment Core Log

LDW-SC-40 (R3)

Project: LDW RI/FS	Water Body Type: Lower Duwamish Waterway	Tube Length (ft): 14.0
Project #: PORS5-18220-511	Water Elevation (ft)/Tide: NA	Penetration Depth (ft): 13.0
Client: LDWG	Water Depth (ft): 10.4	Sample Quality: Good
Collection Date: 2/23/06	Mudline Elevation (ft): -1.0	Recovery in ft (%): 10.0 (77)
Contractor: MSS	N./LAT: 200339 E./LONG: 1270298	Process Date: 2/24/06
Vessel: R/V Nancy Anne	Horiz. Datum: NAD 83 N Vert. Datum: MLLW	Process Method: Cut tube
Operator: Bill Jaworski	Method/Tube ID: Vibracore/3.5" round Al	Logged By: L.McKee, C.Brackett

Recovered Depth (ft)	Recov. Interval & Sample	% Recovery (interval)	Chemical Analysis	PID Measurement	Sediment Description *Classification Scheme:* USCS Contacts are recovered depth (In-situ depth interval in feet with parentheses)	Comments for Recovered Depths	*In-situ* Depth (ft) & Graphic Log
7	SC40-8-8			0			7 — lower alluvium
8	LDW-SC40-8-10						8
9				0			9
10				0	End of core at 10.0'.		10
11							11
12							12
13							13

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Phone: (206) 624-9349
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Remarks: Drive Notes: no freefall, easy (13.0'), penetration goal reached. Three drive attempts made at station. Station re-occupied with vibracore after MCS drives. Core catcher was empty (0.5' sediment loss).

Calculated Recovery
Sample Length/Penetration Length:
10.0/13.0 = 77 %

Note: Stratigraphic interpretations are preliminary and subject to change during the Remedial Investigation.

APPENDIX C TO WORK PLAN

Sampling and Analysis Plan to Complete Remedial Investigation Sampling ICS/FORMER NW Cooperage Site Seattle, Washington

Prepared for:
ICS/Former NW Cooperage

Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

February 2012

Sampling and Analysis Plan to Complete
Remedial Investigation Sampling
ICS/NW Cooperage Site
Seattle, Washington

Contents

List of Attachments

Sampling and Analysis Plan To Complete
Remedial Investigation Sampling
ICS/NW Cooperage Site
Seattle, Washington

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) is part of the work plan to complete Remedial Investigation (RI) sampling at the ICS/NW Cooperage site located within Duwamish Waterway Early Action Area 2 (EAA-2), Seattle, Washington. The SAP was prepared to meet the requirements of Agreed Order No. DE 6720. The purpose of the SAP is to describe the sampling work, field/analytical procedures and quality control/quality assurance (QA/QC) procedures that will be used to collect the data described in the work plan.

The sampling work generally includes the following:

- Installing and sampling monitoring wells
- Surveying well heads and measuring water levels
- Collection and laboratory analysis of:
    - Surface sediment samples (embayment)
    - Sediment core samples (embayment)
    - Seep samples (embayment)
    - Well and push-probe soil samples (Upland)
    - Groundwater samples (Upland)
    - Stormwater sediment and stormwater (2nd Ave. Outfall System)

2.0 PROJECT ORGANIZATION

The project organization to complete the work is described in the RI/FS Work Plan.

3.0 FIELD SAMPLING ACTIVITIES

3.1 General Guidelines and Procedures

- Sediments and soil will be described using ASTM-D2488 as a general guide.
- Observations will be documented in a field log book or field forms (Appendix A) that will become part of the project file.
- Visual indications of contamination (oily soil/sediment, sheen, color, texture, etc.) will be noted.
- Sample head space vapor measurements will be made using a photoionization detector (PID) using the procedure described below (Section 3.1.1).
- Sheen testing will be completed on suspect sediments/soils. Observations will be documented using the visual screening guide summarized in Table SAP-1 below.

Other obvious evidence of the presence of contamination will also be recorded on the field logs.

- The horizontal position of significant features and sample locations will be determined using a DGPS (Trimble GeoXH) to +/- 1.0 feet.
- The approximate elevation of significant features and identified sample locations will be determined by plotting the identified locations on the topographic base map.
- Samples will be labeled, placed in chilled coolers and transported to the analytical laboratory within 48 hours of collection.
- Sample handling will be documented using standard chain-of-custody procedures.

3.1.1 Head Space Analysis

A 1-quart zip-lock bag will be filled about one-half full and sealed shut. After the sample temperature has reached ambient temperature, the probe of the PID (MiniRae 2000 or equivalent) will be inserted through the plastic into head space of the bag. The maximum measurement will be recorded on a field form (included in Attachment A). The PID will be calibrated with 100 ppm isobutylene gas at the beginning of each day. After each sample batch is tested, the PID will be checked against the 100 ppm gas. If the reading is more than ten percent above or below the calibration gas, the instrument will be recalibrated.

3.1.2 Sheen Test

A portion of the sample used to measure head-space vapors will be removed from the 1 quart plastic bag and will be wetted with water to observe for petroleum sheen. The observed sheens will be classified as follows and be documented on the field log forms.

Table SAP-1 - Sheen Classification

Sheen Classification	Description
No Sheen (NS)	No visual sheen on water surface
Light Sheen (LS)	Light colorless sheen, spread is irregular, not rapid; film dissipates rapidly
Moderate Sheen (MS)	Light to heavy film, may have some color or iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on water surface
Heavy Sheen (HS)	Heavy colorful film with iridescence; spread is rapid, and sheen flows off the sample. Entire water surface may be covered with sheen

3.2 Embayment

3.2.1 Collect Surface Sediment Samples

Surface (0 to 10 cm) sediment samples will be collected using hand equipment and sampling equipment deployed from a boat, if necessary. At locations that can be accessed on foot, surface samples will be obtained as follows:

- Clean stainless steel spoons will remove a uniform thickness of sediment to a depth of 10 cm.
- The sediment will be placed in a clean stainless steel or aluminum bowl, thoroughly mixed to a consistent texture and color, and placed in a clean glass jar provided by the receiving laboratory.
- A portion of the sample will be placed in a 1 quart plastic bag and head space and sheen testing will be completed as described above.
- The material type will be described and sample location coordinates determined using a DGPS.

At locations where samples cannot be collected on foot, surface sediment samples will be collected from a boat using a modified van Veen sampler as follows:

- The sampler will be deployed/recovered from a boat using a hydraulic winch.
- The sampler will be lowered at a controlled speed. Under no circumstances will the sampler be allowed to free fall. The sampler should contact the bottom gently and only its weight should be used to penetrate into sediment.
- A position fix will be taken the first time the sampler hits bottom. After impact, the sampler closing arms will be raised slowly to allow the sampler to close properly and the sampler will be slowly raised to the surface.
- Sample run acceptability will be judged based on the following criteria:
    - Significant sediment does not extrude from the upper surface of the sampler and is not pressed against the top of the sampler.
    - The sediment surface in the sampler is relatively flat and undisturbed.
    - Overlying water is present to indicate minimal leakage.
    - Overlying water is not excessively turbid.
    - The penetration depth is at least 10.5 cm for a 10 cm sample.
- The top 10 cm of sediment will be collected using a clean stainless steel spoon, being careful to exclude sediment in contact with the edges or bottom of the sampler.
- A portion of the sample will be placed into a 1 quart plastic bag and head space and sheen testing will be completed as described in Section 3.1.
- Sediment will be transferred to a stainless steel or aluminum bowl and mixed to a consistent texture and color.

- The mixed sample will be placed into clean glass jars provided by the receiving laboratory.
- The material type will be described and documented.

3.2.2 Collect Deeper Sediment (Core) Samples

Access into the Embayment is severely limited. Because of the limited direct shoreline access, the piling/timber obstacles, and narrow, tidally restricted nature of the site, sampling within the upper and central portions of the embayment by boat or tracked vehicle would not be feasible, or at best very limited. Collection of the core samples will likely require sampling from a number of different platforms using a number of methods. These include:

- Upper and Central Portion of Embayment
    - VibraCore deployed by land based crane
    - Hand coring methods
- Lower Portion of Embayment (east of neck)
    - VibraCore deployed from boat

Hand methods are proposed as an alternative to VibraCore collection but may not be capable of penetrating the full depth necessary for deeper samples.

VibraCore Sampling. The majority of deep locations within the upper and central portion of the embayment may be accessible to crane–deployed vibracore sampling. The standard procedure for driving the vibracore will be to position the core, using a large mobile crane with sufficient reach, over pre-determined sample locations within the Embayment. Once reasonably close to the work plan location, the crane will lower the vibracore frame to the mudline. The core will be advanced and the core extracted by the crane and swung to the shoreline where the frame and barrel will be washed off using either a water hose or paper towels as appropriate. Wash water and sediment would be collected for later testing and disposal.

It will be essential to locate the crane on, and operate from, the Douglas Property on the north side of the embayment for best coverage. Another obstacle is the presence of hard-cemented precipitate or concrete along the northern flank of the Embayment. It will be necessary to predrill or break up the harder "*capping*" material prior to advancement of sampling equipment.

Cores located within the lower portion of the embayment will be deployed from a boat.

Vibracore sampling itself will follow these procedures:

- The vibracore uses a hydraulic system that vibrates and drives a 7 to 13 foot length of 4-inch outer diameter (O.D.) aluminum tubing into sediment. A continuous sediment sample is retained within the tubing with the aid of a stainless steel core cutter/catcher. Each sample location will be cored with a pre-cleaned tube and equipment decontaminated by rinsing between each advancement.

- Core compaction will be estimated (core length recovery vs. penetration) and will be used to determine in-situ sampling depths.
- Sediment at the end of each tube section will be visually classified for qualitative sample characteristics. Changes from the top to the bottom of each section of the tube will be noted and recorded on the core log sheet. Empty tubing will be removed to assure that each section is full of sediment. The core ends will then be covered with aluminum foil, a protective cap, and duct tape to prevent leakage. The core sections will be stored upright in a container chilled with ice to approximately 4°C. A full tube will limit disturbance during storage and transport.
- Minimal processing of the samples will occur on site. For ease of handling and storage before processing, the cores may be sectioned into maximum 4-foot lengths in the field. Each length will be assigned a sample identification that reflects the relative depth of that specific core portion (e.g., 0 to 4 feet will be labeled "0004"). As soon as possible after collection, the cores will be transported to ARI for sample processing and sub-sampling.
- Core sections collected for chemical sampling will be extruded at ARI by cutting the tube longitudinally, using a core press, or by vibrating the tube. This process produces a generally intact core for visual classification of the sediments with depth.
- Each core will be vertically sampled.
- Core depth intervals will be selected to represent different strata (i.e. recent and alluvial sediment types).
- Samples of recent and alluvial sediment will be obtained as follows:
    - The cores will be segmented into approximately one foot intervals,
    - Samples will be obtained of each segment but will consist entirely of a single material type (the sample interval may vary depending on material type).
    - Each sample interval will be placed in a clean stainless steel or aluminum bowl, thoroughly mixed to a consistent color and texture, and placed in a clean glass jar provided by the receiving laboratory.
- A portion of the sample (assuming a sufficient volume of sample is recovered) will be placed in a 1 quart plastic bag and head space and sheen testing will be completed as described above.
- The material types will be described.

Precipitate Coring/Breakup. It will be necessary to pre-drill the sampling locations along the northern flank of the Embayment where the precipitate or concrete is present, to allow for sampling of the underlying softer, deeper sediments. As this area is accessible by foot during low tide, the breakup of the precipitate will be accomplished by using a portable rotohammer or diamond coring device. Once the precipitate is removed or broken up, the vibracore would be advanced into the underlying softer soils.

Hand Methods Sampling. At intertidal locations where the VibraCore cannot be deployed by crane and that can be accessed on foot and where the target sample interval can be sufficiently penetrated using hand equipment, deeper samples could be obtained as follows:

- A boring will be advanced using a post-hole digger, hand auger or hand driven barrel sampler to approximately one foot below the target interval (into alluvial sands).
- The bottom of the boring will be cleaned and a sample of alluvial sediment will be obtained from one-half to one foot below the contact of recent/alluvial sediment.
- A portion of the sample will be placed in a 1 quart plastic bag and head space and sheen testing will be completed as described in Section 3.1.
- Recovered sediment will be placed in a clean stainless steel or aluminum bowl, thoroughly mixed to a consistent color and texture, and placed in a clean glass jar provided by the receiving laboratory.
- The material type will be described and location coordinates determined.

If the underlying alluvial material cannot be reached with hand equipment, an attempt will be made to drive a steel rod deeper into the hole to provide data to estimate the depth of the contact between softer recent and assumed denser alluvial sediment.

3.2.3 Seep Sampling

Two to three seeps emanating from the southern embayment shoreline will be sampled if observed during the site reconnaissance. The samples would be collected as follows:

- Horizontal coordinates would be determined of any observed seeps from both banks of the embayment.
- Seep samples would be collected using a peristaltic pump. Samples would be pumped directly into containers, containing the appropriate preservatives, provided by the receiving laboratory.
- Samples for metals analysis would be field filtered using an in-line 0.45 micron filter.
- Field measurements would be made for pH, electrical conductivity, temperature, turbidity and ferrous iron.

3.3 Upland

3.3.1 Mapping of Existing Paving

- The site will be walked and the condition of paving will be noted on the base map for the site.
- Material types (e.g. concrete, asphalt) and condition will be described.
- A map will be prepared documenting the paving observations.

3.3.2 UtilityChecks

- Upland sampling locations would be marked in the field and utility checks would be completed as required by law.
- ICS will "clear" the locations prior to DOF completing the sampling.

3.3.3 Install New Monitoring Wells

- New monitoring wells would be installed using a hollow-stem auger or dual tube probe rig.
- Drilling would proceed to a depth of approximately 25 feet below ground surface (bgs).
- During drilling, soil samples would be collected using a split-spoon sampler on approximately 2.0 feet intervals or continuously using a macro sampler (if using dual tube probe rig).
- Samples would be described and placed in a 1 quart plastic bag (for field screening) and laboratory supplied containers.
- Sample head space vapor measurements will be made using a photoionization detector (PID) using the procedure described in Section 3.1.
- Sheen testing will be completed on suspect soils. Observations will be documented using the visual screening guide summarized in Table SAP-1 (above).
- Once the final drilling depth is reached, 2-inch diameter PVC screen (10-feet long) and riser pipe will be installed through the boring center. It is anticipated that a pre-packaged screen/sand pack would be used. The screen would be placed across the water table observed at the time of drilling.
- The wells would be finished with a surface seal and flush to ground monuments.
- The wells would be developed by pumping until the pumped water visually clears.

3.3.4 Survey Wells and Measure Water Levels

- The top of the PVC riser pipe will be surveyed by a licensed surveyor to 0.01 feet MLLW (navd88 plus 2.425 feet).
- Horizontal coordinates will be determined using a DGPS.
- Water levels will be measured to 0.01 feet using a calibrated electric well probe.

- Water level measurements will be documented on the appropriate field form (Appendix A).

3.3.5 Collect Groundwater Samples

- Groundwater samples will be obtained from the new and existing wells using a small battery powered submersible pump or peristaltic pump depending on well yield. The pump intake with be placed within the upper third of the water column.
- Sampling will be obtained using low flow sampling procedures. Sampling flows will be less than 500 ml/min.
- Field measurements will be made for pH, electrical conductivity, temperature, turbidity and ferrous iron.
- Samples would be obtained once field parameters stabilize to within 10% or three casing volumes are removed from the well.
- Samples will be pumped directly into sample containers (with the appropriate preservatives - see attached Table SAP-2).
- Samples for dissolved metals analyses will be field filtered using an in-line 0.45 micron filter.

3.3.6 Push-Probe Sampling

- A push-probe duel-tube rig will be used to collect soil samples from the former lagoon/ditch area. The target drilling depth is five feet below the bottom of the former ditch. Drilling will be completed up to twenty-feet below existing grade.
- Continuous samples will be collected using a core barrel with an acrylic liner.
- Samples would be collected on approximately 2.0 foot intervals and described. Portions of each sample interval would be placed in laboratory supplied containers (for possible chemical analysis) and a 1 quart plastic bag (for field screening),
- Sample head space vapor measurements will be made using a photoionization detector (PID) using the procedure described in Section 3.1.
- Sheen testing will be completed on suspect soils. Observations will be documented using the visual screening guide summarized in Table SAP-1 (above).

3.3.7 Man-hole Sediment Sampling

- A sample of sediment from one of the man-holes located within the southeastern portion of the site will be collected for laboratory analysis.
- The sample will be collected using a stainless steel spoon attached to an extension pole, or other means dictated by the construction of the manhole.
- The material will be described and placed in laboratory supplied containers for analysis.

3.3.8 2nd Ave. Outfall System Flow Sampling

- During a drier period of the year, flow within the 2nd Ave. Outfall will be sampled, if present.
- Sampling would occur towards the end of a low tide when the outfall is exposed and river water is flushed from the system,
- Flow will be sampled at two locations; within one of the manholes and at the outfall mouth,
- The manhole flow will be sampled using a small submersible pump, peristaltic pump or bailer,
- Flow at the outfall mouth will be accomplished by filling a glass container with water and transferring the water to the laboratory supplied containers,
- Samples for dissolved metals analysis will be pumped through in-line 0.45 micron filters using the submersible or peristaltic pumps.
- Field measurements will made for pH, temperature, conductivity, ferrous iron, and turbidity.

3.4 Field Measurements, Preservatives, and Containers

Field measurements will be made with the following equipment. The equipment will be calibrated, as appropriate, using the manufacturer's instructions.

- Vapors - MiniRae 2000 or equivalent (meter)
- pH - YSI 556 or equivalent (meter)
- Specific conductivity - YSI 556 or equivalent (meter)
- Turbidity - Oakton T100 or equivalent (meter)
- Temperature - YSI 556 or equivalent (meter)
- Ferrous iron - Hach Kit

Sample volumes, types of sample containers and preservatives that will be used are summarized in Table SAP-2. Sample labeling is described in Section 4.0.

3.7 Laboratory Analyses

The number and types of sample analyses are summarized in Table 9 of the work plan. It is anticipated that Analytical Resources Inc. (ARI) of Tukwila, Washington will perform the analyses. ARI is a Washington State Department of Ecology accredited laboratory.

Holding times, containers and preservatives are summarized in Table SAP-2. Screening levels, PQL (reporting limits) and analytical methods are summarized in the following tables:

- Table SAP-3 - Sediment
- Table SAP-4 - Groundwater

- Table SAP-5 - Surface Water (seeps and stormwater)
- Table SAP-6 - Soil

In some instances the PQL is higher than the screening level. For those constituents where this is the case, if the analyst finds the constituent is detected below the normal reporting limit, the estimated concentration will be reported and flagged with a "J".

To assist in assessing the quality of data, blind field duplicates (5%) will be analyzed. Laboratory QA/QC will include analysis of method blanks and matrix spike/matrix spike duplicates, and determination of surrogate recoveries as specified by the methods.

4.0 SAMPLE LABELING

Each sample will be labeled to indicate the project, sample location, date and time, and sampler. Each sample will have a unique sample number generally as follows:

ICS-SS1-So-3-082310 where:

- ICS – Site Identifier (ICS/NW Cooperage Site)
- SS1 – Location
- Media (So=soil; Se=Sediment; GW=groundwater; SW=surface water)
- 3 - Mean Sample Depth (ft. bgs or mudline)
- 082310 – Date of sample

5.0 DECONTAMINATION

Drilling tools (augers, rods, samplers etc.) will be hot-water pressured washed between drilling locations. A cleaning area will be set-up on site that will allow cleaning water to be contained and collected. The water will be tested and disposed of in an appropriate fashion.

Sampling spoons and mixing bowls will be pre-cleaned prior to collecting the samples. It is anticipated that a sufficient number of spoons and bowls will be available so no decontamination of this equipment in the field will be necessary.

During sampling, samplers that will be used between locations will be washed with a laboratory grade detergent and tap water and rinsed with tap water between each sampling run. Wash and rinse water will be collected for proper disposal.

Personnel will follow decontamination procedures outlined in the site Health and Safety Plan.

6.0 HANDLING OF SAMPLING WASTE MATERIALS

Drill cuttings will be segregated and placed in drums. Water resulting from the decontamination of equipment and personnel, and monitoring well development and sampling purge water will be placed in DOT 55 gallon or other suitable containers and held for proper disposal.

7.0 QUALITY ASSURANCE PROJECT PLAN

See Attachment B

TABLE SAP-2 - Sample Handling Requirements

Soil/Sediment Sample Handling Requirements

Constituents	Container Type/No.	Volume	Preservation	Maximum Holding Time
Gasoline Range Hydrocarbons	G**, 2	40 ml	Cool; MeOH	14 days
Diesel Range Hydrocarbons	G**, 1	8 oz	Cool	14 days
Total Organic Carbon				28 days
Total Mercury	G**, 1	4 oz.	Cool	6 months
Other Metals				
SVOCs	G**, 1	8 oz.	Cool	7 days for extraction 40 days after extraction
Pesticides				
PCBs				
Dioxin/Furans	G**, 1	8 oz.	Cool	1 yr. frozen
pH	G	4oz.	Cool	------

Notes: G = Glass
** = Glass bottle with teflon-lined cap

Seep/Groundwater Sample Handling Requirements

Constituents	Container Type/No.	Volume (mL)	Preservation	Maximum Holding Time
Gasoline-range Hydrocarbons	G vial*/2	40	Cool w/ HCl	14 days
Diesel/Residual-range Hydrocarbons	G**/2	500	Cool, store in dark	7 days
VOCs	G vial*/3	40	Cool w/ HCl	14 days
Total/Dissolved Metals	HDPE/1	500	Filtered (dissolved); $HN0_3$	6 months
Total/Dissolved Mercury				28 days
SVOCs	G**/1	1000	Cool, store in dark	7 days to extraction; 40 days post extraction
PAHs	G**/1	1000	Cool, store in dark	7 days to extraction; 40 days post extraction
PCBs	G**/1	1000	Cool, store in dark	7 days to extraction; 40 days post extraction
Pesticides	G**/3	1000	Cool, no headspace	7 days to extraction; 40 days post extraction
Conventionals (Cl, SO4, hardness)	HDEP/1	100	Cool, store in dark	14 days

G = Glass, P = Polyethylene, HDPE = high density polyethylene
* = teflon lined septum
** = Amber glass bottle w/ teflon-lined cap

HCL = Hydrochloric acid
HNO_3 = Nitric acid

TABLE SAP-3 - Sediment Data Quality Objectives and Analytical Methods

Analyte	SEDIMENT MOST STRINGENT	Methods and Analytical Goals				
	LDW Screening Levels	*Extraction Method*	*Analysis Method*	*Sed. PQL (routine)*	*Sed. PQL (low level)*	LDW PQL
	mg/kg DW	-----	-----	mg/kg	mg/kg	mg/kg
acetone	-----	5030B	SW8260C	0.005	-----	
acenaphthene	0.25	Sonication	SW8270	0.02	-----	**0.0012**
acenaphthylene	0.56	Sonication	SW8270	0.02	-----	**0.0018**
anthracene	0.96	Sonication	SW8270	0.02	-----	**0.0018**
benzene	0.04	5030B	WS8260C	0.001	-----	
benzo(g,h,i)perylene	0.48	Sonication	SW8270	0.02	-----	**0.003**
benzo[a]anthracene	0.00022	Sonication	SW8270	0.02	-----	**0.0033**
benzo[a]pyrene	0.00022	Sonication	SW8270	0.02	-----	**0.0033**
benzo[b]fluoranthene	0.00022	Sonication	SW8270	0.02	-----	**0.0033**
benzo[k]fluoranthene	0.00022	Sonication	SW8270	0.02	-----	**0.0032**
bis(2-ethylhexyl) phthalate	0.73	Sonication	SW8270	0.02	0.020	**0.0108/0.02**
butyl benzyl phthalate	0.063	Sonication	SW8270	0.02	0.020	**0.0018**
carbon tetrachloride	-----	5030B	WS8260C	0.001	-----	
chlorobenzene	-----	5030B	WS8260C	0.001	-----	
chloroethane	-----	5030B	WS8260C	0.001	-----	
chloroform (trichloromethane)	-----	5030B	WS8260C	0.001	-----	
chloromethane	-----	5030B	WS8260C	0.001	-----	
chrysene	0.00022	Sonication	SW8270	0.02	-----	**0.0019**
dibenz[a,h]anthracene	0.00022	Sonication	SW8270	0.02	-----	**0.0027**
dibenzofuran	0.23	Sonication	SW8270	0.02	-----	**0.0015**
di-butyl phthalate (di-n-butyl phth.)	1.4	Sonication	SW8270	0.02	0.020	**0.0033**
dichlorobenzene, 1,2-	0.035	Microwave	SW8270D-SIM	0.0063	0.020	**0.0015**
dichlorobenzene, 1,3-	0.021	Microwave	SW8270D-SIM	0.0063	0.020	**0.0019**
dichlorobenzene, 1,4-	0.048	Microwave	SW8270D-SIM	0.0063	0.020	**0.0022**
dichloroethane, 1,1-	-----	5030B	WS8260C	0.001	-----	
dichloroethane, 1,2-	-----	5030B	WS8260C	0.001	-----	
dichloroethylene, 1,1-	-----	5030B	WS8260C	0.001	-----	
diethyl phthalate	0.006	Sonication	SW8270	0.02	0.020	**0.0041**
dimethyl phthalate	0.071	Sonication	SW8270	0.02	0.020	**0.0021**
di-n-octyl phthalate	0.061	Sonication	SW8270	0.02	0.020	**0.0014**
ethylbenzene	0.01	5030B	WS8260C	0.001	-----	
fluoranthene	1.7	Sonication	SW8270	0.02	-----	**0.0029**
fluorene	0.36	Sonication	SW8270	0.02	-----	**0.002**
hexachlorobenzene	0.0059	Sonication	SW8081	0.0005	0.020	
hexachlorobutadiene	0.011	Sonication	SW8081	0.0005	0.100	**0.00057**
indeno[1,2,3-cd]pyrene	0.00022	Sonication	SW8270	0.02	-----	**0.0025**
MEK (Methyl Ethyl Ketone;2-Butanone)	-----	5030B	WS8260C	0.005	-----	

TABLE SAP-3 - Sediment Data Quality Objectives and Analytical Methods

	LDW Screening Levels	*Extraction Method*	*Analysis Method*	*Sed. PQL (routine)*	*Sed. PQL (low level)*	**LDW PQL**
	mg/kg DW	**-----**	**-----**	**mg/kg**	**mg/kg**	**mg/kg**
methylene chloride (dichloromethane)	-----	5030B	WS8260C	0.002	-----	
methylnaphthalene, 2-	0.59	Sonication	SW8270	0.02	-----	
MIBK (M-Isobutyl-K;4-M,2-Pentanone)	-----	5030B	WS8260C	0.005	-----	
naphthalene	1.5	Sonication	SW8270	0.02	-----	**0.0015**
nitrosodiphenylamine, N-	0.028	Microwave	SW8270D-SIM	0.0063	0.020	
pcb mixtures	0.00011	PSEP Low Level	SW8082	0.004	-----	**0.0022**
pcb - Aroclor 1016	0.24	PSEP Low Level	SW8082	0.004	-----	
pcb - Aroclor 1221	-----	PSEP Low Level	SW8082	0.004	-----	
pcb - Aroclor 1232	-----	PSEP Low Level	SW8082	0.004	-----	
pcb - Aroclor 1242	-----	PSEP Low Level	SW8082	0.004	-----	
pcb - Aroclor 1248	0.24	PSEP Low Level	SW8082	0.004	-----	
pcb - Aroclor 1254	0.24	PSEP Low Level	SW8082	0.004	-----	
pcb - Aroclor 1260	0.24	PSEP Low Level	SW8082	0.004	-----	
phenanthrene	1.5	Sonication	SW8270	0.02	-----	**0.0017**
pyrene	2.6	Sonication	SW8270	0.02	-----	**0.0017**
tetrachloroethylene (perchloroethylene)	0.057	5030B	WS8260C	0.001	-----	
trichlorobenzene, 1,2,4-	0.013	Microwave	SW8270D-SIM	0.0063	-----	**0.0018**
trichlorethane, 1,1,1-	-----	5030B	WS8260C	0.001	-----	
trichlorethane, 1,1,2-	-----	5030B	WS8260C	0.001	-----	
trichloroethylene	160	5030B	WS8260C	0.001	-----	
trimethylbenzene, 1,3,5-	-----	5030B	WS8260C	0.001	-----	
toluene	-----	5030B	WS8260C	0.001	-----	
vinyl chloride (chloroethylene)	-----	5030B	WS8260C	0.001	-----	
xylene (dimethylbenzene)	0.04	5030B	WS8260C	0.001	-----	
benzoic acid	0.65	Sonication	SW8270	0.2	0.200	**0.12**
benzyl alcohol	0.057	Microwave	SW8270D-SIM	0.031	0.100	**0.0043**
dimethylphenol, 2,4-	0.029	Microwave	SW8270D-SIM	0.0063	0.020	**0.0064**
methylphenol, 2- (o-cresol)	0.055	Microwave	SW8270D-SIM	0.0063	0.020	**0.004**
methylphenol, 4- (p-cresol)	0.11	Sonication	SW8270	0.02	0.020	**0.0034**
pentachlorophenol	0.012	Microwave	SW8270D-SIM	0.031	0.100	
phenol (total)	0.18	Sonication	SW8270	0.02	0.020	**0.0022**
styrene (phenylethylene)	-----	5030B	WS8260C	0.001	-----	
Tributyltin	0.017	-----	-----	-----	-----	**0.0028/0.006**
Trichlorophenol, 2,4,6-	-----	Sonication	SW8270	0.1	0.100	
Metals						
Aluminum	7700	SW6020	SW6020	20.0	-----	
Antimony	3.1	SW6020	SW6020	0.2	-----	**0.11/1.0**
Arsenic (III)	-----	-----	IC-ICP-MS	0.5	-----	
Arsenic (V)	-----	-----	IC-ICP-MS	0.5	-----	
Arsenic (total)	0.000023	SW6020	SW6020	0.2	-----	**0.02/0.2**
Barium	1500	SW6020	SW6020	0.5	-----	

TABLE SAP-3 - Sediment Data Quality Objectives and Analytical Methods

	LDW Screening Levels	*Extraction Method*	*Analysis Method*	*Sed. PQL (routine)*	*Sed. PQL (low level)*	**LDW PQL**
	mg/kg DW	**-----**	**-----**	**mg/kg**	**mg/kg**	**mg/kg**
Beryllium	-----	SW6020	SW6020	0.2	-----	
Cadmium	0.33	SW6020	SW6020	0.2	-----	**0.02/0.2**
Chromium (VI)	-----	SW3060A	SW7196A	0.1	-----	
Chromium, total (or III)	39	SW6020	SW6020	0.5	-----	**0.09/0.5**
Cobalt	10	SW6020	SW6020	0.2	-----	**0.03/0.3**
Copper	35	SW6020	SW6020	0.5	-----	**0.04/0.2**
Iron	5500	SW6020	SW6020	20.0	-----	
Lead	10	SW6020	SW6020	1.0	-----	**0.0019**
Manganese	180	SW6020	SW6020	0.5	-----	
Mercury	0.41	SW7470A	SW7470A	0.025	-----	**0.003/0.05**
Mercury (organic)	-----	-----	EPA M. 1630	TBD	-----	
Molybdenum	39	SW6020	SW6020	0.2	-----	
Nickel	28	SW6020	SW6020	0.5	-----	**0.38/1.0**
Selenium	1	SW6020	SW6020	0.5	-----	**0.3/5.0**
Silver	0.56	SW6020	SW6020	0.2	-----	
Tin	-----	SW6010	SW6010	1.0	-----	
Thallium	0.51	SW6020	SW6020	0.2	-----	
Vanadium	39	SW6020	SW6020	0.2	-----	**0.03/0.3**
Zinc	260	SW6020	SW6020	4.0	-----	**0.29/0.6**
Total PAHs						
LPAH	5.2	-----	-----	-----	-----	**0.0022**
HPAH	12	-----	-----	-----	-----	**0.0033**
Total Petroleum Hydrocarbons	5.7					
Gasoline	-----	Purge & Trap	NW-TPH-G	5	-----	
Gasoline (w/benzene)	-----	Purge & Trap	NW-TPH-G	5	-----	
Diesel	-----	Sonication	NWTPH-Dx	5.0	-----	
Heavy Oil	-----	Sonication	NWTPH-Dx	10.0	-----	
Dioxin Furans						
2,3,7,8-TCDD (Dioxin)	0.000000141	-----	EPA1613	0.000001	-----	
Pesticides						
Aldrin	-----	Microwave	SW8081	0.002	-----	
alpha-BHC	-----	Microwave	SW8081	0.002	-----	
beta-BHC	-----	Microwave	SW8081	0.002	-----	
gamma-BHC	-----	Microwave	SW8081	0.002	-----	
Chlordane	-----	Microwave	SW8081	0.002	-----	
4,4'-DDT	-----	Microwave	SW8081	0.003	-----	
4,4'-DDE	-----	Microwave	SW8081	0.003	-----	
4,4'-DDD	-----	Microwave	SW8081	0.003	-----	
Dieldrin	-----	Microwave	SW8081	0.003	-----	
alpha-Endosulfan	-----	Microwave	SW8081	1.7	-----	
beta-Endosulfan	-----	Microwave	SW8081	3.3	-----	

TABLE SAP-3 - Sediment Data Quality Objectives and Analytical Methods

	LDW Screening Levels	Extraction Method	Analysis Method	Sed. PQL (routine)	Sed. PQL (low level)	LDW PQL
	mg/kg DW	-----	-----	mg/kg	mg/kg	mg/kg
Endosulfan Sulfate	-----	Microwave	SW8081	0.003	-----	
Endrin	-----	Microwave	SW8081	0.003	-----	
Endrin Aldehyde	-----	Microwave	SW8081	0.003	-----	
Heptachlor	-----	Microwave	SW8081	0.002	-----	
Heptachlor Epoxide	-----	Microwave	SW8081	0.002	-----	
Toxaphene	-----	Microwave	SW8081	0.170	-----	
Total Organic Carbon	-----	PSEP	Plumb	0.02%	-----	

Notes: LDW - Lower Duwamish Waterway
(a) - Source: Ecology spread sheet
CUL - Cleanup Level
PQL - Practical quantitation limit
TBD - To be determined, if needed
----- - Not available/Not applicable
DW - Dry weight

TABLE SAP-4 - Groundwater Data Quality Objectives and Analytical Methods

Analyte	GW MOST STRINGENT POTABLE	WAC 173-340-720	Methods and Analytical Goals			
	LDW Screening Levels	*Method A CUL*	*Extraction Method*	*Analytical Method*	*GW PQL*	**LDW PQL**
	µg/l	ug/l	-----	-----	ug/l	ug/l
Organic Compounds						
acetone	**800**	**-----**	5030B	SW8260C	5.0	**10**
acenaphthene	**2.6**	**-----**	Sep Funnel	SW8270D	1	**0.1**
acenaphthylene	**11**	**-----**	Sep Funnel	SW8270D	1	**0.1**
anthracene	**11**	**-----**	Sep Funnel	SW8270D	1	**0.1**
benzene	**0.80**	**5**	5030B	SW8260C	0.2	**1**
benzo(g,h,i)perylene	**0.0116**	**-----**	Sep Funnel	SW8270D-SIM	0.1	**0.1**
benzo[a]anthracene	**0.0001**	**-----**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
benzo[a]pyrene	**0.000007**	**0.1**	Sep Funnel	SW8270D-SIM	0.1	**0.1**
benzo[b]fluoranthene	**0.000053**	**-----**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
benzo[k]fluoranthene	**0.000055**	**-----**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
bis(2-ethylhexyl) phthalate	**0.28**	**-----**	Sep Funnel	SW8270D	1.0	**1**
butyl benzyl phthalate	**0.52**	**-----**	Sep Funnel	SW8270D	1.0	
carbon tetrachloride	**0.25**	**-----**	5030B	SW8260C	0.2	**1**
chlorobenzene	**100**	**-----**	5030B	SW8260C	0.2	**1**
chloroethane	**21000**	**-----**	5030B	SW8260C	0.2	**1**
chloroform (trichloromethane)	**4.3**	**-----**	5030B	SW8260C	0.2	**1**
chloromethane	**3.4**	**-----**	5030B	SW8260C	0.5	**1**
chrysene	**0.0011**	**-----**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
dibenz[a,h]anthracene	**0.00003**	**-----**	Sep Funnel	SW8270D-SIM	0.1	**0.1**
dibenzofuran	**1.3**	**-----**	Sep Funnel	SW8270D	1	**0.1**
di-butyl phthalate (di-n-butyl phth.)	**47**	**-----**	Sep Funnel	SW8270D	1.0	**1**
dichlorobenzene, 1,2-	**5.2**	**-----**	Sep Funnel	SW8270D	1.0	**1**
dichlorobenzene, 1,3-	**600**	**-----**	Sep Funnel	SW8270D	1.0	**1**
dichlorobenzene, 1,4-	**4.0**	**-----**	Sep Funnel	SW8270D	1.0	**1**
dichloroethane, 1,1-	**1.0**	**-----**	5030B	SW8260C	0.2	**0.2**
dichloroethane, 1,2-	**0.48**	**5**	5030B	SW8260C	0.2	**0.2**
dichloroethylene, 1,1-	**0.73**	**-----**	5030B	SW8260C	0.2	**0.2**
diethyl phthalate	**484**	**-----**	Sep Funnel	SW8270D	1.0	**1**
dimethyl phthalate	**143**	**-----**	Sep Funnel	SW8270D	1.0	**1**
di-n-octyl phthalate	**0.30**	**-----**	Sep Funnel	SW8270D	1.0	**1**
ethylbenzene	**700**	**700**	5030B	SW8260C	0.2	**1**
fluoranthene	**2.3**	**-----**	Sep Funnel	SW8270D	1	**0.1**
fluorene	**2.0**	**-----**	Sep Funnel	SW8270D	1	**0.1**
hexachlorobenzene	**0.05**	**-----**	Sep Funnel	SW8081	0.05	
hexachlorobutadiene	**0.90**	**-----**	Sep Funnel	SW8081	0.05	
indeno[1,2,3-cd]pyrene	**0.00002**	**-----**	Sep Funnel	SW8270D-SIM	0.1	**0.1**
MEK (Methyl Ethyl Ketone;2-Butanor	**4800**	**-----**	5030B	SW8260C	5.0	

TABLE SAP-4 - Groundwater Data Quality Objectives and Analytical Methods

	LDW Screening Levels	*Method A CUL*	*Extraction Method*	*Analytical Method*	*GW PQL*	**LDW PQL**
	µg/l	**ug/l**	-----	-----	**ug/l**	**ug/l**
methylene chloride (dichloromethane	**5.0**	**5**	5030B	SW8260C	0.5	**2**
methylnaphthalene, 2-	**18**	**-----**	Sep Funnel	SW8270D	1	**0.1**
MIBK (M-Isobutyl-K;4-M,2-Pentanon	**640**	**-----**	5030B	SW8260C	5.0	
naphthalene	**54**	**160**	Sep Funnel	SW8270D	1	**0.1**
nitrosodiphenylamine, N-	**1.6**	**-----**	Sep Funnel	SW8270D-SIM	0.5	**1**
pcb mixtures	**0.00002**	**0.1**	Sep Funnel	SW8082-LL	0.01	**0.01**
pcb - Aroclor 1016	**0.00006**	**-----**	Sep Funnel	SW8082-LL	0.01	**0.01**
pcb - Aroclor 1221	**0.00002**	**-----**	Sep Funnel	SW8082-LL	0.01	**0.01**
pcb - Aroclor 1232	**-----**	**-----**	Sep Funnel	SW8082-LL	0.01	**0.01**
pcb - Aroclor 1242	**0.00002**	**-----**	Sep Funnel	SW8082-LL	0.01	**0.01**
pcb - Aroclor 1248	**0.00002**	**-----**	Sep Funnel	SW8082-LL	0.01	**0.01**
pcb - Aroclor 1254	**0.00001**	**-----**	Sep Funnel	SW8082-LL	0.01	**0.01**
pcb - Aroclor 1260	**0.00002**	**-----**	Sep Funnel	SW8082-LL	0.01	**0.01**
phenanthrene	**4.8**	**-----**	Sep Funnel	SW8270D	1	**1**
pyrene	**9.8**	**-----**	Sep Funnel	SW8270D	1	**1**
tetrachloroethylene (perchloroethyler	**0.02**	**5**	5030B	SW8260C	0.2	**0.2**
trichlorobenzene, 1,2,4-	**1.1**	**-----**	5030B	SW8260C	0.5	
trichlorethane, 1,1,1-	**200**	**200**	5030B	SW8260C	0.2	**0.2**
trichlorethane, 1,1,2-	**0.77**	**-----**	5030B	SW8260C	0.2	**0.2**
trichloroethylene	**0.11**	**5**	5030B	SW8260C	0.2	**0.2**
trimethylbenzene, 1,3,5-	**45**	**-----**	5030B	SW8260C	0.2	
toluene	**1000**	**1000**	5030B	SW8260C	0.2	
vinyl chloride (chloroethylene)	**0.02**	**0.2**	5030B	SW8260C	0.2	**0.2**
xylene (dimethylbenzene)	**1000**	**1000**	5030B	SW8260C	0.4	**2**
benzoic acid	**2243**	**-----**	Sep Funnel	SW8270D	10.0	**10**
benzyl alcohol	**182**	**-----**	Sep Funnel	SW8270D	5.0	**5**
dimethylphenol, 2,4-	**2.0**	**-----**	Sep Funnel	SW8270D	1.0	
methylphenol, 2- (o-cresol)	**7.1**	**-----**	Sep Funnel	SW8270D	1.0	
methylphenol, 4- (p-cresol)	**77**	**-----**	Sep Funnel	SW8270D	1.0	**1**
pentachlorophenol	**0.73**	**-----**	Sep Funnel	SW8041	0.25	
phenol (total)	**78**	**-----**	Sep Funnel	SW8270D	1.0	**1**
styrene (phenylethylene)	**1.5**	**-----**	5030B	SW8260C	0.2	**1**
Tributyltin	**-----**	**-----**	**-----**	**-----**	**-----**	
Trichlorophenol, 2,4,6-	**3.0**	**-----**	Sep Funnel	SW8041	0.25	**5**
Metals						
Aluminum	**50**	**-----**	**-----**	200.8	20	
Antimony	**3.9**	**-----**	**-----**	200.8	0.2	
Arsenic (III)	**-----**	**-----**	**-----**	IC-ICP-MS	0.5	
Arsenic (V)	**-----**	**-----**	**-----**	IC-ICP-MS	0.5	
Arsenic (total)	**0.05**	**5**	**-----**	200.8	0.5	**0.2**
Barium	**2.0**	**-----**	**-----**	200.8	0.5	

TABLE SAP-4 - Groundwater Data Quality Objectives and Analytical Methods

	LDW Screening Levels	*Method A CUL*	*Extraction Method*	*Analytical Method*	*GW PQL*	**LDW PQL**
	µg/l	**ug/l**	-----	-----	**ug/l**	**ug/l**
Beryllium	**4.0**	**-----**	**-----**	200.8	0.2	
Cadmium	**0.21**	**5**	**-----**	200.8	0.2	**0.2**
Chromium (VI)	**0.58**	**-----**	**-----**	200.8	10	**10**
Chromium, total (or III)	**50**	**50**	**-----**	200.8	0.5	**0.5**
Cobalt	**-----**	**-----**	**-----**	200.8	0.2	
Copper	**1.3**	**-----**	**-----**	200.8	0.5	**0.5**
Iron	**300**	**-----**	**-----**	200.8	20	
Lead	**2.5**	**15**	**-----**	200.8	1	**1**
Manganese	**50**	**-----**	**-----**	200.8	0.5	
Mercury	**0.0052**	**2**	**-----**	EPA 1631	0.0002	**0.1**
Mercury (organic)	**0.0005**	**-----**	**-----**	EPA 1630	0.00005	
Molybdenum	**40**	**-----**	**-----**	200.8	0.2	
Nickel	**8.2**	**-----**	**-----**	200.8	0.5	**2**
Selenium	**5.0**	**-----**	**-----**	200.8	0.5	
Silver	**1.5**	**-----**	**-----**	200.8	0.2	**0.02**
Tin	**-----**	**-----**	**-----**	6010	10	
Thallium	**0.47**	**-----**	**-----**	200.8	0.2	
Vanadium	**245**	**-----**	**-----**	200.8	0.2	
Zinc	**33**	**-----**	**-----**	200.8	4	**4**
Total PAHs						
LPAH	**0.01**	-----	-----	-----	-----	
HPAH	**0.01**	-----	-----	-----	-----	
Total Petroleum Hydrocarbons						
Gasoline	**1000**	**1000**	Purge & Trap	NWTPH-G	250	
Gasoline (w/benzene)	**800**	**800**	Purge & Trap	NWTPH-G	250	
Diesel	**500**	**500**	Sep. Funnel	NWTPH-Dx	100	**100**
Heavy Oil	**500**	**500**	Sep. Funnel	NWTPH-Dx	200	**100**
Dioxin/Furans						
2,3,7,8-TCDD (Dioxin)	**2.06039E-10**	-----	-----	EPA1613	0.00001	
Pesticides						
Aldrin	**0.0026**	-----	Sep. Funnel	SW8081	0.05	**1E-06**
alpha-BHC	**0.0139**	-----	Sep. Funnel	SW8081	0.05	**5E-07**
beta-BHC	**0.0486**	-----	Sep. Funnel	SW8081	0.05	**5E-07**
gamma-BHC	**0.0002**	-----	Sep. Funnel	SW8081	0.05	**5E-07**
Chlordane	**0.0020**	-----	Sep. Funnel	SW8081	0.05	**5E-07**
4,4'-DDT	**0.2574**	**0.3**	Sep. Funnel	SW8081	0.1	**5E-07**
4,4'-DDE	**0.2574**	-----	Sep. Funnel	SW8081	0.1	**5E-07**
4,4'-DDD	**0.3646**	-----	Sep. Funnel	SW8081	0.1	**5E-07**
Dieldrin	**0.0055**	-----	Sep. Funnel	SW8081	0.1	**5E-06**
alpha-Endosulfan	**96**	-----	Sep. Funnel	SW8081	0.1	**2E-06**
beta-Endosulfan	**96**	-----	Sep. Funnel	SW8081	0.1	**2E-06**

TABLE SAP-4 - Groundwater Data Quality Objectives and Analytical Methods

	LDW Screening Levels	*Method A CUL*	*Extraction Method*	*Analytical Method*	*GW PQL*	**LDW PQL**
	µg/l	**ug/l**	**-----**	**-----**	**ug/l**	**ug/l**
Endosulfan Sulfate	**96**	-----	Sep. Funnel	SW8081	0.1	**5E-07**
Endrin	**0.0020**	-----	Sep. Funnel	SW8081	0.1	**2E-06**
Endrin Aldehyde	**0.0020**	-----	Sep. Funnel	SW8081	0.1	**2E-06**
Heptachlor	**0.0004**	-----	Sep. Funnel	SW8081	0.05	**5E-07**
Heptachlor Epoxide	**0.0002**	-----	Sep. Funnel	SW8081	0.05	**1E-06**
Toxaphene	-----	-----	Sep. Funnel	SW8081	5.0	

Notes:
LDW - Lower Duwamish Waterway
(a) - Source: Ecology spread sheet
CUL - Cleanup Level
PQL - Practical quantitation limit
TBD - To be determined, if needed
----- - Not available/Not applicable

TABLE SAP-5 - Surface Water Data Quality Objectives and Analytical Methods

Analyte	SW MOST STRINGENT Non-Potable	Methods and Analytical Goals			
	LDW Screening Levels	*Extraction Method*	*Analytical Method*	*SW PQL*	LDW PQL
	µg/l	-----	-----	ug/l	ug/l
Organic Compounds					
acetone	**110107**	5030B	SW8260C	5.0	
acenaphthene	**2.6**	Sep Funnel	SW8270D	1	**0.01**
acenaphthylene	**11**	Sep Funnel	SW8270D	1	
anthracene	**11**	Sep Funnel	SW8270D	1	**0.01**
benzene	**1.2**	5030B	SW8260C	0.2	
benzo(g,h,i)perylene	**0.012**	Sep Funnel	SW8270D-SIM	0.1	
benzo[a]anthracene	**0.0003**	Sep Funnel	SW8270D-SIM	0.1	**0.15/0.01**
benzo[a]pyrene	**0.0000**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
benzo[b]fluoranthene	**0.0001**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
benzo[k]fluoranthene	**0.0001**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
bis(2-ethylhexyl) phthalate	**0.28**	Sep Funnel	SW8270D	1.0	**1**
butyl benzyl phthalate	**0.41**	Sep Funnel	SW8270D	1.0	
carbon tetrachloride	**0.23**	5030B	SW8260C	0.2	
chlorobenzene	**20**	5030B	SW8260C	0.2	
chloroethane	**0.41**	5030B	SW8260C	0.2	
chloroform (trichloromethane)	**4.3**	5030B	SW8260C	0.2	
chloromethane	**20**	5030B	SW8260C	0.5	
chrysene	**0.003**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
dibenz[a,h]anthracene	**0.00006**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
dibenzofuran	**1.3**	Sep Funnel	SW8270D	1	
di-butyl phthalate (di-n-butyl phth.)	**47**	Sep Funnel	SW8270D	1.0	
dichlorobenzene, 1,2-	**5.2**	Sep Funnel	SW8270D	1.0	
dichlorobenzene, 1,3-	**320**	Sep Funnel	SW8270D	1.0	
dichlorobenzene, 1,4-	**0.74**	Sep Funnel	SW8270D	1.0	
dichloroethane, 1,1-	**33**	5030B	SW8260C	0.2	
dichloroethane, 1,2-	**0.38**	5030B	SW8260C	0.2	
dichloroethylene, 1,1-	**0.057**	5030B	SW8260C	0.2	
diethyl phthalate	**484**	Sep Funnel	SW8270D	1.0	
dimethyl phthalate	**143**	Sep Funnel	SW8270D	1.0	
di-n-octyl phthalate	**0.30**	Sep Funnel	SW8270D	1.0	
ethylbenzene	**2.4**	5030B	SW8260C	0.2	
fluoranthene	**2.3**	Sep Funnel	SW8270D	1	**0.01**
fluorene	**2.0**	Sep Funnel	SW8270D	1	**0.01**
hexachlorobenzene	**0.00007**	Sep Funnel	SW8081	0.05	
hexachlorobutadiene	**0.44**	Sep Funnel	SW8081	0.05	
indeno[1,2,3-cd]pyrene	**0.00005**	Sep Funnel	SW8270D-SIM	0.1	**0.01**
MEK (Methyl Ethyl Ketone;2-Butanone)	**4800**	5030B	SW8260C	5.0	

TABLE SAP-5 - Surface Water Data Quality Objectives and Analytical Methods

	LDW Screening Levels	*Extraction Method*	*Analytical Method*	*SW PQL*	LDW PQL
	µg/l	-----	-----	ug/l	ug/l
methylene chloride (dichloromethane)	**4.6**	5030B	SW8260C	0.5	
methylnaphthalene, 2-	**18**	Sep Funnel	SW8270D	1	
MIBK (M-Isobutyl-K;4-M,2-Pentanone)		5030B	SW8260C	5.0	
naphthalene	**54**	Sep Funnel	SW8270D	1	**0.01**
nitrosodiphenylamine, N-	**1.5**	Sep Funnel	SW8270D-SIM	0.5	
pcb mixtures	**0.00002**	Sep Funnel	SW8082-LL	0.01	**0.01**
pcb - Aroclor 1016	**0.0005**	Sep Funnel	SW8082-LL	0.01	
pcb - Aroclor 1221	**0.00002**	Sep Funnel	SW8082-LL	0.01	
pcb - Aroclor 1232	**0.014**	Sep Funnel	SW8082-LL	0.01	
pcb - Aroclor 1242	**0.00002**	Sep Funnel	SW8082-LL	0.01	
pcb - Aroclor 1248	**0.00002**	Sep Funnel	SW8082-LL	0.01	
pcb - Aroclor 1254	**0.00001**	Sep Funnel	SW8082-LL	0.01	
pcb - Aroclor 1260	**0.00002**	Sep Funnel	SW8082-LL	0.01	
phenanthrene	**4.8**	Sep Funnel	SW8270D	1	
pyrene	**9.8**	Sep Funnel	SW8270D	1	**0.01**
tetrachloroethylene (perchloroethylene)	**0.02**	5030B	SW8260C	0.2	
trichlorobenzene, 1,2,4-	**1.1**	5030B	SW8260C	0.5	
trichlorethane, 1,1,1-	**46024**	5030B	SW8260C	0.2	
trichlorethane, 1,1,2-	**0.59**	5030B	SW8260C	0.2	
trichloroethylene	**0.74**	5030B	SW8260C	0.2	
trimethylbenzene, 1,3,5-	**45**	5030B	SW8260C	0.2	
toluene	**1294**	5030B	SW8260C	0.2	
vinyl chloride (chloroethylene)	**0.025**	5030B	SW8260C	0.2	
xylene (dimethylbenzene)	**1578**	5030B	SW8260C	0.4	
benzoic acid	**2243**	Sep Funnel	SW8270D	10.0	
benzyl alcohol	**182**	Sep Funnel	SW8270D	5.0	
dimethylphenol, 2,4-	**2.0**	Sep Funnel	SW8270D	1.0	
methylphenol, 2- (o-cresol)	**7.1**	Sep Funnel	SW8270D	1.0	
methylphenol, 4- (p-cresol)	**77**	Sep Funnel	SW8270D	1.0	
pentachlorophenol	**0.27**	Sep Funnel	SW8041	0.25	
phenol (total)	**78**	Sep Funnel	SW8270D	1.0	
styrene (phenylethylene)	-----	5030B	SW8260C	0.2	
Tributyltin	**0.0074**	-----	-----	-----	
Trichlorophenol, 2,4,6-	**0.56**	Sep Funnel	SW8041	0.25	
Metals					
Aluminum	-----	-----	200.8	20	
Antimony	**3.9**	-----	200.8	0.2	
Arsenic (III)	-----	-----	IC-ICP-MS	0.5	
Arsenic (V)	-----	-----	IC-ICP-MS	0.5	
Arsenic (total)	**0.005**	-----	200.8	0.5	**0.02**
Barium	**122**	-----	200.8	0.5	

TABLE SAP-5 - Surface Water Data Quality Objectives and Analytical Methods

	LDW Screening Levels	*Extraction Method*	*Analytical Method*	*SW PQL*	**LDW PQL**
	µg/l	**-----**	**-----**	**ug/l**	**ug/l**
Beryllium	**12**	**-----**	200.8	0.2	
Cadmium	**0.25**	**-----**	200.8	0.2	
Chromium (VI)	**0.12**	**-----**	200.8		
Chromium, total (or III)	**74**	**-----**	200.8	0.5	
Cobalt	**-----**	**-----**	200.8	0.2	
Copper	**3.1**	**-----**	200.8	0.5	
Iron	**-----**	**-----**	200.8	20	
Lead	**0.54**	**-----**	200.8	1	
Manganese	**50**	**-----**	200.8	0.5	
Mercury	**0.0052**	**-----**	EPA 1631	0.0002	
Mercury (organic)	**0.0005**	**-----**	EPA 1630	0.00005	
Molybdenum	**-----**	**-----**	200.8	0.2	
Nickel	**5.0**	**-----**	200.8	0.5	
Selenium	**5.0**	**-----**	200.8	0.5	
Silver	**1.5**	**-----**	200.8	0.2	**0.02**
Tin	**-----**	**-----**	6010	10	
Thallium	**0.23**	**-----**	200.8	0.2	
Vanadium	**-----**	**-----**	200.8	0.2	
Zinc	**33**	**-----**	200.8	4	
Total PAHs					
LPAH	**0.01**	-----	-----	-----	
HPAH	**0.01**	-----	-----	-----	
Total Petroleum Hydrocarbons	**0.208**				
Gasoline	**1000**	Purge & Trap	NWTPH-G	250	
Gasoline (w/benzene)	**800**	Purge & Trap	NWTPH-G	250	
Diesel	**500**	Sep. Funnel	NWTPH-Dx	100	
Heavy Oil	**500**	Sep. Funnel	NWTPH-Dx	200	
Dioxin Furans					
2,3,7,8-TCDD (Dioxin)	**2.06039E-10**	-----	EPA1613	0.00001	
Pesticides					
Aldrin	**0.000012**	Sep. Funnel	SW8081	0.05	
alpha-BHC	**0.0012**	Sep. Funnel	SW8081	0.05	
beta-BHC	**0.0042**	Sep. Funnel	SW8081	0.05	
gamma-BHC	**0.0002**	Sep. Funnel	SW8081	0.05	
Chlordane	**0.0002**	Sep. Funnel	SW8081	0.05	
4,4'-DDT	**0.00005**	Sep. Funnel	SW8081	0.1	
4,4'-DDE	**0.00005**	Sep. Funnel	SW8081	0.1	
4,4'-DDD	**0.00008**	Sep. Funnel	SW8081	0.1	
Dieldrin	**0.00001**	Sep. Funnel	SW8081	0.1	
alpha-Endosulfan	**0.0087**	Sep. Funnel	SW8081	0.1	
beta-Endosulfan	**0.0087**	Sep. Funnel	SW8081	0.1	

TABLE SAP-5 - Surface Water Data Quality Objectives and Analytical Methods

	LDW Screening Levels	*Extraction Method*	*Analytical Method*	*SW PQL*	**LDW PQL**
	µg/l	**-----**	**-----**	**ug/l**	**ug/l**
Endosulfan Sulfate	**0.0087**	Sep. Funnel	SW8081	0.1	
Endrin	**0.002**	Sep. Funnel	SW8081	0.1	
Endrin Aldehyde	**0.002**	Sep. Funnel	SW8081	0.1	
Heptachlor	**0.00002**	Sep. Funnel	SW8081	0.05	
Heptachlor Epoxide	**0.00001**	Sep. Funnel	SW8081	0.05	
Toxaphene	**0.00007**	Sep. Funnel	SW8081	5.0	

Notes: LDW - Lower Duwamish Waterway
(a) - Source: Ecology spread sheet
CUL - Cleanup Level
PQL - Practical quantitation limit
TBD - To be determined, if needed
----- - Not available/Not applicable

TABLE SAP-6 - Soil Data Quality Objectives and Analytical Methods

Analyte	Soil Standard to Protect Potable Ground Waters and Non-Potable Surface Water (a)	WAC 173-340-740	Ecology (1994)	Methods and Analytical Goals				
	LDW Screening Levels	*Method A CUL*	*Puget Sound Background*	*Extraction Method*	*Analysis Method*	*Soil PQL (routine)*	*Soil PQL (low level)*	**LDW PQL**
	mg/kg	**mg/kg**	**mg/kg**	**-----**	**-----**	**mg/kg**	**mg/kg**	**mg/kg**
Organic Compounds								
acetone	0.231	-----	-----	5030B	SW8260C	0.005	-----	**0.02**
acenaphthene	0.017	-----	-----	Sonication	SW8270	0.02	-----	
acenaphthylene	0.069	-----	-----	Sonication	SW8270	0.02	-----	
anthracene	0.223	-----	-----	Sonication	SW8270	0.02	-----	
benzene	0.0005	0.03	-----	5030B	SW8260C	0.001	-----	**0.001**
benzo(g,h,i)perylene	0.031	-----	-----	Sonication	SW8270	0.02	-----	
benzo[a]anthracene	0.000048	-----	-----	Sonication	SW8270	0.02	-----	
benzo[a]pyrene	0.000005	0.1	-----	Sonication	SW8270	0.02	-----	
benzo[b]fluoranthene	0.000042	-----	-----	Sonication	SW8270	0.02	-----	
benzo[k]fluoranthene	0.000043	-----	-----	Sonication	SW8270	0.02	-----	
bis(2-ethylhexyl) phthalate	0.047	-----	-----	Sonication	SW8270	0.02	0.020	**0.02**
butyl benzyl phthalate	0.0040	-----	-----	Microwave	SW8270D-SIM	0.020	0.0063	**0.02**
carbon tetrachloride	0.0001	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
chlorobenzene	0.011	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
chloroethane	0.00013	-----	-----	5030B	SW8260C	0.001	-----	**0.004**
chloroform (trichloromethane)	0.0014	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
chloromethane	0.0015	-----	-----	5030B	SW8260C	0.001	-----	**0.002**
chrysene	0.0003	-----	-----	Sonication	SW8270	0.02	-----	
dibenz[a,h]anthracene	0.0001	-----	-----	Sonication	SW8270	0.02	-----	
dibenzofuran	0.015	-----	-----	Sonication	SW8270	0.02	-----	**0.02**
di-butyl phthalate (di-n-butyl phth.)	0.081	-----	-----	Sonication	SW8270	0.02	0.020	**0.02**
dichlorobenzene, 1,2-	0.0038	-----	-----	Microwave	SW8270D-SIM	0.02	0.0063	**0.001**
dichlorobenzene, 1,3-	0.092	-----	-----	Microwave	SW8270D-SIM	0.02	0.0063	**0.001**
dichlorobenzene, 1,4-	0.0005	-----	-----	Microwave	SW8270D-SIM	0.02	0.0063	**0.001**
dichloroethane, 1,1-	0.0005	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
dichloroethane, 1,2-	0.0001	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
dichloroethylene, 1,1-	0.00002	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
diethyl phthalate	0.200	-----	-----	Sonication	SW8270	0.02	0.020	**0.02**
dimethyl phthalate	0.041	-----	-----	Sonication	SW8270	0.02	0.020	**0.02**
di-n-octyl phthalate	0.0005	-----	-----	Sonication	SW8270	0.02	0.020	**0.02**
ethylbenzene	0.0019	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
fluoranthene	0.161	-----	-----	Sonication	SW8270	0.02	-----	
fluorene	0.024	-----	-----	Sonication	SW8270	0.02	-----	

TABLE SAP-6 - Soil Data Quality Objectives and Analytical Methods

Analyte	*LDW Screening Levels*	*Method A CUL*	*Puget Sound Background*	*Extraction Method*	*Analysis Method*	*Soil PQL (routine)*	*Soil PQL (low level)*	**LDW PQL**
	mg/kg	**mg/kg**	**mg/kg**	**-----**	**-----**	**mg/kg**	**mg/kg**	**mg/kg**
hexachlorobenzene	0.00000024	-----	-----	Sonication	SW8081	0.020	0.0005	
hexachlorobutadiene	0.00056327	-----	-----	Sonication	SW8081	0.100	0.0005	**0.02**
indeno[1,2,3-cd]pyrene	0.00006086	-----	-----	Sonication	SW8270	0.02	-----	
MEK (Methyl Ethyl Ketone;2-Butanone	28000	-----	-----	5030B	SW8260C	0.005	-----	**0.01**
methylene chloride (dichloromethane)	0.0014	0.02	-----	5030B	SW8260C	0.002	-----	**0.0035**
methylnaphthalene, 2-	0.043	5	-----	Sonication	SW8270	0.02	-----	**0.01**
MIBK (M-Isobutyl-K;4-M,2-Pentanone	5300	-----	-----	5030B	SW8260C	0.005	-----	**0.01**
naphthalene	0.114	5	-----	Sonication	SW8270	0.02	-----	**0.002**
nitrosodiphenylamine, N-	0.0014	-----	-----	Microwave	SW8270D-SIM	0.020	0.0063	
pcb mixtures	0.0000007	1	-----	PSEP Low Level	SW8082	0.004	-----	
pcb - Aroclor 1016	0.0000018	-----	-----	PSEP Low Level	SW8082	0.004	-----	**0.1**
pcb - Aroclor 1221	0.0000002	-----	-----	PSEP Low Level	SW8082	0.004	-----	**0.1**
pcb - Aroclor 1232	0.0001486	-----	-----	PSEP Low Level	SW8082	0.004	-----	**0.1**
pcb - Aroclor 1242	0.00000002	-----	-----	PSEP Low Level	SW8082	0.004	-----	**0.1**
pcb - Aroclor 1248	0.0000010	-----	-----	PSEP Low Level	SW8082	0.004	-----	**0.1**
pcb - Aroclor 1254	0.0000004	-----	-----	PSEP Low Level	SW8082	0.004	-----	**0.1**
pcb - Aroclor 1260	0.0000048	-----	-----	PSEP Low Level	SW8082	0.004	-----	**0.1**
phenanthrene	0.101	-----	-----	Sonication	SW8270	0.02	-----	**0.02**
pyrene	0.684	-----	-----	Sonication	SW8270	0.02	-----	
tetrachloroethylene (perchloroethylene	0.000008	0.05	-----	5030B	SW8260C	0.001	-----	**0.001**
trichlorobenzene, 1,2,4-	0.0004	-----	-----	Microwave	SW8270D-SIM	0.0063	-----	**0.002**
trichlorethane, 1,1,1-	0.096	2	-----	5030B	SW8260C	0.001	-----	**0.001**
trichlorethane, 1,1,2-	0.00021	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
trichloroethylene	0.00005	0.03	-----	5030B	SW8260C	0.001	-----	**0.001**
trimethylbenzene, 1,3,5-	0.051	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
toluene	0.698	7	-----	5030B	SW8260C	0.001	-----	**0.001**
vinyl chloride (chloroethylene)	0.000008	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
xylene (dimethylbenzene)	0.873	9	-----	5030B	SW8260C	0.001	-----	**0.002**
benzoic acid	0.644	-----	-----	Sonication	SW8270	0.2	0.200	**0.2**
benzyl alcohol	0.055	-----	-----	Microwave	SW8270D-SIM	0.100	0.031	
dimethylphenol, 2,4-	0.002	-----	-----	Microwave	SW8270D-SIM	0.020	0.0063	
methylphenol, 2- (o-cresol)	0.003	-----	-----	Microwave	SW8270D-SIM	0.020	0.0063	**0.02**
methylphenol, 4- (p-cresol)	0.022	-----	-----	Sonication	SW8270	0.02	0.020	**0.02**
pentachlorophenol	0.001	-----	-----	Microwave	SW8270D-SIM	0.100	0.031	**0.1**
phenol (total)	0.024	-----	-----	Sonication	SW8270	0.02	0.020	**0.02**
styrene (phenylethylene)	0.0014	-----	-----	5030B	SW8260C	0.001	-----	**0.001**
Tributyltin	-----	-----	-----	-----	-----	-----	-----	
Trichlorophenol, 2,4,6-	0.0008	-----	-----	Sonication	SW8270	0.1	0.100	**0.1**

TABLE SAP-6 - Soil Data Quality Objectives and Analytical Methods

Analyte	*LDW Screening Levels*	*Method A CUL*	*Puget Sound Background*	*Extraction Method*	*Analysis Method*	*Soil PQL (routine)*	*Soil PQL (low level)*	**LDW PQL**
	mg/kg	**mg/kg**	**mg/kg**	-----	-----	**mg/kg**	**mg/kg**	**mg/kg**
Metals								
Aluminum	0.022	-----	32600	SW6020	SW6020	20.0	-----	
Antimony	0.175	-----	-----	SW6020	SW6020	0.2	-----	
Arsenic (III)	7.0	-----	-----	-----	IC-ICP-MS	0.5	-----	
Arsenic (V)	10	-----	-----	-----	IC-ICP-MS	0.5	-----	
Arsenic (total)	0.00016	20	20	SW6020	SW6020	0.2	-----	**0.5**
Barium	0.08	-----	-----	SW6020	SW6020	0.5	-----	
Beryllium	3.2	-----	0.600	SW6020	SW6020	0.2	-----	
Cadmium	0.0015	2	1	SW6020	SW6020	0.2	-----	**0.2**
Chromium (VI)	0.0024	19	-----	SW3060A	SW7196A	0.1	-----	**0.1**
Chromium, total (or III)	42	2000	48	SW6020	SW6020	0.5	-----	**0.5**
Cobalt	2.3	-----	-----	SW6020	SW6020	0.2	-----	
Copper	0.029	-----	36	SW6020	SW6020	0.5	-----	**0.2**
Iron	0.086	-----	58700	SW6020	SW6020	20.0	-----	
Lead	5.4	250	24	SW6020	SW6020	1.0	-----	**0.5**
Manganese	0.014	-----	1200	SW6020	SW6020	0.5	-----	
Mercury	0.0003	2	0.07	GFA/CVAA	GFA/CVAA	0.025	-----	**0.05**
Mercury (organic)	0.00000013	-----	-----	-----	EPA M. 1630	TBD	-----	
Molybdenum	0.017	-----	-----	SW6020	SW6020	0.2	-----	
Nickel	0.326	-----	48	SW6020	SW6020	0.5	-----	**0.5**
Selenium	0.026	-----	-----	SW6020	SW6020	0.5	-----	
Silver	0.013	-----	-----	SW6020	SW6020	0.2	-----	**0.5**
Tin	50	-----	-----	SW6010	SW6010	1.0	-----	
Thallium	0.017	-----	-----	SW6020	SW6020	0.2	-----	
Vanadium	0.105	-----	-----	SW6020	SW6020	0.2	-----	
Zinc	2.0	-----	85	SW6020	SW6020	4.0	-----	
Total PAHs								
LPAH	0.000004	-----	-----	-----	-----	-----	-----	
HPAH	0.001576	-----	-----	-----	-----	-----	-----	
Total Petroleum Hydrocarbons								
Gasoline	0.430	100	-----	Purge & Trap		5		
Gasoline (w/benzene)	0.344	30	-----	Purge & Trap		5		
Diesel	0.215	2000	-----	Sonication	NWTPH-Dx	5.0	-----	**10**
Heavy Oil	0.215	2000	-----	Sonication	NWTPH-Dx	10.0	-----	**25**
Dioxin/Furans								
2,3,7,8-TCDD (Dioxin)	0.000000000030	-----	-----	-----	EPA1613	0.000001	-----	
Pesticides								
Aldrin	0.0000006	-----	-----	Microwave	SW8081	0.002	-----	**0.0001**
alpha-BHC	0.0000025	-----	-----	Microwave	SW8081	0.002	-----	**0.00005**
beta-BHC	0.0000102	-----	-----	Microwave	SW8081	0.002	-----	**0.00005**

TABLE SAP-6 - Soil Data Quality Objectives and Analytical Methods

Analyte	*LDW Screening Levels*	*Method A CUL*	*Puget Sound Background*	*Extraction Method*	*Analysis Method*	*Soil PQL (routine)*	*Soil PQL (low level)*	**LDW PQL**
	mg/kg	**mg/kg**	**mg/kg**	**-----**	**-----**	**mg/kg**	**mg/kg**	**mg/kg**
gamma-BHC	0.0000003	-----	-----	Microwave	SW8081	0.002	-----	**0.00005**
Chlordane	0.0000103	-----	-----	Microwave	SW8081	0.002	-----	**0.00005**
4,4'-DDT	0.0000367	-----	-----	Microwave	SW8081	0.003	-----	**0.00005**
4,4'-DDE	0.0000047	-----	-----	Microwave	SW8081	0.003	-----	**0.00005**
4,4'-DDD	0.0000035	-----	-----	Microwave	SW8081	0.003	-----	**0.00005**
Dieldrin	0.0000003	-----	-----	Microwave	SW8081	0.003	-----	**0.0005**
alpha-Endosulfan	0.0000202	-----	-----	Microwave	SW8081	0.0017	-----	**0.0002**
beta-Endosulfan	0.0000202	-----	-----	Microwave	SW8081	0.0033	-----	**0.0001**
Endosulfan Sulfate	0.0000202	-----	-----	Microwave	SW8081	0.003	-----	**0.00005**
Endrin	0.0000222	-----	-----	Microwave	SW8081	0.003	-----	**0.0002**
Endrin Aldehyde	0.0000222	-----	-----	Microwave	SW8081	0.003	-----	**0.0001**
Heptachlor	0.0000002	-----	-----	Microwave	SW8081	0.002	-----	**0.0001**
Heptachlor Epoxide	0.0000008	-----	-----	Microwave	SW8081	0.002	-----	**0.00001**
Toxaphene	0.909	-----	-----	Microwave	SW8081	0.170	-----	
Total Organic Carbon	**-----**	**-----**	**-----**	PSEP	Plumb	0.02%	-----	

Notes:
LDW - Lower Duwamish Waterway
(a) - Source: Ecology spread sheet
CUL - Cleanup Level
PQL - Practical quantitation limit
TBD - To be determined, if needed
----- - Not available/Not applicable

ATTACHMENT A
Field Forms

Dalton, Olmsted & Fuglevand, Inc.

DAILY FIELD REPORT

Sheet __ of __

Project Name: ICS/Trotsky Site
Date:______________________________
Project Number: SUM-008-00
Weather:___________________________
Field Rep:____________________________

Signature of Field Rep:_____________________________________

Dalton, Olmsted & Fuglevand, Inc.
Environmental Consultants

MONITORING WELL NO. _______ - DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION (SHEET 1 OF __)

Field Rep:	Location:
Drilling Co.:	Elevation:
Driller:	Date :
Drill Type:	Weather:
Size/Type Casing:	

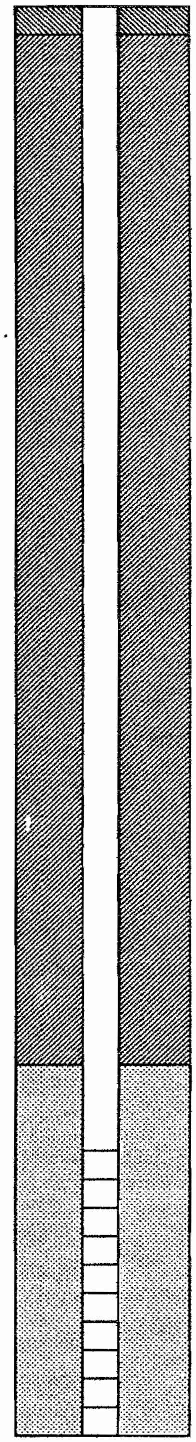
Spl.No.	Type	Drill Action	Spl Depth (Ft.) From - To	Blows/ 6 inches	Spl ength	Time	Sample Description

Dalton, Olmsted & Fuglevand, Inc.
Environmental Consultants

MONITORING WELL NO. ____________ ***- DESCRIPTION OF SAMPLES, TESTS, AND INSTALLATION (Sheet*** __ ***of*** __***)***

Depth(ft.) SUMMARY LOG

MONITORING WELL DIAGRAM



(Bottom of Well)

NOTE: The summary log is an interpretation based on samples, drill action, and interpolation. Variations between what is shown and actual conditions should be anticipated.

MONITORING WELL INFORMATION

Riser Length:	Seal:
Sandpack:	type
type: 10-20 Sand	depth (top/bot)
depth (top/bot)	Monument:
Screen:	
type/slot	
length: Depth (Top/Bot):	

Dalton, Olmsted & Fuglevand, Inc.

Client:

Location:

Sampled/Developed by:

Signature:

WATER SAMPLING /WELL-DEVELOPMENT RECORD

Date:

Job No.:

LOCATION / DATA

Well No.						
well depth						
water level						
water depth						
time						
Casing/Volume						
type:2" PVC						
type: other						
vol/ft						
tot. vol						
3 x vol						
Purge Volume						
gallons purged						
purge/bail/type						
time						
Water Sample						
Sample No.						
Sample Method						
Time						
No. Cont.						
Cont. Type						
Initials						
Sp Cond						
value						
time						
value						
time						
pH						
value						
time						
value						
time						
Temp. (Celsius)						
value						
time						
value						
time						

Sp. Cond. Calibration

Meter Type/No.		
1st Cal.Std./exp.date		
2nd Cal.Std./exp.date		
time		

pH Calibration

Meter Type/No.		
1st Cal.Std./exp.date		
2nd Cal.Std./exp.date		
time		

D.O Calibration

Meter Type/No.		
time		

Turbidity Calibration

Meter Type/No.		
time		

Note: 2" dia. PVC has 0.164 gal/ft; bail 0.5 gal/ft for 3 casing volumes

COMMENTS:

Dalton, Olmsted & Fuglevand, Inc.

WATER LEVEL RECORD

Sheet __ of __

Project Name: ICS/Trotsky Site
Project Number: SUM-008-00
Field Rep:____________________________

Date:______________________________
Weather:___________________________

Well Identification	***Elevation Top of Casing***	***Height of Casing Above Ground***	***Depth to Water From Top of Casing*** Units ________	***Time of*** **Measurement**

Signature of Field Rep:_____________________________________

Dalton, Olmsted & Fuglevand, Inc.

FIELD SAMPLE SCREENING RECORD

Sheet __ of __

Project Name: ICS/Trotsky Site

Project Number: SUM-008-00

Field Rep:____________________________

Date:______________________________

Weather:___________________________

Sample Identification	***Odor***	***Sheen*** (None, Light, Moderate, Heavy)	***PID/OVA*** (Type____________) (Model No._______)

Signature of Field Rep:_____________________________________

Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

19017 120th Avenue N.E., Suite 107 • Bothell, Washington 98011
Telephone (206) 486-7905 (FAX 486-7651)

CHAIN OF CUSTODY REPORT

CLIENT:

ADDRESS:

PHONE: FAX:

REPORT TO:

BILLING TO:

P.O. NUMBER:

NCA QUOTE #:

Turnaround		
SAME DAY (2-8 HR.) RUSH	(+150%)	
NEXT DAY RUSH	(+100%)	
2 DAY RUSH	(+80%)	
3 DAY RUSH	(+60%)	
5 DAY RUSH	(+40%)	
10 DAY STANDARD	(LIST PRICE)	

PROJECT NAME:

PROJECT NUMBER:

SAMPLED BY:

SAMPLE IDENTIFICATION: NUMBER OR DESCRIPTION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONT.	ANALYSIS REQUESTED									COMMENTS & PRESERVATIVES USED	LABORATORY NUMBER
1														
2														
3														
4														
5														
6														
7														
8														
9													TOTAL # OF CONTAINERS	
10													RECEIVED?	

RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:
FIRM:	TIME:	FIRM:	TIME:
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:
FIRM:	TIME:	FIRM:	TIME:

SAMPLE RECEIPT INFORMATION: CONTAINER CONDITION?: GOOD VIOLATED COOL (4° C)? YES NO

ATTACHMENT B to SAP

QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATINO SAMPLING
ICS/NW COOPERAGE SITE
SEATTLE, WASHINGTON

Prepared for:
ICS/Former NW Cooperage

Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

February 2012

ATTACHMENT B
QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION SAMPLING
ICS/NW COOPERAGE SITE
SEATTLE, WASHINGTON

CONTENTS

ATTACHMENT B TO SAP
QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION SAMPLING
ICS/NW COOPERAGE SITE
SEATTLE, WASHINGTON

INTRODUCTION AND PROJECT QUALITY ASSURANCE GOALS

This Quality Assurance Project Plan (QAPP) provides quality assurance and quality control procedures to be used for RI site sampling activities at the ICS/NW Cooperage site, Seattle, WA. The RI sampling work includes sediment, soil, groundwater and stormwater system sampling to assess the need for site remediation.

This QAPP meets the requirements of the Model Toxics Control Act (MTCA) (WAC 173-340-820). The purpose of this QAPP is to detail the quality assurance and quality control procedures to be used to document that the technical data generated as part of the work are of known quality, and are representative of actual field conditions.

Quality assurance (QA) is defined as an integrated program designed to assure reliability and repeatability of monitoring and measurement data. Quality Control (QC) is defined as the routine application of procedures to attain prescribed standards of performance in the monitoring and measurement process. Standard field procedures to be used during the investigation are described in the Sampling and Analysis Plan (SAP).

As necessary or appropriate, additional or modified procedures may be presented in amendments to this QAPP that may be required because of unanticipated field conditions. If any procedures are modified in the field, such changes will be approved by the DOF Project Manager and documented in the daily field report form. The client and Ecology, if appropriate, will be advised of any significant changes or modifications in procedures prior to their implementation.

The overall QA objectives are to develop and implement procedures for obtaining and evaluating data in an accurate, precise, and complete manner so that field measurements, sampling procedures, and analytical data provide information that is comparable and representative of actual field conditions. The definitions for accuracy, precision, completeness, comparability, and representativeness are as follows (EPA 1986):

- Accuracy - the degree of agreement of a measurement with an accepted reference or true value.
- Precision - a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Usually expressed in terms of the standard deviation.
- Completeness - the amount of valid data obtained from a measurement system compared to the amount that was expected and needed to be obtained to meet the project data goals.
- Comparability - expresses the confidence with which one data set can be compared to another.

- Representativeness - refers to a sample or group of samples that reflects the characteristics of the media at the sampling point. It also includes how well the sampling point represents the actual parameter variations which are under study.

The following goals for accuracy and precision are established for the results of chemical analyses of both field and laboratory QC samples:

- For analyses of laboratory QC samples, the goals are consistent with the EPA SW 846 Methods;

- For analyses of field QC samples, the goals are based on 1) the appropriateness of specific types of QC samples for each sample medium, as dictated by sampling limitations, 2) the intended use of the data, and 3) the inherent variability in field QC samples.

The actual precision and accuracy of the results of chemical analyses will be calculated from the results of analysis of the QC samples specified below and in the SAP. These results will be presented in summary form in the appropriate data reports.

The comparability of the data will be maintained by the use of standard analytical methods and by reporting all values in consistent units. For example, no mixtures of standard and metric units will be reported for depths, distances, elevations, etc. Related analytical data will be reported in consistent units [solids in milligrams or micrograms per kilogram (mg/kg or ug/kg) and fluids in milligrams or micrograms per liter (mg/l or ug/l) or the units given in an approved reference methodology]. Results of standard and non-standard analyses will not be compared without explicit presentation of the differences in the methods and their expected effects on the comparability of the data.

The representativeness of the data will be maintained by following appropriate and consistent procedures for drilling, well installation, sample collection, and other types of data collection, as well as by the application of approved, standard analytical methods.

ORGANIZATION AND RESPONSIBILITIES

The environmental consulting firm, Dalton, Olmsted & Fuglevand Inc. (DOF), will be primarily responsible for completing the sampling and analysis activities. The project team and responsibilities are described in the SAP.

FIELD PROGRAM

This section describes the procedures and protocols that will be used while conducting field work activities associated with the project. The field QA program includes:

- Documentation of field measurements, observations, and procedures;

- Field instrument calibration; and

- Disposal of investigation-derived waste

Field Measurements, Observations, and Procedures

Field measurements, observations, and procedures will be recorded on preprinted forms. Data will be recorded directly and legibly with all entries signed and dated. If changes must be made, all changes will not obscure the previous entry, and the change, with an explanation, will be signed and dated. Various forms that will be used to record daily field activities are included in the Sampling and Analysis Plan.

At a minimum, the following data will be recorded on the daily report form:

- A date and log of activities related to accomplishing planned work
- A log of all visitors to the site
- Name of field representative completing the form
- Weather conditions
- Signature of person completing the form.

At a minimum the following data will be recorded on pre-printed forms appropriate to a field activity:

- Name and purpose of the activity
- Location of the activity
- Name of person or persons conducting the activity
- Date of the activity
- Weather conditions at the time of the activity
- Field measurements made (e.g., water levels, pH, temperature etc.)
- Identification of samples taken by number
- Number, volume, and container type for collected samples
- Disposition of samples
- Transporting procedures for samples
- Calibration records for field instruments
- Relevant comments for the activity (e.g., sampling procedures, methods, odor, visual observations, any problems encountered)
- Signature(s) of person(s) performing activity

Sufficient information will be recorded in the daily report form so that field activities coupled with the required information on each activity-specific form (i.e. Field Boring and Well Completion Log, Well Development Record, etc.) can be reconstructed without reliance on personal memory. Original data recorded on field forms, chain of custody forms, and other records will be written in waterproof ink.

If an error is made on a document (including the Field Boring and Well Completion Log printout), the individual that made the entry will make the necessary correction by crossing a line through the error, entering the correct information, and initialing and dating the change. The erroneous information will not be obliterated. Any subsequent error(s) discovered on a document will be corrected by a person discovering the error. All corrections will be initialed and dated.

Field Instrument Calibration

Procedures described in this section pertain to the field calibration of equipment to be used during the investigation. Included is a description of the procedure or a reference to an applicable standard operating procedure, the calibration frequency, and calibration standards used. Instruments are maintained by DOF, and are calibrated prior to being sent to the field. Rented instruments are calibrated prior to use. An equipment technician/field assistant qualified and experienced in equipment repairs, maintenance and calibration may be on-site during the field work. On-site calibrations will be performed by the equipment technician or site geologist.

Portable Gas Analyzers

A photoionization device (PID) will be on-site during field operations for general qualitative survey tasks such as sample screening and breathing zone monitoring. The instrument(s) will be calibrated according to manufacturer's instructions as outlined in the SAP. General calibration procedures are as follows:

- Turn meter on, check battery level, and allow instrument to warm up
- Adjust the zero setting on the meter (in the case of a digital readout instrument this step may not be necessary)
- Introduce the calibration gas to the instrument to perform the calibration and adjust instrument as appropriate (in the case of some digital readout instrument a "calibration" button is pressed, and the readout-indicated steps followed prior to introducing the calibration gas)
- Recheck the zero setting (in the case of a digital readout instrument, reconnect the calibration gas and verify readout is consistent to within 10% of the calibration standard. Recheck the background reading to verify that a reading of 0 is obtained)
- Replace any device that cannot be calibrated or field-repaired.

Combustible Gas Indicators (if required on-site)

A combustible gas indicator may be used during field operations to monitor for percent oxygen, concentrations of flammable vapor in percent of Lower Explosive Limit (LEL). The instrument will be calibrated on a weekly basis according to the manufacturer's instructions. The instrument is generally calibrated as follows:

- Connect the probe to the meter, turn the meter on, check the battery level, and allow instrument to warm up
- Adjust the zero setting on the meter
- Introduce calibration gases and adjust the internal potentiometers as required

- Replace any meter that cannot be field-repaired or calibrated.

Location Measurements

Sample locations will be determined in the field using a DGPS (Trimble GeoXH or equivalent). No field calibration is required with this instrument, however, the position of three "permanent" site features that comprise an approximate triangular pattern will be "located" so that the DGPS data set could be verified by other means, should this become necessary.

Other Field-Measurement Instruments

Instrument	Calibration Procedure
Electrical water-level sounders	Check depth markings with surveyor's tape prior to use
pH Meter (YSI 556 or equivalent)	Use 2-point calibration using laboratory-supplied buffer solutions (traceable to National Bureau of Standards) of pH 7 and 4 or 10 as appropriate for water conditions. Calibrate as outlined in SAP.
Specific Conductivity Meter (YSI 556 or equivalent)	Use 2-point calibration using ambient air and laboratory-supplied calibration solution (traceable to National Bureau of Standards) and at a conductivity near the anticipated range of the water to be tested. Calibrate as outlined in SAP.
Oxidation-Reduction Potential (ORP) (YSI 556 or equivalent)	Calibrate according to the manufacturers instructions as outlined in SAP.
Turbidity Meter (Oakton T100 or equivalent)	Calibrate according to the manufacturers instructions as outlined in SAP.
Dissolved Oxygen Meter (YSI 556) or equivalent	Calibrate according to the manufacturers instructions as outlined in SAP.
Water Temperature Probe (YSI 556 or equivalent)	Check against mercury thermometer at least once weekly

Equipment Decontamination

All equipment that may come into contact with potentially contaminated soil or ground water will be decontaminated prior to and after use. Decontamination may consist of "steam cleaning" (high-pressure, hot water washing), laboratory-grade detergent (Alconox or equivalent) and water wash, and distilled, deionized, or clean water rinse, as appropriate. Acetone rinses may be used if very oily material adhere to the samplers. Decontamination will be conducted in such a manner that cleaning solutions and rinse water can be handled and disposed of as described below.

Drilling, sampling, well-installation, and monitoring equipment will be decontaminated as follows:

- Downhole equipment on drill rigs, such as augers, drill rods, samplers, and drill bits, will be steam cleaned to remove visible soil and grease prior to use at each drill site.

- Casing, screen, couplings, and caps (if not factory cleaned and in factory-sealed containers) to be used in monitoring well installations will be steam-cleaned or washed to remove visible foreign matter prior to installation.

- The exterior surfaces of submersible pumps (Gundfos or equivalent) and associated lines will be washed with a laboratory-grade detergent (Alconox or equivalent) and water solution, rinsed with clean water, and then rinsed with deionized water. The interior portions will be cleaned by pumping approximately one-gallon of a laboratory-grade detergent (Alconox or equivalent) and water solution, followed by pumping approximately two gallons of clean rinse water. This procedure will be used prior to use of the pump.

- Non-disposable bailers will be washed in a laboratory-grade detergent (Alconox or equivalent) and water solution, rinsed twice with clean water, and then rinsed with deionized water prior to each use. Line used to lower and retrieve the bailer will be discarded after each use. Disposable, previously cleaned and factory-sealed, HDPE bailers will not require the above cleaning, however, they will be discarded after each use.

- Steel tapes, electric well sounders, and water quality probes will be rinsed in distilled or deionized water and wiped clean after each use.

Handling and Disposal of Investigation-Derived Wastes

Handling and disposal of all investigation-derived wastes will be in accordance with applicable regulations of EPA and Ecology and disposal facilities requirements, as appropriate. Temporary storage of these materials will be in approved bins, lined and covered temporary storage areas, tanks, or 55-gallon DOT-approved drums until analyses are complete and an acceptable means of disposal has been determined. All bins, storage areas, tanks, or DOT drums will be clearly labeled and stored in a secure location until final disposal is arranged. An inventory of all such material on-site at any time will be maintained using the Port's drum inventory form and documentation of the ultimate disposition of all material removed from the site will be maintained.

FIELD SAMPLE CUSTODY PROCEDURES

Sample custody procedures will be followed through sample collection, transfer, analysis, and ultimate disposal. The purpose of these procedures is to assure that :

- The integrity of samples is maintained during their collection, transportation, and storage prior to analysis, and
- Sample material is properly disposed after analysis.

Sample custody begins with the shipment of the empty sampling containers to the facility. All sample containers are shipped or delivered from or by the laboratory in sealed coolers or cartons with appropriate seals and custody documentation.

Sample quantities, types, and locations will be determined before field work commences. The field sampler will be responsible for the care and custody of the samples until properly transferred. Custody transfer will be documented on the chain of custody form.

Field Documentation

Each sample will be labeled immediately after collection. Sample identification documents will be prepared so that identification and chain of custody records are maintained and sample disposition is controlled. Forms will be filled out with waterproof ink. The following identification documents will be utilized during the field investigation, as appropriate:

- Sample Labels
- Daily Report
- Field Boring and Well Completion Log
- Water Quality Sampling/Well Development Record
- Chain of Custody Form

Sample Labels

Sample labels will be used to identify samples. Each label will contain the information outlined in the SAP.

Chain of Custody Record

A chain of custody record will be filled out and will accompany every sample to the analytical laboratory to establish the documentation necessary to trace sample possession from the time of collection. A copy of the chain of custody form will be retained in the project files according to the Project Number. The record will contain the following information:

- Client Name
- Project name and number
- Names and signatures of sampler(s)
- Sample identification (number or description)
- Sampling date and time
- Sample matrix (**W**ater, **S**oil, **O**ther)
- Number of containers
- Analyses requested
- Comments & preservatives used for each sample
- Laboratory sample number (added by laboratory after delivery)
- Total number of containers
- Requested laboratory results turn-around time
- Name of person to whom results are to be reported (Project Managers Name)
- Date and time of relinquishing samples

- Signature and affiliation of person relinquishing samples
- Date and time of receipt of samples
- Signature and affiliation of person receiving samples

Sample Transfer and Shipment

Samples will always be accompanied by a chain of custody record. When transferring samples, the individuals relinquishing and receiving the samples will enter the date and time and sign the chain of custody record. Samples will be packaged property for shipment, including isolation of samples thought to have high chemical concentrations, and dispatched to the appropriate laboratory for analysis. Custody seals are not deemed necessary when the samples will be in the continuous possession of the technical or laboratory personnel. Custody seals will be used when samples are shipped via courier service or commercial carriers. The chain of custody record will accompany each shipment. The method of shipment, courier name(s), and other pertinent information will be entered in the chain of custody record.

FIELD QUALITY CONTROL SAMPLES

Field QC checks will be accomplished by submission of control samples that are introduced blind to the laboratory from the field. The type of control samples submitted to the laboratory will depend on the media being sampled (i.e. soil or water) as described below:

Sediments and Soils - Field duplicate samples will be obtained to evaluate monitoring variability. Field duplicates will be obtained and analyzed for five percent of the samples analyzed (1 in 20) or per batch of samples submitted to the laboratory for analysis, which ever is more frequent. A batch is up to 20 samples documented on the same chain of custody form.

Waters - Field duplicates, trip blanks, and rinsate blanks will be obtained to evaluate data precision and possible sources of field contamination of samples.

- Field duplicates will be obtained and analyzed for five percent of the samples collected (1 in 20) or 1 per batch of samples. A batch is up to 20 samples documented on the same chain of custody.

- Rinsate (field) blanks will be prepared for at least five percent of the samples collected (1 in 20) or per batch of samples submitted to the laboratory for analysis, whichever is more frequent. The rinsate blank will be prepared by rinsing a bailer with organic-free water or by pumping organic-free water through the pump/pump hosing and placing the rinsate in the appropriate containers for analysis.

- One trip blank will be analyzed for volatiles for each batch of samples submitted to the laboratory for analysis.

LABORATORY METHODS AND QA PROCEDURES

The primary analytical laboratory, ARI will follow their Quality Assurance Program Plans consistent with their Washington State accreditations.

Some of the more important topics are discussed below.

Analytical Methods

The laboratory will follow procedures established by EPA SW 846 Methods, EPA Series 500 and 600 Methods, ASTM, Code of Federal Regulations 40, Standard Methods Edition 17, and Ecology Underground Storage Tank Program Procedures, Appendix L, Laboratory Procedures. EPA Method 7000 from EPA SW-846 establishes general quality control requirements for metals analysis while EPA Method 8000 EPA SW-846 establishes them for analysis of organic compounds. The analytical laboratory will adhere to the quality control measures set out in EPA 7000 for inorganic analyses and in EPA 8000 for organic analysis. Other quality control measures set out in the individual methods and in *Standard Methods for the Examination of Water and Wastewater*, 17th Edition (1989), may also be included.

Standard operating procedures for the analytical methods for organics and inorganics and all quality control documentation measures are kept in the analysts' notebooks and reference binders. Specific analytical methods that will be used to complete the work are discussed in the SAP.

Quality Control Checks

Precision (a measure of mutual agreement among individual measurements of the same property) is addressed using field and laboratory duplicate samples (duplicates). The measure of precision is relative percent difference (RPD) between data from duplicate samples (the absolute value of the difference between two samples divided by the average of the two expressed as a percentage). Accuracy is determined using blanks, spikes, and standards. Spikes are samples containing a known amount of chemical(s) added to a real sample. Standards are samples containing a suite of chemicals at known concentrations in a clean matrix. The measure of accuracy for blanks and standards is how close the measured concentration is to the known value. For spiked samples, accuracy is measured by the percentage of the spike recovered during analysis.

Two types of QC checks will be used to evaluate the performance of the laboratories' analytical procedures. These include field QC checks and laboratory QC checks.

Laboratory QC Checks

Specific requirements and procedures for laboratory QC will be monitored by the laboratory so that the analytical data are generated with known quality and that corrective actions can be taken whenever needed. An independent data validation (performed by DMD) will review the QC information provided by the laboratory as a secondary QC for all chemical data.

Accuracy, Precision, Bias, Representativeness, Completeness, and Comparability The following QC measures will be employed by the analytical laboratory so that results of analyses are within acceptable quality limits:

- **Accuracy:**
  - Certified standard materials will be employed as calibration standards for all analyses.
  - Certified standard materials will also be employed as second source Check Standards and as Laboratory Control Samples.
  - Matrix, Blank and Surrogate spiked samples will be monitored for percent recoveries.

- **Precision:**
  - Sample and Spike duplicates will be monitored for RPD.

- **Bias:**
  - Method blanks will be employed so that bias is not introduced from background laboratory contamination.
  - Matrix spike samples will be employed to monitor bias introduced by the sample matrix.
  - Control Charts will be used to establish limits of acceptability.. They will also be employed to evaluate long term trends which may introduce bias in the results.
  - Materials and reagents will be verified to be free of contamination which would introduce bias.

- **Comparability:**
  - Commercially available check samples will be analyzed to assure comparability of results with external sources.

- **Completeness:**
  - Periodic data quality audits will be performed to assess completeness.

Table B-1 summarizes the type and frequency of QC sampled required for each type of analysis. It should be noted that if a batch of samples contains both soil and water samples then a full set of QC analyses must be provided for each matrix.

Table B-1. Laboratory QC Summary for Data Review

METHOD	BLANKS	DUPLICATES	SPIKES	LCSs
All 8000 Series GC,GC/MS	1 in 20	see MS/MSD	MS/MSD 1 in 20 per Matrix or per batch	1 in 20
NWTPH-G and Dx	1 in 20	1 in 20	Per method	Per method
METALS All ICP Methods (EPA 6010,200.7)	1 in 20	1 in 20	MS 1 in 20 per Matrix	1 in 20
All AA Methods (EPA 7000,200)	1 in 20	1 in 20	MS 1 in 20 per Matrix	1 in 20
OTHER INORGANICS				
Alkalinity/Hardness	1 in 20	1 in 20		1 in 20
Sulfate/chloride	1 in 20	1 in 20	1 in 20	1 in 20
Organic carbon	1 in 20	1 in 20	1 in 20	1 in 20
Polychlorinated Dioxin/Furans	1 in 20	'-----	Stable isotope dilution methodology	1 in 20 (a)

Note: (a) - On-going precision & recovery spike (OPR)

Duplicate Spikes A split/spiked field sample will be analyzed with every analytical batch or once in twenty samples, whichever is the greater frequency. Analytes stipulated by the analytical method, by applicable regulations, or by other specific requirements will be spiked into the sample. Selection of the sample to be spiked and/or split depends on the information required and the variety of conditions within a typical matrix. In some situation, requirements of the site being sampled may dictate that the sampling team select a sample to be spiked and split based on a pre-visit evaluation or the on-site inspection. This does not preclude the laboratory's spiking a sample of its own selection as well. In other situations the laboratory may select the appropriate sample. The laboratory's selection should be guided by the objective of spiking, which is to determine the extent of matrix bias or interference on analyte recovery and sample-to-sample precision.

Blanks Each batch will be accompanied by a reagent blank. The reagent blank will be carried through the entire analytical procedure.

Field Samples/Surrogate Compounds Every blank, standard, and environmental sample (including matrix spike/matrix duplicate samples) will be spiked with surrogate compounds prior to purging or extraction. Surrogates shall be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries shall fall within the control limits set by the laboratory (in accordance with procedures specified in the method or within ± 10%) for samples falling within the quantification limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates below the quantification limit; evaluation of analytical quality then will rely on the quality control embodied in the check, spiked and duplicate spiked samples.

Laboratory Instrument Calibration

In general, calibration procedures can be divided into two major types: (1) fixed calibration or (2) within-batch (run) calibration. In fixed calibration, a calibration curve is determined and then used over a number of analytical batches. In within-batch calibration, a calibration curve or factor is determined for each batch (run) of samples analyzed.

Initially, each instrument is calibrated for the analytical method for which it is designated. Once the operating parameters have been established according to that method, the analyst prepares standard solutions containing all the analytes of interest, any internal standards, and any surrogate standards appropriate to the method. To establish the calibration curve for a particular analyte, these standard solutions are prepared at graduated dilutions. One of the concentrations must be just above the detection limit while the other should define the working range for the instrument.

Standards for instrument calibration are obtained from a variety of sources. Elemental standards are purchased from commercial suppliers, dated upon receipt, and replaced as needed according to the methodology. A standard log is kept containing the following identification :

Name of analyte
Date of receipt
Supplier lot number
Concentration
Any dilutions of the analyte
Unique two-digit code number.

Analysts document the use of standards by entering the two-digit code in their notebooks.

Calibration Frequency

- **Organic Analysis** Instrument calibration is performed on an as needed basis in accordance with the specific method requirements. Recalibrations are performed when fundamental changes to the instrument characteristics take place (i.e. change of analytical column, etc.) or when results of QC Check Standards or Samples indicate an out-of-control condition.

- **Metals Analysis** Instruments are calibrated each time they are used per the requirements of the specified method.

- **Inorganic Analysis** Instrument calibration is performed on an as needed basis in accordance with the specific method requirements. Recalibrations are performed when fundamental changes to the instrument characteristics take place (i.e. change of analytical column, etc.) or when results of QC Check Standards or Samples indicate an out-of-control condition.

- **Miscellaneous Equipment**
  - ***Balance*** calibration and service is performed once per year by an outside company. Calibration is checked using "in house" weights each day of use.
  - ***Critical thermometers*** are checked against a NIST traceable reference thermometer on an annual basis.

QUALITY ASSURANCE AUDITS

During the course of the investigation, audits of the field and analytical programs may be performed, depending on the specific programs. The results of a field audit will presented in the summary report of that phase of work.

The field audit(s) will be performed by the Project Manager. The field audit will focus on whether the drilling, installation, and sampling procedures outlined in this plan have been followed. The field audit will include observation of drilling, well installation, and soil and ground-water sampling operations, and inspection of selected documentation related to the field operations (e.g. field logs, chain of custody forms).

The analytical program audit will be performed by the Project Manager and/or the data validation consultant according to the procedures for data assessment discussed in the following section. The results of the analytical program audit will be presented in the summary report.

Procedures for QA/AC Assessment of Chemical Data

Data validation procedures will be used by the independent data validation consultant and/or the Project Manager for statistically assessing duplicate and external spike samples and checking blank (water) samples that are submitted blind to the analytical laboratory from the field or generated internally by the laboratory in accordance with this QAPP. The purpose of implementing these procedures is to verify that the chemical data generated during the investigation are accurate precise, and complete and, therefore, are representative of site conditions.

The procedures for the data validation will be in general accordance with EPA guidance documents (EPA, 1985 and 1987).

Assessment of Accuracy, Precision, and Completeness

Chemical data derived from the work will be validated according to accuracy, precision, and completeness; for both the analytical laboratory and field sample collection programs. The primary goal of the program is that the data reported during the investigation are representative of conditions in the study area. To meet this goal, a combination of qualitative evaluations and statistical procedures will be used to check the quality of the chemical data. However, the results of the statistical analyses will not be used to eliminate data from the data base. Complex statistical data verification and significance evaluation will not be performed. Statistical analysis of internal laboratory QC samples will be used to validate the analytical procedures used by the laboratory. Statistical analysis of field QC samples will be used to evaluate the field sampling and handling procedures as well as the laboratory analytical procedures. If problems arise and the data are found to deviate from previous analyses or surrounding conditions, the data will be annotated. Sample recollection and analysis will only be used in extreme cases of QC problems.

The statistical analysis program evaluates data on the basis of three types of controlled samples: spikes, blanks, and duplicates. The definition of these types of samples are as follows:

Spikes - Spikes are used to evaluate data accuracy. Spikes are QA/QC samples that are prepared and analyzed internally by the laboratory. The spike samples are prepared by adding known amounts of specific chemicals to water. The results of the spike sample analyses will be reported in the technical report.

Blanks - Blanks are intended to evaluate whether the laboratory or field procedures represent a possible source of contamination of the field samples. Three types of blanks are analyzed during the investigation. Field blanks are QA/QC samples that are prepared in the field by filling sample containers with organic-free water and are submitted blind to the laboratory for appropriate chemical analyses. Trip blanks are QA/QC samples that are filled at the laboratory and are transported with a set of samples. Internal laboratory blanks are QA/QC samples that are prepared and analyzed internally as part of the individual laboratory-specific QA programs. The results of the analyses of the blanks will be reported in the technical report.

Duplicates - Duplicate samples are intended to evaluate data precision. Two types of duplicate samples are analyzed during the investigation. Field duplicates are QA/QC samples that are collected in series from the same location using the same sampling methods. The duplicate sample is submitted to the laboratory blind with the other samples for appropriate analyses. Laboratory duplicates are QA/QC samples that represent a single field sample that is split by the laboratory into two aliquots and is then analyzed in duplicate. The results of field and laboratory duplicate analyses will be presented in the technical report.

The completeness of the investigation data represents an estimate of the volume of data expected from the field program versus the amount of data actually available at the end of the field program for interpretation. The goal for completeness for the field program is 90 or more percent complete. Completeness is also assessed prior to preparation of data reports and includes checking that all data entries are correct, properly entered, and that typographical errors (if any) in the data base are corrected and the data re-entered property.

Corrective Actions

If any occasions arise that indicate field or laboratory measurement error has occurred, one or more of the following corrective action(s) described below may take place. Corrective actions will be handled on a case-by-case basis and will be documented in technical memoranda. Ecology will be consulted concerning significant problems and corrective measures, as appropriate.

Field Situations

The need for corrective action will be identified as a result of the field audits previously described as well as by other means (e.g., equipment malfunction). If problems become apparent that are identified as originating in the field, immediate corrective action (e.g. repair or replace equipment) will take place. If immediate corrective action does not resolve the problem, appropriate personnel will be assigned to investigate and evaluate the cause of the problem. Once a corrective action is implemented, the effectiveness of the action will be verified such that the end result is elimination of the problem.

Laboratory Situations

The need for corrective action as a result of QA audits will be initiated by the laboratory QA/QC manager in consultation with DOF's Project Manager. Corrective action may include, but is not limited to:

- Reanalyzing the samples, if holding-time criteria permit;
- Evaluating the amending sampling and analytical procedures;
- Accepting data with an acknowledged level of uncertainty; or
- Resampling and analyzing.

Immediate Corrective Action

Any equipment and instrument malfunctions will require immediate corrective actions. The actions taken should be noted in the field or laboratory daily reports, but no other formal documentation is required unless further corrective action is necessary. These on-the-spot corrective actions will be applied daily as necessary.

Long-Term Corrective Action

The need for long-term corrective action may be identified by standard QC procedures, control charts, and/or performance of system audits. Any quality problem that cannot be solved by immediate corrective action falls into the long-term category.

The essential steps in the corrective action system are:

- Identification and definition of the problem,
- Investigation and determination of the cause of the problems,
- Determination and implementation of a corrective action to eliminate the problem, and
- Verification that the corrective action has eliminated the problem.

The problem identified for corrective action will be documented. The responsible person may be an analyst, laboratory QA Manager, sampler, or Project Manager. In general, the Project Manager will investigate the situation and determine who will be responsible for implementing the corrective action. DOF's Project Manager will verify that the corrective action has been taken, appears effective, and , at appropriate later dates, verify that the problem has been resolved.

For Field activities, the required corrective action will be documented by the DOF Field Geologist, and the Project Manager, as appropriate. The corrective action will be discussed with the client and/or Ecology as appropriate prior to implementation if the severity of the problem warrants such discussion.

Quality Assurance Reports

The results of the QA/QC audits and assessments will be reported in the technical report. The reports will include an overall assessment of the performance of the field and laboratory programs based on the field audits, the results of data validation, and a summary of the QA/QC statistical evaluations.

DATA EVALUATION

This section describes how the data and documents generated from the work will be evaluated, managed, distributed, and preserved. All documents generated by DOF and its subcontractors will be reviewed by qualified DOF personnel for completeness and accuracy. Technical data (including field data and the results of laboratory analyses) will be tracked to monitor performance of the work tasks.

Data Review and Validation

The following field data and analytical data will be subjected to the review and validation process.

Field Data

Field data includes the raw data gathered from the field investigation and may include, but are not limited to:

- Boring logs
- Sampling forms
- Chain of custody forms
- Maps and photographs
- Water-level measurements
- Well completion and development records
- Daily reports
- Field screening records
- Other field parameters (e.g. pH, conductivity etc.)

Field documents will be reviewed by a designated DOF representative for completeness, accuracy, and legibility. Documents are initialed by the reviewer and copies are appropriately distributed and stored.

Analytical Data

Analytical data includes chemical or physical analyses of field samples and the results of technical analyses. This documentation may include, but is not limited to:

- Laboratory results (paper copies and/or computer disk copies) of chemical analyses samples;
- Calculations of water level elevations
- Maps (ground-water contour, chemical distribution)

The DOF Project Manager assigns personnel to perform QC checks on calculations, maps, and other analytical documents. Assessment of the quality of the chemical data is discussed below.

Data from the laboratory will be submitted in written reports. Prior to receipt by DOF, chemical data will be reviewed by senior chemists at the analytical laboratory. The DOF Project Manager will check the written reports for completeness before they are entered into the chemical database. The data assessment process will include the procedures for evaluating and/or calculating the precision, accuracy, and completeness of the chemical data.

In addition to the internal laboratory QA review and data quality assessment, soil and ground water quality data will be reviewed by the Project Manager and/or an independent "data validator". The review check-list and a data-validation general report outline are presented as Attachment B-1. The results of the review will be included int he technical report.

Technical Reports

Documents generated by DOF are reviewed by qualified DOF personnel. The document is then submitted to the client for review by their technical staffs. After incorporation of comments as appropriate, the document is submitted to the client and/or regulatory agency for review.

DATA MANAGEMENT PLAN

The purpose of data management and tracking is to allow effective performance of the work tasks by the appropriate processing, distribution, and placement of documents into a permanent file system. Documents, data, and/or calculations will be processed depending upon the type and expected use of the data. Documents will be distributed to personnel working on related tasks to facilitate implementation of the work program. The procedures for documenting and tracking of data generated during the work are described in the following sections.

Data Distribution

After processing, documents are distributed as appropriate, to one or more of the following:

- Persons working on related tasks, and•
- Storage (records file)

Documents are distributed to appropriate personnel, the client, and agency by the DOF Project Manager.

Document Control and Storage

The document control system has been established for data and documents generated during the RI process. A Master File, located principally at DOF's offices in Kirkland, Washington, includes (but is not limited to):

- Maps and photographs
- Boring Logs and Well Completion Forms
- Soil Quality and Water Quality Data

- Physical Test Data
- Water Level Records
- Survey Data
- Sampling forms
- Chain of Custody Forms
- Job/correspondence files (by task),
- Project Reports

The project files are organized to segregate technical information from administrative documents. Documents and information are organized by topical categories and the phase of work. The Project Manager will maintain the Master File and document control system. All documents will be preserved for the period required by the contract or Agreed Order.

Computer-Generated Documents and Data Base

Selected chemical and physical data will be entered into a computerized spreadsheet and/or data base to facilitate retrieval, manipulation, and/or calculations of the data. The data will include information such as chemical data, field measurements, water levels, geologic data, and other data relevant to the work.

Ecology has developed an Environmental Information Management (EIM) system that is Ecology's main repository for electronic upland and sediment monitoring data. Site monitoring data collected as part of the work will be formatted and uploaded to the EIM system, if required. Monitoring analytical data will be received from the laboratory in hard copy (laboratory data sheets) and in an EIM compatible format. The data will be formatted and uploaded to Ecology's system, consistent with Ecology's Toxics Cleanup Policy 840.

Data that are entered directly via a keyboard will be checked against chain of custody forms, hard copies of the laboratory reports, field measurements, or other documents.

The computerized information will be stored on an IBM-compatible computer utilizing commercial software applications suitable for the particular task. At completion of the project, copies of the database will be made on CDs and placed in the Master File.

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ATTACHMENT B-1
Data Validation Check List

Sample Data Review Checklist

1. Holding Time
   - Preparation hold time met?
   - Analysis hold time met?
2. Method Blanks
   - Field vs. Lab?
   - Correct frequency?
   - Criteria met?
3. Spikes
   - All analytes present?
   - Required concentration?
   - Correct Frequency?
   - Criteria met?
4. Duplicates
   - Required type?
   - Correct frequency?
   - Criteria met?
5. QC Check Sample
   - Required type?
   - Criteria met?
6. Reported Data
   - Agrees with raw data?
   - Appropriate QL/DLs?
   - Dilutions accounted for?

[redacted]

DATA VALIDATION
GENERAL REPORT OUTLINE

I. **Holding Times**

II. Calibration (Level IV only)

III. **Blank Analyses**

IV. Instrument Performance Checks (Level IV only)

V. **Surrogate Recoveries**

VI. **Matrix Spike/Duplicate Analyses**

VII. **Laboratory Control Sample Analysis**

VIII. Calculation Verifications (Level IV only)

IX. Detection Limit and Quantitation Limit Verification (Level IV only)

X. **Field Replicate**

XI. **Overall Assessment of the Data**

Health and Safety Plan
Remedial Investigation Field Sampling Program
ICS/Former NW Cooperage Site
Seattle, Washington

Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

January 2011

Health and Safety Plan
Site Reconnaissance
ICS/Former NW Cooperage Site
Seattle, Washington

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Health and Safety Plan
Remedial Investigation Field Sampling Program
ICS/Former NW Cooperage Site
Seattle, Washington

1. INTRODUCTION

This Health and Safety Plan (HASP) addresses the health and safety practices and controls that will be implemented by Dalton, Olmsted & Fuglevand Inc. (DOF) during their Remedial Investigation sampling work on the ICS/NW Cooperage Site, Seattle,Washington. Activities addressed in this plan include:

- Conducting a site reconnaissance,
- Surface sediment sampling,
- Sediment core sampling,
- Drilling and soil sampling associated with the installation of monitoring wells,
- Soil sampling using a push-probe,
- Groundwater sampling,
- Stormwater sampling.

The safety and health directives discussed herein apply only to DOF employees and their subcontractors engaged in the work activities mentioned above. Furthermore, this plan has been developed specifically for this project and should not be used in whole or in part for any other project unless such application is reviewed and approved by DOF management. This plan, however, will be updated as appropriate to account for changes in the scope of work and for new hazards discovered at the jobsite once work is underway.

Site work activities will comply with WAC 1730340-810 (of the Model Toxics Control Act) and applicable sections of WAC 296-62-300 and other relevant WISHA construction industry health and safety regulations. Where appropriate, specific WISHA standards will be referenced within the plan to highlight additional health and safety requirements not otherwise discussed. These standards are available on WISHA's web-based homepage. The content of this plan and any relevant WISHA standards will be discussed with DOF project personnel before work begins. However, DOF management, its subcontractors, and its client do not guarantee the health or safety of any person entering this site. Because of the nature of this site and the many different activities occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Adherence to the safety and health guidelines set forth herein will reduce, but not eliminate, the potential for injury at this site.

2. DESCRIPTION OF PROJECT AREA

The site is approximately 7.1 acres in size and consists of an upland (6.3 acres) and intertidal/subtidal embayment (0.8 acres). A barrel manufacturing/refurbishing operation is located on the upland portion of the property. The embayment is connected to the Duwamish River, is tidally influenced and is not currently used for any commercial or industrial purpose. Conditions within each of the areas is generally described below:

2.1 Embayment

The embayment is a relatively narrow channel. Within the embayment is soft sediment and the remains of piling, shipway (pile supported heavy timbers), wrecked boats and other debris including concrete slabs, rebar etc. Past sediment sampling and analysis detected a number of contaminants in surface sediment. These contaminants and their concentrations are listed below:

Contaminant	Concentration Range
Diesel Range Petroleum Hydrocarbons	100 to 10,000 mg/kg
Heavy Oil Range Petroleum Hydrocarbons	400 to 20,000 mg/kg
Arsenic	2.3 to 49 mg/kg
Cadmium	0.15 to 36 mg/kg
Chromium	15.1 to 1,680 mg/kg

Copper	19.6 to 1,090 mg/kg
Lead	36 to 10,400 mg/kg
Mercury	0.18 to 247 mg/kg
Silver	0.13 to 19 mg/kg
Zinc	43 to 4,580 mg/kg
Pentachlorophenol	<1 to 14 mg/kg
PCBs	0.22 to 2,930 mg/kg
DDT Analogs	0.047 to 46 mg/kg
Dioxin/Furan (2,3,7,8 TCDD)	0.36 to 414 ng/kg

Sediment with the highest concentrations is present in samples (SED-1 and SED-2) within the central part of the embayment. Concentrations decline significantly away from this area.

2.2 Upland

Most of the upland is paved. Facility operations generally occur in three buildings. Past sampling of soil and groundwater beneath the site detected a number of constituents including VOCs, SVOCs, PCBs, petroleum hydrocarbons and pesticides. Maximum concentrations are summarized below:

Contaminant	**Soil**	**Groundwater**
Gasoline Range Hydrocarbons	260 mg/kg	6.3 mg/l
Diesel Range Petroleum Hydrocarbons	15,000 mg/kg	0.5 mg/l
Heavy Oil Range Petroleum Hydrocarbons	49,000 mg/kg	0.5 mg/l
Tetrachloroethene	0.87 mg/kg	trace
Vinyl Chloride	0.02 mg/kg	0.25 mg/l
Arsenic	11.7 mg/kg	0.026 mg/l
Cadmium	3.5 mg/kg	0.003 mg/l
Chromium	200 mg/kg	0.08 mg/l
Copper	264 mg/kg	0.07 mg/l
Lead	3,570 mg/kg	0.08 mg/l
Mercury	6.7 mg/kg	0.0004 mg/l
Silver	1.2 mg/kg	0.0004 mg/l
Zinc	640 mg/kg	0.09 mg/l
Benzo(a)Pyrene	0.28 mg/kg	0.0009 mg/l
Pentachlorophenol	0.37 mg/kg	0.02 mg/l
PCBs	119 mg/kg	0.0011 mg.l
DDT Analogs	1.9 mg/kg	<0.000001

3. DOF PROJECT ORGANIZATION

DOF employees and their subcontractors working on site are expected to maintain vigilance at all times to ensure that the work is conducted in a safe and efficient manner. To provide an organizational structure that supports this objective, the following individuals are assigned specific responsibilities and lines of communication for the site reconnaissance.

3.1 On-site Field Project Manager (FPM)

The On-site Field Project Manager (FPM), Dave Cooper of DOF is responsible for overall administration of site field operations. His duties include directing DOF technical staff, ensuring adequate resources are available to complete the work, resolving site safety and health issues as they arise, project planning, and maintaining communications between contractors, regulatory agencies, client, and off-site resources.

3.2 Technical Lead

A technical lead may be assigned to each field team to supervise the environmental sample collection work. The Technical Lead will also monitor compliance with applicable environmental regulations, WISHA standards, and other client-specific requirements. The Technical Lead will coordinate any DOF-related spill response activities that may be needed during the sampling work, inform site management of health and safety issues as they arise, document site activities, and verify that site personnel are adequately trained and qualified for the work. The Technical Lead reports directly to the FPM.

3.3 Site Health and Safety Officer (SHSO)

The FPM will act as DOF’s Site Health and Safety Officer (SHSO) on the project. He is responsible for verification and overall compliance with this site health and safety plan (HASP). His duties include: 1) on site monitoring to determine appropriate levels and use of Personal Protective Equipment (PPE); 2) site surveillance, hazard identification, and health risk analysis; 3) implementation of procedures and programs to eliminate risk to site personnel including initiating changes to the HASP; 4) implementation of site control measures; 5) conducting and documenting daily health and safety briefings; 6) tracking health and safety issues in DOF field note book; 7) conducting incident investigations; 8) informing DOF site personnel of the contents of the HASP; 9) maintaining medical clearance letters and training documentation for site personnel; 10) conducting regular site safety inspections and; 11) exercising stop work authority when warranted by conditions. The Site Health and Safety Officer reports directly to DOF's Project Manager.

3.4 DOF Technical Staff

Each member of DOF's technical staff has the responsibility to report any unsafe or potentially hazardous situations to the FPM . They will maintain knowledge of the information, instructions, and emergency response actions contained in the HASP and comply with rules, regulations, and procedures established for the site. Site employees are expected to stop work and contact their supervisor whenever they believe their work, or that of their coworkers, poses an uncontrolled hazard or unreasonable risk of injury or illness. Furthermore, each project participant is expected and encouraged to participate in the implementation of the environmental safety and health process through participation in meetings, incident reporting and investigations, inspections, hazard identification and hazard analyses.

3.5 Visitors

On occasion, appropriately authorized visitors may come to the site to observe the site characterization operations. Visitors may be from city, state, and federal regulatory and resource agencies that have a specific interest in the project. Before accessing the site, visitors will be briefed on the hazards of the site, contents of the HASP, site safety rules, hazard control measures, and required personal protective equipment. This orientation session will be documented on the Daily Site Briefing form. Visitors will also be expected to follow the direction of the FPM while on-site.

4. DOF WORK PLAN

As indicated in Section 1.0 above, DOF personnel will complete a variety of sampling tasks. Media that will be sampled include sediment, soil, stormwater and groundwater.

5. SITE CHARACTERIZATION

This section presents an assessment of the chemical and physical hazards that may be encountered during the tasks specified in Section 4.0 of this HASP. Additional hazard control information can be found in the Activity Hazard Analyses table in Appendix A and in the listing of General Site Work Rules found in Appendix B. Site personnel will be informed of these hazards and the means that will be taken to control them prior to beginning work

5.1 Chemical Contaminants

Based on the historic activities and available soil, constituents of potential concern (COPCs) include:

- **Metals –** Metals include arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc.
- **Petroleum Hydrocarbons –** Diesel and heavy oil range hydrocarbons. Note gasoline range hydrocarbons were not detected in the sediment samples.
- **Polycyclic Aromatic Hydrocarbons (PAHs) –** PAHs are associated with petroleum products.
- **PCBs –** PCBs were detected in surface sediment.
- **DDT Analogs -** Including 4-4'DDD, 4-4'-DDE and 4-4'-DDT
- **2,3,7,8-TCDD -** Dioxin/furans based on 2,3,7,8 TCDD equivalent concentration.
- **VOCs -** Some low levels of VOCs have been detected in upland soil and groundwater.

MTCA Method C - industrial soil cleanup levels (CULs) were used to screen the detected contaminants to identify those of potentially most concern. These CULs are considered conservative because the assumed duration of exposure is far longer than the duration of the field sampling. The screening are for soil ingestion because the sediments will be wet which reduces the potential for inhalation exposure. The following contaminants are compared to industrial soil contact cleanup levels contained in the Washington State Model Toxics Control Act (MTCA).

Soil Constituent Concentrations Above Cleanup Levels

Soil Constituent	Maximum Conc. (mg/kg)	CUL (mg/kg)	Method
Arsenic	**49**	**20***	**A**
Cadmium	36	3500	C
Chromium	1,680	11,000 (VI)	C
Copper	1,090	130,000	C
Lead	**10,400**	**1,000**	**A**
Mercury	247	1,100	C
Silver	19	18,000	C
Zinc	4,580	1,100,000	C
Diesel Range Hydrocarbons	**15,000**	**2,000***	**A**
Heavy Oil Range Hydrocarbons	**48,000**	**2,000***	**A**
PCBs	2,930	10	A
Pentachlorophenol	14	1100	C
DDT Isomers	46	390 (ddt)	B
2,3,7,8-TCDD	4.1E-4	1.5E-3	B

Note: * Based on protection of groundwater quality.

Based on the comparison summarized above, lead and petroleum hydrocarbons pose the greatest potential risks during the sampling work. One of fourteen sediment samples exceeded the arsenic CUL so potential exposure risks to arsenic are considered much lower compared to the other constituents. The highest upland soil arsenic concentration was below 20 mg/kg. PAHs are associated with petroleum products and may be of potential concern.

Several of the site potential contaminants present in the soil, however, are substances which if exposed to the skin can to some degree be cutaneously absorbed into the body (see American Conference of Governmental Industrial Hygienists Threshold Limit Values with "Skin" notations) or produce other adverse dermal effects (i.e., dermatitis, skin cancer). These materials include, but are not necessarily limited to, arsenic and PCBs. Appropriate chemical protective clothing will be worn whenever the potential for significant dermal contact with these materials exists. Decontamination measures will also be instituted to further reduce contaminant contact and to minimize the spread of contamination in the work area.

A listing of current occupational exposure limits, primary toxicological effects, and relevant physical properties for each of the skin absorbable contaminates is presented in Table 5-1. It is important to note when reviewing this table that the physical and toxicological data contained therein are derived from studies on concentrated (pure) forms of the contaminants and do not accurately represent the low level (ppm) exposure conditions which will be encountered by site personnel working on the project.

Table 5-1. Chemical Data

CHEMICAL	ACGIH TLV	WISHA PEL	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Arsenic	10 ug/m^3	10 ug/m^3	Inhalation Ingestion Skin contact	Skin and eye irritation, resp. tract irritation, lung and skin cancer.	Kidneys, liver, skin, lungs, bone marrow, and lymph.	Sp.G.=3.74 BP= 869F MP=599F Reactivity: acids, bases, oxidizers, iron solutions, and zinc.
Lead	50 ug/m^3	50 ug/m^3	Inhalation Ingestion Skin, eye contact	Skin and eye irritation, resp. tract irritation, lung and skin cancer. –	Eyes, GI tract, kidneys, blood, central nervous system, ginglval tissue	Sp.G.=11.3 BP= 3164F MP=622F Reactivity: acids, oxidizers, hydrogen peroxide.
PAHs	0.2 mg/m^3 as coal tar pitch. volatiles	0.2 mg/m^3 as coal tar pitch. volatiles	Inhalation Ingestion Skin contact	Skin, eye, and respir. tract irritation, nervous system effects, skin cancer, teratogenesis.	Skin, eyes, respiratory tract, and nervous system.	Pyrene example: Sp.G.=1.27 BP=759F MP=313F Reactivity: acids and oxidizers.
Petroleum Hydrocarbons (based on diesel fuel)	100 mg/m^3	100 mg/m^3	Inhalation Ingestion Skin/eye contact	Skin, eye, and respir. tract irritation; GI tract irritation, nausea, vomiting and diarrhea and central nervous system effects (similar to alcohol intoxication) if ingested	Skin, eyes, GI tract, central nervous system	Sp.G.=0.83 BP= 320-690F Flash Point >125F LEL (%) 0.6 UEL (%)7.5
			Inhalation	Eye irritation, liver damage, chloracne, Reproductive effects,	Skin, eyes, liver, and reproductive	Sp.G.=1.38 BP=689 – 734 F

CHEMICAL	ACGIH TLV	WISHA PEL	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
PCBs	0.5 mg/m^3	0.5 mg/m^3	Ingestion Skin contact	potential human carcinogen.	system.	VP=0.00006 Reactivity: Oxidizers.

LEL= Lower Explosive Limit F.Pt.=Flash Point VP=Vapor Pressure BP=Boiling Point
UEL= Upper Explosive Limit React.=Reactivity Sp.G.=Specific Gravity MP=Melting Pt.

5.2 Physical Hazards

Several physical hazards are anticipated to be associated with the planned work. These hazards include thermal stress (depending on weather), slips, trips and falls, physical injury from heavy lifting, working on an industrial site and round heavy machinery. A general discussion of the aforementioned hazards and the work practices that will be used to control them is presented below. A more detailed listing of hazard control strategies for specific tasks is included in the Activity Hazard Analysis (AHA) in Appendix A. This discussion is intended to point out the more obvious hazards reasonably anticipated on this project and assumes that any DOF subcontractor will be responsible for, and meet, all applicable OSHA/WISHA regulations and requirements to their work.

5.2.1 Noise

Noise levels in excess of 85 dBs are not likely to exist during sampling or on-board the sampling vessel. If noise levels exceed 85 dBs and DOF personnel are exposed to these noise levels for the majority of their shift, then they will be required to wear hearing protection and comply with the hearing conservation requirements of WAC 296-817. Hearing protection will be worn in the vicinity of the drill rig, probe rig or crane operation.

5.2.2 Slips, Trips and Falls

Tripping on equipment and on debris on the ground, uneven walking surfaces and slippery intertidal mud is likely to be a concern on this project. There are likely to be slip, trip, and fall hazards on-board the work boats from wet walkways, unsecured equipment left on deck, open hatches, and pitching and rolling actions of the vessels in rough water. These hazards may also exist on the dock where boats will be moored. Uneven walking surfaces on-shore and equipment left on the ground in the work area can also present a slip and trip hazard for workers. These hazards will be controlled by keeping the work area and walkways free of debris and other litter. Site workers will wear steel-toed safety boots and pay careful attention to surface conditions to prevent trip and fall injuries. The work area will be inspected before the start of work each day to identify any hazards that could cause injury. The results of these inspections will be communicated to site personnel at the start of each shift.

5.2.3 Thermal Stress

Because all site work will be conducted outside where temperature conditions vary, there is a risk that site workers could develop heat or cold stress. The likelihood of this occurring is dependent on environmental conditions, the level of work activity, and the personal control measures that are used to manage heat loads (work/rest cycles, use of clothing and/or cooling devices, hydration, etc.).

The planned work, however, is not likely to subject workers to significant heat stress risks unless low-permeability protective clothing is worn (i.e. Tyvek, raingear, etc.) during periods of warm weather. As such, modified Level D and Level C protective clothing will be worn only as necessary and for as short a time period as possible. In addition, workers will be encouraged to self-limit their exposures to heat stress conditions and have co-workers watch for signs and symptoms of heat strain in others. Shaded rest areas and chilled beverages will also be provided.

If visual monitoring indicates that a worker is suffering from heat stress, or if conditions/PPE requirements warrant, workers will be evaluated for heat strain by monitoring their heart rate, body core temperature, and heat strain symptomology. Excessive heat strain may be marked by one or more of the following measures, and an individual’s exposure to heat stress will be discontinued when any of the following occur:

- Sustained heart rate is in excess of 180 beats per minute (bpm) minus the individual's age in years, for individuals with assessed normal cardiac performance, or
- Recovery heart rate at one minute after a peak work effort is greater than 110 bpm, or
- Body core temperature - as measured with an infrared ear drum scanner - is greater than 100.4°F, or
- There are symptoms of sudden and severe fatigue, nausea, dizziness, or lightheadedness.

Workers who appear to be disoriented or confused, or suffer inexplicable irritability, malaise, or flu-like symptoms will also stop work and rest in a cool location with rapidly circulating air and kept under skilled observation.

5.2.4 Drilling and Heavy Equipment Hazards

Some of the sampling work will require working around drilling rigs and cranes. To control these hazards, safe distances will be maintained between workers and mechanical equipment. Personnel needing to approach vehicles while in operation will observe the following protocols:

- Make eye contact with the operator (and spotter).
- Signal the operator to cease heavy equipment activity.
- Approach the equipment and inform the operator of intentions.

All site workers will wear American National Standards Institute (ANSI) / International Safety Equipment Association (ISEA) 107-2004 Class II compliant reflective road vests when heavy equipment or vehicular traffic is in the vicinity. Workers will avoid standing in the blind areas behind vehicles, particularly when they are backing up.

5.2.5 Heavy Lifting

Site personnel will be cautioned not to lift or exert themselves beyond their physical ability and to apply proper ergonomic principles when doing their work. Mechanical lifting devices, such as, winches, pulleys, forklifts, hand carts, and dollies, should be used to lift and move equipment whenever feasible. Also, workers should enlist the help of others when lifting and moving exceptionally heavy loads whenever the use of mechanical lifting devices is not feasible. As a matter of policy, DOF employees will not lift more than 50 lbs. individually. Other contractors on-site are encouraged to follow this rule, as well.

5.2.6 Crane Operations

Subcontractors operating cranes on this project, shall comply with all applicable provisions of 29 CFR 1926.550, 29 CFR 1919.70, the US Army Corps of Engineer's Safety and Health Requirements Manual, EM 385-1-1, (most notably, but not limited to, sections 15, 16.A,B,C,D, and Appendix F, G, H, and I). In addition, site operations will be conducted in accordance with all other applicable worker safety and health requirements contained in Parts 1910 and 1926 of Federal OSHA's General Industry and Construction Safety and Health regulations.

All cranes used on this project must undergo initial, periodic, frequent, and startup inspections as defined by "Crane and Derrick Inspection Criteria," of EM 385-1-1. A competent person will conduct these inspections. Cranes shall be used and maintained in strict accordance with manufacturer's directions and applicable OSHA regulations. The operator shall provide the operating manual, the load rating chart for the crane to be used (crane make & model), and the crane's logbook of operations

Manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks will be followed. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded.

- Load limits will be visibly posted on all lifting devices.
- Operators of equipment covered by ASME B30.5 and which has a lifting capacity of more than 5 tons must have a state issued hoisting machine operators certificate and a current medical exam as per ASME B30.5, Sec. 5-3.1.2(a).
- Prior to any lift, the Crane Contractor shall provide copies of operator qualifications and inspections for the crane that shall be used for the lift. Operators will be familiar with and have experience operating the type of crane that will be used for the project.
- Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.
- Rated load capacities, recommended operating speeds, special hazard warnings, and/or instruction shall be conspicuously posted on all equipment. Instructions or warnings shall be visible to the operator while he is at his control station.

The subcontractor will provide a critical lift plan to DOF project management for all lifts involving any of the following criteria: 1) non-routine lifts, 2) lifts with unusual safety precautions, 3) load weight >75% of crane capacity, 4) blind lifts, 5) multiple crane lifts, 6) lifts of personnel and 7) lifts involving technically difficult rigging. This lift plan must be signed by the crane operator, lift supervisor, rigger, and others involved in the lift. The plan must include a discussion of the size and weight of load to be lifted; equipment manufacturer's maximum load capacities for the entire range of the lift; lift geometry; lift points, rigging gear, and rigging procedures and; environmental conditions under which lift operations are to be stopped.

Rigging equipment for material handling shall be inspected as per EM 385-1-1, Section 15 and Appendix F prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service. Rigging equipment shall not be loaded in excess of its recommended safe working load, as prescribed in Tables H-1 through H-20 in 1926.252 (e) for the specific equipment. Rigging equipment, when not in use, shall be removed from the immediate work area so as not to present a hazard to employees. Each day before being used, rigging and all fastenings and attachments shall be inspected for damage or defects by a competent person designated by the employer. Additional inspections shall be performed during sling use, where service conditions warrant. Damaged or defective slings shall be immediately removed from service.

Crane operations will not be allowed within 15 feet of any overhead power lines. If power line contact is an imminent hazard, the power lines will be moved, de-energized, or removed altogether before work will proceed.

Other operational guidelines that must be followed by the crane operator include the following:

- Crane operator must have full view of load and travel path (unless an approved critical lift plan allows for a blind lift.).
- Operator must respond to instructions from signal person.
- Weight of load must be determined before lifting.
- All loose slings, straps or other equipment should be secured.
- Taglines should be used to guide load (when moving materials or equipment).
- Adequate clearance from electrical sources must be maintained.
- All persons must be clear of swing radius of counterweight.
- Lift and swing path must be clear of obstructions and personnel.
- Load must be secured and balanced.
- No more than one load shall be hoisted at one time.
- No one should ever ride on a load.
- Cranes should not be operated during:
  a. high winds
  b. lightning storms
  c. inadequate illumination

5.2.7 Sediment Sampling From Boat

Operating boats or vessels on the water carries the risk of having a crew member fall overboard and possibly drown, striking or being struck by other vessels operating in the area, losing power or steering and drifting into hazardous areas (i.e. shore, marine facilities etc.) and encountering severe weather and dangerous seas, to name a few. The risk of a boating accident can be reduced by ensuring that boat operators are experienced; operating the vessel in compliance with Coast Guard rules and regulations; maintaining the vessel in good mechanical order; avoiding bad weather and dangerous seas; and ensuring emergency equipment is available on-board (i.e. life vests, life rings, life boats, fire extinguishers, communication equipment etc.)

To address these concerns, all work conducted from the sediment sampling boat will comply with all applicable Coast Guard regulations. Boats, will be operated by experienced crewmembers and all equipment will be inspected prior to use to ensure that it is in proper working order. A small boat inspection checklist for use by DOF sediment sampling crews is provided in Appendix C. Vessel inspections will be conducted by the SHSO initially for each sample boat brought to the jobsite and periodically thereafter throughout the duration of the project. Ultimately, though, the boat operator will be responsible for the safety of all personnel on the boat and for the integrity of the vessel and its safety equipment.

Prior to the start of field activities, the boat operator will give a detailed health and safety briefing on the location and use of all vessel safety equipment and the procedures for addressing on-board emergencies (i.e. fire, mechanical failure, man overboard situation, etc.) All sample boats will meet U.S. Coast Guard license and registration requirements and be equipped to safely support maximum rated crew and passenger sizes. The maximum number of passengers and weight shall be conspicuously posted on each vessel. The number of passengers shall not exceed the number of PFDs (personal flotation devices). Personnel working from the sample boat will be required to wear a Type II or equivalent PFD at all times. The sample boat will have at least one sound signaling device (air horn), a fire extinguisher, and at least one vessel mounted or hand held radio to communicate with shore-based support facilities and other vessels operating in the waterway. To avoid collision with other vessels operating in the area, boat operators will look for and avoid other vessels operating in the area at all times. Boating operations will be suspended during severe weather or rough seas.

5.2.8 Hand and Power Tools

All hand and power tools will be in good repair and used only for the purpose for which designed. Tools will be inspected prior to use and used by trained personnel and in accordance with the manufacturer's instructions. All guards will be in place and all emergency shutoff switches will be operational. A copy of the manufacturer's instructions will be maintained with the tools. Any damaged tool will be immediately tagged-out and removed from service. Only non-sparking or intrinsically safe tools will be used in locations where sources of ignition may cause fire or explosion. Throwing tools or materials from one location to another, from one person to another, or dropping them to lower levels will not be permitted. Tools not in use will be kept out from under foot; portable tools will be stored in a clean, secure area when not in use.

All electrical equipment will be provided with GFCI protection. Extension cords will be protected from physical damage and kept out from under foot.

6. SITE CONTROL MEASURES

6.1 Property Access and Site Security

The site is an operating barrel manufacturing and reconditioner. Sampling will be completed on the site and the embayment will be accessed through the facility. A safety briefing will be conducted prior to beginning work on a daily basis.

6.2 Regulated Work Areas

Because access to the property is generally controlled by fencing and is relatively difficult to access, and because there are no regular activities on the site, there is little chance of exposing the public to the anticipated work activity. Consequently there generally will not be a requirement to establish additional regulated work areas while performing these activities.

6.2.1 Exclusion Zones

Because of the nature of the work, it is unlikely that exclusion zones will be necessary.

6.2.2 Contamination Reduction Zones

As required by site conditions, Contamination Reduction Zone (CRZ) will be established adjacent to each EZ to provide a secure area for decontaminating and removing the protective clothing worn by those site workers working in the EZs. The CRZs will be equipped with the following equipment, as necessary.

- Chairs or benches for the workers to sit on when removing their clothing
- Wash buckets and brushes for cleaning protective clothing and tools
- First Aid Kit
- Bloodborne pathogen kit
- Air horn (or other emergency alert signal)
- Fire Extinguisher (ABC Type, at least five pound size)
- Spill Kit
- Eyewash station
- Hand wash station (or equivalent materials)
- Containers appropriate for containing used PPE
- Additional PPE components (for example, additional disposable gloves or hearing protection)

6.2.3 Support Zone

As required by site conditions, all areas outside of the exclusion and contamination reduction areas will be considered the support zone (SZ). The SZ will include equipment and material storage areas, employee break areas, temporary office facilities, etc. and will be considered open access for site personnel. No special access requirements other than the general security requirements will be required for access to the SZ.

7. COMMUNICATIONS

Communications at the jobsite will be by verbal command, hand signals, cell phone, or a combination of all three. DOF personnel will carry with them cellular telephones and a listing of emergency telephone numbers. These phone numbers are listed in Section 13 of this plan. Copies of these phone numbers will be available at the site .

In the event of an emergency requiring evacuation, the Emergency Coordinator will verbally alert each individual working on-site to immediately proceed to the designated staging location for a head count and for further instructions on exiting the site.

8. TRAINING AND RECORDKEEPING REQUIREMENTS

Site personnel directly involved in activities where sediment will be disturbed, and other site workers who could potentially incur significant dermal or inhalation exposures to the site contaminants will have completed at least 40 hours of hazardous waste operations training, as required by 29 CFR 1910.120/1926.65. These individuals must also have received a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Those personnel who completed the 40-hour training more than 12 months prior to the start of the project will have attended an 8-hour refresher course within the past 12 months. The Field Project Manager, Site Supervisor (including subcontractor supervisors), and the SHSO must have completed an additional 8 hours of hazardous waste site supervisor training.

A copy of the training completion certificates for each employee (including subcontractors) working in either the EZ or CRZ will be maintained at the project site. All personnel working on site will receive site orientation training that will include a discussion of each element of this HASP and all of its attachments. At least one site worker, who has current first aid/cardiopulmonary resuscitation (CPR) training, will be on site at all times when work is underway. The aforementioned training requirements and other mandatory training and certifications required for this project are summarized in Table 8-1.

Table 8-1 Summary of Training Requirements

Personnel	Requirements
SHSO, Field Project Manager, and Site Supervisors	• 40-Hour HAZWOPER, 3 days of supervised field experience training, current 8-hour refresher training • Bloodborne pathogens awareness • Fire extinguisher training [29 CFR 1910.157(g)] • 8 Hr. Site Supervisor Course (29 CFR 1910.120 p. (e)(8)) • First Aid/CPR training • Hearing protection training [29 CFR 1910.95(i),(k)] and hearing conservation program • Site- specific training (including hazcom training)
Technicians working in the EZ or CRZ (includes laborers, scientists, engineers, technicians, etc.)	• 40-Hour HAZWOPER, 3 days of supervised field experience training, current 8-hour refresher training • Hearing protection training [29 CFR 1910.95(i),(k)] and hearing conservation program • Bloodborne pathogens awareness • Fire extinguisher training [29 CFR 1910.157(g)] • Site specific training (including hazcom training)
General site workers **not** working in the EZ or CRZ (includes laborers, scientists, engineers, technicians, etc.)	• Hearing protection training [29 CFR 1910.95(i),(k)] and hearing conservation program • Bloodborne pathogens awareness • Fire extinguisher training [29 CFR 1910.157(g)] • Site specific training (including hazcom training)
Subcontractors and Visitors (not operating in an area where a potential for exposure to contamination exists)	• Site safety brief / safety awareness training

Personnel	Requirements

CPR = cardiopulmonary resuscitation

8.1 Site Specific Training

Prior to starting work, each employee will receive site specific health and safety training. The SHSO, or designee, will provide and document site-specific orientation training during the project site kickoff meeting and whenever new workers arrive on site. No site workers will be allowed to begin work on site until the site-specific training is completed and documented by the SHSO. This training will address this HASP and health and safety requirements and procedures pertinent to site operations.

As part of the site-specific orientation training, the following topics will be covered:

- Project introduction and orientation
- Potential site hazards (chemical, physical, and biological)
- Hazard Communication as per 29 CFR 1910.1200 (particularly arsenic hazard awareness training)
- Selection, use, and limitation of PPE
- Emergency procedures
- Contents of the HASP

8.2 Hazard Communication Training

Material Data Safety Sheets (MSDS) will be kept in Appendix C of this HASP for each hazardous chemical used during the project. These MSDSs will be made available to each employee on request. Employees will also be informed about any site operations involving the use of hazardous chemicals, the hazardous nature of the chemicals used, and the location of the MSDSs. Workers who are exposed to hazardous chemicals will be trained to recognized chemical contact hazards in the workplace, the physical properties and health hazards of hazardous chemicals, and the personal protective measures that will be taken to control exposures. All chemical containers used to store hazardous chemicals will also be marked or labeled with the name of the chemical and its hazard warning.

8.3 Emergency Response Training

Personnel on this project will not respond to off-site releases of hazardous materials, structural or major fires, or other catastrophic incidents. Project personnel will only respond to on-site incidents within their training and competency. On-site response training during initial orientation, as well as periodic drills and reviews at each work area will include:

- Employee alarm system
- Evacuation procedures, routes, meeting places, and accountability
- Control of fuel sources
- Fire extinguisher education (No employee is permitted to attempt to fight a fire beyond incipient stage.)
- Minor spill control/cleanup on site in accordance with the plan. This may include source control (e.g., shutoffs, repositioning containers); containment (e.g., drum overpacks, sorbent booms, earthen dikes); and non-emergency cleanup (e.g., sweeping, digging, pumping, and containerization of spills and residues).
- Rescue operations, as necessary

8.4 First Aid and CPR Training

At a minimum, one site worker per work shift will have received first aid and CPR training taught by a certified instructor and approved by an organization such as the American Red Cross. Persons trained in first aid and CPR shall have received instruction on bloodborne pathogens according to 29 CFR 1910.1030. Site-specific briefings will include information about bloodborne pathogen hazards, and the SHSO will keep a record of all site personnel having such training.

On-site medical emergencies will be handled as discussed in the Emergency Response Plan (Section 13). Type III, 16-unit first aid kits that comply with the criteria contained in ANSI Z308.1-1998 will be located on site and in each of the site vehicles, where possible. Bloodborne pathogen barrier kits containing latex gloves, CPR barrier, masks, and eye protectors will also be staged with the first aid kits.

8.5 Tools and Equipment

Any worker using a specific tool must have had training on the proper use of the tool. For tools having common use in construction activities, a visual observation by a supervisor is sufficient to document that worker is knowledgeable of general trade tools (screwdrivers, hammers, pliers, wrenches, etc.).

8.6 Safety Meetings

Site safety briefings will be conducted prior to the start of work each day. During these sessions, each worker (subcontractors included) will be encouraged to share their observations, thoughts, and experiences on safety and health-related issues pertinent to the jobsite. This venue also allows site management to share important hazard communication topics with the workers, such as plan-of-the-day activities and associated hazards and controls, required use of PPE, decontamination procedures, emergency procedures, safe work practices, and HASP changes.

The SHSO will conduct these briefings at the start of each shift. Site briefings may be repeated during the day if new hazards arise, which must be communicated to site personnel, or if other workers arrive at the jobsite later in the day. It is at this meeting that site workers will review the AHA for the tasks to be performed that day. A Daily Site Briefing form will be used to document these meetings and will include a listing of topics discussed, hazards identified, recommended remedial controls, other pertinent issues, and the names of all attendees. The information gathered in these sessions will be used to correct any unsafe conditions or work practices at the jobsite and amend the SSHP as appropriate. Copies of Daily Site Briefing forms will be maintained in the project files. A copy of this form is included in Attachment C.

8.7 Recordkeeping Requirements

In accordance with the recordkeeping requirements of 29 CFR 1910 and 1926, and DOF's Health and Safety Program, the following health and safety documents will be generated and maintained at the jobsite:

- Daily Tailgate Safety Briefings
- Medical clearance letters
- Training course certificates (i.e. 40Hr. Hazwoper, 8Hr. Refresher, First Aid/CPR, etc.)
- Respirator fit test forms
- Accident report and investigation forms.
- MSDS sheets
- DOF project field notebook
- HASP review declaration
- Weekly and monthly site inspection forms

Copies of these forms are included in Appendix C.

8.8 Inspections

The SHSO will conduct informal daily inspections of the jobsite. The results of these inspections will be recorded in the DOF project field notebook. Safety and health inspections will also be conducted each week by the Field Project Manager and every month by the Project Manager or their designee. Inspection results will be recorded on the "Project Inspection Checklist" found in Appendix C. Copies of the inspection reports will be kept on file for review by the PHSM.

Deficiencies noted during these inspections will be recorded in DOF's project field notebook . Each deficiency will be corrected by a designated authority according to a pre-assigned completion date. Copies of the inspection findings will be sent to the Project Manager for evaluation and correction of any deficiencies.

9. MEDICAL SURVEILLANCE

DOF site personnel and subcontractors who are potentially exposed to hazardous substances on this project will participate in either DOF's Medical Surveillance program or in a comparable surveillance program chosen by their employer that meets the requirements of 29 CFR 1910.120(f). This program requires a complete pre-employment physical with associated laboratory tests and a drug screen. DOF site personnel must have passed this examination and have a copy of their medical clearance on file at the site before they will be allowed to enter the EZ or CRZ. This clearance letter, applicable to both DOF and subcontractor personnel, must include the physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response or from respirator use. It must also list any limitations upon the employee's assigned work.

An annual or biennial physical examination (as determined by the occupational health physician) is also required for all personnel participating in this program. Additional physical exams will be made available to program participants who terminate their employment with DOF or who are reassigned to a job position, which does not require participation in the program.

The medical examinations will be provided by a licensed physician, preferably one knowledgeable in occupational medicine, in accordance with 29 CFR 1910.120 (f)(5).

10. PERSONAL PROTECTIVE EQUIPMENT

Prior to the start of work, the SHSO will review the applicable work plans, site historical records, remedial investigation results, etc. and evaluate each major work activity to determine the appropriate level of PPE needed for the work. This evaluation will include a consideration of potential chemical, physical, and biological hazards present; work operations to be performed; potential routes of exposure; concentrations of contaminants present; and characteristics, capabilities, and limitations of PPE, including any hazards that the PPE may create or exacerbate (i.e., heat stress). Evaluation findings and recommendations for the project, to date, are listed in the AHA tables found in Appendix A.

The SHSO will also evaluate PPE usage at the jobsite on a daily basis and determine the necessary PPE for specific activities or portions of activities not included in the AHAs. If necessary, the HASP will be amended to reflect new or modified PPE requirements. All PPE changes will be communicated to site personnel during the daily site briefings and hazard communication training sessions. At a minimum, though, all field activities will require the use of ANSI-approved hard hats, safety glasses, safety-toe footwear; short-sleeve shirts; and long pants and ANSI / International Safety Equipment Association (ISEA) 107-2004 Class II compliant reflective road vests.

Three different levels of PPE—Level D, modified Level D, and Level C —will be available for use during the planned project activities. The PPE components that make up these levels are listed below.

10.1 Level D

For activities not presenting a risk of significant contact with contaminated sediment, soil or groundwater, site personnel will wear Level D consisting of:

- Standard work clothing (long pants and short or long sleeve shirt), gloves (as appropriate), ANSI-approved hard hat and safety glasses
- Chemical-resistant boots or leather work boots with safety toe (as appropriate)
- Hearing protection as required
- ANSI/ISEA 107-2004 Class II reflective road vests where equipment traffic is present
- Leather work gloves

Site operations that are likely to result in minimal contact with contaminated soil and groundwater include operating mobile equipment, working in the SZ, and working in areas where airborne contaminant levels are below PELs. Personnel performing these tasks will wear Level D PPE unless the SHSO determines an upgrade is necessary.

10.2 Modified Level D

Modified Level D will be worn by those site personnel directly engaged in activities that could result in significant skin contact to contaminated sediment, soil, and groundwater. Also, personnel assigned to assist in decontaminating these individuals will wear the same level of PPE. Modified Level D will consist of the following items:

- Disposable Tyvek coveralls or lightweight neoprene raingear or PolyTyvek coveralls if contact with liquid is possible.
- Nitrile gloves
- Rubber boots with steel toes or leather steel toe boots with chemical resistant boot covers.

- Hard hat
- Safety glasses
- Hearing protection as required
- ANSI/ISEA 107-2004 Class II reflective road vests worn on the outside of the coveralls in areas of equipment traffic.

Workers directly engaged in manually handling contaminated sediment, soil or groundwater (such as, drillers and sampling technicians) in the designated exclusion zones and those who repair equipment that is soiled have the greatest potential for contacting site contaminants.

10.3 Level C

Level C will be worn if the air monitoring results described in Section 12.0 indicate that an inhalation exposure hazard (in addition to a skin contact hazard) to volatile organic vapors or arsenic contaminated dust in excess of the specific action levels listed in Table 12-1 exist at the site. Level C will consist of the Modified Level D clothing specified above plus a full-face air purifying respirator (APR) equipped with organic vapor / HEPA cartridges. Cartridges will not be used beyond their calculated end-of-service-life and at a minimum will be discarded at the end of each day.

Efforts will be made to eliminate airborne exposure hazards before resorting to the use of respiratory protection by, for example, allowing vapor emissions to dissipate before resuming work, using water to wet the ground to control dust release, and using exhaust fans to dilute potentially toxic or explosive atmospheres.

10.4 Respirator Use Requirements

All DOF personnel who must wear half-face air purifying respirators (APR) will receive a qualitative fit test in the exact same model, type, and size respirator to be used on the project prior to starting work. Fit test records will be kept on-file at the jobsite. Fit testing will be repeated every twelve months. Only medically qualified personnel will be allowed to use respiratory protective equipment. Medical clearance letters indicating the worker's ability to a wear respirator will be maintained at the jobsite.

Respirator users will also be trained in the selection, use, limitations, and maintenance of the respirators they have been assigned. This training is typically included in the worker's 40 Hr. Hazwoper training course and 8 Hr. Refresher training. Re-training on this subject, however, will be offered to anyone unfamiliar with the aforementioned topics.

Each respirator user on the project will be issued and fit tested in their own respirator which will be issued to them before work begins. They will be responsible for properly cleaning, inspecting, maintaining, repairing, and storing this equipment. Respirators will be cleaned in the manufacturer's recommended cleaning and disinfecting solution after each use. They will then be dried, placed in plastic bags and stored on-site for future use. Each storage bag will be identified with the respirator user's name. The Site Safety and Health Officer will conduct periodic inspections of all operations requiring the use of respirators to ensure the aforementioned respirator use requirements are being implemented.

10.5 PPE Use and Maintenance

Employees assigned to use PPE are required to inspect the equipment before and after each use, discard any equipment that is defective, clean and maintain the equipment according to manufacturer's recommendations, and store their PPE in a clean, secure area. Specific PPE inspection, cleaning, and maintenance procedures vary according to the type of equipment being used. Employees will be informed of these equipment-specific use and maintenance procedures prior to being assigned to their jobs. Training in PPE equipment inspection, cleaning, and maintenance protocols will be provided during the requisite 40-Hour Hazardous Waste Operations course and in the site-specific orientation training conducted by the SHSO. Employees will practice use and inspection of PPE before entering an EZ.

At the end of each shift, the SHSO will examine the inside of a representative sample of protective garments before they are discarded or cleaned to identify evidence of breakthrough. Such evidence would include any discoloration or staining of the clothing; thinning, blistering, or cracking of the clothing material; and the presence of torn seams and perforations. The SHSO will also note if the workers themselves have become contaminated while wearing the PPE. If, based on this examination, it is apparent that the PPE designated for the work is not adequately controlling worker exposures, the level of personal protection will be upgraded.

11. DECONTAMINATON

11.1 Personnel Decontamination

Decontamination for site personnel wearing Level D PPE will consist of having workers remove their hard hats, safety glasses, leather gloves, hearing protectors, and outer protective garments prior to leaving the site.

Site personnel engaged in activities requiring Modified Level D and Level C PPE will be required to bag or to wash their boots and remove their gloves when leaving the EZ. Disposable coveralls will be placed in a designated container for disposal. Workers will wash their hands and face before leaving the CRZ. Respirators, if worn, will be removed last and placed in plastic bags for later inspection, cleaning, and storage. Separate areas for storing street clothing and changing into and out of chemical protective clothing will be determined at the jobsite should level C or modified level C be required, as appropriate.

Personnel decontamination will be conducted in a CRZ situated adjacent to and contiguous with the EZ, if necessary to control the spread of contamination. A washtub will be placed in the CRZ for workers to use during the decontamination process. Scrub brushes and soap solution may be used to remove soil from clothing. Wash and rinse water will be managed and disposed of as discussed in the Site Work Plan.

The SHSO will ensure that the above-mentioned decontamination procedures are effectively controlling the spread of contamination in the work area by periodically inspecting the recently cleaned clothing and equipment for evidence of residual contamination. The work area also will be examined to detect any sign of contamination outside of the work zones. Should it become apparent that contamination is being dispersed into clean areas of the site, work activities will cease until more effective decontamination methods can be devised.

11.2 Equipment Decontamination

Decontamination of hand tools and heavy machinery will be performed prior to leaving the site or at the conclusion of site activities. Equipment will be cleaned of gross materials using hand tools and brushes and will then be sprayed with water, as necessary. To the greatest extent possible, rinsates will be maintained within the consolidation area or containments. General cleaning of equipment and tools where contact with contaminated materials has not occurred will not be considered decontamination and will not require containment of rinsates. Generation of dust will be minimized to the greatest extent possible.

12. AIR MONITORING

The site reconnaissance activities will minimally disturb sediment and the sediment will be wet and pose little risk of inhalation exposure. Furthermore the area is well ventilated and will only be accessed for several hours during low tides. These factors indicate that air monitoring will not be required.

However, the area with the highest contamination includes high concentrations of petroleum hydrocarobns with distinct odors. If any petroleum odors are noticed, the site workers will move of the area, and ambient air measurements for volatile organic vapors may be collected in the breathing zone of site workers.

If needed, organic vapor levels will be measured with an organic vapor analyzer, such as a PID or FID. As indicated in Table 12-1, total organic vapor levels equal to or less than background will be considered acceptable. Vapor levels in excess of this limit will require that work temporarily stop until vapors dissipate, effective engineering controls are implemented, or workers wear Level C PPE.

Calibration and maintenance of monitoring equipment will be done by the SHSO in compliance with the manufacturer's specifications and will be performed prior to daily monitoring. Calibration records will be kept in the project health and safety files. All direct reading air sampling results from the previous day will be discussed with the site crews at the morning tailgate safety meeting.

The above-mentioned instrument readings will be compared to the actions levels listed in Table 12-1.

Table 12-1 Air Monitoring Action Levels

Monitoring Instruments	Activity	Action Level	Site Action
Organic Vapor Analyzer (PID or FID)	• Drilling soil borings. • Constructing groundwater monitoring wells. • Purging and sampling wells. • Working in VOC contaminated soils	≤ background > background but ≤ 40 ppm. >40 ppm	• Continue working • Wear Level C PPE or stop work until vapors are ≤ background. • Discontinue work • Shut down equipment • Evacuate area • Call Project Manager

Combustible Gas / H_2S Indicator	Drilling soil borings and installing wells in slag pile.	< 10% LEL > 10% LEL < 20 ppm H_2S $\geq$ 20 ppm H_2S	Continue or resume working Stop work, shut down equipment, isolate ignition sources, evacuate immediate work area. Inert auger as appropriate to control explosive atmosphere. Continue or resume working Evacuate imrmediate work area.

13. EMERGENCY RESPONSE

There is a possibility that DOF personnel or their contractors could experience a medical emergency in the normal course of their work or, perhaps, spill fuels and lubricants used to service their equipment. For these emergencies, the following emergency response plan has been drafted. It will be discussed with all project personnel during their initial site orientation training. A copy of the Emergency Response Plan (this section) and a map to the emergency medical facility (Appendix F) will be readily available in the work area.

A listing of emergency response contacts for this project is presented in following table:

13-1. Emergency Response Contacts	
Site Address: International Container Services (ICS) 7152 1st Ave. South, Seattle, WA	
Hospital:	
Harborview Medical Center 325 9th Ave. Seattle, WA 98104	(206) 731-3000
EMT/Ambulance	911
Seattle Police Dept.:	
Emergency	911
Seattle Fire Dept.:	
Emergency	911
US Coast Guard	(206) 217-6000 or VHF chnl 16
DOF Project Manager, Matt Dalton	Cell: (206) 498-6616
National Response Center	800-424-8802
Rick Cabuco (ICS General Manager)	206-763-2345

Dept. of Ecology	800-258-5990

13.1 Emergency Coordinator

DOF's Technical Lead will be the designated emergency coordinator responsible for implementing this emergency response plan. This person will notify emergency responders during a medical emergency (ambulance, hospital, etc.) or spill incident and ensure that the client and all affected project contractors are made aware of any emergencies occurring on-site. DOF's Technical Lead will initiate emergency evacuation procedures, as appropriate, and ensure that injured DOF employees are given emergency medical treatment and are transported to the hospital for follow-up treatment.

1) During a medical emergency, the initial contact will be made to 911.

2) ICS General Manager (Rick Cabuco) will be first notified in case of a spill or after the 911 call is made in a medical emergency.

The emergency coordinator will conduct an inspection of emergency response equipment every month. This equipment includes fire extinguishers, first aid kits, and spill control equipment. As part of the daily site walk-through, he/she will pay close attention to potential fire hazards, spill potentials, and individual work practices. Emergency response equipment will be stored at an easily accessible location in the work area. Monthly fire extinguisher checks will be documented, either on the fire extinguisher or in the SHSO logbook.

13.2 Site Evacuation

Should a serious or catastrophic situation arise on site, such as but not limited to, an uncontrollable fire, airborne release of flammable or toxic chemical, hazardous liquid spill, significant injury to site personnel, and major earthquake or explosion, the job site will be evacuated. Site personnel will be notified of an evacuation through direct communication.

If an evacuation is necessary, all site personnel will proceed immediately to the entry gate to the site on Taylor Way. The emergency coordinator will be informed of the emergency and a head count of all assembled site personnel will be taken. Once everyone is accounted for, they will evacuate further to a safe area designated during site orientation training and the emergency coordinator will assess the situation and outline the actions to be taken.

During the emergency, the emergency coordinator will:

- Ensure injured personnel are given first aid treatment, as appropriate.
- Shut down equipment that could cause a hazard or act as an ignition source;
- Notify applicable emergency response services.
- Prohibit unauthorized personnel from entering the evacuated area by calling.
- Provide emergency equipment as appropriate; and

13.3 Environmental Incident (Spill)

Each contractor working on-site will be responsible for containing, controlling, and cleaning up any spills they create. Except for collecting environmental samples, DOF will not be engaged in any work activities that could result in the significant release of hazardous materials into the environment. Spills associated with drilling activities would likely result from the release of diesel fuel, lubricants, or hydraulic fluid into soil or water from the refueling or maintenance of their equipment. Should such an event occur, the Technical Lead will isolate the spill area; identify the nature and hazardous properties of the spilled material (i.e. reference MSDS sheets); notify site management of the situation; don appropriate personal protective equipment and; contain and control the spill using plugs, patches, containment boom and absorbants, etc.

A small spill, less than 5 gallons, will be handled by the responsible contractor. For spills greater than 5 gallons, the responsible contractor or DOF will:

> **(1) Call the local emergency response hazmat team (Fire Dept.) for assistance, as appropriate.**

The heavy equipment contractor will have on hand appropriate spill control equipment consisting of sorbent pads, sorbent boom, vermiculite, duct tape, large plastic bags, shovel, and one 55-gallon drum (or two 35-gallon drums). This spill kit will also include personal protective equipment, such as, disposable PolyTyvek coveralls or lightweight PVC raingear, nitrile gloves, PVC boot covers, and chemical protective goggles. This equipment will be staged at each major work area.

Any spills that occur in the water will be reported to the appropriate regulatory authorities (i.e. Port Security, Coast Guard, EPA, Dept. of Ecology, etc.) They will direct on-site cleanup resources and efforts.

13.4 Explosion

In the event of an explosion, all non-essential personnel will be evacuated from the site and the work area will be secured. No one will be allowed to re-enter the site, except to possibly save a life, until cleared by the emergency coordinator.

> **1) Call 911 if an injury occurs**
>
> **2) Notify ICS's General Manager**
>
> **3) Notify other emergency responders as appropriate**

If adjacent properties are threatened by the explosion, local emergency response authorities will be called to evaluate the situation and possibly initiate an evacuation of the surrounding community.

13.5 Personal Injury

In the event of serious personnel injury (fatality, patient unconscious, possibility of broken bones, severe bleeding, burns, blood loss, shock, or trauma), the first person on-scene will immediately:

- Administer first aid if qualified; if not qualified, seek out a person qualified to administer first aid; and
- Notify the emergency coordinator of the name of the individual involved, their location, and the nature of injury.

The emergency coordinator, upon receipt of notification of the injury, will immediately:

- **Notify emergency medical services (911) and give the appropriate patient information and their location.**
- **Assist the injured party as deemed appropriate.**
- **Designate someone to accompany the injured party to the hospital and to provide chemical data sheets to the emergency medical team.**
- **Notify ICS's General Manager.**
- **Complete an injury report (see Appendix C.)**

If the emergency coordinator determines that emergency medical services are not necessary (minor injury such as sprain or abrasion, patient is conscious and can be moved), he/she may direct someone to transport the patient by vehicle to the hospital. A hospital route map will be located in DOF’s field vehicle which will be present at each major work area.

1) Notify ICS's General Manager

13.6 Adverse Weather

Weather conditions in Washington State are typically punctuated by severe winds and rain. In the event of adverse weather, the SHSO working with the site superintendent will determine if work can continue without sacrificing the health and safety of field personnel. Some of the items to be considered prior to determining if work should continue are:

- Extreme cold and wind,
- Heavy precipitation,
- Limited visibility, and
- Potential for accidents.

13.7 Emergency Equipment

The following emergency response equipment will be stored at DOF's field vehicle:

- First aid kits for 5 people,
- 5-pound ABC fire extinguishers (to be inspected monthly),
- Portable, emergency eyewash.
- Cellular phones and/or radios.

This equipment will be inspected monthly by the FPM. It will be cleaned, inspected, and replenished immediately after each use.

Postings related to the Emergency Response Plan will be placed in the DOF field vehicle, sediment sampling boat, or each major work area. The following information from the Emergency Response Plan will be highlighted on these postings:

- Emergency telephone numbers for fire, ambulance, hospitals, police
- Location of fire extinguishers and emergency equipment
- Map to the hospital.

14. HEALTH AND SAFETY PLAN CERTIFICATION

By their signature, the following undersigned certify that this plan has been read, or otherwise communicated to them. They further certify that they completely understand this plan and will follow its procedures for the protection of the health and safety of all persons entering this site.

NAME	DATE

APPENDIX A

AHA TABLES

ACTIVITY HAZARD ANALYSIS

Project / Location: Former Arkema Facility, Tacoma, WA.	**Estimated Start Date:** March 2008	**Phase of Work:** Mobilization
Analysis Performed By: Steve Frost	**Date:** 2-2-08	**Analysis Approved By:**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Site Preparation (i.e. establishing control zone around work area, removing surface obstructions, identifying and securing overhead and underground utilities.), including using portable power tools.	Contact with traffic operating near work area.	• Establish traffic lanes around work area using signs, flags, barricade tape, etc. • Install Jersey barriers or equivalent as appropriate. • Ensure vehicles parked in the work area are chocked and have their parking brakes set.
	Back strain from lifting and moving materials stored in work area.	• Use mechanical lifting devices when feasible. • Do not lift more than 50 lbs. per individual. • Have others help lift excessively heavy loads. • When lifting, maintain ergonomically correct lifting posture.
	Cuts and scrapes from handling and moving materials.	• Ensure loads to be handled are free of sharp edges and points. • Wear leather gloves and long sleeved shirts.
	Electrocution from relocating surface and overhead electrical utilities	• De-energize and lockout/tagout surface electrical utilities in the immediate work area that will not be used and could be accidentally disturbed by the construction work. • Ensure temporary electrical wiring is protected from contact by vehicles and equipment. • Have licensed electrical conduct all electrical disconnects.
	Being struck by mobile equipment operating within the work area.	• Ensure mobile equipment has backup alarms • Make eye contact with operator before approaching vehicle. • Have ground crews wear high intensity road vests. • Use spotters to direct traffic as appropriate. • Inspect vehicles and equipment for mechanical integrity daily.

	Slips and trips from uneven or obstructed walking surfaces in the work area.	• Clear work area and walkways of debris. • Cover holes, pits, or other openings in walking surface. • Wear high traction, steel toed boots. • Provide adequate illumination of the work area.
	Heat stress from working outside	• Monitor temperatures and establish work/rest schedules as per SHSP. • Provide shaded rest areas and cold beverages for workers. • Train workers in thermal stress recognition, treatment, and controls.
	Excessive noise exposure	• Monitor noise levels with sound level meter • Demarcate areas where noise levels exceed 85dBs • Post noise hazard warning signs in high noise areas • Post copy of OSHA's noise standard • Have workers wear hearing protection when working in high noise areas.
	Struck by, caught in or between	• Wear leather work gloves and long sleeved work shirts. • Inspect power tools for damage or defects before and after each use. • Ensure all guards are in place. • Use tools only as designed. • Receive proper training in tool use.
	Struck by flying debris	• Wear impact-resistant, ANSI-approved safety glasses with sideshields • Wear face protection in addition to safety glasses for electric or pneumatic grinding, chipping, abrasive saw metal cutting, chain saw and brush cutter work
	Sprains/strains and vibration-induced musculoskeletal disorders	• Do not use heavy tools over shoulder height. • Where tool use is necessary on a continuous or repetitive basis take frequent breaks to rest muscles and joints, particularly if working in awkward positions • Use lightest tool acceptable for application • Use anti-vibration gloves for repetitive use of high velocity or high impact tools, such as impact wrenches, reciprocating saws, etc.

	Electrical contact	• Ensure electrical power tools are connected to ground fault circuit interruptors • Do not use electrical power tools in wet environments. • Use only heavy duty extension cords and inspect daily to ensure insulation and plug connections are intact.
Driving pickup trucks and delivery vehicles	Workers injured while driving vehicles	• Follow all driving rules and regulations. Always wear seat belts whenever vehicle is in motion. Licensed drivers only may drive vehicles. • Wear high-visibility reflective vests at all times in work areas.
	Struck by or against vehicles	• Make eye contact with operators of vehicles. • Understand and review posted hand signals. Traffic barricades, signs, flags, and backup spotters will be used during field activities, as necessary.
Connecting Temporary Power to Site Trailer	Electrocution	• Shut-off and lockout/tagout primary electrical power sources when making electrical connections to office trailer. • Have licensed electrician make all electrical connections. • Check grounding, continuity, and polarity of all electrical service outlets. • Make sure trailer is properly grounded. • Ensure circuit breaker switches are labeled.
	Fall from heights	• Use personal fall protection when working 6 ft or higher above ground. • Secure all ladders when in use. • Use manlifts when feasible to access elevated work locations
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING AND CP REQUIREMENTS**
Pickup trucks Forklifts Ladders Power drills and saws Hand tools Level D PPE Personal fall protection as needed	Daily vehicle and equipment inspection. Inspect ladders before use Inspect personal fall protection equipment before use	OSHA compliant forklift training Ladder safety training Use of PPE Use of personal fall protection and content of OSHA fall protection standard as needed.

ACTIVITY HAZARD ANALYSIS

Project / Location: Former Arkema Facility, Tacoma, WA	**Estimated Start Date:** March 2008	**Phase of Work:** Monitoring Well Inventory and Sampling
Analysis Performed By: Steve Frost	**Date:** 2-2-08	**Analysis Approved By:**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Park vehicle at well.	Vehicle contact	Use spotters when positioning vehicle if needed. Ensure vehicle's backup lights are operational.
	Location could create a traffic hazard.	Locate vehicle in an area that will not obstruct traffic.
Unload equipment and materials from vehicle.	Back strain from heavy lifting	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
Move equipment and materials to designated well location.	Handling of equipment could cause strain to worker.	Use care when walking so that there are no sudden jerks or mis-steps that can cause the worker to strain to maintain control of the equipment. Get assistance from other workers if needed. For loads greater than 50 pounds, use two people to carry.
	Slip, trip, and fall hazards could be present.	Maintain good housekeeping in work area. Mark or remove all identified trip, slip, and fall hazards from sampling area. Maintain proper illumination in work area.
	Worker could be struck by vehicles.	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operators of vehicles. Post an observer, as needed, when well is close to busy streets. Use traffic controls or barricades, if necessary, to keep traffic away from workers.
	Thermal Stress	Provide cold beverages and shaded rest areas for work crews. Establish work/rest schedules based on WBGT readings and physiological monitoring. Train workers in thermal stress signs, symptoms, treatments, and controls. Ensure all workers have been enrolled in a medical surveillance program and they are physically fit to work in temperature conditions existing at jobsite. Ensure no one works alone. Have workers keep track of each other and report any symptoms of thermal stress to supervisor immediately.

Inspect condition of well and remove well cap.	Back strain from heavy lifting	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help if cover is too heavy or it is too difficult to handle because cover is wedged or impaired. If cover is on hinges, ensure that cover is secured in upright position by latching or tie-off to prevent cover from closing on worker.
	Adverse contact with hand tools.	Inspect all tools for damage before use. Do not use damaged tools (mark and tag "out of service"). Select hand tools to minimize following stressors: chronic muscle contraction or steady force; extreme or awkward finger/hand/arm positions; repetitive forceful motions; or excessive gripping, pinching, or pressing with hands and fingers.
	Release of volatile vapors	Test air in breathing zone with organic vapor analyzer. Continue work only if vapor concentrations are at or below background.
	Cuts to hands and fingers	Wear leather gloves.
Measure depth to groundwater.	Dermal contact with contaminated groundwater	Wear nitrile gloves and neoprene, steel-toed boots. Wear disposable Poly-Tyvek coveralls if there is a potential for work clothing to become significantly contaminated with groundwater.
Set up sampling equipment.	Polyethylene sheeting can be slippery.	Wear boots with traction. Use caution when maneuvering on or around polyethylene sheeting, especially if sheeting is wet.
	Worker could be exposed to pinch points.	Use care when setting up equipment. Wear leather gloves if necessary.
Purge well.	Dermal contact with contaminated groundwater	Wear nitrile gloves and neoprene, steel-toed boots Wear disposable Poly-Tyvek coveralls if there is a potential for work clothing to become significantly contaminated with groundwater. Wash hands before leaving exclusion zone
	Back strain from heavy lifting	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help to lift heavy loads.

	Thermal Stress	Provide cold beverages and shaded rest areas for work crews. Establish work/rest schedules based on WBGT readings and physiological monitoring. Train workers in thermal stress signs, symptoms, treatments, and controls. Ensure all workers have been enrolled in a medical surveillance program and they are physically fit to work in temperature conditions existing at jobsite. Ensure no one works alone. Have workers keep track of each other and report any symptoms of thermal stress to supervisor immediately.
	Electrical contact	Ensure electrical equipment (i.e. pumps) is connected to ground fault circuit interruptors Use only heavy duty, water resistent, extension cords and inspect daily to ensure insulation and plug connections are intact.
Collect groundwater samples.	Muscle strain.	Maintain steady pace and follow rest periods given on job. Select a position during sampling to minimize following stressors: chronic muscle contraction or steady force; extreme or awkward positions; repetitive forceful motions; or excessive gripping, pinching, or pressing.
	Dermal contact with contaminated groundwater	Wear nitrile gloves and neoprene, steel-toed boots Wear disposable Poly-Tyvek coveralls if there is a potential for work clothing to become significantly contaminated with groundwater. Decontaminate exteriors of sample containers. Avoid spills. Ensure spill cleanup supplies are available. Wash hands before leaving exclusion zone
	Thermal Stress	Provide cold beverages and shaded rest areas for work crews. Establish work/rest schedules based on WBGT readings and physiological monitoring. Train workers in thermal stress signs, symptoms, treatments, and controls. Ensure all workers have been enrolled in a medical surveillance program and they are physically fit to work in temperature conditions existing at jobsite. Ensure no one works alone. Have workers keep track of each other and report any symptoms of thermal stress to supervisor immediately.

	Electrical contact	Ensure electrical equipment (i.e. pumps) is connected to ground fault circuit interruptors Use only heavy duty, water resistent, extension cords and inspect daily to ensure insulation and plug connections are intact.
Replace well cap	Worker could experience strain from use of tools.	Inspect all tools for damage before use. Do not use damaged tools. Mark and tag "out of service". Select hand tools to minimize the following stressors: chronic muscle contraction or steady force; extreme or awkward finger/hand/arm positions; repetitive forceful motions; or excessive gripping, pinching, or pressing with hands and fingers.
	Worker could get hand caught between cover and top when replacing cover.	Use care when replacing well cover. Wear leather gloves when handling covers.
Decontaminate all reusable materials and equipment.	Lifting of equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Dermal contact with contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Remove PPE properly and wash hands.
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear boots with good traction.
Pack samples for shipment.	Manually moving materials and equipment could cause strains.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck when handling more than one box at a time. Try to pack shipping boxes so that each box does not exceed 50 pounds. For loads greater than 50 pounds, use two people to carry.
	Contents of sample containers could leak, causing exposure to worker and possibly to people handling shipping box.	Ensure that each container top is securely tightened. Pack each container in a manner to prevent damage to container during handling of shipping box and during transportation. Ensure boxes meet required packaging standards based on mode of transportation used for shipping.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING AND CP REQUIREMENTS**
Pickup trucks Hand tools	Daily vehicle and equipment inspection. Outlets – prior to use during site inspection	OSHA compliant forklift training Use of PPE

Modified Level D PPE Personal fall protection as needed Temporary power supplies including GFCIs, extension cords, cord and plug-operated tools	GFCI – prior to use during site inspection Extension cords and cords and plugs on equipment – daily by users	Use of personal fall protection and content of OSHA fall protection standard as needed. General electrical safe work practices training provided during site orientation. Only licensed electricians will install, repair, and maintain electrical equipment and current carrying parts of electrically supplied tools and equipment.

ACTIVITY HAZARD ANALYSIS

Project / Location: : Former Arkema Facility, Tacoma, WA	**Estimated Start Date:** March 2008	**Phase of Work:** Installing groundwater monitoring wells.
Analysis Performed By: Steve Frost	**Date:** 2-2-08	**Analysis Approved By:**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Site Preparation (i.e. establishing control zone around work area, removing surface obstructions, identifying and securing overhead and underground utilities.)	Contact with traffic operating near work area.	• Establish traffic lanes around work area using signs, flags, barricade tape, etc. • Have workers wear traffic vests • Ensure vehicles parked in the work area are chocked and have their parking brakes set.
	Back strain from lifting and moving materials stored in work area.	• Use mechanical lifting devices when feasible. • Do not lift more than 50 lbs. per individual. • Have others help lift excessively heavy loads. • When lifting, maintain ergonomically correct lifting posture.
	Cuts and scrapes from handling and moving materials.	• Ensure loads to be handled are free of sharp edges and points. • Wear leather gloves and long sleeved shirts.
	Electrocution from relocating surface and overhead electrical utilities	• De-energize and lockout/tagout surface electrical utilities in the immediate work area that will not be used and could be accidentally disturbed by the excavation or need to be relocated. • Ensure temporary electrical wiring is protected from contact by vehicles and equipment.
	Being struck by mobile equipment operating within the work area.	• Ensure mobile equipment has backup alarms • Make eye contact with operator before approaching vehicle. • Have ground crews wear high intensity road vests. • Secure area around mobile equipment. • Use spotters to direct traffic as appropriate. • Inspect vehicles and equipment for mechanical integrity daily. • Ensure forklift operators are trained

	Slips and trips from uneven or obstructed walking surfaces in the work area.	• Clear work area and walkways of debris. • Cover holes, pits, or other openings in walking surface. • Wear high traction, steel toed boots. • Provide adequate illumination of the work area.
Operating Drill Rig	Contact with underground utilities and overhead powerlines.	• Conduct an underground utility search before drilling. • Maintain a minimum 15 ft. clearance from overhead power lines. • Review site design drawings • Use non-intrusive utility detection equipment (i.e. magnetometers, ground penetrating radar, etc.) as necessary to locate utilities. • Identify shut off valves and switches to all utilities traversing site before drilling. • De-energize and lockout / tagout utilities passing in, through, or near drilling site if feasible. • Evacuate site if utilities are damaged. Shut off ignition sources. • Use hand shovels and/or air lances to excavate soils when drilling near active utilities.
	Equipment rollover	• Ensure outriggers on drill rig are extended and placed on solid ground. • Ensure drill rig operates on level ground. • Ensure equipment is equipped with roll over protection and seat belts. • Do not move drill rig when drill mast is deployed in vertical position.

	Dermal and inhalation contact with contaminated soil and groundwater	• Wear modified Level D PPE as appropriate. • Wear leather work gloves (over nitrile gloves) that are left in the work area and which are disposed of regularly. • Wash hands and face before each break and before leaving the jobsite. • Undergo decontamination before leaving work area. • Ensure workers are informed and trained in recognition and control of petroleum contact hazard. • Conduct air monitoring near breathing zone of drillers with organic vapor analyzer. • Keep cab of drill rig and support vehicles clean. • Have a portable eyewash available at the jobsite. • Wear Level as indicated by air monitoring
	Struck by drill rig	• Ensure drill rig has backup alarms • Make eye contact with operator before approaching equipment. • Have ground crews wear high intensity road vests. • Secure area around drill rig • Use spotters to direct movement of equipment as appropriate. • Inspect drill rig for mechanical integrity daily. • Ensure operators are trained and experienced
	Thermal stress from working outside	• Evaluate temperature in work area, have work crews wear appropriate clothing. • Comply with thermal stress controls discussed in Section 6. • Have crews take frequent breaks in temperature controlled break room to either warm up or cool down. • Provide water or hot or cold beverages as needed. • Ensure workers are aware of thermal stress symptoms, treatments, and preventative measures.
	Contact with moving mechanical parts.	• Ensure all moving mechanical parts on the drill rig that are accessible to workers are guarded. • Ensure emergency kill switches on drill rig are operational. • Stay a safe distance away from auger. Do not touch auger while drilling. • Do not wear loose clothing around equipment.

	Excessive noise exposure	• Have personnel working near heavy equipment wear hearing protection. • Monitor noise levels in work area with a sound level meter as appropriate. • Post noise hazard warning signs, enroll workers in hearing conservation program, and post copy of OSHA noise standard if noise levels exceed 85 dBs.
	Back strain from heavy lifting	• Do not lift equipment (particularly auger flites) that weighs more than 50 lbs. individually. Have others help. • Use mechanical lifting devices whenever feasible. • Maintain proper posture when lifting (i.e. back straight, lift with legs, keep load close to body, don't twist, etc.) • Size up load before lifting • Clear path when carrying loads. • Wear leather gloves to avoid cuts and scrapes.
Installing Well Casing	Back strain from heavy lifting	• Do not lift equipment that weighs more than 50 lbs. individually. Have others help. • Use mechanical lifting devices whenever feasible. • Maintain proper posture when lifting (i.e. back straight, lift with legs, keep load close to body, don't twist, etc.) • Size up load before lifting • Clear path when carrying loads. • Wear leather gloves to avoid cuts and scrapes.
	Thermal stress from working outside	• Evaluate temperature in work area, have work crews wear appropriate clothing. • Comply with thermal stress controls discussed in SHSP. • Have crews take frequent breaks in temperature controlled break room to either warm up or cool down. • Provide water or hot or cold beverages as needed. • Ensure workers are aware of thermal stress symptoms, treatments, and preventative measures.

	Adverse contact with portable power tools (i.e. cuts, scrapes, puncture, electrocution, noise).	• Wear leather work gloves and long sleeved work shirts. • Inspect power tools for damage or defects before and after each use. • Ensure all guards are in place. • Use tools only as designed. • Receive proper training in tool use. Wear impact-resistant, ANSI-approved safety glasses with sideshields • Wear face protection in addition to safety glasses for grinding, chipping, sanding or sawing. • Monitor noise in work area with sound level meter. • Have workers wear hearing protection when noise levels exceed 85 dBA. • Use quieter equipment, if possible. Do not use heavy tools over shoulder height. • Where tool use is necessary on a continuous or repetitive basis take frequent breaks to rest muscles and joints, particularly if working in awkward positions • Use lightest tool acceptable for application • Use anti-vibration gloves for repetitive use of high velocity tools, such as reciprocating saws, etc. • Ensure electrical power tools are connected to ground fault circuit interrupters • Do not use electrical power tools in wet environments. • Use only heavy duty extension cords and inspect daily to ensure insulation and plug connections are intact.
	Dermal and inhalation exposure to pvc glues and solvents.	• Wear nitrile gloves when cleaning and gluing pvc piping. • Glue and clean pvc pipe only in well ventilated areas. • Eliminate all ignition sources in work area when using pvc glues and solvents. • Have MSDS sheet for pvc glues and solvents available for workers to review before beginning work.

	Contact with bentonite grout and cement	• Wear modified level D PPE. • Use water spray to control dust emissions. • Do not wear non-chemical protective clothing (i.e. standard work clothing) that is contaminated with cement or bentonite. • Wash skin if it becomes contaminated with cement or bentonite. • Wear chemical protective goggles when mixing cement and bentonite. • Stage emergency eyewash in work area.
	Excessive noise exposure	• Have personnel working near heavy equipment wear hearing protection. • Monitor noise levels in work area with a sound level meter as appropriate. • Post noise hazard warning signs, enroll workers in hearing conservation program, and post copy of OSHA noise standard if noise levels exceed 85 dBs.
	Dermal contact with contaminated soil and groundwater	• Control dust emissions with water spray • Wear modified Level D PPE as appropriate. • Wear leather work gloves (over nitrile gloves) that are left in the work area and which are disposed of regularly. • Wash hands and face before each break and before leaving the jobsite. • Undergo decontamination before leaving work area. • Ensure workers are informed and trained in recognition and control of petroleum contact hazard. • Have a portable eyewash available at the jobsite.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING AND CP REQUIREMENTS**
Drill rig	Daily drill rig inspection.	Equipment operators must trained in the type of equipment they are operating.
Portable power tools	Daily tool inspection	Tool operators must be trained in the inspection and use of their tools.

ACTIVITY HAZARD ANALYSIS

Project / Location: Former Arkema Facility, Tacoma, WA	**Estimated Start Date:** March 2008	**Phase of Work:** Collecting Soil and Sediment Samples
Analysis Performed By: Steve Frost	**Date:** 2-2-08	**Analysis Approved By:**

PRINCIPAL STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
Securing work area	Struck by vehicles and mobile equipment operating in area.	Demarcate work area (i.e. rope, barricade tape, signage, etc.) Use spotters to direct traffic away from work area. Wear high visibility traffic vests. Maintain proper illumination
	Slip, trip, and fall	Inspect work area for slip, trip, and fall hazards Cover all surface openings Remove surface obstructions Wear high traction steel-toed work boots. Do not work at heights greater than 6 ft. without fall protection.
Unload equipment and materials from vehicle.	Back strain from heavy lifting	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
Move equipment and materials to designated sampling location.	Handling of equipment could cause strain to worker.	Use care when walking so that there are no sudden jerks or mis-steps that can cause the worker to strain to maintain control of the equipment. Get assistance from other workers if needed. For loads greater than 50 pounds, use two people to carry.
	Slip, trip, and falls.	Maintain good housekeeping in work area. Mark or remove all identified trip, slip, and fall hazards from sampling area. Maintain proper illumination in work area.
	Worker could be struck by vehicles.	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operators of vehicles. Post an observer, as needed, when well is close to busy streets. Use traffic controls or barricades, if necessary, to keep traffic away from workers.

	Thermal Stress	Provide cold beverages and shaded rest areas for work crews. Establish work/rest schedules based on ambient temps, work load and physiological monitoring. Train workers in thermal stress signs, symptoms, treatments, and controls. Ensure all workers have been enrolled in a medical surveillance program and they are physically fit to work in temperature conditions existing at jobsite. Ensure no one works alone. Have workers keep track of each other and report any symptoms of thermal stress to supervisor immediately.
Collect soil or sediment samples	Back strain from heavy lifting	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help if cover is too heavy or it is too difficult to handle because cover is wedged or impaired. If cover is on hinges, ensure that cover is secured in upright position by latching or tie-off to prevent cover from closing on worker.
	Adverse contact with hand tools.	Inspect all tools for damage before use. Do not use damaged tools (mark and tag “out of service”). Select hand tools to minimize following stressors: chronic muscle contraction or steady force; extreme or awkward finger/hand/arm positions; repetitive forceful motions; or excessive gripping, pinching, or pressing with hands and fingers.
	Release of volatile vapors from VOC contaminated areas	Test air in breathing zone with organic vapor analyzer. Continue work only if vapor concentrations are at or below background.
	Cuts to hands and fingers	Wear leather gloves.
	Dermal contact with contaminated soil or sediment	Wear nitrile gloves and neoprene, steel-toed boots. Wear disposable Tyvek coveralls. Undergo decontamination before leaving work area. Wash hands and face before leaving site.
	Tidal engulfment when sampling sediments in waterway	Collect samples only at low tide. Confirm tide schedule. Stay at least 6 ft. from water’s edge. Ensure clear access and egress from sampling area Ensure sediment surface is firm enough to support weight

	Thermal Stress	Provide cold beverages and shaded rest areas for work crews. Establish work/rest schedules based on WBGT readings and physiological monitoring. Train workers in thermal stress signs, symptoms, treatments, and controls. Ensure all workers have been enrolled in a medical surveillance program and they are physically fit to work in temperature conditions existing at jobsite. Ensure no one works alone. Have workers keep track of each other and report any symptoms of thermal stress to supervisor immediately.
Decontaminate all reusable materials and equipment.	Lifting of equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Dermal contact with contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Remove PPE properly and wash hands.
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear boots with good traction.
Pack samples for shipment.	Manually moving materials and equipment could cause strains.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck when handling more than one box at a time. Try to pack shipping boxes so that each box does not exceed 50 pounds. For loads greater than 50 pounds, use two people to carry.
	Contents of sample containers could leak, causing exposure to worker and possibly to people handling shipping box.	Ensure that each container top is securely tightened. Pack each container in a manner to prevent damage to container during handling of shipping box and during transportation. Ensure boxes meet required packaging standards based on mode of transportation used for shipping.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING AND CP REQUIREMENTS**
Pickup trucks Hand tools Modified Level D PPE Personal fall protection as needed	Daily vehicle and equipment inspection Before each use. Before each use. Before each use.	OSHA compliant forklift training Tool-specific training Use of PPE Use of personal fall protection

APPENDIX B

GENERAL SITE WORK RULES

GENERAL SITE WORK RULES

1. All DOF personnel must attend weekly site briefings and other scheduled meetings.
2. Any individual taking prescribed drugs shall inform the site health and safety officer of the type of medication and any possible adverse side effects that could effect the health and well being of the worker while they are performing their jobs. The SHSO will decide if the employee can safely work on-site while taking the medication.
3. The personal protective equipment specified by the SHSO and in the Site Safety and Health Plan(s) shall be worn by all DOF site personnel. This includes hard hats, safety glasses, and steel-toed boots, as a minimum.
4. Facial hair (beards, long sideburns or mustaches) which may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator.
5. All personnel must sign the site log when visiting the jobsite.
6. Personnel must follow proper decontamination procedures.
7. Eating, drinking, chewing tobacco or gum, smoking and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in regulated areas of the jobsite.
8. All lighters, matches, cigarettes and other forms of tobacco are prohibited in regulated areas of the jobsite.
9. All signs and demarcations shall be followed. Such signs and demarcation shall not be removed except as authorized by the site superintendent.
10. No one shall enter a permit-required confined space without approval from the site superintendent and site health and safety officer.
11. All personnel must use the Buddy System when working in regulated areas.
12. All personnel must follow the work-rest regimens and other practices required by the heat stress program.
13. All personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.
14. No person shall operate equipment unless trained and authorized. No one may enter an excavation greater than four feet deep unless authorized by the Competent Person.

Excavations must be sloped or shored properly. Safe means of access and egress from excavations must be maintained.

15. Ladders and scaffolds shall be solidly constructed, in good working condition and inspected prior to use. No one may use defective ladders or scaffolds.
16. Fall protection or fall arrest systems must be in place when working at elevations greater than six feet for temporary working surfaces and four feet for fixed platforms.
17. Safety belts, harnesses and lanyards must be selected by the SHSO. The user must inspect the equipment prior to use. No defective personal fall protection equipment shall be used. Personal fall protection equipment that has been shock loaded must be discarded.
18. Hand and portable power tools must be inspected prior to use. Defective tools and equipment shall not be used.
19. Ground fault interrupters shall be used for cord and plug equipment used outdoors or in damp locations. Electrical cords shall be kept out of walkways and puddles unless protected and rated for the service.
20. Improper use, mishandling, or tampering with safety and health equipment and samples is prohibited.
21. Horseplay of any kind is prohibited.
22. Possession or use of alcoholic beverages or controlled substances on-site is forbidden.
23. All incidents, no matter how minor must be reported immediately to the site superintendent. .
24. All personnel shall be familiar with the Site Emergency Response Plan.
25. All personnel will report any unsafe conditions or practices to site management immediately upon discovery.

The above Work Rules are not all inclusive and it is the responsibility of each employee to comply with all applicable regulations set forth by WISHA, DOF management, the site safety and health plan, the client, DOF, the SHSO and the controlling contractor's work rules and health and safety requirements.

APPENDIX C

HEALTH AND SAFETY FORMS

SITE SAFETY BRIEFING

- Dalton, Olmsted & Fuglevand, Inc.-

Date: ________________ Time: __________ Location: ______________________________

Shift: ______________________________ Person Conducting Briefing: ______________________

1. HEALTH AND SAFETY CONCERNS *(i.e. use of PPE, chemical, physical, or biological hazards, unsafe conditions, unsafe work practices, communication problems, safety equipment, training issues, etc.)*:

2. RECENT INCIDENTS *(i.e. near misses, first aid cases, serious injuries, environmental spills, etc.)*:

3. HAZARD CONTROL MEASURES *(i.e. PPE changes, new site control requirements, recommended work practices, etc..)*:

2. OTHER ISSUES:

3. ATTENDEES (Print Name):

1.	12.
2.	13.
3.	14.
4.	15.
5.	16.
6.	17.
7.	18.
8.	19.
9.	20.
10.	21.
11.	22.

THIS IS YOUR RECORD -- KEEP IN YOUR FILE

SUPERVISOR'S REPORT OF AN ACCIDENT

Name of Injured Employee:______________________________ Date of Report ______________

Age	Length of Employment (At plant / On job)	Department	Section

☐ Head	☐ Hands	☐ Wounds	☐ Amputation	☐ Death	☐ Lost Time
☐ Eyes	☐ Legs	☐ Strain & Sprain	☐ Burns	☐ First Aid Only	
☐ Trunk	☐ Toes	☐ Hernia	☐ Foreign Body		
☐ Arms	☐ Internal	☐ Fracture	☐ Skin (occupational)	☐ Due to Delayed Medical Treatment	
Remarks:____________		Remarks:____________		Remarks:____________	

Date of Injury	Hour	Department	Exact Location

Eyewitnesses ____

Describe accident: Include the machine, equipment, object or substance involved . . . . . All Details . . . . . Use back space if necessary

____

____

CAUSE: Mark basic cause **X** Mark contributing cause, if any **O**

UNSAFE CONDITIONS	**UNSAFE ACTS**
1 ☐ Inadequately Guarded	1 ☐ Operating Without Authority
2 ☐ Unguarded	2 ☐ Operating at Unsafe Speed
3 ☐ Defective Tools, Equipment, or Substance	3 ☐ Making Safety Devices Inoperative
4 ☐ Unsafe Design or Construction	4 ☐ Using Unsafe Equipment or Equipment Unsafely
5 ☐ Hazardous Arrangement	5 ☐ Unsafe Loading, Placing, Mixing
6 ☐ Unsafe Illumination	6 ☐ Taking Unsafe Position
7 ☐ Unsafe Ventilation	7 ☐ Working on Moving or Dangerous Equipment
8 ☐ Unsafe Clothing	8 ☐ Distraction, Teasing, Horse Play
9 ☐ Insufficient Instruction	9 ☐ Failure to use Personal Protective Devices

Why was the unsafe act committed? ____________________ Why did the unsafe condition exist? ____________________

Any physical disabilities? ____

Number of previous disablng injuries ____

GUIDES TO CORRECTIVE ACTION

Based on the cause checked above, I am taking the following corrective action:

UNSAFE ACT	**UNSAFE CONDITION**	If Supervisor Can't Handle, Then
☐ 1 Stop the Behavior	☐ 1 Remove	5 Recommend To: (a) ☐ Own Boss, OR
☐ 2 Study the Job	☐ 2 Guard	(b) ☐ Safety Committee, OR
☐ 3 Instruct (tell--show--try--check)	☐ 3 Warn	(c) ☐ Maintenance Dept., OR
☐ 4 Follow Up	☐ 4 Supervisory Training	(d) ☐ ____________
☐ 5 Enforce		6 Follow Up

What I am actually doing to prevent similar injuries____

____

____

What further recommendations? ____

SIGNATURES

______________________ Immediate Supervisor or Foreman

______________________ Received by Plant Manager or Superintendent

DEPARTMENT OF LABOR AND INDUSTRIES
WISHA SERVICES DIVISION

1. Describe the accident in your own words just as you saw it happen. Describe the surroundings or setting before the accident and the position of the injured party in relation to the surroundings, then describe the steps in proper sequence leading to the accident that happened. If possible attach a picture or make a drawing.

2. Describe any near accidents you have observed in the past week.

3. Report any unsafe procedures you have observed in the past week. (Physical hazards are classed as unsafe procedures as well as human acts.)

Safety and Health Inspection Check List

A = Adequate at time of inspection
B = Needs immediate attention

A	B	
		1. JOB SITE INFORMATION
☐	☐	WISHA and other job site warning posters posted
☐	☐	Scheduled safety meetings held and documented
☐	☐	Adequate employee training – general and specific
☐	☐	Medical services, first aid equipment, stretchers and a qualified first aider available
☐	☐	Emergency telephone numbers posted (medical services, fire department, police)
		2. HOUSEKEEPING AND SANITATION
☐	☐	Working areas generally neat
☐	☐	Waste and trash regularly disposed
☐	☐	Enclosed chute provided when material dropped outside of building from over 20 feet
☐	☐	Lighting adequate for all work tasks
☐	☐	Projecting nails removed or bent over
☐	☐	Oil and grease removed from walkways and stairs
☐	☐	Waste containers provided and used
☐	☐	Sanitary facilities adequate and clear
☐	☐	Potable water available for drinking
☐	☐	Disposable drinking cups and container for used cups provided
		3. FIRE PREVENTION
☐	☐	Fire protection program developed
☐	☐	Fire instructions provided to personnel
☐	☐	Proper type and number of fire extinguishers, identified, checked and accessible
☐	☐	Phone number of fire department posted
☐	☐	Hydrants clear, access open
☐	☐	NO SMOKING signs posted and enforced where needed
☐	☐	Temporary heating devices safe. Adequate ventilation provided
		4. ELECTRICAL INSTALLATIONS
☐	☐	Adequate wiring, well insulated, grounded, protected from damage
☐	☐	Assured grounding program followed (OR)
☐	☐	Ground fault circuit interrupters used
☐	☐	Terminal boxes equipped with required covers
		5. HAND TOOLS
☐	☐	Proper tools being used for each job
☐	☐	Safe carrying practices used
☐	☐	Company and employees' tools regularly inspected and maintained

Safety and Health Inspection Check List – continued

A = Adequate at time of inspection
B = Needs immediate attention

A	B	
		6. POWER TOOLS
☐	☐	Good housekeeping where tools are used
☐	☐	Tools and cords in good condition
☐	☐	Proper grounding of all tools (OR)
☐	☐	Double insulated tools used
☐	☐	Proper instruction in use provided
☐	☐	All mechanical guards in use
☐	☐	Tools neatly stored when not in use.
☐	☐	Right tool being used for the job at hand
☐	☐	Wiring properly installed
		7. POWDER-ACTUATED TOOLS
☐	☐	All operators licensed
☐	☐	Tools and charges protected from unauthorized use
☐	☐	Competent instruction and supervision provided
☐	☐	Tools used only on recommended materials
☐	☐	Flying hazards checked by backing up, removal of personnel, or use of captive stud tool
		8. LADDERS
☐	☐	Ladders inspected and in good condition
☐	☐	Ladders properly secured to prevent slipping, sliding or falling
☐	☐	Side rails extended 36" above the top of landing
☐	☐	Job-built ladders properly constructed
☐	☐	Stepladders fully open when in use
☐	☐	Metal ladders not used around electrical hazards
☐	☐	Ladders not painted
☐	☐	Ladders properly stored
☐	☐	Ladder safety feet in use
		9. HEAVY EQUIPMENT
☐	☐	Inspection and maintenance records up to date
☐	☐	Lights, brakes, warning signals operative
☐	☐	Wheels chocked when necessary
☐	☐	Haul roads well maintained and properly laid out
☐	☐	Equipment is properly secured when not in use
☐	☐	Shut-off devices on hose air lines, in case of hose failure
☐	☐	Noise arrestors in use
☐	☐	ROPS in place

Safety and Health Inspection Check List – continued

A = Adequate at time of inspection
B = Needs immediate attention

A	B	
		10. SCAFFOLDING
☐	☐	Erection properly supervised
☐	☐	All structural members meet safety factors
☐	☐	All connections secure
☐	☐	Scaffold tied in to the structure when required
☐	☐	Working areas free of debris, snow, ice and grease
☐	☐	Foot sills and mud sills provided
☐	☐	Workers protected from falling objects
☐	☐	Scaffolds plumb and square, with cross-bracing
☐	☐	Guard rails, intermediate rails, and toeboards in place
☐	☐	Adequate, sound planking provided
☐	☐	Scaffold equipment in good working order
☐	☐	Ropes and cables in good condition
		11. MOTOR VEHICLES
☐	☐	Roadways or walkway hazards effectively barricaded
☐	☐	Barricades illuminated or reflectorized at night
☐	☐	Traffic control devices used when appropriate
☐	☐	Inspection and maintenance records up to date
☐	☐	Operators qualified for vehicles in use
☐	☐	Local and state vehicle laws and regulations observed
☐	☐	Brakes, lights, warning devices operative
☐	☐	Weight limits and load sizes controlled
☐	☐	Personnel transported in a safe manner
☐	☐	All glass in good condition
☐	☐	Back-up signals provided
☐	☐	Fire extinguishers installed where required
☐	☐	SLOW MOVING VEHICLE signs used when required
		12. HOISTS, CRANES AND DERRICKS
☐	☐	Cables and sheaves regularly inspected
☐	☐	Slings and chains, hooks and eyes inspected before each use
☐	☐	Equipment firmly supported
☐	☐	Outriggers used if needed
☐	☐	Power lines inactivated, removed, or at a safe distance
☐	☐	Proper loading for capacity at lifting radius. Rated load capacities posted?
☐	☐	All equipment properly lubricated and maintained
☐	☐	Signalpersons where needed
☐	☐	Signals posed, understood, and observed
☐	☐	Inspection and maintenance logs maintained
☐	☐	Hazard signs posted and visible to operator

Safety and Health Inspection Check List – continued

A = Adequate at time of inspection
B = Needs immediate attention

A	B	
		13. BARRICADES
☐	☐	Floor and wall openings planked over or barricaded
☐	☐	Roadways or walkway hazards effectively barricaded
☐	☐	Barricades illuminated or reflectorized at night
☐	☐	Traffic control devices used when appropriate
		14. HANDLING AND STORAGE OF MATERIALS
☐	☐	Materials properly stored or stacked
☐	☐	Passageways clear
☐	☐	Stacks on firm footings, not too high
☐	☐	Materials protected against weather conditions
☐	☐	Trash chutes safeguarded and properly used
☐	☐	Dust protection observed
☐	☐	Traffic controlled in the storage area
		15. EXPLOSIVES
☐	☐	Qualified operators and supervision during all explosives operations
☐	☐	Proper transport vehicles as required by Department of Transportation and WISHA
☐	☐	State and local laws and regulations observed
☐	☐	Storage magazines constructed per regulations
☐	☐	Cases opened ONLY with wooden tools
☐	☐	NO SMOKING signs posted and observed where appropriate
☐	☐	Detonators tested before each shot
☐	☐	All personnel familiar with signals; signals properly used at all times
☐	☐	Inspection after each shot
☐	☐	Proper protection and accounting for all explosives at all times
☐	☐	Proper disposition of wrappings, waste, and scrap
☐	☐	Nearby residents advised of blasting and danger
☐	☐	Radio frequency hazards checked
		16. WELDING AND CUTTING
☐	☐	Operators qualified
☐	☐	Screens and shields used when needed
☐	☐	Goggles, welding helmets, gloves, clothing used as required
☐	☐	Equipment in safe operating condition
☐	☐	Electrical equipment grounded
☐	☐	Power cables and hoses protected and in good repair
☐	☐	Fire extinguishers of proper type nearby
☐	☐	Surrounding area inspected for fire hazards
☐	☐	Flammable materials protected or removed
☐	☐	Gas cylinders secured upright
☐	☐	Cylinder caps in use

Safety and Health Inspection Check List – continued

A = Adequate at time of inspection
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A	B	
		17. FLAMMABLE GASES AND LIQUIDS
☐	☐	All containers approved and clearly identified
☐	☐	Proper storage practices observed
☐	☐	Fire hazards checked
☐	☐	Proper types and number of extinguishers nearby
☐	☐	Proper method for moving cylinders used
		18. EXCAVATION AND SHORING
☐	☐	Adjacent structures properly shored
☐	☐	Excavation shored, shielded, or sloped as required
☐	☐	Roads and sidewalks supported and protected
☐	☐	Material stored away from excavations
☐	☐	Excavation barricades and lighting adequate
☐	☐	Equipment a safe distance from edge of excavation
☐	☐	Ladders provided
☐	☐	Equipment ramps adequate
☐	☐	Observer(spotter) provided during trenching operations
		19. STEEL ERECTION
☐	☐	Fall protection provided with safety nets, planked floors, or personnel restraint devices
☐	☐	Hard hats worn as required
☐	☐	Tools and materials secured from falling
☐	☐	Fire hazards at rivet, forge, and welding operations eliminated
☐	☐	Floor openings covered or barricaded
☐	☐	Ladders, stairs, or other safe access provided
☐	☐	Daily inspection of hoisting apparatus
☐	☐	Employees prohibited from riding the ball or loads
		20. PERSONAL PROTECTIVE EQUIPMENT MONITORED BY SUPERVISORS
☐	☐	Hard hats available on-site; worn when overhead hazards exist
☐	☐	Eye protection
☐	☐	Face shields
☐	☐	Written respirator program; respirators fit-tested; replacement cartridges; cleaning and maintenance
☐	☐	Helmets and hoods
☐	☐	Hearing protection – noise monitoring; written program
☐	☐	Foot protection
☐	☐	Rubber or plastic gloves, aprons, and sleeves for chemical protection
☐	☐	Electrician's rubber gloves and protectors

Safety and Health Inspection Check List -- continued

A = Adequate at time of inspection
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A	B	
		21. HIGHWAY CONSTRUCTION
☐	☐	Laws and ordinances observed
☐	☐	Competent flaggers properly instructed and dressed; area posted
☐	☐	Adequate traffic control devices used throughout construction area
☐	☐	Equipment cleared from right-of-way
☐	☐	Adequate marking and maintenance of detours approaching construction area
☐	☐	Dust controlled
☐	☐	Adequate lighting for night crews
☐	☐	**22. CONCRETE CONSTRUCTION**
☐	☐	Forms properly installed and braced
☐	☐	Adequate shoring, plumbed and cross-braced
☐	☐	Shoring remain in place until strength is attained
☐	☐	Proper curing period and procedures followed
☐	☐	Heating devices checked for fire safety
☐	☐	Mixing and transport equipment supported; traffic planned and routed
☐	☐	Adequate runways and ramps provided for concrete placement equipment
☐	☐	Employees protected from cement dust
☐	☐	Hard hats, boots, gloves, eye protection, and skin protection worn at all times
☐	☐	Nails bent over or removed and stripped material removed from area
		23. LIFTING AND BACK SAFETY
☐	☐	Team lifting used for heavy or awkward loads
☐	☐	Mechanical lifting devices used when appropriate
☐	☐	Back care training provided to all employees
☐	☐	Bent-knee lifting used by workers
☐	☐	Work hardening program used for returning time-loss employees
☐	☐	Employees do "warm up" exercises before strenuous work
		24. HAZARD COMMUNICATION PROGRAM
☐	☐	Chemical inventory list developed and maintained
☐	☐	Containers properly labeled
☐	☐	Material Safety Data Sheets collected and available
☐	☐	Adequate employee information and training provided
☐	☐	Written program available

Safety and Health Inspection Check List – continued

A = Adequate at time of inspection
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A	B	
		25. MASONRY
☐	☐	Scaffolding procedures meet at least minimum requirements
☐	☐	Masonry saws properly equipped and grounded, dust protection provided
☐	☐	Hoisting equipment in safe operating condition and used by qualified personnel
☐	☐	Limited access zone established
☐	☐	Walls over 8 feet in height adequately braced
		26. CONFINED SPACE
☐	☐	Written confined space program
☐	☐	Competent instruction and supervisors provided
☐	☐	Hot work permits obtained, if needed, prior to entry and work
☐	☐	Evaluation and monitoring – sampling devices adequate, calibrated, and used
☐	☐	Ventilation adequate, testing and monitoring during operation
☐	☐	Respirators, standby person , harness/lifeline at the site
☐	☐	**27. DEMOLITION**
☐	☐	Written demolition plan
☐	☐	Protection of adjacent structures
☐	☐	Material chutes used. Floor openings for material disposal barricaded
☐	☐	Sidewalk and other public protection provided
☐	☐	Clear opening space for trucks and other vehicles
☐	☐	Adequate access ladders or stairs maintained
		28. PILE DRIVING
☐	☐	Stored piles properly secured
☐	☐	Unloading only by properly instructed workers
☐	☐	Steam lines, slings, etc., in safe operating condition
☐	☐	Piledriving rigs properly supported
☐	☐	Cofferdams maintained and inspected
☐	☐	Adequate pumping available

(Customize the checklist above by adding any additional areas or equipment and deleting the information that does not apply to your business.)

SMALL BOAT INSPECTION CHECKLIST

	Date of Inspection:
Boat Owner / Operator:	Boat Registration No.:
Inspected by (Signature)	

		Yes	No	N/A
1	Is the vessel's registration and certification current?			
2	Is the maximum number of passengers that can be safely transported posted?			
3	Is the hull in satisfactory condition? (Any obvious leaks?)			
4	Are navigation lights working properly?			
5	Are visual distress signaling devices (day and night) present and up to date? (i.e. signal flares).			
6	Is a signal device provided on the vessel to give signals required by applicable navigation rules? (i.e. Air horn.)			
7	Are paddles and/or oars on board and in good condition?			
8	Is bilge pump and discharge (if so equipped) properly located and in good operating condition?			
9	Is a fully stocked First Aid kit of the proper size on board?			
10	Has a Type III/Type V or better USCG personal flotation device (PFD) been provided to all boat passengers and properly worn?			
11	Are PFDs inspected for defects which would alter their buoyancy before and after each use? (i.e. at least 13 pounds of buoyancy required).			
12	Are survival suits available for each passenger?			
13	Are all PFDs equipped with retro-reflective tape?			
14	Is each boat equipped with at least one USCG approved life ring or ring buoy with at least 90 feet of " solid braid polypropylene line or equal attached?			
15	Is the motorboat equipped with a kill switch?			
16	Are boat seats securely bolted to the boat deck?			
17	Are all launches and motorboats equipped with fire extinguishers of at least the size and rating(s) specified? (Type 1-A:10-B:C)			
18	Are all carburetors on gasoline engines equipped with a backfire trap or flame arrestor?			
19	Are fuel tank overflow, fill, and vent pipes so equipped that liquid or vapor cannot escape inside hull or cabin, and will flow overboard?			
20	Are boats powered by internal combustion engines, located within compartments or confined spaces, equipped with vent fans rated for Class I locations?			
21	Are ventilator intakes extended to a distance not more than one foot from the engine compartment bottom?			
		Yes	No	N/A
22	Are the lights properly maintained, assuring that they are visible between sunset and sunrise?			
23	Is the boat equipped with a white stern light having a 32 point, 2 mile visibility?			
24	Is the condition of the fuel supply hose satisfactory?			
25	Is the boat equipped with a functional radio?			

	LIFEBOAT AND LIFE SKIFFS			
1	Is a life saving skiff available where men are working over or near water?			
2	Does the lifeboat have the following equipment?			
	a. Four oars or equivalent means of propulsion. (Two if skiff is motor powered.)			
	b. Oar locks attached to oars or gunwales.			
	c. One ball pointed boat hook.			
	d. One ring buoy with 70 feet of 3/8 inch polypropylene or equivalent line attached.			
	e. Two personal flotation devices.			
3	Is a suitable motorboat provided where use of oars is impractical?			
4	Is the life skiff kept afloat or is a means for instant safe launching provided?			
5	Are trained persons kept at ready for launching and operating the life skiff? (			
6	Is the life boat used for other purposes than drills or emergencies? **THIS IS A VIOLATION.**			
7	When a motor boat is used as a lifeboat, is it equipped with a compatible fire extinguisher?			
8	Is the maximum capacity of boat posted? (Capacity should be no less than 3.)			
9	Does the boat meet the minimum flotation requirements of the USCG?			
10	Does the horsepower of the motor conform with the capacity plate .			
11	Is the fuel supply hose in satisfactory condition?			
12	Is the hull in a good condition? (No obvious leaks.)			

APPENDIX D

CERTIFICATIONS

APPENDIX E

MSDS SHEETS

APPENDIX F

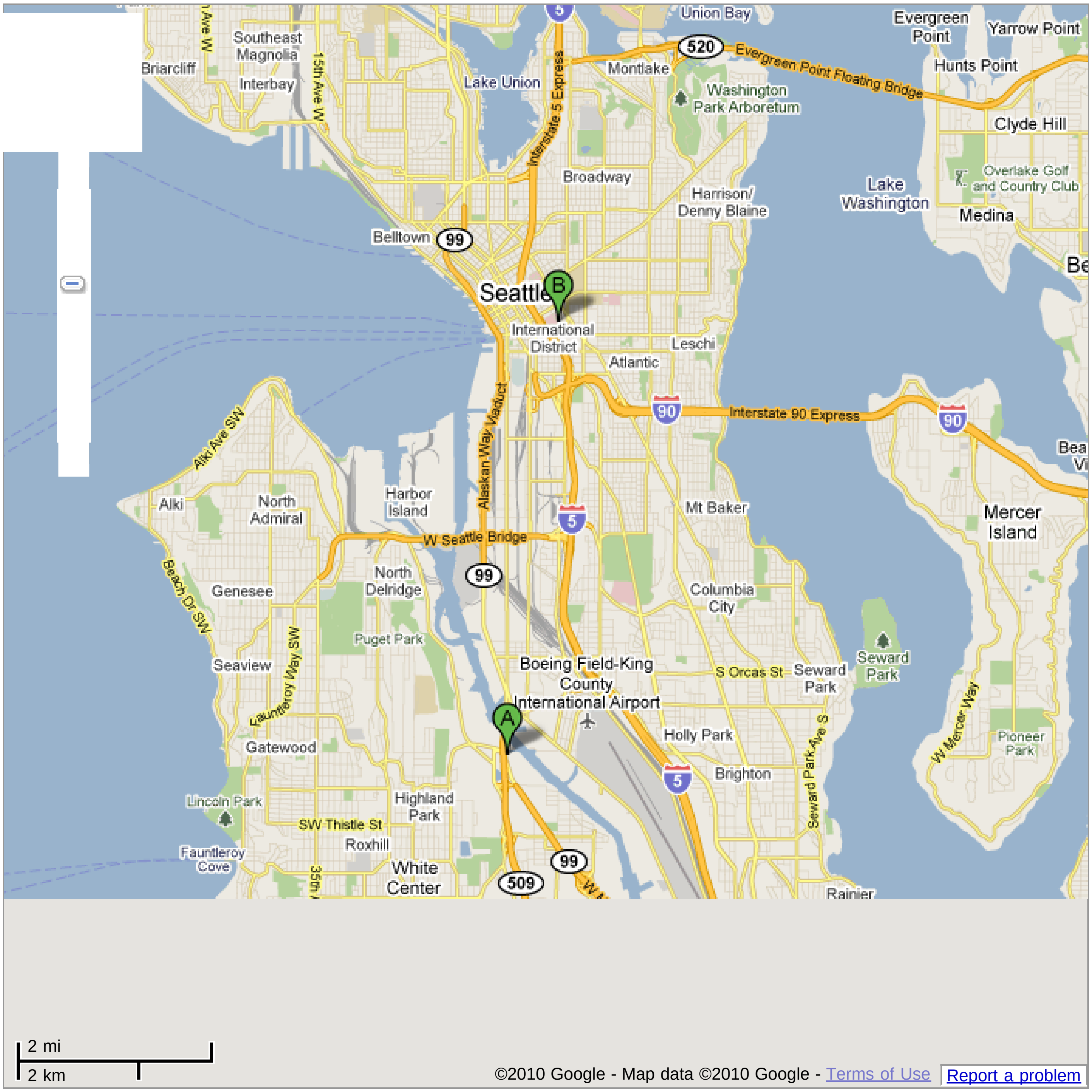
HOSPITAL ROUTE MAP

Show for all steps: Text only | Maps | Street View ☑ Include large map Print
Roll over the directions to customize each step.

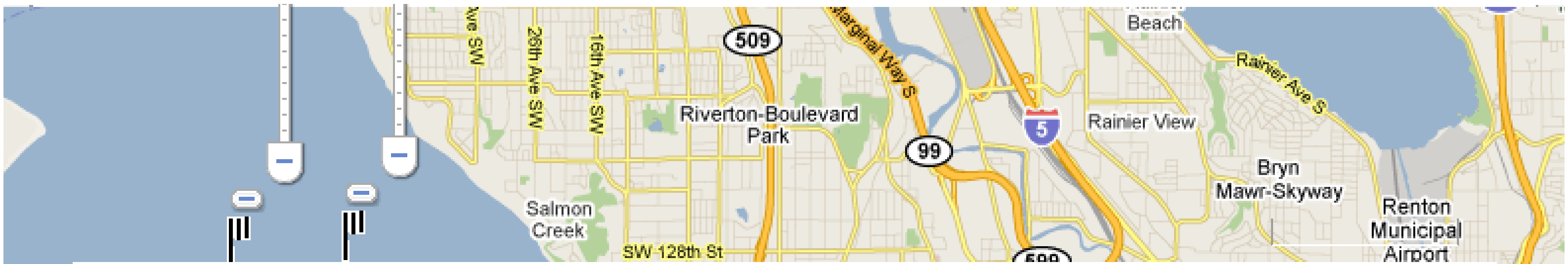
Google maps

Directions to 325 9th Ave, Seattle, WA 98104
6.9 mi – about 13 mins

You can enter notes here.



A 7152 1st Ave S, Seattle, WA 98108



1.	Head north on 1st Ave S toward Duwamish Bikeway About 1 min	go 0.2 mi total 0.2 mi
2.	Turn left at 2nd Ave SW	go 348 ft total 0.3 mi
3.	Turn left at W Marginal Way About 2 mins	go 0.4 mi total 0.7 mi
4.	Take the WA-99 N/E Marginal Way ramp to I-5	go 0.3 mi total 1.0 mi
5.	Merge onto WA-509 N/WA-99 N	go 0.4 mi total 1.4 mi
6.	Take the Michigan St exit toward I-5	go 0.2 mi total 1.6 mi
7.	Slight left at E Marginal Way S	go 69 ft total 1.6 mi
8.	Slight right at S Michigan St About 1 min	go 0.5 mi total 2.1 mi
9.	Continue onto S Bailey St	go 344 ft total 2.2 mi
10.	Turn left to merge onto I-5 N About 4 mins	go 3.1 mi total 5.3 mi
11.	Take exit 164A for Dearborn St toward James St/Madison St	go 0.5 mi total 5.7 mi
12.	Follow signs for I-5 N About 1 min	go 0.6 mi total 6.3 mi
13.	Keep right at the fork, follow signs for James St	go 0.3 mi total 6.6 mi
14.	Turn right at James St	go 0.1 mi total 6.7 mi
15.	Take the 1st right onto 9th Ave	go 0.1 mi total 6.9 mi

B 325 9th Ave, Seattle, WA 98104