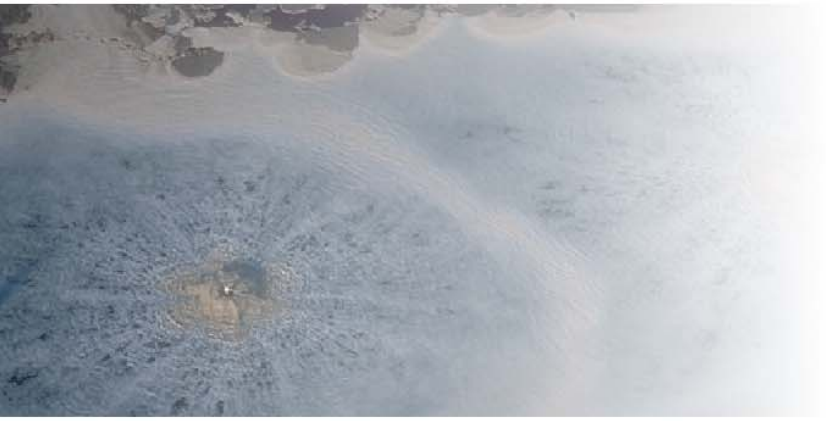

Lower Duwamish Waterway
Bank Sampling Summary Report
Seattle, Washington

Prepared for
Washington State
Department of Ecology

March 13, 2012
17800-17

HARTCROWSER

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Prepared by
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LOWER DUWAMISH WATERWAY BANK SAMPLING
SUMMARY REPORT
SEATTLE, WASHINGTON

1.0 INTRODUCTION

This report presents the results of a reconnaissance-level investigation performed for the Washington State Department of Ecology (Ecology) at nine locations along the banks of the Lower Duwamish Waterway (LDW). The work was completed in general accordance with the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP), dated April 21, 2011 (Hart Crowser 2011b). The objective of the bank sampling was to assess the potential for the sampled areas to recontaminate sediment.

2.0 BACKGROUND

The LDW is the 5.5-mile portion of the Duwamish River south of Harbor Island in Seattle, Washington. The Duwamish River is fed mainly by the Green River and smaller tributaries, and flows into Elliott Bay. The LDW was added to the US Environmental Protection Agency's (EPA) National Priorities List in 2001. Ecology added the site to the Washington State Hazardous Sites List in 2002.

Ecology and the EPA are working together to clean up contaminated sediment and control sources of recontamination in the LDW. Ecology is the lead agency responsible for source control in the LDW. Source control for the LDW is the process of finding and stopping or reducing releases of pollution to waterway sediment to the extent practicable. The goal of source control is to minimize post-remediation recontamination.

Previous investigations by others have included the collection and chemical analysis of over 1,200 surface sediment samples to characterize contamination in the LDW focusing on five chemicals or chemical groups including polychlorinated biphenyls (PCBs), arsenic, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), dioxins and furans, and bis(2-ethylhexyl) phthalate. These investigations were summarized in the LDW Remedial Investigation (RI) Report (Windward 2010a). Since the intent of these investigations was to evaluate the sediment within the LDW, the vast majority of these samples were collected at or below 0 feet elevation[1]. No samples were collected from the

[1] All elevation relative to Mean Lower Low Water (MLLW).

intertidal zone above +4 feet or from areas above the intertidal zone. A supplemental dioxin/furan investigation did include composite samples of select beach areas along the LDW and some of these samples were above elevation +4 (Windward 2010b).

There was little information on the nature of contamination in the high intertidal areas (approximately above +4 feet) and above the mean higher high water (MHHW) line (approximately +10 to +14 feet). The locations selected for this study include sand beaches with pilings, armored riprap, fill material of unknown origin, and suspected slag piles from industrial operations. These areas could be potential sources of sediment recontamination.

3.0 SCOPE OF WORK

The scope of work completed for the reconnaissance-level investigation included the following activities:

- Collection of bank samples at nine sites at locations that are at or above the mean high water line;
- Completion of two soil borings at one site using direct-push drilling methods to 12 feet below ground surface (bgs);
- Submission of soil samples from each sample location and two each from both boring locations for chemical analysis;
- Evaluation of laboratory chemical analysis results; and
- Preparation of this report presenting the findings of our work.

4.0 ANALYTICAL METHODS AND SCREENING LEVELS

Soil samples were submitted to Analytical Resources, Inc. (ARI) in Tukwila, Washington. Chemical data quality review and laboratory reports are provided in Appendix B.

Soil samples were analyzed for the following:

- Total organic carbon (TOC) by EPA Method 9060;
- Total petroleum hydrocarbons (TPH) including Ecology's NWTPH-Gx (using 5035A collection methods for soil) and NWTPH-Dx methods;

- Total metals including arsenic, cadmium, chromium, copper, lead, silver, and zinc by EPA Method 6010B and total mercury by EPA Method 7471;
- Semivolatile organic compounds (SVOCs) by EPA Method 8270D;
- Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270D-SIM (to achieve lower reporting limits than possible with EPA Method 8270);
- Pesticides by EPA Method 8081;
- PCBs by EPA Method 8082;
- Tributyltin (TBT) by the method developed by Krone (REF) as modified for the Puget Sound Dredge Disposal Analysis (PSDDA) program;
- Polychlorinated dioxins and furans by EPA Method 1613B; and
- Polybrominated diethyl ethers (PBDEs) by EPA Method 8082.

For screening purposes, analytical results were compared to:

Soil screening levels protective of sediment (developed and provided by Ecology). Soil screening levels protective of sediment were calculated by Ecology to be protective of Sediment Quality Standards (SQS) using equations 747-1 and 747-2 per WAC 173-340-740(1)(d). Screening levels were based on the soil to groundwater and groundwater to sediment pathways. The screening levels were provided by Ecology in an Excel file titled "Draft LDW Preliminary Screening Levels v12r7.xls," on April 13, 2011.

"Most Stringent" soil screening levels (developed and provided by Ecology). The "Most Stringent" soil screening levels were developed by Ecology to be protective of potable groundwater (but not potable surface water). These screening levels are quite conservative and do not necessarily account for site specific information. The "Most Stringent" soil screening levels were provided by Ecology in an Excel file titled "Draft LDW Preliminary Screening Levels v12r7.xls," on April 13, 2011.

Model Toxics Control Act (MTCA) soil cleanup levels. Analytical results were compared to MTCA soil cleanup levels to assess human health risk. Generally, MTCA Method B cleanup levels were used in this report and are standard formula values from Ecology's Cleanup Levels and Risk Calculations (CLARC) database. Method B standard formula values were calculated using default assumptions based on the direct contact pathway for the protection of human health. For analytes that have carcinogen and non-carcinogen Method B values, the lower of the two values was used for comparison. For lead and arsenic MTCA Method A values were used as screening levels. There is no Method B value for lead; the Method A cleanup level is based on preventing unacceptable blood lead levels. The Method A cleanup level for arsenic is based on direct contact using Equation 740-2 and protection of drinking water use but it has been adjusted for natural background for soil.

Apparent Effects Threshold sediment screening levels. Analytical results were also compared to Apparent Effects Threshold (AET) sediment criteria. Although samples were collected from above the ordinary high water level, there is a potential for erosion of the banks into the LDW. The Lowest Apparent Effects Threshold (LAET) values are the dry weight equivalent of the SQS criteria. The Second Lowest Apparent Effects Threshold (2LAET) values are the dry weight equivalent of the CSL criteria. The LAET and 2LAET criteria have been used when evaluating source control.

Remedial Action Levels (RALs). RAL levels were identified in the Feasibility Study (FS) for the LDW sediment (LDWG 2010). RALs are chemical-specific sediment concentrations that might trigger the need for active remediation. RALs were developed for the four risk drivers including arsenic, cPAHs, total PCBs, and dioxins/furans. The RAL for these compound used as screening levels in this report were provided by Ecology and were presented in the Draft Final FS for Alternative 5C (LDWG 2010).

Natural Background Based on Ocean Survey Vessel (OSV) Bold Data. The Draft Final FS uses data from EPA's OSV Bold Study to develop natural background concentrations for the four risk drivers. Data were collected from 70 sampling locations throughout Puget Sound, as well as from the area around the San Juan Islands and the Strait of Juan de Fuca (LDWG 2010).

Published soil background levels (for metals). Metal concentrations were also compared to natural background levels in soil for the Puget Sound area (Ecology 1994).

5.0 BANK SAMPLING SITE DESCRIPTIONS, METHODS, AND RESULTS

Ecology selected nine sites for characterization of the bank material to assess for the potential of sediment recontamination. The nine sites are presented in Table 1. These sites were selected because information about past use at the site or adjacent upland areas, or visual observations indicated that there may be suspect material on the bank that could be a source of sediment recontamination. One of the identified locations, the South Park Street End, was selected to confirm there is no risk because it is an area that is readily accessible by the public.

Table 1 summarizes information for each bank site including the address, King County Parcel number, rationale for the investigation, site access, sampling techniques and number of samples collected per site. Hart Crowser's scope of work for sampling, analysis, and data presentation are based on conversations

with Ecology, and site visits by boat on October 21, 2010, and by land on January 25, 2011. Each bank sampling site is described below.

Investigation field efforts were completed in accordance with the SAP/QAPP (Hart Crowser 2011b) except where necessary due to field conditions as noted below. A detailed description of the field methods and the explorations logs are presented in Appendix A. Sample locations were documented in the field using a Trimble GPS and details about each location are provided in Table A-1 in Appendix A. Hart Crowser field screened the soil samples, which included a combination of photoionization detector (PID) tests, sheen tests, and visual observations. Field screening results are also presented in Table A-1.

Analytical results for each sampling location are discussed below in comparison to screening levels. Samples were run for PAHs by both EPA Method 8270 and 8270-SIM. Results for the two analyses yielded similar results; however, there were some discrepancies because of the heterogeneous nature of soils. Location-specific results are discussed in further detail below.

5.1 Riverside Marina

5.1.1 Site Description

The Riverside Marina bank sampling site is located at about River Mile (RM) 0.15 west (Figure 3). The site is currently owned by the Port of Seattle (Port). The site was formerly a marina and has also been used for industrial activities. The site is now a mud bank/beach area with the remnants of wood piles. The site borders the Port's former Terminal 105 facility and is accessible by land from the Terminal 103 public access at low tide.

5.1.2 Previous Investigations

As part of the sediment RI, five surface and one subsurface sediment samples, and one seep sample were collected from the intertidal area near the site. The sample locations are shown on Figure 3. Surface sediment samples did not exceed the SMS criteria for the chemicals analyzed. Subsurface sediment sample (LDW-SC5) concentrations were greater than the SQS and less than or equal to the CSL for SMS chemicals. Metals and PCBs were detected in seep sample, SP-71 (Windward 2010a).

This area was also investigated as part of a dioxin and furan study to supplement the RI (Windward 2010b). Two eight-point composite samples were collected along the beach. The subsample locations that made up samples LDW-SS502 and LDW-SS503 are shown on Figure 3.

Sediment sample LDW-SS502 was collected from a depth of 0 to 10 cm, and LDW-SS503 was collected from a depth of 0 to 43 cm. Samples were analyzed for dioxin and furan congeners, grain size, total organic carbon, arsenic, PCBs, and PAHs. The dioxin and furan TEQ ranged from 2.06 to 2.77 ng/kg dry weight (dw). Other analyte concentrations were below SMS criteria (Windward 2010b).

LDW-SS502 was also analyzed for the full suite of SMS chemicals including a larger list of metals and SVOCs. Sample analytical results were below SMS criteria (Windward 2010b).

5.1.3 Bank Sampling Activities and Soil Conditions

Five bank samples (RM-BS-1 through RM-BS-5) were collected between the apparent MHHW elevation and the vegetation line. Samples were collected from depths of approximately 1 to 10 cm using a shovel (Appendix A). Sample locations are shown on Figure 3. Bank material generally consisted of damp sand and gravelly sand. Scattered debris including metal, brick, and concrete was observed adjacent to sampling locations RM-BS-1 and RM-BS-3.

Samples were collected at about elevation +13 feet, and are considered to be from the vadose zone. No evidence of contamination was observed during field screening. Field screening results are presented in Table A-1 in Appendix A.

5.1.4 Bank Sampling Analytical Results

Analytical results are presented in Tables 2 through 7.

TPH

The five soil samples had low-level TPH detections below Ecology's screening criteria. Gasoline-range petroleum hydrocarbons were detected in samples RM-BS-1 and RM-BS-3 at 9.9 and 8.4 mg/kg, respectively. Diesel-range petroleum hydrocarbons were measured in four of the samples at concentrations ranging from 5.6 to 49 mg/kg. Oil-range petroleum hydrocarbons were measured in four of the samples at concentrations ranging from 29 to 340 mg/kg. TPH results are presented in Table 2.

Metals

The five soil samples have detections of five or more of the eight metals. Metal results are presented in Table 2. Metals are compared directly to AET criteria in

Table 6. Arsenic is compared to the RAL and the OSV natural background values in Table 7.

Arsenic. Arsenic concentrations in samples RM-BS-2, RM-BS-3, RM-BS-4, and RM-BS-5 ranged from 5.8 to 43 mg/kg. These concentrations exceeded the most stringent soil screening level. Arsenic concentrations in samples RM-BS-4 and RM-BS-5 exceeded the natural background level for arsenic in the Puget Sound area of 7 mg/kg (Ecology 1994). The arsenic concentration in sample RM-BS-4 exceeds the MTCA soil cleanup level. Arsenic concentrations were below AET criteria (Table 6) and the OSV natural background levels (Table 7). The arsenic concentration in sample RM-BS-4 exceeds the RAL (Table 7). Sample RM-BS-1 had an elevated reporting limit that exceeded the most stringent soil screening level, the MTCA soil cleanup level, background concentrations, and the RAL for arsenic.

Cadmium. Cadmium was detected in soil samples RM-BS-1 and RM-BS-2 at concentrations of 1.0 and 0.3 mg/kg, respectively. These concentrations exceeded the most stringent soil screening level but are comparable with the natural background level in the Puget Sound area of 1 mg/kg (Ecology 1994). The reporting limit for cadmium exceeded the most stringent soil screening level of 0.001 mg/kg. All concentrations were below AET criteria.

Chromium. Chromium was detected in all five samples at concentrations ranging from 13.1 to 178 mg/kg. Only sample RM-BS-1, at a concentration of 178 mg/kg, exceeded the most stringent soil screening level of 42 mg/kg and the natural chromium background level in the Puget Sound area of 48 mg/kg (Ecology 1994). All concentrations were below AET criteria.

Copper. Copper was detected in all five samples at concentrations ranging from 22 to 118 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.053 mg/kg. Copper concentrations in samples RM-BS-1, RM-BS-4, and RM-BS-5 exceeded the natural copper background level in the Puget Sound area of 36 mg/kg (Ecology 1994). All concentrations were below AET criteria.

Lead. Lead was detected in the five samples at concentrations ranging from 14 to 120 mg/kg. These concentrations exceeded the most stringent soil screening level of 5.4 mg/kg and but were below the MTCA Method A cleanup level of 250 mg/kg. Lead concentrations in samples RM-BS-1, RM-BS-4, and RM-BS-5 exceeded the natural lead background level in the Puget Sound area of 24 mg/kg (Ecology 1994). All concentrations were below AET criteria.

Mercury. Mercury was detected in samples RM-BS-1, RM-BS-2, RM-BS-3, and RM-BS-5 at concentrations ranging from 0.04 to 1.05 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.00027 mg/kg. Mercury concentrations in samples RM-BS-1 and RM-BS-5 exceeded the natural mercury background level in the Puget Sound area of 0.07 mg/kg (Ecology 1994). Mercury concentration detected in sample RM-BS-1 exceeded the 0.41 mg/kg screening level for vadose soil protective of SQS. The reporting limit for sample RM-BS-4 exceeded the most stringent soil screening level. Mercury concentrations detected in sample RM-BS-1 exceeded the LAET and 2LAET criteria.

Silver. Silver was not detected in samples above the reporting limit. The reporting limit for silver exceeds the most stringent soil screening level. All reporting limits were below AET criteria.

Zinc. Zinc was detected in all five samples at concentrations ranging from 34 to 334 mg/kg. These concentrations exceeded the most stringent soil screening level of 2.03 mg/kg. Only samples RM-BS-1 and RM-BS-4 exceeded the natural zinc background level in the Puget Sound area of 85 mg/kg (Ecology 1994). Sample RM-BS-1 exceeded the screening level for vadose soil protective of SQS of 327 mg/kg. All concentrations were below AET criteria.

Semivolatile Organic Compounds

Riverside Marina soil sample analytical results for SVOCs are presented in Table 3 and are described below. SVOCs that are included in the SMS are compared to AET criteria in Table 6. The cPAH TEQ concentrations are compared to the OSV natural background level and the RAL in Table 7.[2]

Chlorinated Hydrocarbons. Chlorinated hydrocarbons were not detected in the five samples at concentrations above the reporting limits. Reporting limits for four out of the five compounds exceeded the most stringent soil screening level.

Acid Extractables. Phenol was detected in sample RM-BS-1 at a concentration (82 µg/kg) above the most stringent soil screening level. Results for 2,4-dimethylphenol were rejected based on the data quality review (see Appendix B, page B-28). No other acid extractable was detected at a

[2] The cPAH TEQ concentrations were calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270.

concentration above the reporting limit. Reporting limits for some compounds exceeded the most stringent soil screening level. The detected concentration and reporting limits were below AET criteria.

Phthalates. Di-n-butyl phthalate was detected in sample RM-BS-1 at 42 ug/kg, above the most stringent soil screening level. No other phthalate was detected at a concentration above the reporting limit. Reporting limits for some compounds exceeded the most stringent soil screening level. The detected concentration and reporting limits were below AET criteria.

Miscellaneous Extractables. The miscellaneous extractables were not detected at concentrations above the reporting limits. Hexachlorobenzene and n-Nitrosodiphenylamine had reporting limits which exceeded the most stringent soil screening level.

PAHs. PAHs were detected in each sample at concentrations ranging from 3.2 to 1,600 µg/kg. Numerous PAH compounds exceeded the most stringent soil screening level. Sample RM-BS-1 exceeded the MTCA Method B cleanup level for benzo(a)pyrene and dibenz(a,h)anthracene. Samples RM-BS-2 and RM-BS-5 exceeded the MTCA Method B cleanup level for benzo(a)pyrene. The cPAH TEQ concentrations for the five samples exceeded the OSV natural background concentration. RM-BS-1 exceeded the RAL for cPAHs (Table 7).

Pesticides

All soil sample analytical results for pesticides were below reporting limits with the exception of endrin in sample RM-BS-1. The estimated measured endrin concentration (48 µg/kg) in sample RM-BS-1 was below the most stringent soil screening level. Reporting limits for some compounds exceeded the most stringent soil screening level. Pesticide results are presented in Table 4.

PCBs

Aroclor 1254 was detected in samples RM-BS-4 and RM-BS-5 at concentrations of 31 and 32 µg/kg, respectively which exceeded the most stringent soil screening level (Table 4). Aroclor 1260 was detected in samples RM-BS-1, RM-BS-2, RM-BS-4, and RM-BS-5 at concentrations ranging from 16 to 46 µg/kg which exceeded the most stringent soil screening level. Other concentrations were below the method reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level. Total PCB concentrations compared to AET criteria are presented in Table 6. Total PCB concentrations for RM-BS-1, RM-BS-2, RM-BS-4, and RM-BS-5 exceeded the OSV natural background level but were below the RAL (Table 7).

TBT

TBT was not detected in samples at concentrations above the reporting limits which ranged from 3.1 to 10 µg/kg. These values are not compared with screening levels because no screening levels have been established for TBT for this study. TBT results are presented in Table 4.

Dioxin/Furans

The dioxin/furan TEQ concentrations ranged from 0.97 to 25.56 pg/g and exceeded the OSV natural background concentrations. The dioxin/furan TEQ concentration in sample RM-BS-1 exceeded the RAL (Table 7). Individual dioxin/furan congener and homolog results are presented in Table 5.

PBDEs

Only one PBDE was detected at a concentration above the reporting limits, PBDE-47 in sample RM-BS-1 at 2.3 µg/kg. No screening levels have been established for PBDEs. PBDE results are presented in Table 5.

5.2 T-107 CKD

5.2.1 Site Description

The T-107 CKD bank sampling site is located at RM 0.9 west (Figure 4). The site is currently owned by the Port. A layer of unidentified white material, possibly cement kiln dust, is exposed in the vertical face of the bank. The site borders the Port's T-107 Park and a parking area that appears to be used for container storage. Lafarge Corporation is located southeast of the site. The site was accessed by boat to collect the soil samples.

5.2.2 Previous Investigations

Several surface sediment samples have been collected near the site as part of the sediment RI (Figure 4). Only three of the samples exceeded the SQS and none exceeded the CSL. Sample DRO47 exceeded the SQS for phenol by a factor of 1.8 and fluoranthene by a factor of 1.1. Samples WIT290 and WIT291 exceeded the SQS for PCBs by factors of about 3 (Windward 2010a).

5.2.3 Bank Sampling Activities and Soil Conditions

Five bank samples (T107-BS-1 through T107-BS-5) were collected between the apparent MHHW elevation and the vegetation line. The soil sample locations

were collected from a vertical sidewall. Samples from approximately 1 to 10 cm deep were collected from the sidewall using a hand trowel and shovel. Sample locations are shown on Figure 4. Bank material generally consisted of silty sand and gravelly fill material. In general, the bank sampling locations undercut overhanging vegetation. Sample T107-BS-5 contained orange colored sandy gravel which was interpreted to be oxidized because of the high iron content of the material and appeared to be fill.

Samples were collected at about elevation +12.5 feet, and are considered to be from the vadose zone. No evidence of contamination was observed during field screening. Field screening results are presented in Table A-1 in Appendix A.

5.2.4 Bank Sampling Analytical Results

Analytical results are presented in Tables 8 through 13.

TPH

Petroleum hydrocarbons were not detected at concentrations above the reporting limits in the five samples. TPH results are presented in Table 8.

Metals

Analytical results indicate that the five soil samples have detections of six or more of the eight metals analyzed. Metal results are presented in Table 8. Metals are compared directly with AET criteria in Table 12. Arsenic is compared to the RAL and the OSV natural background level in Table 13.

Arsenic. Arsenic was detected in the five samples at concentrations ranging from 197 to 324 mg/kg. These concentrations exceeded the most stringent soil screening level, the MTCA soil cleanup level, the natural background level for arsenic (Ecology 1994), the AET criteria, the OSV natural background, and the RAL.

Cadmium. Samples T107-BS-2 through T107-BS-5 had cadmium concentrations ranging from 2 to 3 mg/kg. These concentrations exceeded the most stringent soil screening level but are comparable with the natural background level in the Puget Sound area of 1 mg/kg (Ecology 1994). The reporting limit for cadmium exceeded the most stringent soil screening level of 0.001 mg/kg. All detected concentrations were below AET criteria.

Chromium. Chromium was detected in the five samples at concentrations ranging from 5 to 9 mg/kg, below screening levels and the natural chromium background level. All concentrations were below AET criteria.

Copper. Copper was detected in all five samples at concentrations ranging from 70 to 108 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.053 mg/kg and the natural copper background level in the Puget Sound area of 36 mg/kg (Ecology 1994). All concentrations were below AET criteria.

Lead. Lead was detected in all five samples at concentrations ranging from 640 to 1610 mg/kg. These concentrations exceeded the most stringent soil screening level of 5.4 mg/kg and natural lead background level of 24 mg/kg. There concentrations exceeded the MTCA Method A value of 250 mg/kg. Lead concentrations in samples T107-BS-2 and T107-BS-5 exceeded the screening level for vadose soil protective of SQS of 1,133 mg/kg. All five samples exceeded the LAET criteria of 450 mg/kg.

Mercury. Mercury was not detected in samples above the reporting limit, which exceeds the most stringent soil screening level. All reporting limits were below AET criteria.

Silver. Silver was detected in all five samples at concentrations ranging from 2 to 4 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.013 mg/kg. All concentrations were below AET criteria.

Zinc. Zinc was detected in the five samples at concentrations ranging from 440 to 2480 mg/kg. These concentrations exceeded the most stringent soil screening level, the screening level for vadose zone soil protective of SQS, the natural zinc background level in the Puget Sound area (Ecology 1994) and the 2LAET criteria. Zinc concentrations in samples T107-BS-2, T107-BS-4, and T107-BS-5 exceeded the LAET criteria.

Semivolatile Organic Compounds

Analytical results for SVOCs are presented in Table 9 and are described below, organized by subgroup. SVOCs that are included in the SMS are compared to the AET in Table 12. The cPAH TEQs are compared to the OSV natural background concentration and the RAL in Table 13.

Chlorinated Hydrocarbons. Chlorinated hydrocarbons were not detected at concentrations above the reporting limits; however, reporting limits for most

compounds exceeded screening levels. Reporting limits for samples T107-BS-1 and T107-BS-3 exceeded AET criteria.

Acid Extractables. Acid Extractables were not detected at concentrations above the reporting limits; however, reporting limits for some compounds exceeded the most stringent soil screening level. Reporting limits for samples T107-BS-1 and T107-BS-3 exceeded AET criteria.

Phthalates. Phthalates were not detected at concentrations above the reporting limits; however, reporting limits for some compounds exceeded the most stringent soil screening level. Reporting limits for samples T107-BS-1 and T107-BS-3 exceeded AET criteria.

Miscellaneous Extractables. The miscellaneous extractables were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level. Reporting limits for samples T107-BS-1 and T107-BS-3 exceeded AET criteria.

PAHs. PAHs were detected in the five samples at concentrations ranging from 2.2 to 1000 µg/kg. Samples T107-BS-1, T107-BS-2, and T107-BS-4 had several PAHs at concentrations exceeding the most stringent soil screening level. Reporting limits for a few compounds exceeded the most stringent soil screening level[3]. PAHs did not exceed AET criteria (Table 12). The cPAH TEQ concentrations did not exceed RALs or OSV natural background concentrations.

Pesticides

Pesticides were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level. Pesticide results are presented in Table 10.

PCBs

Aroclor 1254 was detected in sample T107-BS-4 at an estimated concentration of 2.2 µg/kg, which exceeded the most stringent soil screening level. Reporting limits for some compounds exceeded the most stringent soil screening level. PCB results are presented in Table 10. Total PCB concentrations ranging from

[3] Screening level exceedance discussions for PAHs are based on the data reported from EPA Method 8270 SIM, because this method has significantly lower reporting limits than EPA Method 8270.

non detect to 2.2 µg/kg are presented in Table 12 compared to AET criteria. The total PCB concentration in T107-BS-4 exceeded the OSV natural background concentration but was below the RAL and the AET criteria.

TBT

TBT was not detected in samples at concentrations above the reporting limit which ranged from 3.4 to 3.7 µg/kg. TBT results are presented in Table 10.

Dioxin/Furans

The dioxin/furan TEQ concentrations ranged from 0.22 to 1.87 pg/g and were below the OSV natural background concentrations and the RAL (Table 13). Individual dioxin/furan congener and homolog results are presented in Table 11.

PBDEs

PBDEs were not detected in samples at concentrations above the reporting limit. PBDE results are presented in Table 11.

5.3 Fox Avenue South Street End

5.3.1 Site Description

The Fox Avenue South Street End bank sampling site is located in Slip 3 at approximately RM 2.1 east (Figure 5). The adjacent upland area has been used as a shipyard and a hazardous waste storage area. The bank is a near vertical face and is partially covered by a pier. The original scope included sampling at SeaTac Marine property, however access was to the property was not granted so it was not sampled. Samples were instead collected from areas of the Port-managed waterway within the Fox Avenue South street right-of-way. The site was accessed by boat.

5.3.2 Previous Investigations

Surface and subsurface sediment samples taken at the head of Slip 3 had elevated PCB, cPAH, and metal concentrations. The highest arsenic concentrations at the head of Slip 3 were 81 and 2,000 mg/kg dw in surface and subsurface sediment, respectively (Windward 2010a).

Surface sediment sample LDW-SS73 exceeded the SQS and the CSL for benzyl alcohol by factors of 2.6 and 2.1, respectively. However, LDW-SS73 only exceeded the SQS based on toxicity tests. Surface sediment sample LDW-SS77

exceeded the SQS for arsenic by a factor of 1.4 and exceeded the CSL based on toxicity tests. Subsurface sediment core LDW-SC37 exceeded the SQS and was less than or equal to the CSL for all SMS chemicals (Windward 2010a).

5.3.3 Bank Sampling Activities and Soil Conditions

Three bank samples (STM-BS-1 through STM-BS-3) were collected between the apparent MHHW elevation and the vegetation line. Samples were collected from depths of approximately 1 to 10 cm using hand tools. Sample locations are shown on Figure 5. Riprap and debris were removed by hand to access the soil and fill material along the bank. Due to the large amount of debris and riprap and the relatively narrow band of soil located between the MHHW line and the vegetation, only one sample was collected from each of the three locations identified in the SAP (Hart Crowser 2011b). Samples were collected from approximately elevation +10 to +13 feet, and are considered to be from the vadose zone.

Bank material was fill and contained sandy gravel and gravelly sand. Scattered debris, including metal, brick, and concrete was observed adjacent to sampling locations. No evidence of contamination was observed from the field screening. Field screening results are presented in Table A-1 in Appendix A.

5.3.4 Bank Sampling Soil Analytical Results

Analytical results are presented in Tables 14 through 19.

TPH

The three soil samples had low-level TPH detections below screening criteria. Gasoline-range petroleum hydrocarbons were not detected at concentrations above reporting limits. Diesel-range petroleum hydrocarbons were measured at concentrations ranging from 17 to 150 mg/kg. Oil-range petroleum hydrocarbons were measured at concentrations ranging from 91 to 840 mg/kg. TPH results are presented in Table 14.

Metals

The three soil samples had detections of seven of the eight metals analyzed. Metal results are presented in Table 14 and are compared directly to AET criteria in Table 18. Arsenic is compared to the RAL and the OSV natural background level in Table 19.

Arsenic. Arsenic was detected in the three samples at concentrations ranging from 12 to 51 mg/kg. These concentrations exceeded the most stringent soil screening level, the natural background level for arsenic in the Puget Sound area, and the OSV natural background. STM-BS-3 had an arsenic concentration above the MTCA Method A cleanup level of 20 mg/kg. Concentrations from the three samples were below AET criteria. The arsenic concentration in STM-BS-3 exceeded the RAL (Table 19).

Cadmium. Cadmium was detected in the three samples at concentrations ranging from 0.5 to 2 mg/kg. These concentrations exceeded the most stringent soil screening level but are comparable with the natural background level in the Puget Sound area of 1 mg/kg (Ecology 1994). Concentrations from the three samples were below AET criteria.

Chromium. Chromium was detected in the three samples at concentrations ranging from 19 to 85 mg/kg. Only sample STM-BS-3, at a concentration of 85 mg/kg, exceeded the most stringent soil screening level of 42 mg/kg and the natural chromium background level in the Puget Sound area of 48 mg/kg (Ecology 1994). Concentrations from the three samples were below AET criteria.

Copper. Copper was detected in the three samples at concentrations ranging from 45.5 to 272 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.053 mg/kg and the natural copper background level in the Puget Sound area of 36 mg/kg (Ecology 1994). Concentrations from the three samples were below AET criteria.

Lead. Lead was detected in the three samples at concentrations ranging from 120 to 512 mg/kg. These concentrations exceeded the most stringent soil screening level of 5.4 mg/kg and the natural lead background level in the Puget Sound area of 24 mg/kg (Ecology 1994). The concentration of lead in sample STM-BS-2 exceeded the MTCA Method A cleanup level. Lead was detected in sample STM-BS-2 at 512 mg/kg which exceeded the AET criteria.

Mercury. Mercury was detected in the three samples at concentrations ranging from 0.08 to 0.3 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.00027 mg/kg and the natural mercury background level in the Puget Sound area of 0.07 mg/kg (Ecology 1994). Concentrations from the three samples were below AET criteria.

Silver. Silver was not detected in samples above the reporting limit. The reporting limit for silver exceeded the most stringent soil screening level.

Zinc. Zinc was detected in the three samples at concentrations ranging from 195 to 1120 mg/kg. These concentrations exceeded the most stringent soil screening level of 2.03 mg/kg and the natural zinc background level in the Puget Sound area of 85 mg/kg (Ecology 1994). Sample STM-BS-3 exceeded the screening level for vadose soil protective of SQS of 327 mg/kg and exceeded the LAET criteria of 410 mg/kg.

Semivolatile Organic Compounds

Analytical results for SVOCs are presented in Table 15 and are described below, organized by subgroup. SVOCs that are included in the SMS are compared to AET criteria in Table 18. The cPAH TEQs are compared to the OSV natural background concentration and the RAL in Table 19.

Chlorinated Hydrocarbons. Chlorinated hydrocarbons were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level.

Acid Extractables. Acid Extractables were detected in the three samples at concentrations ranging from 9.1 to 610 µg/kg. Several compounds were detected in sample STM-BS-3 at concentrations above the most stringent soil screening level. Concentrations of 2,4-Dimethylphenol and 2-methylphenol were also above the screening level for vadose zone soil protective of SQS. Reporting limits for some compounds exceeded screening levels. Concentrations of 2,4-Dimethylphenol and 2-methylphenol in sample STM-BS-3 exceeded LAET and 2LAET criteria.

Phthalates. Phthalates were detected in the three samples at concentrations ranging from 8.9 to 23,000 µg/kg. Several phthalates were detected at concentrations above the most stringent soil screening level in sample STM-BS-2 and STM-BS-3. Concentrations of bis(2-ethylhexyl)phthalate and butyl benzyl phthalate in sample STM-BS-3 exceeded the screening level for vadose zone soil protective of SQS. Reporting limits for some compounds exceeded screening levels. Samples STM-BS-2 and STM-BS-3 exceeded AET criteria for butyl benzyl phthalate.

Miscellaneous Extractables. The miscellaneous extractables were not detected at concentrations above the reporting limits except for dibenzofuran which was detected in the three samples at concentrations ranging from 24 to 100 µg/kg. Reporting limits for some compounds exceeded the most stringent soil screening level and the AET criteria.

PAHs. PAHs were detected in each sample at concentrations ranging from 21 to 13,000 µg/kg and numerous PAH compounds exceeded the most stringent soil screening level. The three samples exceeded the MTCA Method B cleanup level for benzo(a)pyrene. STM-BS-2 and STM-BS-3 also exceeded the MTCA Method B cleanup levels and screening levels for vadose zone soil protective of SQS for several other PAHs. Samples STM-BS-2 and STM-BS-3 exceeded AET criteria for PAHs (Table 18). The cPAH TEQ concentrations for the three samples exceeded the OSV natural background. The cPAH TEQ concentrations in samples STM-BS-2 and STM-BS-3 exceeded the RAL (Table 19).

Pesticides

Pesticides were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level. Pesticide results are presented in Table 16.

PCBs

Aroclor 1254 was detected in sample STM-BS-3 at a concentration (40 µg/kg) exceeding the most stringent soil screening level. Aroclor 1260 was detected in the three samples at concentrations ranging from 36 to 260 µg/kg, which exceeded the most stringent soil screening level. The Aroclor 1260 concentration (260 µg/kg) exceeded screening level for vadose soil protective of SQS in sample STM-BS-2. Reporting limits for some compounds exceeded the most stringent soil screening level. PCB results are presented in Table 16. Samples STM-BS-1 and STM-BS-2 exceeded LAET criteria for total PCBs (Table 18). The total PCB concentration in the three samples exceeded the OSV natural background level. The concentration in sample STM-BS-2 exceeded the RAL for total PCBs (Table 19).

TBT

TBT was detected in the three samples at concentrations ranging from 2 to 18 µg/kg. TBT results are presented in Table 16.

Dioxin/Furans

The dioxin/furan TEQ concentrations ranged from 12.52 to 126.35 pg/g and exceeded the OSV natural background concentration. The TEQ concentrations in samples STM-BS-2 and STM-BS-3 exceeded the RAL (Table 19). Individual dioxin/furan congener and homolog results are presented in Table 17.

PBDEs

PBDEs were not detected in samples at concentrations above the reporting limit. PBDE results are presented in Table 17.

5.4 Boyer-Trotsky Street End

5.4.1 Site Description

The Boyer-Trotsky Street End bank sampling site is located at approximately RM 2.3 west. The site is bordered by Boyer Towing and Trotsky Property (Industrial Container Services – WA, LLC). The bank surface is riprap and is sometimes used as a public access point to the LDW. The site is located just south of Early Action Area 2 (Ecology 2007). The site was selected by Ecology to further evaluate the extent of impacts associated with Early Action Area 2. The site is owned by the Port and was accessed by land at the end of 2nd Avenue South and South Orchard Street.

5.4.2 Previous Investigations

Nine sediment samples were collected near the site as part of the sediment RI (Figure 6) (Windward 2010a). Surface sediment sample DR157 exceeded the SQS for PCBs, mercury, BEHP, and benzyl butyl phthalate (BBP) by factors ranging from 1.4 to 3.9. DR157 exceeded the CSL for PCBs, mercury, and BEHP by factors ranging from 1.2 to 4.7. Surface sediment samples DR138 and LDW-SS85, exceeded the SQS for PCBs by factors of 1.4 and 2.8, respectively. However LDW-SS85 did not exceed the SQS based on toxicity tests. Sample DR141 exceeded the SQS for phenanthrene by a factor of 1.3, acenapthene by a factor of 1.2 and fluorene by a factor of 1.1.

5.4.3 Bank Sampling Activities

Four bank samples (BT-BS-1 through BT-BS-4) were collected between the apparent MHHW elevation and the vegetation line. Samples were collected from depths of approximately 1 to 10 cm using a shovel. Pairs of samples were collected from two locations at different elevations. Sample locations are shown on Figure 6. Riprap along the bank was removed by hand before collecting the sample. Bank material generally consisted of sandy gravel fill. Scattered debris including brick and concrete was observed adjacent to sampling locations. No evidence of contamination was observed during field screening. Field screening results are presented in Table A-1 in Appendix A.

5.4.4 Bank Soil Analytical Results

Analytical results are presented in Tables 20 through 25.

TPH

The four samples had TPH detections below Ecology's screening criteria. Gasoline-range petroleum hydrocarbons were not detected at concentrations above reporting limits except for in sample BT-BS-1. Diesel-range petroleum hydrocarbons were measured at concentrations ranging from 46 to 160 mg/kg. Oil-range petroleum hydrocarbons were measured at concentrations ranging from 260 to 470 mg/kg. TPH results are presented in Table 20.

Metals

The four soil samples had detections of seven of the eight metals analyzed. Metal results are presented in Table 20. Metals are compared directly to AET criteria in Table 24. Arsenic is compared to the RAL and the OSV natural background level in Table 25.

Arsenic. Arsenic was detected in the four samples at concentrations ranging from 9.2 to 14.7 mg/kg. These concentrations exceeded the most stringent soil screening level, the natural background level for arsenic in the Puget Sound area, and the OSV natural background. Concentrations in the four samples were below AET criteria and the RAL for arsenic.

Cadmium. Cadmium was detected in the four samples at concentrations ranging from 0.4 to 1 mg/kg. These concentrations exceeded the most stringent soil screening level but are comparable with the natural background level in the Puget Sound area of 1 mg/kg (Ecology 1994). Concentrations in the four samples were below AET criteria.

Chromium. Chromium was detected in the four samples at concentrations ranging from 24.1 to 112 mg/kg. Only sample BT-BS-3, at a concentration of 112 mg/kg, exceeded the most stringent soil screening level of 42 mg/kg and the natural chromium background level in the Puget Sound area of 48 mg/kg (Ecology 1994). Concentrations in the four samples were below AET criteria.

Copper. Copper was detected in the four samples at concentrations ranging from 37.4 to 55.7 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.053 mg/kg and the natural copper background level in the Puget Sound area of 36 mg/kg (Ecology 1994). Concentrations in the four samples were below AET criteria.

Lead. Lead was detected in the four samples at concentrations ranging from 83 to 127 mg/kg. These concentrations exceeded the most stringent soil screening level of 5.4 mg/kg and the natural lead background level in the Puget Sound area of 24 mg/kg (Ecology 1994). Concentrations in the four samples were below AET criteria.

Mercury. Mercury was detected in the four samples at concentrations ranging from 0.05 to 0.11 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.00027 mg/kg. Samples BT-BS-1, BT-BS-2, and BT-BS-4 exceeded the natural mercury background level in the Puget Sound area of 0.07 mg/kg (Ecology 1994). Concentrations in the four samples were below AET criteria.

Silver. Silver was not detected in samples above the reporting limit. The reporting limit for silver exceeds the most stringent soil screening level.

Zinc. Zinc was detected in the four samples at concentrations ranging from 73 to 150 mg/kg. These concentrations exceeded the most stringent soil screening level of 2.03 mg/kg. Zinc concentrations in samples BT-BS-2 and BT-BS-4 exceeded the natural zinc background level in the Puget Sound area of 85 mg/kg (Ecology 1994). Concentrations in the four samples were below AET criteria.

Semivolatile Organic Compounds

Analytical results for SVOCs are presented in Table 21 and are described below, organized by subgroup. SVOCs that are included in the SMS are compared to AET criteria in Table 24. The cPAH TEQs are compared to the OSV natural background concentration and the RAL in Table 25.

Chlorinated Hydrocarbons. Chlorinated hydrocarbons were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level. Reporting limits were below AET criteria.

Acid Extractables. Acid extractables were not detected at concentrations above reporting limits. Results for 2,4-dimethylphenol were rejected based on the data quality review (see Appendix B, page B-28). Reporting limits for some compounds exceeded screening levels. Reporting limits concentrations were below AET criteria.

Phthalates. Butyl benzyl phthalate was detected at concentrations above the most stringent soil screening level in samples BT-BS-1 and BT-BS-2 at 28 and 130

µg/kg, respectively. The concentration of bis(2-ethylhexyl)phthalate in sample BT-BS-2 exceeded the most stringent soil screening level at 98 µg/kg. The butyl benzyl phthalate concentration in BT-BS-2 exceeded the screening level for vadose zone soil protective of SQS and the LAET in BT-BS-2. Reporting limits for some compounds exceeded screening levels.

Miscellaneous Extractables. The miscellaneous extractables were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the screening levels.

PAHs. PAHs were detected in each sample at concentrations ranging from 5.8 to 950 µg/kg and numerous PAH compounds exceeded the most stringent soil screening level. BT-BS-1 and BT-BS-2 exceeded the MTCA Method B cleanup level for benzo(a)pyrene. Concentrations in the four samples were below AET criteria (Table 24). The cPAH TEQ concentrations in the four samples exceeded the OSV natural background level but were below the RAL (Table 25).

Pesticides

Pesticides were detected in BT-BS-2 at concentrations at concentrations ranging from 11 to 14 µg/kg, below the most stringent screening level. Reporting limits for some compounds exceeded screening levels. Pesticide results are presented in Table 22.

PCBs

Aroclor 1254 was detected in samples BT-BS-2 and BT-BS-4 at concentrations ranging from 19 to 280 µg/kg, exceeding the most stringent soil screening level. Aroclor 1260 was detected in the four samples at concentrations ranging from 19 to 280 µg/kg, exceeding the most stringent soil screening level. The concentrations of Aroclor 1254 and 1260 in sample BT-BS-2 also exceeded the screening level for vadose zone soil protective of SQS. Reporting limits for some compounds exceeded the most stringent soil screening level. PCB results are presented in Table 22. Total PCB concentrations compared to AET criteria are presented in Table 24 and to the RAL and OSV natural background in Table 25. The total PCB concentration in the four samples exceeded the OSV natural background level. The concentration in samples BT-BS-3 and BT-BS-4 exceeded the LAET criteria and the RAL for total PCBs.

TBT

TBT was detected in samples BT-BS-2 and BT-BS-4 at concentrations of 9.3 and 4.3 µg/kg, respectively. TBT results are presented in Table 22.

Dioxin/Furans

The dioxin/furan TEQ concentrations in the four samples ranged from 6.59 to 48.77 pg/g and exceeded the OSV natural background concentration. The TEQ concentration in samples BT-BS-2 and BT-BS-4 exceeded the RAL (Table 25). Individual dioxin/furan congener and homolog results are presented in Table 23.

PBDEs

PBDEs were not detected in samples at concentrations above the reporting limit. PBDE results are presented in Table 23.

5.5 Seattle Iron & Metals

5.5.1 Site Description

The Seattle Iron & Metals bank sampling site is located at approximately RM 2.55 east. The bank at the southern end of the Seattle Iron & Metals property is covered by fill material and debris, including brick. The site is owned by the Shalmar Group. The site was accessed by boat.

5.5.2 Previous Investigations

Two surface sediment samples were collected near the site as part of the sediment RI (Figure 7) (Windward 2010a). Samples did not exceed the SMS criteria.

5.5.3 Bank Sampling Activities and Soil Conditions

Four bank (SIM-BS-1 through SIM-BS-4) samples were collected between the apparent MHHW elevation and the vegetation line. Samples were collected from depths of approximately 1 to 5 cm using a shovel and rock hammer. Sample locations are shown on Figure 7. Fill material was observed along the bank and consisted of cemented gravelly sand and sandy gravel. Abundant debris including metal, brick, and concrete was observed adjacent to sampling locations within the cemented material. No evidence of contamination was observed during field screening. Field screening results are presented in Table A-1 in Appendix A.

5.5.4 Bank Sampling Analytical Results

Analytical results are presented in Tables 26 through 31.

TPH

All four samples had TPH detections below Ecology's screening criteria. Gasoline-range petroleum hydrocarbons concentrations were below reporting limits. Diesel-range petroleum hydrocarbons were measured at concentrations ranging from 6.3 to 11 mg/kg. Oil-range petroleum hydrocarbons were measured at concentrations ranging from 28 to 81 mg/kg. TPH results are presented in Table 26.

Metals

Metal results are presented in Table 26. Metals are compared directly to AET criteria in Table 30. Arsenic is compared to the RAL and the OSV natural background level in Table 31.

Arsenic. Arsenic was detected in samples SIM-BS-3 and SIM-BS-4 at concentrations of 35 and 67 mg/kg, respectively. These concentrations exceeded the most stringent soil screening level, the MTCA soil cleanup level, and the natural background level for arsenic in the Puget Sound area. Sample SIM-BS-4 exceeded the LAET criteria for arsenic (Table 30). Samples SIM-BS-3 and SIM-BS-4 exceeded the OSV natural background level and the RAL for arsenic. Reporting limits for SIM-BS-1 and SIM-BS-2 were elevated (see Appendix B) and above screening levels.

Cadmium. Cadmium was detected in samples SIM-BS-1 and SIM-BS-2 at concentrations of 9 and 4 mg/kg, respectively. These concentrations exceeded the most stringent soil screening level and the natural background level in the Puget Sound area of 1 mg/kg (Ecology 1994). SIM-BS-1 exceeded the AET criteria for cadmium.

Chromium. Chromium was detected in the four samples at concentrations ranging from 851 to 3450 mg/kg. These concentrations exceeded the most stringent soil screening level, the MTCA Method B cleanup level, and the natural chromium background level in the Puget Sound area of 48 mg/kg (Ecology 1994). The four samples exceeded the AET criteria for chromium.

Copper. Copper was detected in the four samples at concentrations ranging from 317 to 552 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.053 mg/kg and the natural copper background level in the Puget Sound area of 36 mg/kg (Ecology 1994). SIM-BS-1, SIM-BS-2, and SIM-BS-4 exceeded the AET criteria for copper.

Lead. Lead was detected in the four samples at concentrations ranging from 170 to 470 mg/kg. These concentrations exceeded the most stringent soil screening level of 5.4 mg/kg and the natural lead background level in the Puget Sound area of 24 mg/kg (Ecology 1994). The lead concentration in SIM-BS-4 exceeded the MTCA Method A cleanup level. Sample SIM-BS-4 also exceeded the AET criteria for lead.

Mercury. Mercury was detected in samples SIM-BS-1, SIM-BS-2, and SIM-BS-3 at concentrations ranging from 0.03 to 0.19 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.00027 mg/kg. Sample SIM-BS-1 exceeded the natural mercury background level in the Puget Sound area of 0.07 mg/kg (Ecology 1994). Detected concentrations were below AET criteria.

Silver. Silver was detected in samples SIM-BS-1, SIM-BS-2, and SIM-BS-3 at concentrations ranging from 3 to 4 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.013 mg/kg. The reporting limit for silver exceeded the most stringent soil screening level. Detected concentrations were below AET criteria.

Zinc. Zinc was detected in the four samples at concentrations ranging from 130 to 1950 mg/kg. These concentrations exceeded the most stringent soil screening level of 2.03 mg/kg and the natural zinc background level in the Puget Sound area of 85 mg/kg (Ecology 1994). Samples SIM-BS-1 and SIM-BS-2 also exceeded the screening levels for vadose zone soil protective of SQS. Samples SIM-BS-1 and SIM-BS-2 also exceed the LAET criteria.

Semivolatile Organic Compounds

Analytical results for SVOCs are presented in Table 27 and are described below, organized by subgroup. SVOCs that are included in the SMS are compared to the AET in Table 30. The cPAH TEQs are compared to the OSV natural background concentration and the RAL in Table 13.

Chlorinated Hydrocarbons. Chlorinated hydrocarbons were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level. Reporting limits were below AET criteria.

Acid Extractables. Phenol was detected in the four samples at concentrations ranging from 31 to 550 µg/kg and exceeded the most stringent screening level. Reporting limits for some compounds exceeded screening levels. The phenol concentration in sample SIM-BS-1 exceeded the LAET criteria.

Phthalates. Phthalates were detected at concentrations ranging from 12 to 110 µg/kg. Butyl benzyl phthalate was detected at above the most stringent soil screening level in samples SIM-BS-1 and SIM-BS-2. The concentration of bis(2-ethylhexyl)phthalate in sample SIM-BS-1 exceeded the most stringent soil screening level. Reporting limits for some compounds exceed screening levels. Concentrations in the four samples were below AET criteria.

Miscellaneous Extractables. The miscellaneous extractables were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the screening levels.

PAHs. PAHs were detected in each sample at concentrations ranging from 2.6 to 120 µg/kg and numerous PAH compounds exceed the most stringent soil screening level. Concentrations in the four samples were below AET criteria. The cPAH TEQ concentrations in the four samples exceeded the OSV natural background level but were below the RAL (Table 31).

Pesticides

The pesticides 4,4'-DDT was detected in samples SIM-BS-1 and SIM-BS-2 at concentrations of 2.4 and 11 µg/kg, respectively, which are below the most stringent screening level. Reporting limits for some compounds exceeded screening levels. Pesticide results are presented in Table 28.

PCBs

Aroclor 1254 was detected in samples SIM-BS-1, SIM-BS-2, and SIM-BS-3 at concentrations ranging from 47 to 150 µg/kg, exceeding the most stringent soil screening level. Aroclor 1260 was detected in samples SIM-BS-1, SIM-BS-3, and SIM-BS-4 at concentrations ranging from 24 to 53 µg/kg, exceeding the most stringent soil screening level. Reporting limits for some compounds exceeded the most stringent soil screening level. PCB results are presented in Table 28. Sample SIM-BS-1 exceeded the LAET criteria for total PCBs (Table 30). The total PCB concentration in the four samples exceeded the OSV natural background level but were below the RAL (Table 31).

TBT

TBT was detected in samples SIM-BS-1 at a concentration of 3.5 µg/kg, respectively. TBT results are presented in Table 28.

Dioxin/Furans

The dioxin/furan TEQ concentrations in the four samples ranged from 2.29 to 17.27 pg/g and exceeded the OSV natural background concentration but were below the RAL (Table 31). Individual dioxin/furan congener and homolog results are presented in Table 29.

PBDEs

PBDEs were detected in samples SIM-BS-1, SIM-BS-2, and SIM-BS-3 at concentrations ranging from 0.6 to 2.7 µg/kg. PBDE results are presented in Table 29.

5.6 Puget Sound Truck Lines

5.6.1 Site Description

The Puget Sound Truck Lines bank sampling sites are located from approximately RM 2.6 to 2.7 east. This upland site has been used for various industrial purposes including a drum reconditioning plant, concrete pipe company, and a truck company. The concrete company reportedly deposited concrete waste on the bank (Hart Crowser 2011a). A layer of white material is present along the vertical face of the bank above the MHHW line. Field observations indicate that the material is not uniform along the bank and may be from different sources.

Samples were collected from areas within the Port-managed waterway (Figure 8) and not from the Puget Sound Truck Lines property due to access restrictions and were accessed by boat.

5.6.2 Previous Investigations

Twelve surface sediment samples were collected near the site as part of the sediment RI (Figure 8) (Windward 2010a). Samples EST176, EIT075, and EST179 were only analyzed for PCBs. PCB concentrations in these samples exceeded the SQS by factors ranging from 1.1 to 2.0.

Sample LDW-SS88 exceeded the SQS and CSL for mercury by factors of 1.5 and 1.1, respectively. Sample LDW-SS88 exceeded the SQS value for PCBs by a factor of 3.2. This sample also exceeded the CSL based on toxicity tests. Sample LDW-SS89 exceeded the SQS and the CSL for PCBs by factors of 15 and 2.8, respectively. LDW-SS89 did not exceed the SMS based on toxicity tests.

5.6.3 Bank Sampling Activities and Soil Conditions

Eleven samples (PSTL-BS-1a, PSTL-BS-1b, PSTL-BS-2, PTSL-BS-3, PSTL-BS-4a, PSTL-BS-4b, PSTL-BS-5a, PSTL-BS-5b, PSTL-BS-6a, PSTL-BS-6b, PSTL-BS-7) were collected from seven locations along the vertical bank face at depths of approximately 1 to 10 cm (Figure 8). Riprap armor along the shore limited sample locations and only eleven samples were collected instead of the twenty-one identified in the SAP (Hart Crowser 2011b). Two samples were collected from different elevations at 4 of the 7 locations (Figure 8) where riprap could be moved to access the bank material above MHHW elevation.

Where possible, the unidentified white material was sampled. Bank material generally consisted of dry sandy gravel and gravelly sand. Fill material was observed along the bank and consisted of cemented gravelly sand and sandy gravel. Abundant debris including metal, brick, and concrete was observed adjacent to sampling locations within the cemented material. Samples were collected between elevation +9 to +15.5 feet. Samples are considered to be from the vadose zone. No evidence of contamination was observed during field screening. Approximate elevations, coordinates, and sample descriptions are presented in Table A-1, Appendix A.

5.6.4 Bank Sampling Analytical Results

Analytical results are presented in Tables 32 through 37.

TPH

Gasoline-range petroleum hydrocarbons were detected in two samples at concentrations below screening levels. PSTL-BS-2 was not sampled for gasoline-range hydrocarbons because the material was too hard to collect a sample using EPA Method 5035. Diesel-range petroleum hydrocarbons were measured at concentrations ranging from 11 to 1400 mg/kg. Five samples had diesel-range petroleum hydrocarbons at concentrations above the most stringent screening level of 200 mg/kg. Oil-range petroleum hydrocarbons were measured at concentrations ranging from 36 to 2000 mg/kg. TPH results are presented in Table 32.

Metals

The eleven samples have detections of five or more of the eight metals analyzed. Metal results are presented in Table 32. Metals are compared directly to AET criteria in Table 36. Arsenic is compared to the RAL and the OSV natural background level in Table 37.

Arsenic. Arsenic was detected in the ten of the eleven samples at concentrations ranging from 16 to 82 mg/kg. These concentrations exceeded the most stringent soil screening level and the natural background level for arsenic in the Puget Sound area and the OSV natural background. Arsenic concentrations in samples PSTL-BS-1a, PSTL-BS-1b, PSTL-BS-2, PSTL-BS-3, PSTL-BS-6a, and PSTL-BS-6b exceeded the MTCA Method A cleanup level. Samples PSTL-BS-2, PSTL-BS-3 and PSTL-BS-6a exceeded the LAET criteria for arsenic (Table 31).

Cadmium. Cadmium was detected in samples PSTL-BS-1a, PSTL-BS-1b, PSTL-BS-5a, and PSTL-BS-5b at concentrations ranging from 0.3 to 1 mg/kg. These concentrations exceeded the most stringent soil screening level but are consistent with the natural background level in the Puget Sound area of 1 mg/kg (Ecology 1994). Cadmium concentrations do not exceed AET criteria.

Chromium. Chromium was detected in the eleven samples at concentrations ranging from 19 to 39 mg/kg. These concentrations were below screening levels and the natural chromium background level in the Puget Sound area. Concentrations in the eleven samples were below AET criteria.

Copper. Copper was detected in the eleven samples at concentrations ranging from 37.1 to 166 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.053 mg/kg and the natural copper background level in the Puget Sound area of 36 mg/kg (Ecology 1994). Concentrations in the eleven samples were below AET criteria.

Lead. Lead was detected in the eleven samples at concentrations ranging from 11 to 81 mg/kg. These concentrations exceeded the most stringent soil screening level of 5.4 mg/kg. Nine samples exceeded the natural lead background level in the Puget Sound area of 24 mg/kg (Ecology 1994). Concentrations in the eleven samples were below AET criteria.

Mercury. Mercury was detected in nine samples at concentrations ranging from 0.03 to 0.06 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.00027 mg/kg but were below the natural mercury background level in the Puget Sound area of 0.07 mg/kg (Ecology 1994). Detected concentrations were below AET criteria.

Silver. Silver was not detected in samples above the reporting limit. The reporting limit for silver exceeds the most stringent soil screening level.

Zinc. Zinc was detected in the eleven samples at concentrations ranging from 93 to 366 mg/kg. These concentrations exceeded the most stringent soil

screening level of 2.03 mg/kg and the natural zinc background level in the Puget Sound area of 85 mg/kg (Ecology 1994). Sample PSTL-BS-1b exceeded the screening levels for vadose zone soil protective of SQS. Concentrations in the eleven samples were below AET criteria.

Semivolatile Organic Compounds

Analytical results for SVOCs are presented in Table 33 and are described below, organized by subgroup. SVOCs that are included in the SMS are compared to AET criteria in Table 36. The cPAH TEQs are compared to the OSV natural background concentration and the RAL in Table 37.

Chlorinated Hydrocarbons. Chlorinated hydrocarbons were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceed the most stringent soil screening level. Reporting limits were below AET criteria.

Acid Extractables. Phenol was detected in four samples at concentrations ranging from 11 to 110 µg/kg. The concentration of phenol in sample PSTL-BS-7 exceeded the most stringent screening level. Reporting limits for some compounds exceed screening levels. All concentrations were below AET criteria.

Phthalates. The diethyl phthalate concentration exceeded the most stringent screening level in sample PSTL-BS-5a at 200 µg/kg. Reporting limits for some compounds exceeded screening levels. All concentrations were below AET criteria.

Miscellaneous Extractables. The miscellaneous extractables were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the screening levels.

PAHs. PAHs were detected in each sample at concentrations ranging from 2.8 to 960 µg/kg and numerous PAH compounds exceeded the most stringent soil screening level. The benzo(a)pyrene concentration in sample PSTL-BS-7 exceeded the MTCA Method B cleanup level. Concentrations were below AET criteria. The cPAH TEQ concentrations in the samples exceeded the OSV natural background level but were below the RAL (Table 37).

Pesticides

Endrin aldehyde was detected in samples PSTL-BS-4a and PSTL-BS-5b at a concentration of 2.1 µg/kg, below the screening levels. 4,4'-DDT was detected

in sample PSTL-BS-5a at a concentration of 10 µg/kg, below the screening levels. Reporting limits for some compounds exceeded screening levels. Pesticide results are presented in Table 34.

PCBs

Aroclor 1254 was detected in seven samples at concentrations ranging from 6.5 to 32 µg/kg, which exceeded the most stringent soil screening level. Aroclor 1260 was detected in nine samples at concentrations ranging from 8.2 to 40 µg/kg, which exceeded the most stringent soil screening level. Reporting limits for some compounds exceeded the most stringent soil screening level. PCB results are presented in Table 34. Total PCB concentrations were below to AET criteria (Table 36). The total PCB concentration exceeded the OSV natural background level but were below the RAL (Table 37).

TBT

TBT was not detected in the eleven samples at concentrations above the reporting limit. TBT results are presented in Table 34.

Dioxin/Furans

The dioxin/furan TEQ concentrations ranged from 1.69 to 14.80 pg/g and in all samples except for PSTL-BS-2 exceeded the OSV natural background concentration. No samples exceeded the RAL (Table 37). Individual dioxin/furan congener and homolog results are presented in Table 35.

PBDEs

PBDEs were detected in sample PSTL-BS-6b at concentrations ranging from 0.7 to 3.3 µg/kg. PBDE results are presented in Table 35.

5.7 South Park Street End

5.7.1 Site Description

The South Park Street End bank sampling site is located at approximately RM 3.3 west. The surrounding area is residential and this area has high public use. Little is known about the bank conditions in this area. The site is owned by the Port and is accessible by land at the end of South Rose Street.

5.7.2 Previous Investigations

Two surface and one subsurface sediment samples were collected near the site as part of the sediment RI (Figure 9). Sediment samples did not exceed SQS or CSL for SMS chemicals (Windward, 2010a).

5.7.3 Bank Sampling Activities and Soil Conditions

The bank material was sampled using a push probe rig positioned as close to the edge of the bank as possible. Two push probes were advanced to a depth of approximately 10 to 12 feet bgs to extend to the approximate elevation of high tide. Samples were collected every 4 feet above or at the observed water table (Appendix A). Four samples (SP-BS-1-1, SP-BS-1-2, SP-BS-2-1, SP-BS-2-2) were submitted for chemical analysis. Push probe locations are shown on Figure 9.

Both borings were located at the top of a riprap-armored shoreline. From 0 to 4 feet below ground surface (bgs) a gravel fill material was encountered. Underlying the fill material, brown silty Sand and sandy Silt were observed to 12 feet bgs. At the time of drilling, the water level was observed at 8 feet bgs in push probe SP-2. Shallow perched water was observed at 3 feet bgs in push probe SP-1. No evidence of contamination was observed during field screening. Field screening results are presented in Table A-1 in Appendix A.

5.7.4 Bank Sampling Analytical Results

Analytical results are presented in Tables 38 through 43.

TPH

Gasoline-range petroleum hydrocarbons were not detected at concentrations above reporting limits. Diesel-range petroleum hydrocarbons were detected in SP-BS-1-1 and SP-BS-2-1 at concentrations of 8.8 and 35 mg/kg, respectively. Oil-range petroleum hydrocarbons were detected in SP-BS-1-1 and SP-BS-2-1 at concentrations of 32 and 360 mg/kg, respectively. TPH results are presented in Table 38.

Metals

The four samples had detections of five or more of the eight metals analyzed. Metal results are presented in Table 38. Metals are compared directly with AET criteria in Table 42. Arsenic is compared to the RAL and the OSV natural background level in Table 42.

Arsenic. Arsenic was detected in the four samples at concentrations ranging from 6.4 to 9 mg/kg. These concentrations exceeded the most stringent soil screening level but are comparable with the natural background level for arsenic in the Puget Sound area. Concentrations in the four samples were below AET criteria (Table 42) and the RAL for arsenic (Table 43). Sample SP-BS-2-1 exceeded the OSV natural background level.

Cadmium. Sample SP-BS-2-1 had a cadmium concentration of 0.9 mg/kg. This concentration exceeded the most stringent soil screening level but is comparable with the natural background level in the Puget Sound area of 1 mg/kg (Ecology 1994). The reporting limit for cadmium exceeded the most stringent soil screening level.

Chromium. Chromium was detected in the four samples at concentrations ranging from 14.6 to 18.4 mg/kg, below screening levels and the natural chromium background level. Concentrations in the four samples were below AET criteria.

Copper. Copper was detected in the four samples at concentrations ranging from 20.1 to 56.4 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.053 mg/kg. Sample SP-BS-2-1 exceeded the natural copper background level in the Puget Sound area of 36 mg/kg (Ecology 1994). Concentrations in the four samples were below AET criteria.

Lead. Lead was detected in samples SP-BS-1-1, SP-BS-1-2, and SP-BS-2-1 at concentrations ranging from 6 to 116 mg/kg. These concentrations exceeded the most stringent soil screening level of 5.4 mg/kg. Only SP-BS-2-1, at a concentration of 116, exceeded the natural lead background level of 24 mg/kg. Detected concentrations were below AET criteria.

Mercury. Mercury was detected in the four samples at concentrations ranging from 0.03 to 0.09 mg/kg. These concentrations exceeded the most stringent soil screening level but are comparable to the natural mercury background level of 0.07 mg/kg. Concentrations in the four samples were below AET criteria.

Silver. Silver was not detected in samples above the reporting limit. The reporting limit for silver exceeded the most stringent soil screening level.

Zinc. Zinc was detected in the four samples at concentrations ranging from 51 to 149 mg/kg. These concentrations exceeded the most stringent soil screening level. SP-BS-2-2 and SP-BS-2-1 exceeded the natural zinc background level in the Puget Sound area. Zinc concentrations in the four samples were below AET criteria.

Semivolatile Organic Compounds

Analytical results for SVOCs are presented in Table 39 and are described below, organized by subgroup. SVOCs that are included in the SMS are compared to AET criteria in Table 42. The cPAH TEQs are compared to the OSV natural background concentration and the RAL in Table 43.

Chlorinated Hydrocarbons. Chlorinated hydrocarbons were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level. Reporting limits were below AET criteria.

Acid Extractables. Results for 2,4-dimethylphenol were rejected based on the data quality review (see Appendix B, page B-28). Benzoic acid and phenol exceeded the most stringent screening levels in sample SP-BS-2-1 at concentrations of 650 and 45 µg/kg, respectively. Reporting limits for some compounds exceeded the most stringent soil screening level. Detected concentrations and reporting limits were below AET criteria.

Phthalates. The concentration of bis(2-ethylhexyl)phthalate in sample SP-BS-2-1 exceeded the most stringent soil screening level at 140 µg/kg. Butyl benzyl phthalate was detected at concentrations of 32 and 30 µg/kg in samples SP-BS-1-1 and SP-BS-2-1, which exceeded the most stringent soil screening level. Reporting limits for some compounds exceeded the most stringent soil screening level. Detected concentrations and reporting limits were below AET criteria.

Miscellaneous Extractables. The miscellaneous extractables were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level.

PAHs. PAHs were detected at concentrations ranging from 2.5 to 210 µg/kg. The four samples had PAHs at concentrations exceeding the most stringent soil screening level. Reporting limits for some compounds exceeded the most stringent soil screening level. Concentrations were below AET criteria (Table 42). The cPAH TEQ concentrations in samples SP-BS-1-1, SP-BS-2-1, SP-BS-2-2 exceeded the OSV natural background level and all samples were below the RAL (Table 43).

Pesticides

4,4'DDT was detected in samples SP-BS-1-1 and SP-BS-2-1 at concentrations of 9.6 and 18 µg/kg, respectively, which are below screening levels. Reporting

limits for some compounds exceeded the most stringent soil screening level. Pesticide results are presented in Table 40.

PCBs

Aroclor 1260 was detected in samples SP-BS-1-1 and SP-BS-2-1 at concentrations of 27 and 34 µg/kg, which exceeded the most stringent soil screening level. Reporting limits for some compounds exceeded the most stringent soil screening level. PCB results are presented in Table 40. Total PCB concentrations did not exceed the AET criteria (Table 42). The total PCB concentration in samples SP-BS-1-1 and SP-BS-2-1 exceeded the OSV natural background level. The total PCB concentrations in the four samples were below the RAL (Table 37).

TBT

TBT was detected in samples SP-BS-1-1 and SP-BS-2-1 at concentrations of 11 and 8.9 µg/kg, respectively. TBT results are presented in Table 40.

Dioxin/Furans

The dioxin/furan TEQ concentrations ranged from 0.62 to 21.67 pg/g (Table 43). TEQ concentrations in samples SP-BS-1-1 and SP-BS-2-1 exceeded the OSV natural background concentration. No samples exceeded the RAL. Individual dioxin/furan congener and homolog results are presented in Table 41.

PBDEs

One PBDE was detected in sample SP-BS-1-2 at a concentration of 0.6 µg/kg. PBDE results are presented in Table 41.

5.8 Sea King Industrial

5.8.1 Site Description

The Sea King Industrial bank sampling site is located at approximately RM 4.0 west (Figure 10). The upland area has been used for industrial activity and trash dumping has been observed in the area. The site is owned by Sea King Industrial Park. The site was accessed by boat.

5.8.2 Previous Investigations

Nine surface sediment samples were collected near the site as part of the Sediment RI (Figure 10). Surface samples LDW-SS122 and DR258 exceeded the

SQS but did not exceed the CSL for all SMS chemicals. LDW-SS122 did not exceed SMS based on toxicity tests. LDW-SS122 exceeded the SQS for PCBs by a factor of 2.3. Sample DR258 exceeded the SQS value for BBP by a factor of 1.3. The seep sample (SP-41) had detectable levels of arsenic, cadmium, lead, mercury, nickel, silver, and zinc (Windward, 2010a).

5.8.3 Bank Sampling Activities and Soil Conditions

Six bank samples (SKI-BS-1 through SKI-BS-6) were collected from between the apparent MHHW elevation and the vegetation line. Sample locations are shown on Figure 10. Samples were collected from depths of approximately 1 to 10 cm using hand tools. Bank material generally consisted of moist to wet, gravelly, silty, sand. Scattered roots and organics were observed in sampling areas.

Samples were collected at approximately elevation +11 feet and are considered to be from the vadose zone. No evidence of contamination was observed during field screening. Field screening results and detailed soil descriptions are presented in Table A-1 in Appendix A.

5.8.4 Bank Sampling Analytical Results

Analytical results are presented in Tables 44 through 49.

TPH

Gasoline- and diesel-range petroleum hydrocarbons were not detected at concentrations above reporting limits. Oil-range petroleum hydrocarbons were detected in SKI-BS-2 and SKI-BS-5 at concentrations of 28 and 15 mg/kg, respectively. TPH results are presented in Table 44.

Metals

The six samples have detections of three or more of the eight metals analyzed. Metal results are presented in Table 44. Metals are compared directly with AET criteria in Table 48. Arsenic is compared to the RAL and the OSV natural background level in Table 49.

Arsenic. Arsenic was detected in samples SKI-BS-2 through SKI-BS-6 at concentrations ranging from 8.7 to 19.7 mg/kg. These concentrations exceeded the most stringent soil screening level and the natural background level for arsenic in the Puget Sound area. Concentrations in the six samples were below AET criteria (Table 48) and the RAL for arsenic (Table 49). The concentration in the six samples exceeded the OSV natural background level.

Cadmium. Cadmium was detected in four of the samples at concentrations ranging from 0.3 to 0.7 mg/kg. These concentrations exceeded the most stringent soil screening level but are comparable with the natural background level in the Puget Sound area of 1 mg/kg (Ecology 1994). The reporting limit for cadmium exceeded the most stringent soil screening level. Concentrations were below AET criteria.

Chromium. Chromium was detected in the six samples at concentrations ranging from 10.9 to 32.1 mg/kg. Sample SKI-BS-5 exceeded the most stringent screening level and the natural chromium background level. Concentrations were below AET criteria.

Copper. Copper was detected in the six samples at concentrations ranging from 12.2 to 46.1 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.053 mg/kg. Samples SKI-BS-4 and SKI-BS-5 exceeded the natural copper background level in the Puget Sound area of 36 mg/kg (Ecology 1994). Concentrations were below AET criteria.

Lead. Lead was detected in samples SKI-BS-2 through SKI-BS-6 at concentrations ranging from 10 to 44 mg/kg. These concentrations exceeded the most stringent soil screening level of 5.4 mg/kg. SKI-BS-1 and SKI-BS-4 exceeded the natural lead background level of 24 mg/kg. There is no MTCA Method B value for lead but concentrations were below the MTCA Method A value of 250 mg/kg. Concentrations were below AET criteria.

Mercury. Mercury was detected in samples SKI-BS-2 through SKI-BS-6 at concentrations ranging from 0.03 to 0.14 mg/kg. These concentrations exceeded the most stringent soil screening level. Samples SKI-BS-4 and SKI-BS-5 exceeded the natural mercury background level of 0.07 mg/kg. Concentrations were below AET criteria.

Silver. Silver was not detected in samples above the reporting limit. The reporting limit for silver exceeds the most stringent soil screening level.

Zinc. Zinc was detected in the six samples at concentrations ranging from 32 to 122 mg/kg. These concentrations exceeded the most stringent soil screening level. SKI-BS-4 exceeded the natural zinc background level in the Puget Sound area. Concentrations were below AET criteria.

Semivolatile Organic Compounds

Analytical results for SVOCs are presented in Table 45 and are described below, organized by subgroup. SVOCs that are included in the SMS are compared to

the AET in Table 48. The cPAH TEQs are compared to the OSV natural background concentration and the RAL in Table 13.

Chlorinated Hydrocarbons. Chlorinated hydrocarbons were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded screening levels. Reporting limits did not exceed AET criteria.

Acid Extractables. Sample SKI-BS-4 had detections of three acid extractable SVOCs at concentrations ranging from 10 to 130 µg/kg, below screening levels. Reporting limits for some compounds exceeded screening levels. Reporting limits did not exceed AET criteria.

Phthalates. The concentration of butyl benzyl phthalate in sample SKI-BS-2 exceeded the most stringent screening level at 24 µg/kg. Reporting limits for some compounds exceeded screening levels.

Miscellaneous Extractables. The miscellaneous extractables were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the most stringent soil screening level.

PAHs. PAHs were detected at concentration ranging from 1.8 to 140 µg/kg. The six samples had PAHs at concentrations exceeding the most stringent soil screening level. Reporting limits for some compounds exceeded screening levels. The cPAH TEQ concentrations were below AET criteria (Table 48). The cPAH TEQ concentrations in samples SKI-BS-2, SKI-BS-4, and SKI-BS5 exceeded the PSV natural background concentration (Table 49). All samples were below the RAL.

Pesticides

Pesticides were detected in samples SKI-BS-4, SKI-BS-5, and SKI-BS6 at concentrations ranging from 2.9 to 3.4 µg/kg, below screening levels. Reporting limits for some compounds exceeded screening levels. Pesticide results are presented in Table 46.

PCBs

Aroclors 1248, 1254, and/or 1260 were detected in samples SKI-BS-2 through SKI-BS-6 at concentrations ranging from 5 to 73 µg/kg, exceeding the most stringent soil screening level. Reporting limits for some compounds exceeded screening levels. PCB results are presented in Table 46. Total PCB concentrations were below AET criteria (Table 48). Total PCB concentrations in

the six samples exceeded the OSV natural background level but were below the RAL (Table 49).

TBT

TBT was detected in sample SKI-BS-2 at a concentration of 2.5 µg/kg. TBT results are presented in Table 46.

Dioxin/Furans

The dioxin/furan TEQ concentrations ranged from 0.20 to 5.12 pg/g (Table 49). TEQ concentrations in samples SKI-BS-2, SKI-BS-4, SKI-BS-5, and SKI-BS-6 exceeded the OSV natural background concentration. No concentrations exceeded the RAL for the dioxin/furan TEQ. Individual dioxin/furan congener and homolog results are presented in Table 47.

PBDEs

PBDEs were not detected at concentrations above the reporting limit. PBDE results are presented in Table 47.

5.9 Hamm Creek

5.9.1 Site Description

The Hamm Creek bank sampling site is located at approximately RM 4.4 west. The upland area was part of the Hamm Creek habitat restoration project. The site is owned by Seattle City Light. The mudflat was accessed by boat.

5.9.2 Previous Investigations

Eighteen surface sediment samples were collected near the site as part of the sediment RI (Figure 11). Only one sample (WIT258) exceeded the SQS and was less than or equal to the CSL for PCBs. WIT258 exceeded the SQS by a factor of 1.8 (Windward 2010a).

The beach area north of the site was investigated as part of the dioxin and furan study to supplement the RI (Windward 2010b). One eight-point composite sample (LDW-SS544) was collected along the beach. The subsample locations (LDW-SS544-A through LDW-SS544G) that made up sample LDW-SS544 are shown on Figure 11. LDW-SS544 was collected from a depth of 0 to 10 cm. Samples were analyzed for dioxin and furan congeners, grain size, TOC, arsenic, PCBs, and PAHs.

5.9.3 Bank Sampling Activities and Soil Conditions

Three bank samples (HC-BS-1 through HC-BS-3) were collected along one transect perpendicular to the shore in the pocket beach as specified by Ecology. Sample locations are shown on Figure 11. Samples were collected from depths of approximately 1 to 10 cm using a shovel (Appendix A).

Bank material generally consisted of moist, brown, slightly silty sand. Samples were collected at elevations +11.5, +12.5, and +14 feet and are considered to be from the vadose zone. No evidence of contamination was observed from field screening. Field screening results and soil condition description are presented in Table A-1 in Appendix A.

5.9.4 Bank Sampling Analytical Results

Analytical results are presented in Tables 50 through 55.

TPH

Gasoline-, diesel-, and oil-range petroleum hydrocarbons were not detected at concentrations above reporting limits. TPH results are presented in Table 50.

Metals

The three samples had detections of five or more of the eight metals analyzed. Metal results are presented in Table 50. Metals are compared directly with AET criteria in Table 54. Arsenic is compared to the RAL and the OSV natural background level in Table 55.

Arsenic. Arsenic was detected in samples HC-BS-2 and HC-BS-3 at concentrations of 6.4 and 6.1 mg/kg, respectively. These concentrations exceeded the most stringent soil screening level but were below the natural background level for arsenic. The reporting limit for arsenic exceeded screening levels. Concentrations were below AET criteria (Table 54). Concentrations were below the OSV natural background level and the RAL (Table 55).

Cadmium. Cadmium was detected in samples HC-BS-2 and HC-BS-3 at a concentration of 0.2 mg/kg. This concentration exceeded the most stringent soil screening level but is below with the natural background level in the Puget Sound area of 1 mg/kg (Ecology 1994). The reporting limit for cadmium exceeded screening levels. Concentrations were below AET criteria.

Chromium. Chromium was detected in the three samples at concentrations ranging from 11.7 to 12.1 mg/kg, below screening levels and the natural chromium background level. Concentrations were below AET criteria.

Copper. Copper was detected in the three samples at concentrations ranging from 9.9 to 11.1 mg/kg. These concentrations exceeded the most stringent soil screening level of 0.053 mg/kg but were below the natural copper background level in the Puget Sound area of 36 mg/kg (Ecology 1994). Concentrations were below AET criteria.

Lead. Lead was detected in samples HC-BS-2 and HC-BS-3 at a concentration of 3 mg/kg, below screening levels. Concentrations were below AET criteria.

Mercury. Mercury was not detected in the three samples at concentrations above the reporting limit.

Silver. Silver was not detected in samples above the reporting limit. The reporting limit for silver exceeded the most stringent screening level.

Zinc. Zinc was detected in the three samples at concentrations ranging from 33 to 38 mg/kg. These concentrations exceeded the most stringent soil screening level. Concentrations were below AET criteria.

Semivolatile Organic Compounds

Analytical results for SVOCs are presented in Table 51 and are described below, organized by subgroup. SVOCs that are included in the SMS are compared to AET criteria in Table 54. The cPAH TEQ concentrations are compared to the OSV natural background concentration and the RAL in Table 13.

Chlorinated Hydrocarbons. Chlorinated hydrocarbons were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded screening levels. Reporting limits were below AET criteria.

Acid Extractables. Phenol was detected in sample HC-BS-1 at a concentration of 18 µg/kg, which is below screening levels. Reporting limits for some compounds exceeded screening levels. Reporting limits were below AET criteria.

Phthalates. Diethyl phthalate was detected in samples HC-BS-1 and HC-BS-2 at concentrations of 15 and 12 µg/kg, respectively, which are below screening levels. Reporting limits for some compounds exceeded screening levels. Detected concentrations and reporting limits were below AET criteria.

Miscellaneous Extractables. The miscellaneous extractable SVOCs were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded screening levels.

PAHs. PAHs were detected at concentrations ranging from 2.8 to 8.7 µg/kg. The three samples had PAHs at concentrations exceeding the most stringent soil screening level. Reporting limits for some compounds exceeded screening levels. Concentrations were below AET criteria (Table 54). The cPAH TEQ concentrations were below the OSV natural background and the RAL (Table 55).

Pesticides

Pesticides were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the screening levels. Pesticide results are presented in Table 52.

PCBs

PCBs were not detected at concentrations above the reporting limits. Reporting limits for some compounds exceeded the screening levels. PCB results are presented in Table 52. The reporting limits for the total PCB concentrations are below AET criteria (Table 54). The reporting limit for total PCBs is above the OSV natural background level but below the RAL (Table 55).

TBT

TBT was not detected at concentrations above the reporting limits. TBT results are presented in Table 52.

Dioxin/Furans

The dioxin/furan TEQ concentrations ranged from 0.86 to 1.81 pg/g and were below the OSV natural background level and the RAL (Table 55). Individual dioxin/furan congener and homolog results are presented in Table 53.

PBDEs

PBDEs were not detected at concentrations above the reporting limits. PBDE results are presented in Table 53.

6.0 REFERENCES

Ecology, 1994. Natural Background Soil Metals Concentrations in Washington State. Publication 94-115, Washington State Department of Ecology, Olympia, Washington.

Ecology, 2007. Lower Duwamish Waterway Source Control Action Plan for Early Action Area 2. Washington State Department of Ecology. Publication No. 07-09-002. June 2007.

Hart Crowser, 2011a. Lower Duwamish Waterway Bank Sampling Reconnaissance Plan, Prepared for Washington State Department of Ecology. April 21, 2011.

Hart Crowser, 2011b. Sampling and Analysis Plan/Quality Assurance Project Plan Lower Duwamish Waterway Bank Sampling Prepared for Washington State Department of Ecology April 21, 2011.

LDWG, 2010. Draft Final Feasibility Study Lower Duwamish Waterway, , Prepared by AECOM for the Lower Duwamish Waterway Group, October 15, 2010.

Windward, 2010a. Remedial Investigation Report. Prepared by Windward Environmental LLC for the Lower Duwamish Waterway Group. July 2010.

Windward, 2010b. Technical Memorandum: 2009/2010 Surface Sediment Sampling Results for Dioxins and Furnas and Other Chemicals. Prepared by Windward Environmental LLC for the Lower Duwamish Waterway Group. July 2010.

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Table 1 - Bank Sampling Sites

Site Name	Site Address	King County Parcel Number	Rationale for Investigation	Site Access	Sampling Techniques	Number of Samples
Riverside Marina	4100 West Marginal Way SW	7666703532	Old marina, industrial history, pilings	Land - T-105 park	Hand tools	5
T-107 CKD	5402 West Marginal Way SW	1924049103	Unknown white material, potential cement kiln dust	Boat	Vertical face/ hand tools	5
SeaTac Marine	6701 Fox Ave South	0001800104	Shipyard, industrial activity	Boat	Vertical face/ hand tools	3
Boyer -Trotsky Street End	South Orchard St & 2nd Ave South	292404HYDR	Industrial activity	Land - street end	Hand tools	4
Seattle Iron & Metals	620 South Othello St	2924049089	Industrial activity, brick and debris	Boat	Vertical face/ hand tools	4
PS Truck Lines	7401 8TH Ave South	2136200670	Former Seattle concrete, white/grey material	Boat	Vertical face/ hand tools	11
South Park Street End	South Rose Street	322404HYDR	High public use area	Land - street end	Push probe	4
Sea King Industrial	1620 South 92nd Place	0001600060	Dumping, industrial activity	Boat or land -industrial park	Hand tools	6
Hamm Creek	9850 W Marginal Pl South	5624200931	Transfer station, dredge spoils	Land - Seattle City Light	Hand tools	3

Table 2 - Riverside Marina Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	RM-BS-1 5/12/2011	RM-BS-2 5/12/2011	RM-BS-3 5/12/2011	RM-BS-4 5/12/2011	RM-BS-5 5/12/2011
Conventionals in %									
Total Solids					86.1	85	92.2	85.7	89.6
Total Organic Carbon					2	0.949	0.283	0.597	1.35
TPH in mg/kg									
Diesel Range Organics			200		49	13	5.6	28	26 U
Lube Oil			2,000		120	29	11 U	340	64
Gasoline Range Organics			30/100[d]		9.9	5.8 U	8.4	7.3 U	4.8 U
BTEX in ug/kg									
Benzene			0.0002	18,180	*17 U*	*14 U*	*20 U*	*18 U*	*12 U*
Ethyl Benzene			1.70	8,000,000	*17 U*	*14 U*	*20 U*	*18 U*	*12 U*
m,p-Xylene			200	16,000,000	33 U	29 U	40 U	36 U	24 U
o-Xylene			200	16,000,000	29	120	**2,500**	130	120
Toluene			698	6,400,000	17 U	14 U	20 U	18 U	12 U
Metals in mg/kg									
Arsenic	7		1.58E-04	20	*29 U*	**6.3**	**5.8**	**43**	**8.5**
Cadmium	1	26	0.001	80	**1**	**0.3**	*0.2 U*	*0.6 U*	*0.2 U*
Chromium	48	5,201	42	240	**178**	15.3	13.1	24	16.6
Copper	36	780	0.053	3,200	**118**	**29.6**	**22**	**93.3**	**49.9**
Lead	24	1,133	5.4	250	**120**	**70**	**14**	**21**	**72**
Mercury	0.07	0.41	2.70E-04		**1.05**	**0.04**	**0.07**	*0.02 U*	**0.31**
Silver		12	0.013	400	*2 U*	*0.3 U*	*0.3 U*	*0.9 U*	*0.3 U*
Zinc	85	327	2.03	24,000	**334**	**58**	**34**	**197**	**73**

Notes:

a) Natural Background Concentrations for the Puget Sound Area (Ecology 1994).

b) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

d) MTCA Method B levels except for lead and arsenic where Method A values are used. Values from CLARC Database.

e) 30 mg/kg with benzene, 100 mg/kg without benzene.

U = Not detected at reporting limit indicated.

J = Estimated value.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 3 - Riverside Marina Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	RM-BS-1 5/12/2011	RM-BS-2 5/12/2011	RM-BS-3 5/12/2011	RM-BS-4 5/12/2011	RM-BS-5 5/12/2011
Semivolatiles in ug/kg								
Chlorinated Hydrocarbons in ug/kg								
1,2,4-Trichlorobenzene		0.40		*18 U*	*18 U*	*20 U*	*19 U*	*19 U*
1,2-Dichlorobenzene	67.6	3.79		*18 U*	*18 U*	*20 U*	*19 U*	*19 U*
1,3-Dichlorobenzene		275.20	7,200,000	18 U	18 U	20 U	19 U	19 U
1,4-Dichlorobenzene	92.0	0.41		*18 U*	*18 U*	*20 U*	*19 U*	*19 U*
2,4,6-Trichlorophenol				89 U	90 U	98 U	97 U	97 U
Acid Extractables								
2,4-Dimethylphenol	37	2.03		R	R	R	R	R
2 Methylphenol	91	2.69		*18 U*	*18 U*	*20 UJ*	*19 U*	*19 U*
4 Methylphenol	979	22.13		18 U	18 U	20 U	19 U	19 U
Benzoic acid	9,622	644.32		180 U	180 U	200 U	190 U	190 U
Benzyl alcohol	785	55.02	8,000,000	18 U	18 U	20 U	19 U	19 U
Pentachlorophenol	381	2.56	2,500	*89 UJ*	*90 UJ*	*98 UJ*	*97 UJ*	*97 UJ*
Phenol	733	23.88	24,000,000	**82**	18 U	20 U	19 U	19 U
Phthalates								
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	35 U	18 U	20 U	33 U	46 U
Butyl benzyl phthalate	100	3.95	526,000	*18 U*	*18 U*	*20 U*	*19 U*	*19 U*
Diethyl phthalate	3,157	199.78	64,000,000	18 U	18 U	20 U	19 U	19 U
Dimethyl phthalate	1,631	40.95		18 U	18 U	20 U	19 U	19 U
Di-n-butyl phthalate	5,003	81.36		42	18 U	20 U	19 U	19 U
Di-n-octyl phthalate	1,161	0.55		*18 U*	*18 U*	*20 U*	*19 U*	*19 U*
Miscellaneous Extractables								
Hexachlorobenzene	8.1	0.24	625	*18 U*	*18 U*	*20 U*	*19 U*	*19 U*
Hexachlorobutadiene	97	1,281	12,820	18 U	18 U	20 U	19 U	19 U
Hexachloroethane			71,429	18 U	18 U	20 U	19 U	19 U
N-Nitrosodiphenylamine		9.54	204,000	*18 U*	*18 U*	*20 U*	*19 U*	*19 U*
LPAHs								
2-Methylnaphthalene	833	43.21	320,000	**230**	21	20 U	19 U	19 U
Acenaphthene	330	16.75	4,800,000	**110**	*18 U*	*20 U*	*19 U*	*19 U*
Acenaphthylene	1,363	69.09		18 U	18 U	20 U	19 U	19 U
Anthracene	4,443	223.09	24,000,000	45	18 U	20 U	19 U	19 U
Fluorene	468	23.56	3,200,000	**96**	18 U	20 U	19 U	19 U
Naphthalene	2,197	0.47	1,600,000	**350**	**23**	*20 U*	*19 U*	*19 U*
Phenanthrene	2,019	101.38		**680**	41	74	36	70
HPAHs								
Benzo(a)anthracene	2,201	0.005	1,370	**420**	**46**	**74**	**22**	**84**
Benzo(a)pyrene	1,981	0.01	137	**560**	**56**	**75**	**23**	**98**
Benzo(g,h,i)perylene	620	31.00		**530**	**65**	**72**	**34**	**95**
Chrysene	2,202	0.27	137,000	**540**	**71**	**90**	**36**	**110**
Dibenzo(a,h)anthracene	240	0.07	137	**220**	*18 U*	*20 U*	*19 U*	**21**
Dibenzofuran		15.37	80,000	**150**	*18 U*	*20 U*	*19 U*	*19 U*
Fluoranthene	3,209	160.53	3,200,000	**630**	93	150	54	**170**
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**520**	**50**	**54**	**26**	**80**
Pyrene	20,058	684.43	2,400,000	570	110	160	57	190
Total Benzofluoranthenes	4,601	0.04		**1,300**	**130**	**140**	**62**	**210**

Table 3 - Riverside Marina Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	RM-BS-1 5/12/2011	RM-BS-2 5/12/2011	RM-BS-3 5/12/2011	RM-BS-4 5/12/2011	RM-BS-5 5/12/2011
LPAHs (SIM)								
1-Methylnaphthalene				130	79	4.8 U	3.9 T	8.6
2-Methylnaphthalene	833	43.21	320,000	**250**	**120**	4.8 U	6	19
Acenaphthene	330	16.75	4,800,000	**130**	16	4.8 U	5.7	5.8
Acenaphthylene	1,363	69.09		16	24	5.5	4.4 T	15
Anthracene	4,443	223.09	24,000,000	76	36	4.7 T	12	27
Fluorene	468	23.56	3,200,000	**110**	8.7	4.8 U	11	5.5
Naphthalene	2,197	0.47	1,600,000	**430**	**100**	**3.2** T	**9.5**	**31**
Phenanthrene	2,019	101.38		**740**	**170**	11	60	**110**
HPAHs (SIM)								
Benzo(a)anthracene	2,201	0.005	1,370	**510**	**170**	**29**	**26**	**130**
Benzo(a)pyrene	1,981	0.01	137	**770**	**180**	**52**	**26**	**160**
Benzo(g,h,i)perylene	620	31.00		**400**	**74**	**34**	16	**77**
Chrysene	2,202	0.27	137,000	**640**	**200**	**42**	**34**	**160**
Dibenz(a,h)anthracene	240	0.07	137	**150**	**34**	**10**	**4.5** T	**22**
Dibenzofuran		15.37	80,000	**170**	**36**	4.8 U	7.2	11
Fluoranthene	3,209	160.53	3,200,000	**750**	**360**	51	58	**260**
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**390**	**68**	**28**	**13**	**74**
Pyrene	20,058	684.43	2,400,000	670	340	63	52	260
Total Benzofluoranthenes	4,601	0.04		**1,600**	**320**	**94**	**52**	**300**

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

R = Data are not usable because of significant exceedance of QC criteria.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 4 - Riverside Marina Analytical Results - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	RM-BS-1 5/12/2011	RM-BS-2 5/12/2011	RM-BS-3 5/12/2011	RM-BS-4 5/12/2011	RM-BS-5 5/12/2011
Pesticides in ug/kg								
4,4'-DDD		3.54	4,167	1.8 U	1.9 U	1.9 UJ	1.9 UJ	1.9 UJ
4,4'-DDE		4.70	2,941	1.8 U	1.9 U	1.9 UJ	1.9 UJ	1.9 UJ
4,4'-DDT		36.74	2,941	1.8 U	1.9 U	1.9 UJ	1.9 UJ	1.9 UJ
Aldrin		0.61	58.82	*0.92 UJ*	*0.96 UJ*	*0.94 U*	*0.94 U*	*0.94 U*
alpha-BHC (Benzene HexaChloride)		2.47		0.92 U	0.96 U	0.94 U	0.94 U	0.94 U
beta-BHC		10.23		0.92 U	0.96 U	0.94 U	0.94 U	0.94 U
cis-Chlordane				0.92 U	0.96 U	0.94 U	0.94 U	0.94 U
Dieldrin		0.34	62.5	*1.8 U*	*1.9 U*	*1.9 U*	*1.9 U*	*1.9 U*
alpha-Endosulfan		20.24	480,000	0.92 U	0.96 U	0.94 U	0.94 U	0.94 U
beta-Endosulfan		20.24	480,000	1.8 UJ	1.9 UJ	1.9 U	1.9 U	1.9 U
Endosulfan Sulfate		20.24		1.8 U	1.9 U	1.9 U	1.9 U	1.9 U
Endrin		22.20	24,000	4.8 JP	1.9 U	1.9 UJ	1.9 UJ	1.9 UJ
Endrin Aldehyde		22.20		1.8 UJ	1.9 UJ	1.9 UJ	1.9 UJ	1.9 UJ
gamma-BHC (Lindane)		0.36	24,000	*0.92 U*	*0.96 U*	*0.94 U*	*0.94 U*	*0.94 U*
Heptachlor		0.19	222	*0.92 U*	*0.96 U*	*0.94 U*	*0.94 U*	*0.94 U*
Heptachlor Epoxide		0.81	109.89	*0.92 U*	*0.96 U*	*0.94 U*	*0.94 U*	*0.94 U*
Hexachlorobenzene (HCB)	8.1	0.24	625	*0.92 U*	*0.96 U*	*0.94 U*	*0.94 U*	*0.94 U*
Hexachlorobutadiene	97	1,281	12,821	0.92 U	0.96 U	0.94 U	0.94 U	0.94 U
Toxaphene		0.06	909	*92 U*	*96 U*	*94 UJ*	*94 UJ*	*94 UJ*
trans-Chlordane				0.92 U	0.96 U	0.94 U	0.94 U	0.94 U
PCBs in ug/kg								
Aroclor 1016	242	1.77	5,600	*3.8 U*	*3.9 U*	*3.7 U*	*3.9 U*	*3.7 U*
Aroclor 1221		0.24		*3.8 U*	*3.9 U*	*3.7 U*	*3.9 U*	*3.7 U*
Aroclor 1232		120.00		*3.8 U*	*3.9 U*	*3.7 U*	*3.9 U*	*3.7 U*
Aroclor 1242		0.02		*3.8 U*	*3.9 U*	*3.7 U*	*3.9 U*	*3.7 U*
Aroclor 1248	241	1.02		*5.6 U*	*3.9 U*	*3.7 U*	*16 U*	*15 U*
Aroclor 1254	241	0.42	500	*19 U*	*16 U*	*3.7 U*	**31**	**32**
Aroclor 1260	240	4.77	500	**47**	**16**	3.7 U	**16**	**46**
Aroclor 1262				3.8 U	3.9 U	3.7 U	3.9 U	3.7 U
Aroclor 1268				3.8 U	3.9 U	3.7 U	3.9 U	3.7 U
TBT in ug/kg								
Tributyltin Ion				3.6 U	3.1 U	10 U	3.5 U	3.4 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

P = Sample confirmation exceeded 40 percent on the two chromatographic columns

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 5 - Riverside Marina Analytical Results - Dioxins and PBDEs

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters[b]	MTCA Soil Cleanup Level [c]	RM-BS-1 5/12/2011	RM-BS-2 5/12/2011	RM-BS-3 5/12/2011	RM-BS-4 5/12/2011	RM-BS-5 5/12/2011
Dioxins in pg/g								
2,3,7,8-TCDD		3.02E-05		*0.965 UK*	**1.89**	*0.089 UK*	*0.22 UK*	*0.134 UK*
1,2,3,7,8-PeCDD				8.11	3.64	0.384 T	0.996	0.95 T
1,2,3,4,7,8-HxCDD				3.56	2.36	0.172 T	0.67 T	0.865 T
1,2,3,6,7,8-HxCDD				14.7	4.73	0.419 UK	1.26 T	2.79
1,2,3,7,8,9-HxCDD				8.34	3.58	0.38 T	1.03 T	1.7 T
1,2,3,4,6,7,8-HpCDD				84.9	63.4	4.72	16.2	63.2
OCDD				476	449	31.3	100	512
2,3,7,8-TCDF				8.49	6.03	0.52 T	2.84	1.15
1,2,3,7,8-PeCDF				6.28 J	3.42 J	0.584 T	2.06	0.91 T
2,3,4,7,8-PeCDF				14.2	4.89	0.447 T	3.69	0.983 T
1,2,3,4,7,8-HxCDF				16.7	4.11	0.829 T	4.48	1.7 T
1,2,3,6,7,8-HxCDF				16.4	3.86	0.38 T	3.23	1.16 T
1,2,3,7,8,9-HxCDF				6.54	1.5 T	0.111 T	0.644 T	0.353 T
2,3,4,6,7,8-HxCDF				34.6	5.56	0.378 T	3.94	1.62 T
1,2,3,4,6,7,8-HpCDF				52.8	31.6	3.09	18.9	18.8
1,2,3,4,7,8,9-HpCDF				5.14	4.34	0.166 UK	0.809 T	0.999 T
OCDF				52.4	92.4	4.55 T	9.04	39.4
Total TCDD				32	59.1	2.6	8.82	7.82
Total PeCDD				79.2	65.2	3.29	10.7	10.2
Total HxCDD				156	81.8	3.9	14.5	25.2
Total HpCDD				170	122	9.15	32.9	141
Total TCDF				234	122	3.43	82.7	18.9
Total PeCDF				852	90.1	7.55	63.9	22.8
Total HxCDF				432	55.1	5.63	50	28.3
Total HpCDF				117	73.1	6.8	27.2	51
PDBEs in ug/kg								
2,2',4-Tribromodiphenyl ether (PBDE-17)				4.3 U	0.5 U	0.5 U	0.5 U	1.6 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)				2.3	0.5 U	0.5 U	0.5 U	1.7 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)				9.7 U	0.5 U	0.5 U	0.5 U	1.4 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)				0.5 U	0.5 U	0.5 U	2.1 U	0.5 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)				1 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

K = ion ratios did not meet criteria for positive identification of the analyte

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 6 - Riverside Marina Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		RM-BS-1	RM-BS-2	RM-BS-3	RM-BS-4	RM-BS-5
Sampling Date	LAET	2LAET	5/12/2011	5/12/2011	5/12/2011	5/12/2011	5/12/2011
Metals in mg/kg							
Arsenic	57	93	29 U	6.3	5.8	43	8.5
Cadmium	5.1	6.7	1	0.3	0.2 U	0.6 U	0.2 U
Chromium	260	270	178	15.3	13.1	24	16.6
Copper	390	390	118	29.6	22	93.3	49.9
Lead	450	530	120	70	14	21	72
Mercury	0.41	0.59	**1.05**	0.04	0.07	0.02 U	0.31
Silver	6.1	6.1	2 U	0.3 U	0.3 U	0.9 U	0.3 U
Zinc	410	960	334	58	34	197	73
Semivolatiles in ug/kg							
Chlorinated Hydrocarbons in ug/kg							
1,2,4-Trichlorobenzene	35	50	18 U	18 U	20 U	19 U	19 U
1,2-Dichlorobenzene	170	170	18 U	18 U	20 U	19 U	19 U
1,4-Dichlorobenzene	110	120	18 U	18 U	20 U	19 U	19 U
Acid Extractables in ug/kg							
2,4-Dimethylphenol	29	29	R	R	R	R	R
2-Methylphenol	63	63	18 U	18 U	20 UJ	19 U	19 U
4-Methylphenol	670	670	18 U	18 U	20 U	19 U	19 U
Benzoic acid	650	650	180 U	180 U	200 U	190 U	190 U
Benzyl alcohol	57	73	18 U	18 U	20 U	19 U	19 U
Pentachlorophenol	360	690	89 UJ	90 UJ	98 UJ	97 UJ	97 UJ
Phenol	420	1200	82	18 U	20 U	19 U	19 U
Phthalates in ug/kg							
Bis(2-ethylhexyl)phthalate	1300	1900	35 U	18 U	20 U	33 U	46 U
Butyl benzyl phthalate	63	900	18 U	18 U	20 U	19 U	19 U
Diethyl phthalate	200	200	18 U	18 U	20 U	19 U	19 U
Dimethyl phthalate	71	160	18 U	18 U	20 U	19 U	19 U
Di-n-butyl phthalate	1400	1400	42	18 U	20 U	19 U	19 U
Di-n-octyl phthalate	6200	6200	18 U	18 U	20 U	19 U	19 U
Miscellaneous Extractables in ug/kg							
Dibenzofuran	540	700	150	18 U	20 U	19 U	19 U
Hexachlorobenzene[a]	22	70	0.92 U	0.96 U	0.94 U	0.94 U	0.94 U
Hexachlorobutadiene[a]	11	120	0.92 U	0.96 U	0.94 U	0.94 U	0.94 U
N-Nitrosodiphenylamine	28	40	18 U	18 U	20 U	19 U	19 U
LPAHs in ug/kg							
2-Methylnaphthalene	670	1400	230	21	20 U	19 U	19 U
Acenaphthene	500	730	110	18 U	20 U	19 U	19 U
Acenaphthylene	1300	1300	18 U	18 U	20 U	19 U	19 U
Anthracene	960	4400	45	18 U	20 U	19 U	19 U
Fluorene	540	1000	96	18 U	20 U	19 U	19 U
Naphthalene	2100	2400	350	23	20 U	19 U	19 U
Phenanthrene	1500	5400	680	41	74	36	70
Total LPAHs [b]	5200	13000	1281	64	74	36	70
HPAHs in ug/kg							
Benzo(a)anthracene	1300	1600	420	46	74	22	84
Benzo(a)pyrene	1600	3000	560	56	75	23	98
Benzo(g,h,i)perylene	670	720	530	65	72	34	95
Chrysene	1400	2800	540	71	90	36	110
Dibenzo(a,h)anthracene	230	540	220	18 U	20 U	19 U	21
Fluoranthene	1700	2500	630	93	150	54	170
Indeno(1,2,3-cd)pyrene	600	690	520	50	54	26	80
Pyrene	2600	3300	570	110	160	57	190
Total Benzofluoranthenes	3200	3600	1300	130	140	62	210
Total HPAHs [b]	12000	17000	5290	621	815	314	1058
LPAHs (SIM) in ug/kg							
2-Methylnaphthalene	670	1400	250	120	4.8 U	6	19
Acenaphthene	500	730	130	16	4.8 U	5.7	5.8
Acenaphthylene	1300	1300	16	24	5.5	4.4 T	15

Table 6 - Riverside Marina Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		RM-BS-1	RM-BS-2	RM-BS-3	RM-BS-4	RM-BS-5
Sampling Date	LAET	2LAET	5/12/2011	5/12/2011	5/12/2011	5/12/2011	5/12/2011
Anthracene	960	4400	76	36	4.7 T	12	27
Fluorene	540	1000	110	8.7	4.8 U	11	5.5
Naphthalene	2100	2400	430	100	3.2 T	9.5	31
Phenanthrene	1500	5400	740	170	11	60	110
Total LPAHs [b]	5200	13000	1502	354.7	24.4 J	102.6 J	194.3
HPAHs (SIM) in ug/kg							
Benzo(a)anthracene	1300	1600	510	170	29	26	130
Benzo(a)pyrene	1600	3000	770	180	52	26	160
Benzo(g,h,i)perylene	670	720	400	74	34	16	77
Chrysene	1400	2800	640	200	42	34	160
Dibenz(a,h)anthracene	230	540	150	34	10	4.5 T	22
Fluoranthene	1700	2500	750	360	51	58	260
Indeno(1,2,3-cd)pyrene	600	690	390	68	28	13	74
Pyrene	2600	3300	670	340	63	52	260
Total Benzofluoranthenes	3200	3600	1600	320	94	52	300
Total HPAHs [b]	12000	17000	5880	1746	403	281.5 J	1443
Miscellaneous Extractables (SIM) in ug/kg							
Dibenzofuran	540	700	170	36	4.8 U	7.2	11
PCBs in ug/kg							
Aroclor 1016			3.8 U	3.9 U	3.7 U	3.9 U	3.7 U
Aroclor 1221			3.8 U	3.9 U	3.7 U	3.9 U	3.7 U
Aroclor 1232			3.8 U	3.9 U	3.7 U	3.9 U	3.7 U
Aroclor 1242			3.8 U	3.9 U	3.7 U	3.9 U	3.7 U
Aroclor 1248			5.6 U	3.9 U	3.7 U	16 U	15 U
Aroclor 1254			19 U	16 U	3.7 U	31	32
Aroclor 1260			47	16	3.7 U	16	46
Aroclor 1262			3.8 U	3.9 U	3.7 U	3.9 U	3.7 U
Aroclor 1268			3.8 U	3.9 U	3.7 U	3.9 U	3.7 U
Total PCBs	130	1000	47	16	3.7 U	47	78

Notes:
Blank indicates no AET established for specific analyte.
Bolded value exceeds LAET.
Boxed value exceeds 2LAET.
Italicized value has detection limit that exceeds one or more criteria.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
R = Data are not usable because of significant exceedance of QC criteria.
a) Compounds are reported from the pesticides (EPA Method 8081) instead of SVOCs (EPA Method 8270) because EPA Method 8081 has a lower reporting limit for the compounds indicated.
b) Detected compound concentrations are summed to calculate the total LPAH and HPAH concentrations.

Table 7 - Riverside Marina Analytical Results Compared to LDW Risk Drivers

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	RM-BS-1 5/12/2011	RM-BS-2 5/12/2011	RM-BS-3 5/12/2011	RM-BS-4 5/12/2011	RM-BS-5 5/12/2011
Arsenic in mg/kg	28	8	*29 U*	6.3	5.8	**43**	**8.5**
cPAHs TEQ in ug/kg [c]	900	7.3	**1041.4**	**241.2**	**68.52**	**35.89**	**214.2**
Total PCBs in ug/kg [d]	240	2	**47**	**16**	*3.7 U*	**47**	**78**
Dioxin/Furans TEQ in pg/g [e]	25	2	**25.56**	**11.43**	**0.97**	**4.48**	**3.47**

Notes:

Boxed value exceeds Remedial Action Level.

Bolded value exceeds Natural Background Level.

Italicized value has detection limit that exceeds one or more criteria.

U = Not detected at the reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

a) Remedial Action Levels for Alternative 5C, provided by Ecology as presented in the Draft Final Feasibility Study for the Lower Duwamish Waterway (LDWG 2010).

b) Natural Background Values based on Ocean Survey Vessel (OSV) Bold Data (LDWG 2010).

c) The cPAH TEQ concentration was calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270. The cPAH was calculated as the sum of each individual PAH concentration multiplied by the corresponding toxicity factor (TEF). When the individual PAH compound concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

d) Total PCBs were calculated by summing the detected values for the individual components. For individual samples in which none of the individual components were detected, the total value was given a value equal to the highest reporting limit of an individual component, and assigned a U-qualifier.

e) The TEQ was calculated as the sum of each dioxin/furan congener concentration multiplied by the corresponding TEF value. When the dioxin/furan congener concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

Table 8 - T107 CKD Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	T107-BS-1 5/10/2011	T107-BS-2 5/10/2011	T107-BS-3 5/10/2011	T107-BS-4 5/10/2011	T107-BS-5 5/10/2011
Conventionals in %									
Total Solids					50.4	61	36.8	69.1	49.7
Total Organic Carbon					2.65	1.51	0.547	0.508	0.336
TPH in mg/kg									
Diesel Range Organics			200		10 U	5.8 U	13 U	6.6 U	8.9 U
Lube Oil			2,000		20 U	12 U	26 U	13 U	18 U
Gasoline Range Organics			30/100[e]		20 U	7.6 U	26 U	10 U	14 U
BTEX in ug/kg									
Benzene			0.0002	18,180	*49 U*	*19 U*	*66 U*	*25 U*	*35 U*
Ethyl Benzene			1.70	8,000,000	*49 U*	*19 U*	*66 U*	*25 U*	*35 U*
m,p-Xylene			200	16,000,000	98 U	38 U	130 U	50 U	69 U
o-Xylene			200	16,000,000	49 U	19 U	66 U	25 U	35 U
Toluene			698	6,400,000	49 U	19 U	66 U	25 U	35 U
Metals in mg/kg									
Arsenic	7		1.58E-04	20	**197**	**310**	**190**	**313**	**324**
Cadmium	1	26	0.001	80	*2 U*	**3**	**2**	**2**	**4**
Chromium	48	5,201	42	240	8	6	8	5	9
Copper	36	780	0.053	3,200	**72**	**108**	**70**	**90**	**87**
Lead	24	1,133	5.4	250	**730**	**1140**	**640**	**970**	**1610**
Mercury	0.07	0.41	2.70E-04		*0.04 U*	*0.03 U*	*0.05 U*	*0.03 U*	*0.04 U*
Silver		12	0.013	400	**3**	**3**	**2**	**3**	**4**
Zinc	85	327	2.03	24,000	**440**	**1280**	**603**	**1440**	**2480**

Notes:

a) Natural Background Concentrations for the Puget Sound Area (Ecology 1994)

b) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011

c) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

d) MTCA Method B levels except for lead and arsenic where Method A values are used. Values from CLARC Database

e) 30 mg/kg with benzene, 100 mg/kg without benzene

U = Not detected at reporting limit indicated.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded

Values that exceed screening levels protective of sediment standards are boxed

Values that exceed MTCA Method B (Human Health Criteria) are shaded

Italicized value has detection limit that exceeds one or more criteria

Blank indicates sample not analyzed for specific analyte or no criteria available

Table 9 - T107 CKD Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS[a]	Most Stringent Soil Standard to Protect Potable Ground Waters[b]	MTCA Soil Cleanup Level [c]	T107-BS-1 5/10/2011	T107-BS-2 5/10/2011	T107-BS-3 5/10/2011	T107-BS-4 5/10/2011	T107-BS-5 5/10/2011
Semivolatiles in ug/kg								
Chlorinated Hydrocarbons in ug/kg								
1,2,4-Trichlorobenzene		0.40		*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
1,2-Dichlorobenzene	67.6	3.79		*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
1,3-Dichlorobenzene		275.20	7,200,000	*6,000 U*	19 U	*5,700 U*	19 U	18 U
1,4-Dichlorobenzene	92.0	0.41		*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
2,4,6-Trichlorophenol				30,000 U	96 U	28,000 U	96 U	92 UJ
Acid Extractables in ug/kg								
2,4-Dimethylphenol	37	2.03		*6,000 UJ*	*19 UJ*	*5,700 UJ*	*19 UJ*	*18 UJ*
2 Methylphenol	91	2.69		*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 UJ*
4 Methylphenol	979	22.13		*6,000 U*	19 U	*5,700 U*	19 U	18 UJ
Benzoic acid	9,622	644.32		*60,000 UJ*	190 UJ	*57,000 UJ*	190 UJ	180 UJ
Benzyl alcohol	785	55.02	8,000,000	*6,000 U*	19 U	*5,700 U*	19 U	18 UJ
Pentachlorophenol	381	2.56	2,500	*30,000 U*	*96 UJ*	*28,000 U*	*96 UJ*	*92 UJ*
Phenol	733	23.88	24,000,000	*6,000 U*	19 U	*5,700 U*	19 U	18 UJ
Phthalates in ug/kg								
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	*6,000 U*	19 U	*5,700 U*	26 U	18 U
Butyl benzyl phthalate	100	3.95	526,000	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Diethyl phthalate	3,157	199.78	64,000,000	*6,000 U*	19 U	*5,700 U*	19 U	18 U
Dimethyl phthalate	1,631	40.95		*6,000 U*	19 U	*5,700 U*	19 U	18 U
Di-n-butyl phthalate	5,003	81.36		*6,000 U*	19 U	*5,700 U*	19 U	18 U
Di-n-octyl phthalate	1,161	0.55		*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Miscellaneous Extractables in ug/kg								
Hexachlorobenzene	8.1	0.24	625	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Hexachlorobutadiene	97	1,281	12,820	*6,000 U*	19 U	*5,700 U*	19 U	18 U
Hexachloroethane			71,429	6,000 U	19 U	5,700 U	19 U	18 U
N-Nitrosodiphenylamine		9.54	204,000	*6,000 UJ*	*19 UJ*	*5,700 UJ*	*19 U*	*18 U*
LPAHs								
2-Methylnaphthalene	833	43.21	320,000	*6,000 U*	19 U	*5,700 U*	19 U	18 U
Acenaphthene	330	16.75	4,800,000	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Acenaphthylene	1,363	69.09		*6,000 U*	19 U	*5,700 U*	19 U	18 U
Anthracene	4,443	223.09	24,000,000	*6,000 U*	19 U	*5,700 U*	19 U	18 U
Fluorene	468	23.56	3,200,000	*6,000 U*	19 U	*5,700 U*	19 U	18 U
Naphthalene	2,197	0.47	1,600,000	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Phenanthrene	2,019	101.38		*6000 U*	19 U	*5700 U*	19 U	18 U
HPAHs								
Benzo(a)anthracene	2,201	0.005	1,370	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Benzo(a)pyrene	1,981	0.01	137	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Benzo(g,h,i)perylene	620	31.00		*6,000 U*	19 U	*5,700 U*	19 U	18 U
Chrysene	2,202	0.27	137,000	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Dibenzo(a,h)anthracene	240	0.07	137	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Dibenzofuran		15.37	80,000	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Fluoranthene	3,209	160.53	3,200,000	*6,000 UJ*	19 UJ	*5,700 UJ*	19 UJ	18 UJ
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
Pyrene	20,058	684.43	2,400,000	*6,000 U*	19 U	*5,700 U*	19 U	18 U

Table 9 - T107 CKD Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS[a]	Most Stringent Soil Standard to Protect Potable Ground Waters[b]	MTCA Soil Cleanup Level [c]	T107-BS-1 5/10/2011	T107-BS-2 5/10/2011	T107-BS-3 5/10/2011	T107-BS-4 5/10/2011	T107-BS-5 5/10/2011
Total Benzofluoranthenes	4,601	0.04		*6,000 U*	*19 U*	*5,700 U*	*19 U*	*18 U*
LPAHs (SIM)								
1-Methylnaphthalene	833	43.21	320,000	5 U	4.9 U	4.9 U	4.7 U	4.6 U
2-Methylnaphthalene	330	16.75	4,800,000	5 U	4.9 U	4.9 U	4.7 U	4.6 U
Acenaphthene	1,363	69.09		5 U	4.9 U	4.9 U	4.7 U	4.6 U
Acenaphthylene	4,443	223.09	24,000,000	**1,000**	4.9 U	19	4.7 U	4.6 U
Anthracene	468	23.56	3,200,000	5 U	4.9 U	4.9 U	4.7 U	4.6 U
Fluorene	2,197	0.47	1,600,000	*5* U	*4.9* U	*4.9* U	*4.7* U	*4.6* U
Naphthalene	2,019	101.38		5 U	4.9 U	3.0 T	4.7 U	2.8 T
Phenanthrene	2,019	101.38		6.4	9.3	4.9 U	7.3	4 T
HPAHs (SIM)								
Benzo(a)anthracene	2,201	0.005	1,370	*5* U	**3.9** T	*4.9* U	*4.7* U	*4.6* U
Benzo(a)pyrene	1,981	0.01	137	*5* U	*4.9* U	*4.9* U	*4.7* U	*4.6* U
Benzo(g,h,i)perylene	620	31.00		6	4.9 U	4.9 U	4.7 U	4.6 U
Chrysene	2,202	0.27	137,000	*5* U	**3.6** T	*4.9* U	**3.1** T	*4.6* U
Dibenz(a,h)anthracene	240	0.07	137	*5* U	*4.9* U	*4.9* U	*4.7* U	*4.6* U
Dibenzofuran		15.37	80,000	5 U	4.9 U	4.9 U	4.7 U	4.6 U
Fluoranthene	3,209	160.53	3,200,000	22	10	3.4 T	4.2 T	4.6 U
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**5** T	*5* U	*4.9* U	*4.7* U	*4.6* U
Pyrene	20,058	684.43	2,400,000	5	9.5	2.8 T	2.2 T	4.6 U
Total Benzofluoranthenes	4,601	0.04		*5* U	*4.9* U	*4.9* U	*4.7* U	*4.6* U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL

Values that exceed the most stringent soil standard to protect potable groundwater are bolded

Values that exceed screening levels protective of sediment standards are boxed

Values that exceed MTCA Method B (Human Health Criteria) are shaded

Italicized value has detection limit that exceeds one or more criteria

Blank indicates sample not analyzed for specific analyte or no criteria available

Table 10 - T107 CKD Analytical Results - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS[a]	Most Stringent Soil Standard to Protect Potable Ground Waters[b]	MTCA Soil Cleanup Level [c]	T107-BS-1 5/10/2011	T107-BS-2 5/10/2011	T107-BS-3 5/10/2011	T107-BS-4 5/10/2011	T107-BS-5 5/10/2011
Pesticides in ug/kg								
4,4'-DDD		3.54	4,167	1.9 U	2 U	2 U	2 U	2 U
4,4'-DDE		4.70	2,941	1.9 U	2 U	2 U	2 U	2 U
4,4'-DDT		36.74	2,941	1.9 U	2 U	2 U	2 U	2 U
Aldrin		0.61	58.82	*0.96 U*	*0.98 U*	*0.99 U*	*0.99 U*	*0.98 U*
alpha-BHC (Benzene HexaChloride)		2.47		0.96 U	0.98 U	0.99 U	0.99 U	0.98 U
beta-BHC		10.23		0.96 U	0.98 U	0.99 U	0.99 U	0.98 U
cis-Chlordane				0.96 U	0.98 U	0.99 U	0.99 U	0.98 U
Dieldrin		0.34	62.5	*1.9 U*	*2 U*	*2 U*	*2 U*	*2 U*
alpha-Endosulfan		20.24	480,000	0.96 U	0.98 U	0.99 U	0.99 U	0.98 U
beta-Endosulfan		20.24	480,000	1.9 U	2 U	2 U	2 U	2 U
Endosulfan Sulfate		20.24		1.9 U	2 U	2 U	2 U	2 U
Endrin		22.20	24,000	1.9 U	2 U	2 U	2 U	2 U
Endrin Aldehyde		22.20		1.9 U	2 U	2 U	2 U	2 U
gamma-BHC (Lindane)		0.36	24,000	*0.96 U*	*0.98 U*	*0.99 U*	*0.99 U*	*0.98 U*
Heptachlor		0.19	222	*0.96 U*	*0.98 U*	*0.99 U*	*0.99 U*	*0.98 U*
Heptachlor Epoxide		0.81	110	*0.96 U*	*0.98 U*	*0.99 U*	*0.99 U*	*0.98 U*
Hexachlorobenzene (HCB)	8.1	0.24	625	*0.96 U*	*0.98 U*	*0.99 U*	*0.99 U*	*0.98 U*
Hexachlorobutadiene	97	1,281	12,821	0.96 U	0.98 U	0.99 U	0.99 U	0.98 U
Toxaphene		0.06	909	*96 U*	*98 U*	*99 U*	*99 U*	*98 U*
trans-Chlordane				0.96 U	0.98 U	0.99 U	0.99 U	0.98 U
PCBs in ug/kg								
Aroclor 1016	242	1.77	5,600	*3.8 U*	*3.9 U*	*4 U*	*3.9 U*	*3.9 U*
Aroclor 1221		0.24		*3.8 U*	*3.9 U*	*4 U*	*3.9 U*	*3.9 U*
Aroclor 1232		120.00		3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1242		0.02		*3.8 U*	*3.9 U*	*4 U*	*3.9 U*	*3.9 U*
Aroclor 1248	241	1.02		*3.8 U*	*3.9 U*	*4 U*	*3.9 U*	*3.9 U*
Aroclor 1254	241	0.42	500	*3.8 U*	*3.9 U*	*4 U*	**2.2** T	*3.9 U*
Aroclor 1260	240	4.77	500	3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1262				3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1268				3.8 U	3.9 U	4 U	3.9 U	3.9 U
TBT in ug/kg								
Tributyltin Ion				3.6 U	3.6 U	3.6 U	3.7 U	3.4 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 11 - T107 CKD Analytical Results - Dioxins and PBDEs

Sample ID	Vadose Zone	Most Stringent		T107-BS-1	T107-BS-2	T107-BS-3	T107-BS-4	T107-BS-5
Sampling Date	Soil Protective of SQS[a]	Soil Standard to Protect Potable Ground Waters[b]	MTCA Soil Cleanup Level c	5/10/2011	5/10/2011	5/10/2011	5/10/2011	5/10/2011
Dioxins in pg/g								
2,3,7,8-TCDD		3.02E-05		*0.0467* U	*0.0483* U	*0.168* UK	*0.0788* UK	*0.0976* UK
1,2,3,7,8-PeCDD				0.173 UK	0.0591 U	0.756 T	0.21 UK	0.341 T
1,2,3,4,7,8-HxCDD				0.0949 U	0.0778 U	0.675 T	0.212 UK	0.221 T
1,2,3,6,7,8-HxCDD				0.124 UK	0.51 T	2.14	1.06 T	0.677 T
1,2,3,7,8,9-HxCDD				0.229 T	0.277 UK	2.24	0.646 T	0.631 UK
1,2,3,4,6,7,8-HpCDD				2.29	15.9	43.2	23.7	10.4
OCDD				10.5 U	142	180	217	38.8
2,3,7,8-TCDF				0.0335 UK	0.0562 UK	0.0579 T	0.197 UK	0.0697 T
1,2,3,7,8-PeCDF				0.0906 UK	0.0397 U	0.0559 T	0.081 UK	0.0857 UK
2,3,4,7,8-PeCDF				0.108 T	0.0442 U	0.0659 T	0.144 T	0.0685 U
1,2,3,4,7,8-HxCDF				0.0514 U	0.0882 U	0.0778 UK	0.258 UK	0.104 T
1,2,3,6,7,8-HxCDF				0.0467 U	0.08 U	0.0459 UK	0.0461 U	0.0418 UK
1,2,3,7,8,9-HxCDF				0.0821 U	0.138 U	0.0761 U	0.0431 U	0.113 U
2,3,4,6,7,8-HxCDF				0.0566 U	0.0932 U	0.0536 U	0.184 T	0.0697 UK
1,2,3,4,6,7,8-HpCDF				0.07 U	0.508 UK	0.425 U	2.16 U	0.235 UK
1,2,3,4,7,8,9-HpCDF				0.131 U	0.118 U	0.0627 U	0.0875 UK	0.22 U
OCDF				0.142 U	1.15 T	0.459 UK	3.76 T	0.25 U
Total TCDD				0.146	0.0775	1.56	0.396	0.0817
Total PeCDD				0.173 U	0.0591 U	4.82	0.982	1.04
Total HxCDD				0.853	2.05	19.7	7.18	4.89
Total HpCDD				2.29	32.8	80.3	43.6	19.7
Total TCDF				0.0335 U	0.0562 U	0.17	1.44	0.0697
Total PeCDF				0.108	0.341	0.124	2.59	0.0685 U
Total HxCDF				0.0821 U	0.481	0.158	2.84	0.104
Total HpCDF				0.131 U	1.68	1.07	5.23	0.22
PDBEs in ug/kg								
2,2',4-Tribromodiphenyl ether (PBDE-17)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

K = ion ratios did not meet criteria for positive identification of the analyte

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 12 - T107 CKD Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		T107-BS-1	T107-BS-2	T107-BS-3	T107-BS-4	T107-BS-5
Sampling Date	LAET	2LAET	5/10/2011	5/10/2011	5/10/2011	5/10/2011	5/10/2011
Metals in mg/kg							
Arsenic	57	93	**197**	**310**	**190**	**313**	**324**
Cadmium	5.1	6.7	2 U	3	2	2	4
Chromium	260	270	8	6	8	5	9
Copper	390	390	72	108	70	90	87
Lead	450	530	**730**	**1140**	**640**	**970**	**1610**
Mercury	0.41	0.59	0.04 U	0.03 U	0.05 U	0.03 U	0.04 U
Silver	6.1	6.1	3	3	2	3	4
Zinc	410	960	**440**	**1280**	**603**	**1440**	**2480**
Semivolatiles in ug/kg							
Chlorinated Hydrocarbons in ug/kg							
1,2,4-Trichlorobenzene	35	50	*6000 U*	19 U	*5700 U*	19 U	18 U
1,2-Dichlorobenzene	170	170	*6000 U*	19 U	*5700 U*	19 U	18 U
1,4-Dichlorobenzene	110	120	*6000 U*	19 U	*5700 U*	19 U	18 U
Acid Extractables in ug/kg							
2,4-Dimethylphenol	29	29	*6000 UJ*	19 UJ	*5700 UJ*	19 UJ	18 UJ
2-Methylphenol	63	63	*6000 U*	19 U	*5700 U*	19 U	18 UJ
4-Methylphenol	670	670	*6000 U*	19 U	*5700 U*	19 U	18 UJ
Benzoic acid	650	650	*60000 UJ*	190 UJ	*57000 UJ*	190 UJ	180 UJ
Benzyl alcohol	57	73	*6000 U*	19 U	*5700 U*	19 U	18 UJ
Pentachlorophenol	360	690	*30000 U*	96 UJ	*28000 U*	96 UJ	92 UJ
Phenol	420	1200	*6000 U*	19 U	*5700 U*	19 U	18 UJ
Phthalates in ug/kg							
Bis(2-ethylhexyl)phthalate	1300	1900	*6000 U*	19 U	*5700 U*	26 U	18 U
Butyl benzyl phthalate	63	900	*6000 U*	19 U	*5700 U*	19 U	18 U
Diethyl phthalate	200	200	*6000 U*	19 U	*5700 U*	19 U	18 U
Dimethyl phthalate	71	160	*6000 U*	19 U	*5700 U*	19 U	18 U
Di-n-butyl phthalate	1400	1400	*6000 U*	19 U	*5700 U*	19 U	18 U
Di-n-octyl phthalate	6200	6200	6000 U	19 U	5700 U	19 U	18 U
Miscellaneous Extractables in ug/kg							
Dibenzofuran	540	700	*6000 U*	19 U	*5700 U*	19 U	18 U
Hexachlorobenzene[a]	22	70	0.96 U	0.98 U	0.99 U	0.99 U	0.98 U
Hexachlorobutadiene[a]	11	120	0.96 U	0.98 U	0.99 U	0.99 U	0.98 U
N-Nitrosodiphenylamine	28	40	*6000 UJ*	19 UJ	*5700 UJ*	19 U	18 U
LPAHs in ug/kg							
2-Methylnaphthalene	670	1400	*6000 U*	19 U	*5700 U*	19 U	18 U
Acenaphthene	500	730	*6000 U*	19 U	*5700 U*	19 U	18 U
Acenaphthylene	1300	1300	*6000 U*	19 U	*5700 U*	19 U	18 U
Anthracene	960	4400	*6000 U*	19 U	*5700 U*	19 U	18 U
Fluorene	540	1000	*6000 U*	19 U	*5700 U*	19 U	18 U
Naphthalene	2100	2400	*6000 U*	19 U	*5700 U*	19 U	18 U
Phenanthrene	1500	5400	*6000 U*	19 U	*5700 U*	19 U	18 U
Total LPAHs [b]	5200	13000	*6000 U*	19 U	*5700 U*	19 U	18 U
HPAHs in ug/kg							
Benzo(a)anthracene	1300	1600	*6000 U*	19 U	*5700 U*	19 U	18 U
Benzo(a)pyrene	1600	3000	*6000 U*	19 U	*5700 U*	19 U	18 U
Benzo(g,h,i)perylene	670	720	*6000 U*	19 U	*5700 U*	19 U	18 U
Chrysene	1400	2800	*6000 U*	19 U	*5700 U*	19 U	18 U
Dibenzo(a,h)anthracene	230	540	*6000 U*	19 U	*5700 U*	19 U	18 U
Fluoranthene	1700	2500	*6000 UJ*	19 UJ	*5700 UJ*	19 UJ	18 UJ
Indeno(1,2,3-cd)pyrene	600	690	*6000 U*	19 U	*5700 U*	19 U	18 U
Pyrene	2600	3300	*6000 U*	19 U	*5700 U*	19 U	18 U
Total Benzofluoranthenes	3200	3600	*6000 U*	19 U	*5700 U*	19 U	18 U
Total HPAHs [b]	12000	17000	6000 U	19 UJ	5700 UJ	19 UJ	18 UJ
LPAHs (SIM) in ug/kg							
2-Methylnaphthalene	670	1400	5 U	4.9 U	4.9 U	4.7 U	4.6 U
Acenaphthene	500	730	5 U	4.9 U	4.9 U	4.7 U	4.6 U
Acenaphthylene	1300	1300	1000	4.9 U	19	4.7 U	4.6 U
Anthracene	960	4400	5 U	4.9 U	4.9 U	4.7 U	4.6 U

Table 12 - T107 CKD Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		T107-BS-1	T107-BS-2	T107-BS-3	T107-BS-4	T107-BS-5
Sampling Date	LAET	2LAET	5/10/2011	5/10/2011	5/10/2011	5/10/2011	5/10/2011
Fluorene	540	1000	5 U	4.9 U	4.9 U	4.7 U	4.6 U
Naphthalene	2100	2400	5 U	4.9 U	3 T	4.7 U	2.8 T
Phenanthrene	1500	5400	6.4	9.3	4.9 U	7.3	4 T
Total LPAHs [b]	5200	13000	1006.4	9.3	22 J	7.3	6.8 J
HPAHs (SIM) in ug/kg							
Benzo(a)anthracene	1300	1600	5 U	3.9 T	4.9 U	4.7 U	4.6 U
Benzo(a)pyrene	1600	3000	5 U	4.9 U	4.9 U	4.7 U	4.6 U
Benzo(g,h,i)perylene	670	720	6.3	4.9 U	4.9 U	4.7 U	4.6 U
Chrysene	1400	2800	5 U	3.6 T	4.9 U	3.1 T	4.6 U
Dibenz(a,h)anthracene	230	540	5 U	4.9 U	4.9 U	4.7 U	4.6 U
Fluoranthene	1700	2500	22	10	3.4 T	4.2 T	4.6 U
Indeno(1,2,3-cd)pyrene	600	690	4.8 T	4.9 U	4.9 U	4.7 U	4.6 U
Pyrene	2600	3300	5	9.5	2.8 T	2.2 T	4.6 U
Total Benzofluoranthenes	3200	3600	5 U	4.9 U	4.9 U	4.7 U	4.6 U
Total HPAHs [b]	12000	17000	38.1 J	27 J	6.2 J	9.5 J	4.6 U
Miscellaneous Extractables (SIM) in ug/kg							
Dibenzofuran	540	700	5 U	4.9 U	4.9 U	4.7 U	4.6 U
PCBs in ug/kg							
Aroclor 1016			3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1221			3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1232			3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1242			3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1248			3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1254			3.8 U	3.9 U	4 U	2.2 T	3.9 U
Aroclor 1260			3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1262			3.8 U	3.9 U	4 U	3.9 U	3.9 U
Aroclor 1268			3.8 U	3.9 U	4 U	3.9 U	3.9 U
Total PCBs	130	1000	3.8 U	3.9 U	4 U	2.2 J	3.9 U

Notes:
Blank indicates no AET established for specific analyte.
Bolded value exceeds LAET.
Boxed value exceeds 2LAET.
Italicized value has detection limit that exceeds one or more criteria.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
a) Compounds are reported from the pesticides (EPA Method 8081) instead of SVOCs (EPA Method 8270) because EPA Method 8081 has a lower reporting limit for the compounds indicated.
b) Detected compound concentrations are summed to calculate the total LPAH and HPAH concentrations.

Table 13 - T107 CKD Analytical Results Compared to LDW Risk Drivers

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	T107-BS-1 5/10/2011	T107-BS-2 5/10/2011	T107-BS-3 5/10/2011	T107-BS-4 5/10/2011	T107-BS-5 5/10/2011
Arsenic in mg/kg	28	8	**197**	**310**	**190**	**313**	**324**
cPAHs TEQ in ug/kg [c]	900	7.3	3.76	3.61	3.45 U	3.32	3.24 U
Total PCBs in ug/kg [d]	240	2	*3.8 U*	*3.9 U*	*4 U*	**2.2** J	*3.9 U*
Dioxin/Furans TEQ in pg/g [e]	25	2	0.22	0.36	1.87	0.73	0.67

Notes:

Boxed value exceeds Remedial Action Level.

Bolded value exceeds Natural Background Level.

Italics indicate reporting limit above level.

U = Not detected at the reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

a) Remedial Action Levels for Alternative 5C, provided by Ecology as presented in the Draft Final Feasibility Study for the Lower Duwamish Waterway (LDWG 2010).

b) Natural Background Values based on Ocean Survey Vessel (OSV) Bold Data (LDWG 2010).

c) The cPAH TEQ concentration was calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270. The cPAH was calculated as the sum of each individual PAH concentration multiplied by the corresponding toxicity factor (TEF). When the individual PAH compound concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

d) Total PCBs were calculated by summing the detected values for the individual components. For individual samples in which none of the individual components were detected, the total value was given a value equal to the highest reporting limit of an individual component, and assigned a U-qualifier.

e) The TEQ was calculated as the sum of each dioxin/furan congener concentration multiplied by the corresponding TEF value. When the dioxin/furan congener concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

Table 14 - Fox Avenue South Street End Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	STM-BS-1 5/10/2011	STM-BS-2 5/10/2011	STM-BS-3 5/10/2011
Conventionals in %							
Total Solids					78.6	77.9	66.2
Total Organic Carbon					2.22	1.39	6.76
TPH in mg/kg							
Diesel Range Organics			200		17	120	150
Lube Oil			2000		91	360	840
Gasoline Range Organics			30/100[e]		6.6 U	7.5 U	16 U
BTEX in ug/kg							
Benzene			0.0002	18,180	*16 U*	*19 U*	*40 U*
Ethyl Benzene			1.70	8,000,000	*16 U*	*19 U*	*40 U*
m,p-Xylene			200	16,000,000	33 U	38 U	79 U
o-Xylene			200	16,000,000	16	29	40 U
Toluene			698	6,400,000	16 *U*	19 *U*	40 *U*
Metals in mg/kg							
Arsenic	7		1.58E-04	20	**13**	**12**	**51**
Cadmium	1	26	0.001	80	**0.5**	**0.5**	**2**
Chromium	48	5201	42	240	19	23.4	**85**
Copper	36	780	0.053	3,200	**46.2**	**45.5**	**272**
Lead	24	1133	5.4	250	**228**	**512**	**120**
Mercury	0.07	0.41	2.70E-04		**0.08**	**0.3**	**0.09**
Silver		12	0.013	400	*0.4 U*	*0.4 U*	*2 U*
Zinc	85	327	2.029	24,000	**196**	**248**	**1120**

Notes:

a) Natural Background Concentrations for the Puget Sound Area (Ecology 1994).

b) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

d) MTCA Method B levels except for lead and arsenic where Method A values are used. Values from CLARC Database.

e) 30 mg/kg with benzene, 100 mg/kg without benzene.

U = Not detected at reporting limit indicated.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 15 - Fox Avenue South Street End Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	STM-BS-1 5/10/2011	STM-BS-2 5/10/2011	STM-BS-3 5/10/2011
Semivolatiles in ug/kg						
Chlorinated Hydrocarbons in ug/kg						
1,2,4-Trichlorobenzene		0.40		*18 U*	*18 U*	*57 U*
1,2-Dichlorobenzene	67.6	3.79		*18 U*	*18 U*	*57 U*
1,3-Dichlorobenzene		275.20	7,200,000	18 U	18 U	57 U
1,4-Dichlorobenzene	92.0	0.41		*18 U*	*18 U*	*57 U*
2,4,6-Trichlorophenol				89 U	91 U	280 U
Acid Extractables in ug/kg						
2,4-Dimethylphenol	37	2.03		*18 UJ*	*18 UJ*	**330** J
2 Methylphenol	91	2.69		*18 U*	*18 U*	**140**
4 Methylphenol	979	22.13		18 U	9.1 T	**520**
Benzoic acid	9,622	644.32		62 JT	180 UJ	610 J
Benzyl alcohol	785	55.02	8,000,000	18 U	18 U	31 T
Pentachlorophenol	381	2.56	2,500	*89 U*	*91 U*	**120** T
Phenol	733	23.88	24,000,000	12 T	12 T	**280**
Phthalates in ug/kg						
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	*51* U	**61**	**1200**
Butyl benzyl phthalate	100	3.95	526,000	*18* U	**73**	**23000**
Diethyl phthalate	3,157	199.78	64,000,000	18 U	18 U	57 U
Dimethyl phthalate	1,631	40.95		18 U	18 U	*57 U*
Di-n-butyl phthalate	5,003	81.36		8.9 T	10 T	**410**
Di-n-octyl phthalate	1,161	0.55		*18 U*	*18 U*	*57 U*
Miscellaneous Extractables in ug/kg						
Hexachlorobenzene	8.1	0.24	625	*18 U*	*18 U*	*57 U*
Hexachlorobutadiene	97	1,281	12,820	18 U	18 U	57 U
Hexachloroethane			71,429	18 U	18 U	57 U
N-Nitrosodiphenylamine		9.54	204,000	*18 UJ*	*18 UJ*	*57 UJ*
LPAHs						
2-Methylnaphthalene	833	43.21	320,000	**70**	36	**57**
Acenaphthene	330	16.75	4,800,000	**24**	**31**	**91**
Acenaphthylene	1,363	69.09		**80**	**80**	**1500**
Anthracene	4,443	223.09	24,000,000	82	210	**3700**
Fluorene	468	23.56	3,200,000	**27**	**58**	**120**
Naphthalene	2,197	0.47	1,600,000	**72**	**52**	**130**
Phenanthrene	2,019	101.38		**370**	**580**	**1100**
HPAHs						
Benzo(a)anthracene	2,201	0.005	1,370	**280**	**370**	**2100**
Benzo(a)pyrene	1,981	0.01	137	**340**	**410**	**4100**
Benzo(g,h,i)perylene	620	31.00		**230**	**280**	**11000**
Chrysene	2,202	0.27	137,000	**440**	**530**	**3400**
Dibenzo(a,h)anthracene	240	0.07	137	**61**	**68**	**2000**
Dibenzofuran		15.37	80,000	**24**	**26**	**100**
Fluoranthene	3,209	160.53	3,200,000	**630** J	**820** J	**3700** J
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**190**	**240**	**5200**
Pyrene	20,058	684.43	2,400,000	610	**780**	**4000**
Total Benzofluoranthenes	4,601	0.04		**570**	**670**	**6600**

Table 15 - Fox Avenue South Street End Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	STM-BS-1 5/10/2011	STM-BS-2 5/10/2011	STM-BS-3 5/10/2011
LPAHs (SIM)						
1-Methylnaphthalene				21	250	23
2-Methylnaphthalene	833	43.21	320,000	27	**260**	**49**
Acenaphthene	330	16.75	4,800,000	**31**	**150**	**170**
Acenaphthylene	1,363	69.09		68	**260**	**970**
Anthracene	4,443	223.09	24,000,000	100	210	**3500**
Fluorene	468	23.56	3,200,000	**42**	**290**	**210**
Naphthalene	2,197	0.47	1,600,000	**44**	**260**	**86**
Phenanthrene	2,019	101.38		**360**	**5600**	**3200**
HPAHs (SIM)						
Benzo(a)anthracene	2,201	0.005	1,370	**310**	**890**	**4800**
Benzo(a)pyrene	1,981	0.01	137	**360**	**1500**	**6000**
Benzo(g,h,i)perylene	620	31.00		**240**	**1100**	**10000**
Chrysene	2,202	0.27	137,000	**420**	**2200**	**6300**
Dibenz(a,h)anthracene	240	0.07	137	**80**	**220**	**2200**
Dibenzofuran		15.37	80,000	**21**	**220**	**120**
Fluoranthene	3,209	160.53	3,200,000	**540**	**3800**	**13000**
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**210**	**930**	**7600**
Pyrene	20,058	684.43	2,400,000	670	**4400**	**11000**
Total Benzofluoranthenes	4,601	0.04		**580**	**2600**	**10000**

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 16 - Fox Avenue South Street End Analytical Results - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	STM-BS-1 5/10/2011	STM-BS-2 5/10/2011	STM-BS-3 5/10/2011
Pesticides in ug/kg						
4,4'-DDD		3.54	4,167	*9.2 U*	*9.5 U*	*19 UJ*
4,4'-DDE		4.70	2,941	*9.2 U*	*9.5 U*	*19 U*
4,4'-DDT		36.74	2,941	9.2 U	21 U	19 UJ
Aldrin		0.61	58.82	*4.6 U*	*4.8 U*	*9.5 U*
alpha-BHC (Benzene HexaChloride)		2.47		*4.6 U*	*4.8 U*	*9.5 U*
beta-BHC		10.23		4.6 U	4.8 U	9.5 U
cis-Chlordane				4.6 U	4.8 U	9.5 U
Dieldrin		0.34	62.5	*9.2 U*	*9.5 U*	*19 U*
alpha-Endosulfan		20.24	480,000	4.6 U	4.8 U	9.5 U
beta-Endosulfan		20.24	480,000	9.2 U	9.5 U	19 UJ
Endosulfan Sulfate		20.24		9.2 U	9.5 U	19 UJ
Endrin		22.20	24,000	9.2 U	9.5 U	19 UJ
Endrin Aldehyde		22.20		9.2 U	9.5 U	19 UJ
gamma-BHC (Lindane)		0.36	24,000	*4.6* U	*4.8* U	*9.5* U
Heptachlor		0.19	222	*4.6* U	*4.8* U	*9.5* U
Heptachlor Epoxide		0.81	109.89	*4.6* U	*4.8* U	*9.5* U
Hexachlorobenzene (HCB)	8.1	0.24	625	*4.6* U	*4.8* U	*9.5* U
Hexachlorobutadiene	97	1,281	12,821	4.6 U	4.8 U	9.5 U
Toxaphene		0.06	909	*460 U*	*480 U*	*950 UJ*
trans-Chlordane				4.6 U	4.8 U	9.5 U
PCBs in ug/kg						
Aroclor 1016	242	1.77	5,600	*37 U*	*38 U*	*38 U*
Aroclor 1221		0.24		*37 U*	*38 U*	*38 U*
Aroclor 1232		120.00		37 U	38 U	38 U
Aroclor 1242		0.02		*37 U*	*38 U*	*38 U*
Aroclor 1248	241	1.02		*37 U*	*38 U*	*38 U*
Aroclor 1254	241	0.42	500	*56 U*	*76 U*	**40**
Aroclor 1260	240	4.77	500	**210**	**260**	**36** T
Aroclor 1262				37 U	38 U	38 U
Aroclor 1268				37 U	38 U	38 U
TBT in ug/kg						
Tributyltin Ion				2 T	13	18

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 17 - Fox Avenue South Street End Analytical Results - Dioxins and PBDEs

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	STM-BS-1 5/10/2011	STM-BS-2 5/10/2011	STM-BS-3 5/10/2011
Dioxins in pg/g						
2,3,7,8-TCDD		3.02E-05		*0.73 UK*	**1.27**	*0.711 UK*
1,2,3,7,8-PeCDD				3.44	7.67	5.42
1,2,3,4,7,8-HxCDD				4.38	10.3	15.2
1,2,3,6,7,8-HxCDD				10.5	27.2	110
1,2,3,7,8,9-HxCDD				7.66	22.3	32.9
1,2,3,4,6,7,8-HpCDD				266	700	7090
OCDD				1930	4950	70700
2,3,7,8-TCDF				2.67	3.78	4.21
1,2,3,7,8-PeCDF				1.63 T	2.93	7.93
2,3,4,7,8-PeCDF				2.91	4.16	7.05
1,2,3,4,7,8-HxCDF				4.53	9.41	25.1
1,2,3,6,7,8-HxCDF				3.14	5.48	9.57
1,2,3,7,8,9-HxCDF				1.09 T	2.03	12
2,3,4,6,7,8-HxCDF				5.46	8.03	14.1
1,2,3,4,6,7,8-HpCDF				55.7	87.5	313
1,2,3,4,7,8,9-HpCDF				2.81 UK	7.26	25.2
OCDF				125	179	1390
Total TCDD				25.5	30.1	17.4
Total PeCDD				41.3	43.9	74.1
Total HxCDD				121	273	2810
Total HpCDD				652	1850	19600
Total TCDF				63.5	81.6	47
Total PeCDF				138	159	160
Total HxCDF				103	159	680
Total HpCDF				150	255	1430
PDBEs in ug/kg						
2,2',4-Tribromodiphenyl ether (PBDE-17)				1.8 U	6.2 U	2.4 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)				0.5 U	0.5 U	2.4 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)				1 U	0.8 U	2.4 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	2.4 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	2.4 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)				0.5 U	0.5 U	2.4 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)				2 U	0.5 U	12 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)				0.5 U	0.5 U	2.4 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)				2.7 U	3.4 U	17 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)				1.3 U	0.5 U	2.4 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)				0.5 U	0.5 U	2.4 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)				3.7 U	0.5 U	2.4 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

T = Value is between the MDL and MRL.

K = ion ratios did not meet criteria for positive identification of the analyte

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 18 - Fox Avenue South Street End Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		STM-BS-1	STM-BS-2	STM-BS-3
Sampling Date	LAET	2LAET	5/10/2011	5/10/2011	5/10/2011
Metals in mg/kg					
Arsenic	57	93	13	12	51
Cadmium	5.1	6.7	0.5	0.5	2
Chromium	260	270	19	23.4	85
Copper	390	390	46.2	45.5	272
Lead	450	530	228	**512**	120
Mercury	0.41	0.59	0.08	0.3	0.09
Silver	6.1	6.1	0.4 U	0.4 U	2 U
Zinc	410	960	196	248	**1120**
Semivolatiles in ug/kg					
Chlorinated Hydrocarbons in ug/kg					
1,2,4-Trichlorobenzene	35	50	18 U	18 U	57 U
1,2-Dichlorobenzene	170	170	18 U	18 U	57 U
1,4-Dichlorobenzene	110	120	18 U	18 U	57 U
Acid Extractables in ug/kg					
2,4-Dimethylphenol	29	29	18 UJ	18 UJ	**330** J
2-Methylphenol	63	63	18 U	18 U	**140**
4-Methylphenol	670	670	18 U	9.1 T	520
Benzoic acid	650	650	62 JT	180 UJ	610 J
Benzyl alcohol	57	73	18 U	18 U	31 T
Pentachlorophenol	360	690	89 U	91 U	120 T
Phenol	420	1200	12 T	12 T	280
Phthalates in ug/kg					
Bis(2-ethylhexyl)phthalate	1300	1900	51 U	61	1200
Butyl benzyl phthalate	63	900	18 U	**73**	**23000**
Diethyl phthalate	200	200	18 U	18 U	57 U
Dimethyl phthalate	71	160	18 U	18 U	57 U
Di-n-butyl phthalate	1400	1400	8.9 T	10 T	410
Di-n-octyl phthalate	6200	6200	18 U	18 U	57 U
Miscellaneous Extractables in ug/kg					
Dibenzofuran	540	700	24	26	100
Hexachlorobenzene[a]	22	70	4.6 U	4.8 U	9.5 U
Hexachlorobutadiene[a]	11	120	4.6 U	4.8 U	9.5 U
N-Nitrosodiphenylamine	28	40	18 UJ	18 UJ	*57 UJ*
LPAHs in ug/kg					
2-Methylnaphthalene	670	1400	70	36	57
Acenaphthene	500	730	24	31	91
Acenaphthylene	1300	1300	80	80	**1500**
Anthracene	960	4400	82	210	**3700**
Fluorene	540	1000	27	58	120
Naphthalene	2100	2400	72	52	130
Phenanthrene	1500	5400	370	580	1100
Total LPAHs [b]	5200	13000	655	1011	**6641**

Table 18 - Fox Avenue South Street End Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		STM-BS-1	STM-BS-2	STM-BS-3
Sampling Date	LAET	2LAET	5/10/2011	5/10/2011	5/10/2011
HPAHs in ug/kg					
Benzo(a)anthracene	1300	1600	280	370	**2100**
Benzo(a)pyrene	1600	3000	340	410	**4100**
Benzo(g,h,i)perylene	670	720	230	280	**11000**
Chrysene	1400	2800	440	530	**3400**
Dibenzo(a,h)anthracene	230	540	61	68	**2000**
Fluoranthene	1700	2500	630 J	820 J	**3700** J
Indeno(1,2,3-cd)pyrene	600	690	190	240	**5200**
Pyrene	2600	3300	610	780	**4000**
Total Benzofluoranthenes	3200	3600	570	670	**6600**
Total HPAHs [b]	12000	17000	3351 J	4168 J	**42100** J
LPAHs (SIM) in ug/kg					
1-Methylnaphthalene			21	250	23
2-Methylnaphthalene	670	1400	27	260	49
Acenaphthene	500	730	31	150	170
Acenaphthylene	1300	1300	68	260	970
Anthracene	960	4400	100	210	**3500**
Fluorene	540	1000	42	290	210
Naphthalene	2100	2400	44	260	86
Phenanthrene	1500	5400	360	5600	3200
Total LPAHs [b]	5200	13000	645	6770	**8136**
HPAHs (SIM) in ug/kg					
Benzo(a)anthracene	1300	1600	310	890	**4800**
Benzo(a)pyrene	1600	3000	360	1500	**6000**
Benzo(g,h,i)perylene	670	720	240	**1100**	**10000**
Chrysene	1400	2800	420	**2200**	**6300**
Dibenz(a,h)anthracene	230	540	80	220	**2200**
Fluoranthene	1700	2500	540	**3800**	**13000**
Indeno(1,2,3-cd)pyrene	600	690	210	**930**	**7600**
Pyrene	2600	3300	670	**4400**	**11000**
Total Benzofluoranthenes	3200	3600	580	2600	**10000**
Total HPAHs [b]	12000	17000	3410	**17640**	**70900**
Miscellaneous Extractables (SIM) in ug/kg					
Dibenzofuran	540	700	21	220	120
PCBs in ug/kg					
Aroclor 1016			37 U	38 U	38 U
Aroclor 1221			37 U	38 U	38 U
Aroclor 1232			37 U	38 U	38 U
Aroclor 1242			37 U	38 U	38 U
Aroclor 1248			37 U	38 U	38 U
Aroclor 1254			56 U	76 U	40
Aroclor 1260			210	260	36 T
Aroclor 1262			37 U	38 U	38 U
Aroclor 1268			37 U	38 U	38 U
Total PCBs	130	1000	**210**	**260**	76 J

Notes:
Blank indicates no AET established for specific analyte.
Bolded value exceeds LAET.
Boxed value exceeds 2LAET.
Italicized value has detection limit that exceeds one or more criteria.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
a) Compounds are reported from the pesticides (EPA Method 8081) instead of SVOCs (EPA Method 8270) because EPA Method 8081 has a lower reporting limit for the compounds indicated.
b) Detected compound concentrations are summed to calculate the total LPAH and HPAH concentrations.

Table 19 - Fox Avenue South Street End Analytical Results Compared to LDW Risk Drivers

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	STM-BS-1 5/10/2011	STM-BS-2 5/10/2011	STM-BS-3 5/10/2011
Arsenic in mg/kg	28	8	**13**	**12**	**51**
cPAHs TEQ in ug/kg [c]	900	7.3	**482.2**	**1986**	**8523**
Total PCBs in ug/kg [d]	240	2	**210**	**260**	**76** J
Dioxin/Furans TEQ in pg/g [e]	25	2	**12.52**	**28.62**	**126.35**

Notes:

Boxed value exceeds Remedial Action Level.

Bolded value exceeds Natural Background Level.

Italics indicate reporting limit above level.

U = Not detected at the reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

a) Remedial Action Levels for Alternative 5C, provided by Ecology as presented in the Draft Final Feasibility Study for the Lower Duwamish Waterway (LDWG 2010).

b) Natural Background Values based on Ocean Survey Vessel (OSV) Bold Data (LDWG 2010).

c) The cPAH TEQ concentration was calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270. The cPAH was calculated as the sum of each individual PAH concentration multiplied by the corresponding toxicity factor (TEF). When the individual PAH compound concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

d) Total PCBs were calculated by summing the detected values for the individual components. For individual samples in which none of the individual components were detected, the total value was given a value equal to the highest reporting limit of an individual component, and assigned a U-qualifier.

e) The TEQ was calculated as the sum of each dioxin/furan congener concentration multiplied by the corresponding TEF value. When the dioxin/furan congener concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

Table 20 - Boyer-Trotsky Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	BT-BS-1 5/12/2011	BT-BS-2 5/12/2011	BT-BS-3 5/12/2011	BT-BS-4 5/12/2011
Conventionals in %								
Total Solids					89.9	76.5	90	87.2
Total Organic Carbon					2.34	2.74	2.14	2.46
TPH in mg/kg								
Diesel Range Organics			200		46	82	71	160
Lube Oil			2,000		260	470	450	1,000
Gasoline Range Organics			30/100		14	9 U	5.8 U	6.3 U
BTEX in ug/kg								
Benzene			0.0002	18,180	*14 U*	*23 U*	*14 U*	*16 U*
Ethyl Benzene			1.70	8,000,000	*14 U*	*23 U*	*14 U*	*16 U*
m,p-Xylene			200	16,000,000	28 U	45 U	29 U	32 U
o-Xylene			200	16,000,000	100	110	35	30
Toluene			698	6,400,000	14 U	43	14 U	16 U
Metals in mg/kg								
Arsenic	7		1.58E-04	20	**9.2**	**14.7**	**9.9**	**12.5**
Cadmium	1	26	0.001	80	**0.4**	**0.5**	**0.4**	**1**
Chromium	48	5201	42	240	24.1	26	**112**	39.6
Copper	36	780	0.053	3,200	**37.4**	**52.8**	**55.7**	**45.7**
Lead	24	1133	5.4	250	**103**	**83**	**91**	**127**
Mercury	0.07	0.41	2.70E-04		**0.09**	**0.11**	**0.05**	**0.08**
Silver		12	0.013	400	*0.3 U*	*0.4 U*	*0.3 U*	*0.3 U*
Zinc	85	327	2.029	24,000	**76**	**150**	**73**	**138**

Notes:

a) Natural Background Concentrations for the Puget Sound Area (Ecology 1994).

b) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

d) MTCA Method B levels except for lead and arsenic where Method A values are used. Values from CLARC Database.

e) 30 mg/kg with benzene, 100 mg/kg without benzene.

U = Not detected at reporting limit indicated.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 21 - Boyer-Trotsky Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	BT-BS-1 5/12/2011	BT-BS-2 5/12/2011	BT-BS-3 5/12/2011	BT-BS-4 5/12/2011
Semivolatiles in ug/kg							
Chlorinated Hydrocarbons in ug/kg							
1,2,4-Trichlorobenzene		0.40		*20 U*	*20 U*	*19 U*	*36 U*
1,2-Dichlorobenzene	67.6	3.79		*20 U*	*20 U*	*19 U*	*36 U*
1,3-Dichlorobenzene		275.20	7200000	20 U	20 U	19 U	36 U
1,4-Dichlorobenzene	92.0	0.41		*20 U*	*20 U*	*19 U*	*36 U*
2,4,6-Trichlorophenol				99 U	99 U	94 U	180 U
Acid Extractables in ug/kg							
2,4-Dimethylphenol	37	2.03		R	R	R	R
2 Methylphenol	91	2.69		*20 U*	*20 U*	*19 U*	*36 U*
4 Methylphenol	979	22.13		20 U	20 U	19 U	*36* U
Benzoic acid	9,622	644.32		200 U	200 U	190 U	360 U
Benzyl alcohol	785	55.02	8,000,000	20 U	20 U	19 U	36 U
Pentachlorophenol	381	2.56	2,500	*99 UJ*	*99 UJ*	*94 UJ*	*180 UJ*
Phenol	733	23.88	24,000,000	20 U	20 U	19 U	*36* U
Phthalates in ug/kg							
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	*48 U*	**98**	*60 U*	*63 U*
Butyl benzyl phthalate	100	3.95	526,000	**28**	**130**	*19 U*	*36 U*
Diethyl phthalate	3,157	199.78	64,000,000	20 U	20 U	19 U	36 U
Dimethyl phthalate	1,631	40.95		20 U	20 U	26 J	36 U
Di-n-butyl phthalate	5,003	81.36		20 U	20 U	19 U	36 U
Di-n-octyl phthalate	1,161	0.55		*20 U*	*20 U*	*19 U*	*36 U*
Miscellaneous Extractables in ug/kg							
Hexachlorobenzene	8.1	0.24	625	*20 U*	*20 U*	*19 U*	*36 U*
Hexachlorobutadiene	97	1281.15	12,820	20 U	20 U	19 U	36 U
Hexachloroethane			71,429	20 U	20 U	19 U	36 U
N-Nitrosodiphenylamine		9.54	204,000	*20 U*	*20 U*	*19 U*	*36 U*
LPAHs							
2-Methylnaphthalene	833	43.21	320,000	20 U	20 U	19 U	36 U
Acenaphthene	330	16.75	4,800,000	*20 U*	**22**	*19 U*	*36 U*
Acenaphthylene	1,363	69.09		20 U	29	19 U	36 U
Anthracene	4,443	223.09	24,000,000	20 U	66	21	36 U
Fluorene	468	23.56	3,200,000	20 U	21	19 U	*36* U
Naphthalene	2,197	0.47	1,600,000	*20 U*	*20 U*	*19 U*	*36 U*
Phenanthrene	2,019	101.38		78	**300**	93	70

Table 21 - Boyer-Trotsky Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	BT-BS-1 5/12/2011	BT-BS-2 5/12/2011	BT-BS-3 5/12/2011	BT-BS-4 5/12/2011
HPAHs							
Benzo(a)anthracene	2,201	0.005	1,370	**86**	**230**	**61**	**72**
Benzo(a)pyrene	1,981	0.01	137	**100**	**170**	**67**	**88**
Benzo(g,h,i)perylene	620	31.00		**87**	**110**	**46**	**83**
Chrysene	2,202	0.27	137,000	**180**	**520**	**75**	**140**
Dibenzo(a,h)anthracene	240	0.07	137	**26**	**38**	*19 U*	*36 U*
Dibenzofuran		15.37	80,000	*20 U*	*20 U*	*19 U*	*36 U*
Fluoranthene	3,209	160.53	3,200,000	**190**	**950**	130	150
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**46**	**95**	**27**	*36* U
Pyrene	20,058	684.43	2,400,000	220	**800**	160	140
Total Benzofluoranthenes	4,601	0.04		**300**	**690**	**120**	**170**
LPAHs (SIM)							
1-Methylnaphthalene				6.6	6.3	9.9	5.8 T
2-Methylnaphthalene	833	43.21	320,000	13	11	20	15
Acenaphthene	330	16.75	4,800,000	12	**19**	**33**	10
Acenaphthylene	1,363	69.09		13	20	9.6 U	9.2 U
Anthracene	4,443	223.09	24,000,000	36	52	28	33
Fluorene	468	23.56	3,200,000	12	21	21	7.4 T
Naphthalene	2,197	0.47	1,600,000	**18**	**12**	**12**	**7.9** T
Phenanthrene	2,019	101.38		**170**	**270**	**120**	**110**
HPAHs (SIM)							
Benzo(a)anthracene	2,201	0.005	1,370	**160**	**240**	**74**	**120**
Benzo(a)pyrene	1,981	0.01	137	**260**	**210**	**78**	**120**
Benzo(g,h,i)perylene	620	31.00		**170**	**140**	**57**	**74**
Chrysene	2,202	0.27	137,000	**320**	**500**	**89**	**150**
Dibenz(a,h)anthracene	240	0.07	137	**50** J	**45**	**8.8** T	**23**
Dibenzofuran		15.37	80,000	11	**16**	**18**	5.3 T
Fluoranthene	3,209	160.53	3,200,000	**390**	**880**	160	**210**
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**92** J	**130**	**34**	**49**
Pyrene	20,058	684.43	2,400,000	400	**750**	140	200
Total Benzofluoranthenes	4,601	0.04		**590**	**700**	**130**	**220**

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

R = Data are not usable because of significant exceedance of QC criteria.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 22 - Boyer-Trotsky Analytical Results - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	BT-BS-1 5/12/2011	BT-BS-2 5/12/2011	BT-BS-3 5/12/2011	BT-BS-4 5/12/2011
Pesticides in ug/kg							
4,4'-DDD		3.54	4,167	*19 U*	*9.9 U*	*9.6 U*	*19 U*
4,4'-DDE		4.70	2,941	*19 U*	*9.9 U*	*9.6 U*	*19 U*
4,4'-DDT		36.74	2,941	19 U	9.9 U	9.6 U	19 U
Aldrin		0.61	58.82	*9.4 UJ*	*5 UJ*	*4.8 UJ*	*9.4 UJ*
alpha-BHC (Benzene HexaChloride)		2.47		*9.4* U	*5* U	*4.8* U	*9.4* U
beta-BHC		10.23		9.4 U	5 U	4.8 U	9.4 U
cis-Chlordane				9.4 U	11	4.8 U	9.4 U
Dieldrin		0.34	62.5	*19 U*	*9.9 U*	*9.6 U*	*19 U*
alpha-Endosulfan		20.24	480,000	9.4 U	5 U	4.8 U	9.4 U
beta-Endosulfan		20.24	480,000	19 UJ	9.9 UJ	9.6 UJ	19 UJ
Endosulfan Sulfate		20.24		19 U	9.9 U	9.6 U	19 U
Endrin		22.20	24,000	19 U	12	9.6 U	19 U
Endrin Aldehyde		22.20		19 UJ	9.9 UJ	9.6 UJ	19 UJ
gamma-BHC (Lindane)		0.36	24,000	*9.4 U*	*5 U*	*4.8 U*	*9.4 U*
Heptachlor		0.19	222	*9.4 U*	*5 U*	*4.8 U*	*9.4 U*
Heptachlor Epoxide		0.81	109.89	*9.4 U*	*7.8 U*	*4.8 U*	*9.4 U*
Hexachlorobenzene (HCB)	8.1	0.24	625	*9.4 U*	*5 U*	*4.8 U*	*9.4 U*
Hexachlorobutadiene	97	1,281	12,821	9.4 U	5 U	4.8 U	9.4 U
Toxaphene		0.06	909	*940 U*	*500 U*	*480 U*	*940 U*
trans-Chlordane				9.4 U	14	4.8 U	9.4 U
PCBs in ug/kg							
Aroclor 1016	242	1.77	5,600	*20 U*	*19 U*	*3.9 U*	*3.8 U*
Aroclor 1221		0.24		*20 U*	*19 U*	*3.9 U*	*3.8 U*
Aroclor 1232		120.00		20 U	19 U	3.9 U	3.8 U
Aroclor 1242		0.02		*20 U*	*19 U*	*3.9 U*	*3.8 U*
Aroclor 1248	241	1.02		*20 U*	*94 U*	*7.8 U*	*28 U*
Aroclor 1254	241	0.42	500	*34* U	**280**	*23* U	**120**
Aroclor 1260	240	4.77	500	**44**	**280**	**19**	**73** JP
Aroclor 1262				20 U	19 U	3.9 U	3.8 U
Aroclor 1268				20 U	19 U	3.9 U	3.8 U
TBT in ug/kg							
Tributyltin Ion				3.5 U	*9.3*	3.5 U	*4.3*

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

P = Sample confirmation exceeded 40 percent on the two chromatographic columns

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 23 - Boyer-Trotsky Analytical Results - Dioxins and PBDEs

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	BT-BS-1 5/12/2011	BT-BS-2 5/12/2011	BT-BS-3 5/12/2011	BT-BS-4 5/12/2011
Dioxins in pg/g							
2,3,7,8-TCDD		3.02E-05		*0.355 UK*	**2.66**	*0.336 UK*	**2.94**
1,2,3,7,8-PeCDD				1.73	9.82	1.6	10.9
1,2,3,4,7,8-HxCDD				1.69 T	14	1.74 T	17
1,2,3,6,7,8-HxCDD				5.97	47.1	6.24	56.9
1,2,3,7,8,9-HxCDD				3.59	39.8	3.83	46.7
1,2,3,4,6,7,8-HpCDD				247	1300	163	1450
OCDD				3350	13300	1610	10500
2,3,7,8-TCDF				1.7	3.16	1.28	4.65
1,2,3,7,8-PeCDF				1.37 T	3.69	1.18 T	5.13
2,3,4,7,8-PeCDF				2.29	3.62	1.43	4.22
1,2,3,4,7,8-HxCDF				2.89	10.8	2.29	9.35
1,2,3,6,7,8-HxCDF				2.68	7.08	1.7 T	5.13
1,2,3,7,8,9-HxCDF				0.7 T	1.98 T	0.575 T	2.19
2,3,4,6,7,8-HxCDF				4.77	9.95	2.76	6.89
1,2,3,4,6,7,8-HpCDF				24.5	138	17.2	88.3
1,2,3,4,7,8,9-HpCDF				1.71 T	7.24	1.45 T	6.26
OCDF				70.8	301	42.3	120
Total TCDD				6.39	18.5	5.25	16
Total PeCDD				12.5	51.5	12	50.1
Total HxCDD				56.8	410	42.5	385
Total HpCDD				760	3820	292	2540
Total TCDF				63.7	83.6	33.8	83.6
Total PeCDF				155	181	75	131
Total HxCDF				77	255	43.2	143
Total HpCDF				79.8	422	49.3	217
PDBEs in ug/kg							
2,2',4-Tribromodiphenyl ether (PBDE-17)				2.5 U	5.6 U	2.4 U	9 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)				2.5 U	0.5 U	2.4 U	9 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)				2.5 U	6.7 U	2.4 U	9 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				2.5 U	0.5 U	2.4 U	9 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				2.5 U	0.5 U	2.4 U	9 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)				2.5 U	0.5 U	2.4 U	9 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)				2.5 U	0.5 U	2.4 U	9 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)				2.5 U	0.5 U	2.4 U	9 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)				2.5 U	0.5 U	2.4 U	9 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)				2.5 U	0.5 U	2.4 U	9 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)				2.5 U	0.5 U	2.4 U	9 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)				2.5 U	0.5 U	2.4 U	9 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

K = ion ratios did not meet criteria for positive identification of the analyte

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 24 - Boyer-Trotsky Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		BT-BS-1	BT-BS-2	BT-BS-3	BT-BS-4
Sampling Date	LAET	2LAET	5/12/11	5/12/11	5/12/11	5/12/11
Metals in mg/kg						
Arsenic	57	93	9.2	14.7	9.9	12.5
Cadmium	5.1	6.7	0.4	0.5	0.4	1
Chromium	260	270	24.1	26	112	39.6
Copper	390	390	37.4	52.8	55.7	45.7
Lead	450	530	103	83	91	127
Mercury	0.41	0.59	0.09	0.11	0.05	0.08
Silver	6.1	6.1	0.3 U	0.4 U	0.3 U	0.3 U
Zinc	410	960	76	150	73	138
Semivolatiles in ug/kg						
Chlorinated Hydrocarbons in ug/kg						
1,2,4-Trichlorobenzene	35	50	20 U	20 U	19 U	36 U
1,2-Dichlorobenzene	170	170	20 U	20 U	19 U	36 U
1,4-Dichlorobenzene	110	120	20 U	20 U	19 U	36 U
Acid Extractables in ug/kg						
2,4-Dimethylphenol	29	29	R	R	R	R
2-Methylphenol	63	63	20 U	20 U	19 U	36 U
4-Methylphenol	670	670	20 U	20 U	19 U	36 U
Benzoic acid	650	650	200 U	200 U	190 U	360 U
Benzyl alcohol	57	73	20 U	20 U	19 U	36 U
Pentachlorophenol	360	690	99 UJ	99 UJ	94 UJ	180 UJ
Phenol	420	1200	20 U	20 U	19 U	36 U
Phthalates in ug/kg						
Bis(2-ethylhexyl)phthalate	1300	1900	48 U	98	60 U	63 U
Butyl benzyl phthalate	63	900	28	**130**	19 U	36 U
Diethyl phthalate	200	200	20 U	20 U	19 U	36 U
Dimethyl phthalate	71	160	20 U	20 U	26 J	36 U
Di-n-butyl phthalate	1400	1400	20 U	20 U	19 U	36 U
Di-n-octyl phthalate	6200	6200	20 U	20 U	19 U	36 U
Miscellaneous Extractables in ug/kg						
Dibenzofuran	540	700	20 U	20 U	19 U	36 U
Hexachlorobenzene[a]	22	70	9.4 U	5 U	4.8 U	9.4 U
Hexachlorobutadiene[a]	11	120	9.4 U	5 U	4.8 U	9.4 U
N-Nitrosodiphenylamine	28	40	20 U	20 U	19 U	*36 U*
LPAHs in ug/kg						
2-Methylnaphthalene	670	1400	20 U	20 U	19 U	36 U
Acenaphthene	500	730	20 U	22	19 U	36 U
Acenaphthylene	1300	1300	20 U	29	19 U	36 U
Anthracene	960	4400	20 U	66	21	36 U
Fluorene	540	1000	20 U	21	19 U	36 U
Naphthalene	2100	2400	20 U	20 U	19 U	36 U
Phenanthrene	1500	5400	78	300	93	70
Total LPAHs [b]	5200	13000	78	438	114	70

Table 24 - Boyer-Trotsky Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		BT-BS-1	BT-BS-2	BT-BS-3	BT-BS-4
Sampling Date	LAET	2LAET	5/12/11	5/12/11	5/12/11	5/12/11
HPAHs in ug/kg						
Benzo(a)anthracene	1300	1600	86	230	61	72
Benzo(a)pyrene	1600	3000	100	170	67	88
Benzo(g,h,i)perylene	670	720	87	110	46	83
Chrysene	1400	2800	180	520	75	140
Dibenzo(a,h)anthracene	230	540	26	38	19 U	36 U
Fluoranthene	1700	2500	190	950	130	150
Indeno(1,2,3-cd)pyrene	600	690	46	95	27	36 U
Pyrene	2600	3300	220	800	160	140
Total Benzofluoranthenes	3200	3600	300	690	120	170
Total HPAHs [b]	12000	17000	1235	3603	686	843
LPAHs (SIM) in ug/kg						
2-Methylnaphthalene	670	1400	13	11	20	15
Acenaphthene	500	730	12	19	33	10
Acenaphthylene	1300	1300	13	20	9.6 U	9.2 U
Anthracene	960	4400	36	52	28	33
Fluorene	540	1000	12	21	21	7.4 T
Naphthalene	2100	2400	18	12	12	7.9 T
Phenanthrene	1500	5400	170	270	120	110
Total LPAHs [b]	5200	13000	261	394	214	168.3 J
HPAHs (SIM) in ug/kg						
Benzo(a)anthracene	1300	1600	160	240	74	120
Benzo(a)pyrene	1600	3000	260	210	78	120
Benzo(g,h,i)perylene	670	720	170	140	57	74
Chrysene	1400	2800	320	500	89	150
Dibenz(a,h)anthracene	230	540	50 J	45	8.8 T	23
Fluoranthene	1700	2500	390	880	160	210
Indeno(1,2,3-cd)pyrene	600	690	92 J	130	34	49
Pyrene	2600	3300	400	750	140	200
Total Benzofluoranthenes	3200	3600	590	700	130	220
Total HPAHs [b]	12000	17000	2432 J	3595	770.8 J	1166
Miscellaneous Extractables (SIM) in ug/kg						
Dibenzofuran	540	700	11	16	18	5.3
PCBs in ug/kg						
Aroclor 1016			20 U	19 U	3.9 U	3.8 U
Aroclor 1221			20 U	19 U	3.9 U	3.8 U
Aroclor 1232			20 U	19 U	3.9 U	3.8 U
Aroclor 1242			20 U	19 U	3.9 U	3.8 U
Aroclor 1248			20 U	94 U	7.8 U	28 U
Aroclor 1254			34 U	280	23 U	120
Aroclor 1260			44	280	19	73 JP
Aroclor 1262			20 U	19 U	3.9 U	3.8 U
Aroclor 1268			20 U	19 U	3.9 U	3.8 U
Total PCBs	130	1000	44	**560**	19	**193** J

Notes:
Blank indicates no AET established for specific analyte.
Bolded value exceeds LAET.
Italicized value has detection limit that exceeds one or more criteria.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
R = Data are not usable because of significant exceedance of QC criteria.
a) Compounds are reported from the pesticides (EPA Method 8081) instead of SVOCs (EPA Method 8270) because EPA Method 8081 has a lower reporting limit for the compounds indicated.
b) Detected compound concentrations are summed to calculate the total LPAH and HPAH concentrations.

Table 25 - Boyer-Trotsky Analytical Results Compared to LDW Risk Drivers Criteria

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	BT-BS-1 5/12/11	BT-BS-2 5/12/11	BT-BS-3 5/12/11	BT-BS-4 5/12/11
Arsenic in mg/kg	28	8	**9.2**	**14.7**	**9.9**	**12.5**
cPAHs TEQ in ug/kg [c]	900	7.3	**352.4**	**326.5**	**103.57**	**162.7**
Total PCBs in ug/kg [d]	240	2	**44**	**560**	**19**	**193** J
Dioxin/Furans TEQ in pg/g [e]	25	2	**8.79**	**45.60**	**6.59**	**48.77**

Notes:

Boxed value exceeds Remedial Action Level.

Bolded value exceeds Natural Background Level.

Italics indicate reporting limit above level.

U = Not detected at the reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

a) Remedial Action Levels for Alternative 5C, provided by Ecology as presented in the Draft Final Feasibility Study for the Lower Duwamish Waterway (LDWG 2010).

b) Natural Background Values based on Ocean Survey Vessel (OSV) Bold Data (LDWG 2010).

c) The cPAH TEQ concentration was calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270. The cPAH was calculated as the sum of each individual PAH concentration multiplied by the corresponding toxicity factor (TEF). When the individual PAH compound concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

d) Total PCBs were calculated by summing the detected values for the individual components. For individual samples in which none of the individual components were detected, the total value was given a value equal to the highest reporting limit of an individual component, and assigned a U-qualifier.

e) The TEQ was calculated as the sum of each dioxin/furan congener concentration multiplied by the corresponding TEF value. When the dioxin/furan congener concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

Table 26 - Seattle Iron & Metals Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	SIM-BS-1 5/11/2011	SIM-BS-2 5/11/2011	SIM-BS-3 5/11/2011	SIM-BS-4 5/11/2011
Conventionals in %								
Total Solids					87.2	87.6	91.2	90.6
Total Organic Carbon					1.58	2.13	0.701	0.798
TPH in mg/kg								
Diesel Range Organics			200		11	9.5	23	6.3
Lube Oil			2,000		53	36	81	28
Gasoline Range Organics			30/100[e]		7 U	7.1 U	6.3 U	7.3 U
BTEX in ug/kg								
Benzene			0.0002	18,180	*18 U*	*18 U*	*16 U*	*18 U*
Ethyl Benzene			1.70	8,000,000	*18 U*	*18 U*	*16 U*	*18 U*
m,p-Xylene			200	16,000,000	35 U	35 U	32 U	36 U
o-Xylene			200	16,000,000	**990**	45	**670**	**600**
Toluene			698	6,400,000	18 U	18 U	16 U	18 U
Metals in mg/kg								
Arsenic	7		1.58E-04	20	*51 U*	*54 U*	**35**	**67**
Cadmium	1	26	0.001	80	**9**	**4**	*1* U	*2* U
Chromium	48	5,201	42	240	**3450**	**3150**	**1770**	**851**
Copper	36	780	0.053	3,200	**392**	**422**	**317**	**522**
Lead	24	1,133	5.4	250	**210**	**170**	**200**	**470**
Mercury	0.07	0.41	2.70E-04		**0.19**	**0.06**	**0.03**	*0.02* U
Silver		12	0.013	400	**4**	**4**	**3**	*3 U*
Zinc	85	327	2.03	24,000	**1950**	**690**	**220**	**130**

Notes:

a) Natural Background Concentrations for the Puget Sound Area (Ecology 1994).

b) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

d) MTCA Method B levels except for lead and arsenic where Method A values are used. Values from CLARC Database.

e) 30 mg/kg with benzene, 100 mg/kg without benzene.

U = Not detected at reporting limit indicated.

J = Estimated value.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 27 - Seattle Iron & Metals Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	SIM-BS-1 5/11/2011	SIM-BS-2 5/11/2011	SIM-BS-3 5/11/2011	SIM-BS-4 5/11/2011
Semivolatiles in ug/kg							
Chlorinated Hydrocarbons in ug/kg							
1,2,4-Trichlorobenzene		0.40		*18 U*	*18 U*	*19 U*	*18 U*
1,2-Dichlorobenzene	67.6	3.79		*18 U*	*18 U*	*19 U*	*18 U*
1,3-Dichlorobenzene		275.20	7,200,000	18 U	18 U	19 U	18 U
1,4-Dichlorobenzene	92.0	0.41		*18 U*	*18 U*	*19 U*	*18 U*
2,4,6-Trichlorophenol				89 U	91 U	96 U	92 U
Acid Extractables in ug/kg							
2,4-Dimethylphenol	37	2.03		*18 UJ*	*18 UJ*	*19 UJ*	*18 UJ*
2 Methylphenol	91	2.69		*18* U	*18* U	*19* U	*18* U
4 Methylphenol	979	22.13		18 U	18 U	19 U	18 U
Benzoic acid	9,622	644.32		180 U	180 U	190 U	180 U
Benzyl alcohol	785	55.02	8,000,000	18 U	18 U	19 U	18 U
Pentachlorophenol	381	2.56	2,500	*89 UJ*	*91 UJ*	*96 UJ*	*92 UJ*
Phenol	733	23.88	24,000,000	**550**	**140**	**42**	**31**
Phthalates in ug/kg							
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	**110**	**54**	30	23
Butyl benzyl phthalate	100	3.95	526,000	**19** J	*18 U*	*19 U*	*18 U*
Diethyl phthalate	3,157	199.78	64,000,000	18 U	18 U	12 JT	18 U
Dimethyl phthalate	1,631	40.95		11 JT	18 U	19 U	18 U
Di-n-butyl phthalate	5,003	81.36		12 T	18 U	19 U	18 U
Di-n-octyl phthalate	1,161	0.55		*18 U*	*18 U*	*19 U*	*18 U*
Miscellaneous Extractables in ug/kg							
Hexachlorobenzene	8.1	0.24	625	*18 U*	*18 U*	*19 U*	*18 U*
Hexachlorobutadiene	97	1,281	12,820	18 U	18 U	19 U	18 U
Hexachloroethane			71,429	18 U	18 U	19 U	18 U
N-Nitrosodiphenylamine		9.54	204,000	*18 U*	*18 U*	*19 U*	*18 U*
LPAHs							
2-Methylnaphthalene	833	43.21	320,000	18	14 T	19 U	10 T
Acenaphthene	330	16.75	4,800,000	*18 U*	*18 U*	*19 U*	*18 U*
Acenaphthylene	1,363	69.09		18 U	18 U	19 U	18 U
Anthracene	4,443	223.09	24,000,000	18 U	18 U	19 U	18 U
Fluorene	468	23.56	3,200,000	18 U	18 U	19 U	18 U
Naphthalene	2,197	0.47	1,600,000	**24**	**18**	*19* U	**11** T
Phenanthrene	2,019	101.38		66	41	48	54

Table 27 - Seattle Iron & Metals Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	SIM-BS-1 5/11/2011	SIM-BS-2 5/11/2011	SIM-BS-3 5/11/2011	SIM-BS-4 5/11/2011
HPAHs							
Benzo(a)anthracene	2,201	0.005	1,370	**33**	**18**	**18** T	**13** T
Benzo(a)pyrene	1,981	0.01	137	**44** J	**14** JT	**14** JT	**13** JT
Benzo(g,h,i)perylene	620	31.00		**49**	22	**36**	17 T
Chrysene	2,202	0.27	137,000	**74**	**33**	**39**	**25**
Dibenzo(a,h)anthracene	240	0.07	137	**14** T	*18 U*	*19 U*	*18 U*
Dibenzofuran		15.37	80,000	**18**	14 T	12 T	10 T
Fluoranthene	3,209	160.53	3,200,000	100	45	46	39
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**40**	**17** T	**26**	**15** T
Pyrene	20,058	684.43	2,400,000	84	38	35	30
Total Benzofluoranthenes	4,601	0.04		**120**	**50**	**56**	**38**
LPAHs (SIM)							
1-Methylnaphthalene				5.7	6.2	4.6 T	4.4 T
2-Methylnaphthalene	833	43.21	320,000	18	19	14	10
Acenaphthene	330	16.75	4,800,000	4.4 T	4.7	5.2	4.9 U
Acenaphthylene	1,363	69.09		2.6 T	4.6 U	4.9 U	4.9 U
Anthracene	4,443	223.09	24,000,000	3.9 T	3.6 T	7.1	4.9 U
Fluorene	468	23.56	3,200,000	3.2 T	4.3 T	3.8 T	4.9 U
Naphthalene	2,197	0.47	1,600,000	**24**	**22**	**13**	**13**
Phenanthrene	2,019	101.38		56	65	66	26
HPAHs (SIM)							
Benzo(a)anthracene	2,201	0.005	1,370	**28**	**20**	**32**	**6.4**
Benzo(a)pyrene	1,981	0.01	137	**39**	**24**	**34**	**7.2**
Benzo(g,h,i)perylene	620	31.00		**44**	30	**63**	11
Chrysene	2,202	0.27	137,000	**66**	**46**	**68**	**17**
Dibenz(a,h)anthracene	240	0.07	137	**13**	**9.7**	**14**	*4.9 U*
Dibenzofuran		15.37	80,000	**17**	**21**	15	5.5
Fluoranthene	3,209	160.53	3,200,000	86	70	73	20
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**35**	**23**	**42**	**7.6**
Pyrene	20,058	684.43	2,400,000	73	53	54	16
Total Benzofluoranthenes	4,601	0.04		**120**	**73**	**120**	**24**

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

R = Data are not usable because of significant exceedance of QC criteria.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 28 - Seattle Iron & Metals Analytical Results for Soil Samples - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	SIM-BS-1 5/11/2011	SIM-BS-2 5/11/2011	SIM-BS-3 5/11/2011	SIM-BS-4 5/11/2011
Pesticides in ug/kg							
4,4'-DDD		3.54	4,167	1.9 U	1.9 U	1.8 U	1.9 U
4,4'-DDE		4.70	2,941	2.7 U	1.9 U	1.8 U	1.9 U
4,4'-DDT		36.74	2,941	2.4	11	1.8 U	1.9 U
Aldrin		0.61	58.82	*0.97 U*	*0.94 U*	*0.93 U*	*0.94 U*
alpha-BHC (Benzene HexaChloride)		2.47		0.97 U	0.94 U	0.93 U	0.94 U
beta-BHC		10.23		0.97 U	0.94 U	0.93 U	0.94 U
cis-Chlordane				0.97 U	0.94 U	0.93 U	0.94 U
Dieldrin		0.34	62.5	*1.9 U*	*1.9 U*	*1.8 U*	*1.9 U*
alpha-Endosulfan		20.24	480,000	0.97 U	0.94 U	0.93 U	0.94 U
beta-Endosulfan		20.24	480,000	1.9 U	1.9 U	1.8 U	1.9 U
Endosulfan Sulfate		20.24		1.9 U	1.9 U	1.8 U	1.9 U
Endrin		22.20	24,000	1.9 U	1.9 U	1.8 U	1.9 U
Endrin Aldehyde		22.20		1.9 U	1.9 U	1.8 U	1.9 U
gamma-BHC (Lindane)		0.36	24,000	*0.97 U*	*0.94 U*	*0.93 U*	*0.94 U*
Heptachlor		0.19	222	*0.97 U*	*0.94 U*	*0.93 U*	*0.94 U*
Heptachlor Epoxide		0.81	110	*3.5 U*	*2.2 U*	*0.93 U*	*0.94 U*
Hexachlorobenzene (HCB)	8.1	0.24	625	*0.97 U*	*0.94 U*	*0.93 U*	*0.94 U*
Hexachlorobutadiene	97	1,281	12,821	0.97 *U*	0.94 *U*	0.93 *U*	0.94 *U*
Toxaphene		0.06	909	*97* U	*94* U	*93* U	*94* U
trans-Chlordane				0.97 U	0.94 U	0.93 U	0.94 U
PCBs in ug/kg							
Aroclor 1016	242	1.77	5,600	*20 U*	*19 U*	*19 U*	*19 U*
Aroclor 1221		0.24		*20 U*	*19 U*	*19 U*	*19 U*
Aroclor 1232		120.00		20 U	19 U	19 U	19 U
Aroclor 1242		0.02		*20 U*	*19 U*	*19 U*	*19 U*
Aroclor 1248	241	1.02		*49 U*	*19 U*	*19 U*	*19 U*
Aroclor 1254	241	0.42	500	**150**	**62**	**47**	*19* U
Aroclor 1260	240	4.77	500	**42**	*19 U*	**24**	**53**
Aroclor 1262				20 U	19 U	19 U	19 U
Aroclor 1268				20 U	19 U	19 U	19 U
TBT in ug/kg							
Tributyltin Ion				3.5	3.5 U	3.5 U	3.1 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

P = Sample confirmation exceeded 40 percent on the two chromatographic columns

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 29 - Seattle Iron & Metals Analytical Results for Soil Samples - Dioxins and PBDEs

Sample ID Sampling Date	Most Stringent Soil Screening Level to Protect Potable Ground Waters[b]	MTCA Soil Cleanup Level [c]	SIM-BS-1 5/11/2011	SIM-BS-2 5/11/2011	SIM-BS-3 5/11/2011	SIM-BS-4 5/11/2011
Dioxins in pg/g						
2,3,7,8-TCDD	3.02E-05		0.31 *UK*	0.516 *UK*	0.236 *UK*	0.113 *UK*
1,2,3,7,8-PeCDD			2.15	4.55	1.05	0.588 T
1,2,3,4,7,8-HxCDD			2.27	3.53	1.09 T	0.615 T
1,2,3,6,7,8-HxCDD			9.49	11.6	4.77	2.03
1,2,3,7,8,9-HxCDD			5.82	7.68	2.63	1.3 T
1,2,3,4,6,7,8-HpCDD			138	111	60.8	32.9
OCDD			841	652	357	221
2,3,7,8-TCDF			4.58	6.52	4.03	1.61
1,2,3,7,8-PeCDF			2.38 J	7.13	1.8 T	0.94 T
2,3,4,7,8-PeCDF			3.49	9.21	2.32	1.03
1,2,3,4,7,8-HxCDF			5.38	16	3.02	1.73 U
1,2,3,6,7,8-HxCDF			4.29	13.5	1.62 T	0.898 T
1,2,3,7,8,9-HxCDF			1.2 T	3.13	0.387 T	0.277 T
2,3,4,6,7,8-HxCDF			4.78	12.1	1.69 T	0.861 T
1,2,3,4,6,7,8-HpCDF			29.3	70	9.52	5.75
1,2,3,4,7,8,9-HpCDF			2.35	6.16	0.65 UK	0.661 T
OCDF			33.7	51.1	13.4	9.49
Total TCDD			9.72	17.3	4.77	2.37
Total PeCDD			20.5	36.1	9.45	3.34
Total HxCDD			87.1	104	36.8	17.6
Total HpCDD			356	262	125	82.4
Total TCDF			51.2	92.1	32.4	12.1
Total PeCDF			55.5	141	27	9.4
Total HxCDF			55.4	134	20.4	11.5
Total HpCDF			56.6	108	19.6	12.9
PDBEs in ug/kg						
2,2',4-Tribromodiphenyl ether (PBDE-17)			3.9 U	2.2 U	1.6 U	1.4 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)			0.4 U	0.5 U	0.5 U	0.5 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)			2.3	1.7	0.5 U	4.6 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)			0.4 U	0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)			0.4 U	0.5 U	0.5 U	0.5 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)			0.4 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)			2.7	2.2	0.9	0.5 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)			1.2 JP	0.8 JP	0.5 U	0.5 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)			0.4 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)			0.6	0.5 U	0.5 U	0.5 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)			0.9 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)			1.2 U	1 U	0.5 U	0.5 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

K = ion ratios did not meet criteria for positive identification of the analyte

P = Sample confirmation exceeded 40 percent on the two chromatographic columns

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 30 - Seattle Iron & Metals Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		SIM-BS-1	SIM-BS-2	SIM-BS-3	SIM-BS-4
Sampling Date	LAET	2LAET	5/11/11	5/11/11	5/11/11	5/11/11
Metals in mg/kg						
Arsenic	57	93	51 U	54 U	35	**67**
Cadmium	5.1	6.7	**9**	4	1 U	2 U
Chromium	260	270	**3450**	**3150**	**1770**	**851**
Copper	390	390	**392**	**422**	317	**522**
Lead	450	530	210	170	200	**470**
Mercury	0.41	0.59	0.19	0.06	0.03	0.02 U
Silver	6.1	6.1	4	4	3	3 U
Zinc	410	960	**1950**	**690**	220	130
Semivolatiles in ug/kg						
Chlorinated Hydrocarbons in ug/kg						
1,2,4-Trichlorobenzene	35	50	18 U	18 U	19 U	18 U
1,2-Dichlorobenzene	170	170	18 U	18 U	19 U	18 U
1,4-Dichlorobenzene	110	120	18 U	18 U	19 U	18 U
Acid Extractables in ug/kg						
2,4-Dimethylphenol	29	29	18 UJ	18 UJ	19 UJ	18 UJ
2-Methylphenol	63	63	18 U	18 U	19 U	18 U
4-Methylphenol	670	670	18 U	18 U	19 U	18 U
Benzoic acid	650	650	180 U	180 U	190 U	180 U
Benzyl alcohol	57	73	18 U	18 U	19 U	18 U
Pentachlorophenol	360	690	89 UJ	91 UJ	96 UJ	92 UJ
Phenol	420	1200	**550**	140	42	31
Phthalates in ug/kg						
Bis(2-ethylhexyl)phthalate	1300	1900	110	54	30	23
Butyl benzyl phthalate	63	900	19 J	18 U	19 U	18 U
Diethyl phthalate	200	200	18 U	18 U	12 JT	18 U
Dimethyl phthalate	71	160	11 JT	18 U	19 U	18 U
Di-n-butyl phthalate	1400	1400	12 T	18 U	19 U	18 U
Di-n-octyl phthalate	6200	6200	18 U	18 U	19 U	18 U
Miscellaneous Extractables in ug/kg						
Dibenzofuran	540	700	18	14 T	12 T	10 T
Hexachlorobenzene[a]	22	70	0.97 U	0.94 U	0.93 U	0.94 U
Hexachlorobutadiene[a]	11	120	0.97 U	0.94 U	0.93 U	0.94 U
N-Nitrosodiphenylamine	28	40	18 U	18 U	19 U	18 U
LPAHs in ug/kg						
2-Methylnaphthalene	670	1400	18	14 T	19 U	10 T
Acenaphthene	500	730	18 U	18 U	19 U	18 U
Acenaphthylene	1300	1300	18 U	18 U	19 U	18 U
Anthracene	960	4400	18 U	18 U	19 U	18 U
Fluorene	540	1000	18 U	18 U	19 U	18 U
Naphthalene	2100	2400	24	18	19 U	11 T
Phenanthrene	1500	5400	66	41	48	54
Total LPAHs [b]	5200	13000	108	73 J	48	75 J

Table 30 - Seattle Iron & Metals Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		SIM-BS-1	SIM-BS-2	SIM-BS-3	SIM-BS-4
Sampling Date	LAET	2LAET	5/11/11	5/11/11	5/11/11	5/11/11
HPAHs in ug/kg						
Benzo(a)anthracene	1300	1600	33	18	18 T	13 T
Benzo(a)pyrene	1600	3000	44 J	14 JT	14 JT	13 JT
Benzo(g,h,i)perylene	670	720	49	22	36	17 T
Chrysene	1400	2800	74	33	39	25
Dibenzo(a,h)anthracene	230	540	14 T	18 U	19 U	18 U
Fluoranthene	1700	2500	100	45	46	39
Indeno(1,2,3-cd)pyrene	600	690	40	17 T	26	15 T
Pyrene	2600	3300	84	38	35	30
Total Benzofluoranthenes	3200	3600	120	50	56	38
Total HPAHs [b]	12000	17000	558 J	237 J	270 J	190 J
LPAHs (SIM) in ug/kg						
1-Methylnaphthalene			5.7	6.2	4.6 T	4.4 T
2-Methylnaphthalene	670	1400	18	19	14	10
Acenaphthene	500	730	4.4 T	4.7	5.2	4.9 U
Acenaphthylene	1300	1300	2.6 T	4.6 U	4.9 U	4.9 U
Anthracene	960	4400	3.9 T	3.6 T	7.1	4.9 U
Fluorene	540	1000	3.2 T	4.3 T	3.8 T	4.9 U
Naphthalene	2100	2400	24	22	13	13
Phenanthrene	1500	5400	56	65	66	26
Total LPAHs [b]	5200	13000	94.1 J	99.6 J	95.1 J	39 J
HPAHs (SIM) in ug/kg						
Benzo(a)anthracene	1300	1600	28	20	32	6.4
Benzo(a)pyrene	1600	3000	39	24	34	7.2
Benzo(g,h,i)perylene	670	720	44	30	63	11
Chrysene	1400	2800	66	46	68	17
Dibenz(a,h)anthracene	230	540	13	9.7	14	4.9 U
Fluoranthene	1700	2500	86	70	73	20
Indeno(1,2,3-cd)pyrene	600	690	35	23	42	7.6
Pyrene	2600	3300	73	53	54	16
Total Benzofluoranthenes	3200	3600	120	73	120	24
Total HPAHs [b]	12000	17000	504	348.7	500	109.2
Miscellaneous Extractables (SIM) in ug/kg						
Dibenzofuran	540	700	17	21	15	5.5
PCBs in ug/kg						
Aroclor 1016			20 U	19 U	19 U	19 U
Aroclor 1221			20 U	19 U	19 U	19 U
Aroclor 1232			20 U	19 U	19 U	19 U
Aroclor 1242			20 U	19 U	19 U	19 U
Aroclor 1248			49 U	19 U	19 U	19 U
Aroclor 1254			150	62	47	19 U
Aroclor 1260			42	19 U	24	53
Aroclor 1262			20 U	19 U	19 U	19 U
Aroclor 1268			20 U	19 U	19 U	19 U
Total PCBs	130	1000	**192**	62	71	53

Notes:
Blank indicates no AET established for specific analyte.
Bolded value exceeds LAET.
Boxed value exceeds 2LAET.
Italicized value has detection limit that exceeds one or more criteria.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
a) Compounds are reported from the pesticides (EPA Method 8081) instead of SVOCs (EPA Method 8270) because EPA Method 8081 has a lower reporting limit for the compounds indicated.
b) Detected compound concentrations are summed to calculate the total LPAH and HPAH concentrations.

Table 31 - Seattle Iron & Metals Analytical Results Compared to LDW Risk Drivers

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	SIM-BS-1 5/11/11	SIM-BS-2 5/11/11	SIM-BS-3 5/11/11	SIM-BS-4 5/11/11
Arsenic in mg/kg	28	8	*51 U*	*54 U*	**35**	**67**
cPAHs TEQ in ug/kg [c]	900	7.3	**59.26**	**37.03**	**55.48**	**11.42**
Total PCBs in ug/kg [d]	240	2	**192**	**62**	**71**	**53**
Dioxin/Furans TEQ in pg/g [e]	25	2	**9.16**	**17.27**	**4.66**	**2.29**

Notes:

Boxed value exceeds Remedial Action Level.

Bolded value exceeds Natural Background Level.

Italics indicate reporting limit above level.

U = Not detected at the reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

a) Remedial Action Levels for Alternative 5C, provided by Ecology as presented in the Draft Final Feasibility Study for the Lower Duwamish Waterway (LDWG 2010).

b) Natural Background Values based on Ocean Survey Vessel (OSV) Bold Data (LDWG 2010).

c) The cPAH TEQ concentration was calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270. The cPAH was calculated as the sum of each individual PAH concentration multiplied by the corresponding toxicity factor (TEF). When the individual PAH compound concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

d) Total PCBs were calculated by summing the detected values for the individual components. For individual samples in which none of the individual components were detected, the total value was given a value equal to the highest reporting limit of an individual component, and assigned a U-qualifier.

e) The TEQ was calculated as the sum of each dioxin/furan congener concentration multiplied by the corresponding TEF value. When the dioxin/furan congener concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

Table 32 - Puget Sound Truck Lines Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	PSTL-BS-1a 5/11/2011	PSTL-BS-1b 5/11/2011	PSTL-BS-2 5/11/2011	PSTL-BS-3 5/11/2011	PSTL-BS-4a 5/11/2011
Conventionals in %									
Total Solids					84.8	84.4	84.9	95.7	93.9
Total Organic Carbon					0.876	0.884	0.987	1.53	1.62
TPH in mg/kg									
Diesel Range Organics			200		11	52	**660**	**1,400**	38
Lube Oil			2,000		36	76	800	780	150
Gasoline Range Organics			30/100[e]		6.6 U	16		9.5	5.8 U
BTEX in ug/kg									
Benzene			0.0002	18,180	*17 U*	*15 U*		*19 U*	*14 U*
Ethyl Benzene			1.70	8,000,000	*17 U*	*15 U*		*19 U*	*14 U*
m,p-Xylene			200	16,000,000	33 U	29 U		38 U	29 U
o-Xylene			200	16,000,000	**460**	**600**		**3,300**	35
Toluene			698	6,400,000	17 U	15 U		19 U	14 U
Metals in mg/kg									
Arsenic	7		1.58E-04	20	**27.6**	**25**	**75**	**82**	**18**
Cadmium	1	26	0.001	80	**0.3**	**0.4**	*0.6 U*	*0.5* U	*0.5* U
Chromium	48	5,201	42	240	27.3 J	22.2	20	19	25
Copper	36	780	0.053	3,200	**37.1**	**39**	**54.2**	**97.4**	**50.3**
Lead	24	1,133	5.4	250	**27**	**49**	**11**	**28**	**75**
Mercury	0.07	0.41	2.70E-04		**0.03**	**0.04**	*0.02 U*	**0.03**	**0.04**
Silver		12	0.013	400	*0.3 U*	*0.3 U*	*0.9 U*	*0.7 U*	*0.7 U*
Zinc	85	327	2.029	24,000	**231**	**366**	**217**	**191**	**194**

Table 32 - Puget Sound Truck Lines Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	PSTL-BS-4b 5/11/2011	PSTL-BS-5a 5/11/2011	PSTL-BS-5b 5/11/2011	PSTL-BS-6a 5/11/2011	PSTL-BS-6b 5/11/2011	PSTL-BS-7 5/11/2011
Conventionals in %										
Total Solids					79.1	94	73.9	82	66.7	82.7
Total Organic Carbon					0.923	1.97	1.23	2.16	1.39	1.13
TPH in mg/kg										
Diesel Range Organics			200		**1,100**	57	23	75	**500**	**250**
Lube Oil			2,000		2,000	270	120	82	260	310
Gasoline Range Organics			30/100[e]		11 U	6.3 U	8.5 U	7 U	10 U	8.3 U
BTEX in ug/kg										
Benzene			0.0002	18,180	*27 U*	*16 U*	*21 U*	*17 U*	*26 U*	*21 U*
Ethyl Benzene			1.70	8,000,000	*27 U*	*16 U*	*21 U*	*17 U*	*26 U*	*21 U*
m,p-Xylene			200	16,000,000	53 U	32 U	42 U	35 U	52 U	41 U
o-Xylene			200	16,000,000	130	130	88	98	180	130
Toluene			698	6,400,000	27 U	16 U	21 U	17 U	26 U	21 U
Metals in mg/kg										
Arsenic	7		1.58E-04	20	*15 U*	**16.9**	**19**	**69**	**41**	**16**
Cadmium	1	26	0.001	80	*0.6 U*	**1**	**0.8**	*0.6* U	*0.7* U	*0.6* U
Chromium	48	5,201	42	240	32	26.9	27	39	29	30
Copper	36	780	0.053	3,200	**48.1**	**48.5**	**166**	**66.8**	**70.8**	**82.7**
Lead	24	1,133	5.4	250	**15**	**65**	**45**	**52**	**36**	**81**
Mercury	0.07	0.41	2.70E-04		**0.03**	**0.06**	**0.05**	*0.02 U*	**0.04**	**0.06**
Silver		12	0.013	400	*0.9 U*	*0.3 U*	*0.9 U*	*0.9 U*	*1 U*	*0.9 U*
Zinc	85	327	2.029	24,000	**93**	**195**	**208**	**221**	**227**	**152**

Notes:

a) Natural Background Concentrations for the Puget Sound Area (Ecology 1994).
b) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.
c) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.
d) MTCA Method B levels except for lead and arsenic where Method A values are used. Values from CLARC Database.
e) 30 mg/kg with benzene, 100 mg/kg without benzene.
U = Not detected at reporting limit indicated.
J = Estimated value.
Values that exceed the most stringent soil standard to protect potable groundwater are bolded.
Values that exceed screening levels protective of sediment standards are boxed.
Values that exceed MTCA Method B (Human Health Criteria) are shaded.
Italicized value has detection limit that exceeds one or more criteria.

Table 33 - Puget Sound Truck Lines Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [d]	PSTL-BS-1a 5/11/2011	PSTL-BS-1b 5/11/2011	PSTL-BS-2 5/11/2011	PSTL-BS-3 5/11/2011	PSTL-BS-4a 5/11/2011
Semivolatiles in ug/kg								
Chlorinated Hydrocarbons in ug/kg								
1,2,4-Trichlorobenzene		0.40		*19 U*	*18 U*	*19 U*	*18 U*	*19 U*
1,2-Dichlorobenzene	67.6	3.79		*19 U*	*18 U*	*19 U*	*18 U*	*19 U*
1,3-Dichlorobenzene		275.20	7,200,000	19 U	18 U	19 U	18 U	19 U
1,4-Dichlorobenzene	92.0	0.41		*19 U*	*18 U*	*19 U*	*18 U*	*19 U*
2,4,6-Trichlorophenol				94 U	92 U	95 U	91 U	93 U
Acid Extractables in ug/kg								
2,4-Dimethylphenol	37	2.03		*19 UJ*	*18 UJ*	*19 UJ*	*18 UJ*	*19 UJ*
2 Methylphenol	91	2.69		*19 U*	*18 U*	*19 U*	*18 U*	*19 U*
4 Methylphenol	979	22.13		19 U	18 U	19 U	18 U	19 U
Benzoic acid	9,622	644.32		190 U	180 U	190 U	180 U	190 UJ
Benzyl alcohol	785	55.02	8,000,000	19 U	18 U	19 U	18 U	19 U
Pentachlorophenol	381	2.56	2,500	*94 UJ*	*92 UJ*	*95 UJ*	*91 UJ*	*93 UJ*
Phenol	733	23.88	24,000,000	19 U	11 T	22	18 U	19 U
Phthalates in ug/kg								
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	19	18	33	18 U	16 T
Butyl benzyl phthalate	100	3.95	526,000	*19 U*	*18 U*	*19 U*	*18 U*	*19 U*
Diethyl phthalate	3,157	199.78	64,000,000	19 U	18 U	19 U	18 U	19 U
Dimethyl phthalate	1,631	40.95		19 U	18 U	19 U	18 U	19 U
Di-n-butyl phthalate	5,003	81.36		19 U	18 U	19 U	18 U	20
Di-n-octyl phthalate	1,161	0.55		*19 U*	*18 U*	*19 U*	*18 U*	*19 U*
Miscellaneous Extractables in ug/kg								
Hexachlorobenzene	8.1	0.24	625	*19 U*	*18 U*	*19 U*	*18 U*	*19 U*
Hexachlorobutadiene	97	1,281	12,820	19 U	18 U	19 U	18 U	19 U
Hexachloroethane			71,429	19 U	18 U	19 U	18 U	19 U
N-Nitrosodiphenylamine		9.54	204,000	*19 U*	*18 U*	*19 U*	*18 U*	*19 U*
LPAHs								
2-Methylnaphthalene	833	43.21	320,000	11 T	20	13 T	18	19 U
Acenaphthene	330	16.75	4,800,000	*19 U*	*18 U*	*19 U*	*18 U*	*19 U*
Acenaphthylene	1,363	69.09		19 U	18 U	19 U	18 U	19 U
Anthracene	4,443	223.09	24,000,000	19 U	18 U	19 U	18 U	19 U
Fluorene	468	23.56	3,200,000	19 U	18 U	19 U	18 U	19 U
Naphthalene	2,197	0.47	1,600,000	**11** T	**28**	*19 U*	*18 U*	*19 U*
Phenanthrene	2,019	101.38		40	53	19 U	18 U	28
HPAHs								
Benzo(a)anthracene	2,201	0.005	1,370	**15** T	*18 U*	*19 U*	*18 U*	**88**
Benzo(a)pyrene	1,981	0.01	137	**17** JT	*18 U*	*19 U*	*18 U*	**79** J
Benzo(g,h,i)perylene	620	31.00		25	11 T	10 T	18 U	**54**
Chrysene	2,202	0.27	137,000	**24**	**12** T	**46**	**48**	**100**
Dibenzo(a,h)anthracene	240	0.07	137	*19 U*	*18 U*	*19 U*	*18 U*	**18** T
Dibenzofuran		15.37	80,000	*19 U*	13 T	*19 U*	*18 U*	*19 U*
Fluoranthene	3,209	160.53	3,200,000	40	34	16 T	18 U	87
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**20**	*18 U*	*19 U*	*18 U*	**42**
Pyrene	20,058	684.43	2,400,000	44	25	29	18 U	95
Total Benzofluoranthenes	4601	0.04		**43**	**20**	**23**	*18 U*	**140**

Table 33 - Puget Sound Truck Lines Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [d]	PSTL-BS-1a 5/11/2011	PSTL-BS-1b 5/11/2011	PSTL-BS-2 5/11/2011	PSTL-BS-3 5/11/2011	PSTL-BS-4a 5/11/2011
LPAHs (SIM)								
1-Methylnaphthalene				6	18	8.1	19	4.2 T
2-Methylnaphthalene	833	43.21	320,000	10	**52**	20	30	8
Acenaphthene	330	16.75	4,800,000	4.8 U	4.5 U	4.8 U	4.6 U	3.5 T
Acenaphthylene	1,363	69.09		3.3 T	4.8	4.8 U	4.6 U	2.8 T
Anthracene	4,443	223.09	24,000,000	2.8 T	7.4	4.8 U	4.6 U	10
Fluorene	468	23.56	3,200,000	4.8 U	10	4.8 U	4.6 U	4.6 U
Naphthalene	2,197	0.47	1,600,000	**9.2**	**50**	**5.5**	**10**	**9.1**
Phenanthrene	2,019	101.38		15	77	43	**140**	42
HPAHs (SIM)								
Benzo(a)anthracene	2,201	0.005	1,370	**8.5**	**14**	**4.6** T	*4.6 U*	**100**
Benzo(a)pyrene	1,981	0.01	137	**12**	**12**	**34**	**18**	**83**
Benzo(g,h,i)perylene	620	31.00		15	17	12	8.8	**58**
Chrysene	2,202	0.27	137,000	**14**	**20**	**60**	**56**	**120**
Dibenz(a,h)anthracene	240	0.07	137	**3.3** T	*4.5 U*	*4.8 U*	*4.6 U*	**19**
Dibenzofuran		15.37	80,000	4.8 U	**21**	4.8 U	4.6 U	4.4 T
Fluoranthene	3,209	160.53	3,200,000	17	50	15	4.6 U	130
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**9.6**	**12**	**6.2**	*4.6* U	**45**
Pyrene	20,058	684.43	2,400,000	18	36	35	4.6 U	120
Total Benzofluoranthenes	4,601	0.04		**23**	**28**	**24**	*4.6* U	**160**

Table 33 - Puget Sound Truck Lines Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [d]	PSTL-BS-4b 5/11/2011	PSTL-BS-5a 5/11/2011	PSTL-BS-5b 5/11/2011	PSTL-BS-6a 5/11/2011	PSTL-BS-6b 5/11/2011	PSTL-BS-7 5/11/2011
Semivolatiles in ug/kg									
Chlorinated Hydrocarbons in ug/kg									
1,2,4-Trichlorobenzene		0.40		*19 U*	*19 U*	*19 U*	*19 U*	*18 U*	*18 U*
1,2-Dichlorobenzene	67.6	3.79		*19 U*	*19 U*	*19 U*	*19 U*	*18 U*	*18 U*
1,3-Dichlorobenzene		275.20	7,200,000	19 U	19 U	19 U	19 U	18 U	18 U
1,4-Dichlorobenzene	92.0	0.41		*19 U*	*19 U*	*19 U*	*19 U*	*18 U*	*18 U*
2,4,6-Trichlorophenol				97 U	95 U	97 U	93 U	92 U	92 U
Acid Extractables in ug/kg									
2,4-Dimethylphenol	37	2.03		*19 UJ*	*19 UJ*	*19 UJ*	*19 UJ*	*18 UJ*	*18 UJ*
2 Methylphenol	91	2.69		*19 U*	*19 U*	*19 U*	*19 U*	*18 U*	*18 U*
4 Methylphenol	979	22.13		19 U	19 U	19 U	19 U	18 U	18 U
Benzoic acid	9,622	644.32		190 U	190 U	190 U	190 U	180 U	180 U
Benzyl alcohol	785	55.02	8,000,000	19 U	19 U	19 U	19 U	18 U	18 U
Pentachlorophenol	381	2.56	2,500	*97 UJ*	*95 UJ*	*97 UJ*	*93 UJ*	*94 UJ*	*92 UJ*
Phenol	733	23.88	24,000,000	19 U	19 U	19 U	12 T	18 U	**110**
Phthalates in ug/kg									
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	19 U	28	18 T	20	18 U	24
Butyl benzyl phthalate	100	3.95	526,000	*19 U*	*19 U*	*19 U*	*19 U*	*18 U*	*18 U*
Diethyl phthalate	3,157	199.78	64,000,000	19 U	**200** J	19 U	19 U	18 U	18 U
Dimethyl phthalate	1,631	40.95		19 U	19 U	19 U	19 U	18 U	18 U
Di-n-butyl phthalate	5,003	81.36		19 U	19 U	19 U	19 U	18 U	11 T
Di-n-octyl phthalate	1,161	0.55		*19 U*	*19 U*	*19 U*	*19 U*	*18 U*	*18 U*
Miscellaneous Extractables in ug/kg									
Hexachlorobenzene	8.1	0.24	625	*19 U*	*19 U*	*19 U*	*19 U*	*18 U*	*18 U*
Hexachlorobutadiene	97	1,281	12,820	19 U	19 U	19 U	19 U	18 U	18 U
Hexachloroethane			71,429	19 U	19 U	19 U	19 U	18 U	18 U
N-Nitrosodiphenylamine		9.54	204,000	*19 U*	*19 U*	*19 U*	*19 U*	*18 U*	*18 U*
LPAHs									
2-Methylnaphthalene	833	43.21	320,000	19 U	9.5 T	14 T	33	12 T	10 T
Acenaphthene	330	16.75	4,800,000	*19 U*	*19 U*	*19 U*	*19 U*	*18 U*	*18 U*
Acenaphthylene	1,363	69.09		19 U	16 T	19 U	19 U	18 U	18 U
Anthracene	4,443	223.09	24,000,000	19 U	10 T	19 U	19 U	18 U	18 U
Fluorene	468	23.56	3,200,000	19 U	19 U	19 U	19 U	18 U	18 U
Naphthalene	2,197	0.47	1,600,000	*19 U*	**9.5** T	**15** T	**10** T	**9.2** T	*18 U*
Phenanthrene	2,019	101.38		73	56	26	94	18 U	28
HPAHs									
Benzo(a)anthracene	2,201	0.005	1,370	*19 U*	**32**	**13** T	*19 U*	*18 U*	**18**
Benzo(a)pyrene	1,981	0.01	137	*19 U*	**44** J	**16** JT	**10** JT	*18 U*	**25** J
Benzo(g,h,i)perylene	620	31.00		19 U	**39**	13 T	22	21	25
Chrysene	2,202	0.27	137,000	**23**	**63** J	**22**	**16** T	**20**	**27**
Dibenzo(a,h)anthracene	240	0.07	137	*19 U*	*19* U	*19 U*	*19 U*	*18 U*	*18 U*
Dibenzofuran		15.37	80,000	*19 U*	*19* U	*19 U*	13 T	*18 U*	*18 U*
Fluoranthene	3,209	160.53	3,200,000	21	63	31	23	17 T	31
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	*19 U*	**18** T	*19 U*	**9.3** T	*18 U*	**16** T
Pyrene	20,058	684.43	2,400,000	33	98	39	28	16 T	28
Total Benzofluoranthenes	4601	0.04		*19 U*	**73**	**24**	**22**	**24**	**42**

Table 33 - Puget Sound Truck Lines Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [d]	PSTL-BS-4b 5/11/2011	PSTL-BS-5a 5/11/2011	PSTL-BS-5b 5/11/2011	PSTL-BS-6a 5/11/2011	PSTL-BS-6b 5/11/2011	PSTL-BS-7 5/11/2011
LPAHs (SIM)									
1-Methylnaphthalene				4.9 U	9.1 J	7.7	22	4.7 U	12
2-Methylnaphthalene	833	43.21	320,000	**130**	22 J	17	**58**	**270**	35
Acenaphthene	330	16.75	4,800,000	4.9 U	12	5.2	14	4.7 U	4.6 U
Acenaphthylene	1,363	69.09		4.9 U	20	6.9	8	4.7 U	5.8
Anthracene	4,443	223.09	24,000,000	4.9 U	27	6.8	22	19	12
Fluorene	468	23.56	3,200,000	4.9 U	6	3.9 T	5.1	4.7 U	5.4
Naphthalene	2,197	0.47	1,600,000	**5.7**	**13** J	**13**	**18**	**8.2**	**13**
Phenanthrene	2,019	101.38		92	**960**	40	**110**	27	49
HPAHs (SIM)									
Benzo(a)anthracene	2,201	0.005	1,370	**8.8**	**96**	**32**	**16**	**8.7**	**280**
Benzo(a)pyrene	1,981	0.01	137	**26**	**110**	**29**	**22**	**8.1**	**310**
Benzo(g,h,i)perylene	620	31.00		11	**56**	18	**54**	18	**200**
Chrysene	2,202	0.27	137,000	**26**	**140** J	**42**	**24**	**21**	**320**
Dibenz(a,h)anthracene	240	0.07	137	*4.9 U*	**15**	**6.2**	**13**	*4.7 U*	**68**
Dibenzofuran		15.37	80,000	4.9 U	**20**	8.3	**22**	4.7 U	4.6 U
Fluoranthene	3,209	160.53	3,200,000	29	**210**	72	31	24	99
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**5**	**44**	**16**	**30**	**10**	**180**
Pyrene	20,058	684.43	2,400,000	41	220	71	35	25	130
Total Benzofluoranthenes	4,601	0.04		**41**	**190**	**57**	**43**	**34**	**560**

Notes:
a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.
b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.
c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.
U = Not detected at reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
R = Data are not usable because of significant exceedance of QC criteria.
Values that exceed the most stringent soil standard to protect potable groundwater are bolded.
Values that exceed screening levels protective of sediment standards are boxed.
Values that exceed MTCA Method B (Human Health Criteria) are shaded.
Italicized value has detection limit that exceeds one or more criteria.
Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 34 - Puget Sound Truck Lines Analytical Results - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [c]	PSTL-BS-1a 5/11/2011	PSTL-BS-1b 5/11/2011	PSTL-BS-2 5/11/2011	PSTL-BS-3 5/11/2011	PSTL-BS-4a 5/11/2011
Pesticides in ug/kg								
4,4'-DDD		3.54	4,167	1.9 U	1.8 U	1.9 U	1.8 U	1.8 U
4,4'-DDE		4.70	2,941	1.9 U	1.8 U	1.9 U	1.8 U	1.8 U
4,4'-DDT		36.74	2,941	1.9 U	1.8 U	1.9 U	1.8 U	1.8 U
Aldrin		0.61	59	*0.93 U*	*0.91 U*	*0.93 U*	*0.92 U*	*0.9 U*
alpha-BHC (Benzene HexaChloride)		2.47		0.93 U	0.91 U	0.93 U	0.92 U	0.9 U
beta-BHC		10.23		0.93 U	0.91 U	0.93 U	0.92 U	0.9 U
cis-Chlordane				0.93 U	0.91 U	0.93 U	0.92 U	0.9 U
Dieldrin		0.34	62.5	*1.9 U*	*1.8 U*	*1.9 U*	*1.8 U*	*1.8 U*
alpha-Endosulfan		20.24	480,000	0.93 U	0.91 U	0.93 U	0.92 U	0.9 U
beta-Endosulfan		20.24	480,000	1.9 U	1.8 U	1.9 U	1.8 U	1.8 U
Endosulfan Sulfate		20.24		1.9 U	1.8 U	1.9 U	1.8 U	1.8 U
Endrin		22.20	24,000	1.9 U	1.8 U	1.9 U	1.8 U	1.8 U
Endrin Aldehyde		22.20		1.9 U	1.8 U	1.9 U	1.8 U	2.1
gamma-BHC (Lindane)		0.36	24,000	*0.93 U*	*0.91 U*	*0.93 U*	*0.92 U*	*0.9 U*
Heptachlor		0.19	222	*0.93 U*	*0.91 U*	*0.93 U*	*0.92 U*	*0.9 U*
Heptachlor Epoxide		0.81	110	*0.93 U*	*0.91 U*	*0.93 U*	*0.92 U*	*0.9 U*
Hexachlorobenzene (HCB)	8.1	0.24	625	*0.93 U*	*0.91 U*	*0.93 U*	*0.92 U*	*0.9 U*
Hexachlorobutadiene	97	1,281	12,821	0.93 U	0.91 U	0.93 U	0.92 U	0.9 U
Toxaphene		0.06	909	*93 U*	*91 U*	*93 U*	*92 U*	*90 U*
trans-Chlordane				0.93 U	0.91 U	0.93 U	0.92 U	0.9 U
PCBs in ug/kg								
Aroclor 1016	242	1.77	5,600	*3.8 U*	*3.6 U*	*3.9 U*	*3.7 U*	*18 U*
Aroclor 1221		0.24		*3.8 U*	*3.6 U*	*3.9 U*	*3.7 U*	*18 U*
Aroclor 1232		120.00		5.7 U	3.6 U	3.9 U	3.7 U	18 U
Aroclor 1242		0.02		*3.8 U*	*3.6 U*	*3.9 U*	*3.7 U*	*18 U*
Aroclor 1248	241	1.02		*3.8 U*	*5.4 U*	*3.9 U*	*3.7 U*	*18 U*
Aroclor 1254	241	0.42	500	**7.7**	**14**	*3.9* U	**6.5**	*27* U
Aroclor 1260	240	4.77	500	**9.9**	**12**	3.9 U	3.7 U	**43**
Aroclor 1262				3.8 U	3.6 U	3.9 U	3.7 U	18 U
Aroclor 1268				3.8 U	3.6 U	3.9 U	3.7 U	18 U
TBT in ug/kg								
Tributyltin Ion				3.6 U	3.4 U	3.6 U	3 U	3.2 U

Table 34 - Puget Sound Truck Lines Analytical Results - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [c]	PSTL-BS-4b 5/11/2011	PSTL-BS-5a 5/11/2011	PSTL-BS-5b 5/11/2011	PSTL-BS-6a 5/11/2011	PSTL-BS-6b 5/11/2011	PSTL-BS-7 5/11/2011
Pesticides in ug/kg									
4,4'-DDD		3.54	4,167	1.8 U	*9.4* U	1.9 U	1.9 U	1.9 U	1.9 U
4,4'-DDE		4.70	2,941	1.8 U	*9.4* U	1.9 U	1.9 U	1.9 U	1.9 UJ
4,4'-DDT		36.74	2,941	1.8 U	10	1.9 U	1.9 U	1.9 U	1.9 U
Aldrin		0.61	59	*0.91 U*	*4.7 U*	*0.94 U*	*0.93 U*	*0.95 U*	*0.94 UJ*
alpha-BHC (Benzene HexaChloride)		2.47		0.91 U	*4.7* U	0.94 U	0.93 U	0.95 U	0.94 UJ
beta-BHC		10.23		0.91 U	4.7 U	0.94 U	0.93 U	0.95 U	0.94 UJ
cis-Chlordane				0.91 U	4.7 U	0.94 U	0.93 U	0.95 U	0.94 UJ
Dieldrin		0.34	62.5	*1.8 U*	*9.4 U*	*1.9 U*	*1.9 U*	*1.9 U*	*1.9 UJ*
alpha-Endosulfan		20.24	480,000	0.91 U	4.7 U	0.94 U	0.93 U	0.95 U	0.94 UJ
beta-Endosulfan		20.24	480,000	1.8 U	9.4 U	1.9 U	1.9 U	1.9 U	1.9 UJ
Endosulfan Sulfate		20.24		1.8 U	9.4 U	1.9 U	1.9 U	1.9 U	1.9 UJ
Endrin		22.20	24,000	1.8 U	9.4 U	1.9 U	1.9 U	1.9 U	1.9 UJ
Endrin Aldehyde		22.20		1.8 U	9.4 U	2.1	1.9 U	1.9 U	1.9 U
gamma-BHC (Lindane)		0.36	24,000	*0.91 U*	*4.7 U*	*0.94 U*	*0.93 U*	*0.95 U*	*0.94 UJ*
Heptachlor		0.19	222	*0.91 U*	*4.7 U*	*0.94 U*	*0.93 U*	*0.95 U*	*0.94 UJ*
Heptachlor Epoxide		0.81	110	*0.91 U*	*4.7 U*	*0.94 U*	*0.93 U*	*0.95 U*	*0.94 UJ*
Hexachlorobenzene (HCB)	8.1	0.24	625	*0.91 U*	*4.7 U*	*0.94 U*	*0.93 U*	*0.95 U*	*0.94 U*
Hexachlorobutadiene	97	1,281	12,821	0.91 U	4.7 U	0.94 U	0.93 U	0.95 U	0.94 U
Toxaphene		0.06	909	*91 U*	*470 U*	*94 U*	*93 U*	*95 U*	*94 U*
trans-Chlordane				0.91 U	4.7 U	0.94 U	0.93 U	0.95 U	0.94 UJ
PCBs in ug/kg									
Aroclor 1016	242	1.77	5,600	*3.7 U*	*3.7 U*	*3.8 U*	*3.8 U*	*3.9 U*	*3.7 U*
Aroclor 1221		0.24		*3.7 U*	*3.7 U*	*3.8 U*	*3.8 U*	*3.9 U*	*3.7 U*
Aroclor 1232		120.00		3.7 U	3.7 U	3.8 U	3.8 U	3.9 U	3.7 U
Aroclor 1242		0.02		*3.7 U*	*3.7 U*	*3.8 U*	*3.8 U*	*3.9 U*	*3.7 U*
Aroclor 1248	241	1.02		*8.3 U*	*7.5 U*	*11 U*	*3.8 U*	*7.8 U*	*5.5 U*
Aroclor 1254	241	0.42	500	**14**	**32**	**31**	*13* U	*16* U	*9.1* U
Aroclor 1260	240	4.77	500	**8.2**	**40**	**29**	**11**	**24**	**19**
Aroclor 1262				3.7 U	3.7 U	3.8 U	3.8 U	3.9 U	3.7 U
Aroclor 1268				3.7 U	3.7 U	3.8 U	3.8 U	3.9 U	3.7 U
TBT in ug/kg									
Tributyltin Ion				3.3 U	3.2 U	3.3 U	3.3 U	3.4 U	3.3 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 35 - Puget Sound Truck Lines Analytical Results - Dioxins and PBDEs

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B[u]	PSTL-BS-1a 5/11/2011	PSTL-BS-1b 5/11/2011	PSTL-BS-2 5/11/2011	PSTL-BS-3 5/11/2011	PSTL-BS-4a 5/11/2011
Dioxins in pg/g								
2,3,7,8-TCDD		3.02E-05		*0.221 UK*	*0.437 UK*	*0.225 UK*	*0.503 UK*	*0.659 UK*
1,2,3,7,8-PeCDD				1.09	2.92	0.582 T	2.32	5.46
1,2,3,4,7,8-HxCDD				0.951 T	3.22	0.385 T	2.95	6.33
1,2,3,6,7,8-HxCDD				1.85 T	7.58	0.991 T	4.86	11.5
1,2,3,7,8,9-HxCDD				1.63 T	5.99	0.802 T	4.82	10.7
1,2,3,4,6,7,8-HpCDD				31.1	186	15.4	72.2	195
OCDD				253	1730	111	320	1160
2,3,7,8-TCDF				1.17	1.83	0.935 T	1.51 T	3.36
1,2,3,7,8-PeCDF				0.923 T	1.14 T	0.614 T	1.14 U	1.69 T
2,3,4,7,8-PeCDF				0.955 T	1.63	0.81 T	1.49 U	2.49
1,2,3,4,7,8-HxCDF				1.62 U	3.11	1.06 U	2.18 U	4.88
1,2,3,6,7,8-HxCDF				0.961 T	1.67 T	0.638 T	1.86 T	3.16
1,2,3,7,8,9-HxCDF				0.452 T	0.597 T	0.171 T	0.63 T	1.01 T
2,3,4,6,7,8-HxCDF				1.19 T	2.23	0.457 T	2.34	4.75
1,2,3,4,6,7,8-HpCDF				7.64	30.6	5.32	28.5	36.1
1,2,3,4,7,8,9-HpCDF				0.84 T	2.17	0.281 T	1.19 T	3.41
OCDF				12.2	123	5.02	23.5	70.2
Total TCDD				4.32	7.43	3.91	5.69	9.83
Total PeCDD				7.43	18.4	4.63	10.7	32.4
Total HxCDD				18.3	64.1	10.2	39	114
Total HpCDD				60.8	333	39.3	137	376
Total TCDF				15.9	23.2	18.6	17.3	41.8
Total PeCDF				28	46.5	29.2	38.3	106
Total HxCDF				16.8	48.7	13.5	40.5	84.2
Total HpCDF				16.9	109	10.3	45.8	98.6
PDBEs in ug/kg								
2,2',4-Tribromodiphenyl ether (PBDE-17)				0.5 U	0.5 U	0.5 U	0.4 U	3.2 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)				0.5 U	0.5 U	0.5 U	0.4 U	0.5 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)				0.8 U	1.3 U	0.5 U	0.4 U	4 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.4 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.4 U	0.5 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)				0.5 U	0.5 U	0.5 U	0.4 U	0.5 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)				0.5 U	0.5 U	0.5 U	0.4 U	0.5 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)				0.5 U	0.5 U	0.5 U	0.4 U	0.5 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)				0.5 U	0.5 U	0.5 U	0.4 U	0.5 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)				1.6 U	0.5 U	0.5 U	0.4 U	0.5 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)				0.5 U	0.5 U	0.5 U	0.4 U	0.5 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)				0.5 U	0.5 U	0.5 U	0.4 U	0.5 U

Table 35 - Puget Sound Truck Lines Analytical Results - Dioxins and PBDEs

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [u]	PSTL-BS-4b 5/11/2011	PSTL-BS-5a 5/11/2011	PSTL-BS-5b 5/11/2011	PSTL-BS-6a 5/11/2011	PSTL-BS-6b 5/11/2011	PSTL-BS-7 5/11/2011
Dioxins in pg/g									
2,3,7,8-TCDD		3.02E-05		*0.46 UK*	*0.689 UK*	*0.362 UK*	*0.62 UK*	*0.566 UK*	*0.336 UK*
1,2,3,7,8-PeCDD				3.58	5.54	2.25	4.63	3.92	2.32
1,2,3,4,7,8-HxCDD				3.98	6.26	2.32	4.57	4.09	2.55
1,2,3,6,7,8-HxCDD				22.1	12	5.04	8.4	12.4	6.62
1,2,3,7,8,9-HxCDD				12.8	11.5	4.65	8.81	9.88	5.3
1,2,3,4,6,7,8-HpCDD				193	211	78.5	132	194	98.9
OCDD				819	1290	562	688	1210	512
2,3,7,8-TCDF				1.57	5.39	2.93	1.74	1.53	1.52
1,2,3,7,8-PeCDF				1.07 T	2.54	1.59 T	0.787 T	1.97 T	0.985 T
2,3,4,7,8-PeCDF				1.21	3.32	1.82	1.31	1.63	1.77
1,2,3,4,7,8-HxCDF				3.15	5.24	2.88	3.05	4.59	3.13
1,2,3,6,7,8-HxCDF				2.28	3.35	1.71 T	1.41 T	2.21	1.9 T
1,2,3,7,8,9-HxCDF				0.896 T	1.15 T	0.472 T	0.524 T	0.723 T	0.584 T
2,3,4,6,7,8-HxCDF				3.5	4.81	2.11	1.92 T	2.25	2.93
1,2,3,4,6,7,8-HpCDF				48.5	33.1	15.2	14.3	22.5	27.9
1,2,3,4,7,8,9-HpCDF				3.26	2.93	1.35 T	1.44 T	2.31	1.76 T
OCDF				73.2	53.6	24.5	19.8	44.8	33.1
Total TCDD				12.2	15.8	5.73	9.91	10.6	4.67
Total PeCDD				25	34.6	13.6	23.3	25.4	14.1
Total HxCDD				162	125	47.4	81.1	98.4	59.6
Total HpCDD				359	418	154	249	393	193
Total TCDF				27.1	71.1	30.2	23.2	23	21.2
Total PeCDF				45.4	94.3	47.7	36.7	44.1	46.8
Total HxCDF				86.5	79.4	35.3	34.2	45.8	50.1
Total HpCDF				152	78.8	36.3	34.3	60.2	71.5
PDBEs in ug/kg									
2,2',4-Tribromodiphenyl ether (PBDE-17)				0.5 U	1 U	1.4 U	0.5 U	0.5 U	0.5 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)				0.5 U	2.4 U	3.1 U	0.5 U	2.6	1.6 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)				0.5 U	0.5 U	0.5 U	0.5 U	3.3 J	0.5 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)				0.5 U	0.5 U	0.5 U	0.5 U	1.1 U	0.5 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)				0.5 U	0.5 U	0.5 U	0.5 U	0.7	0.5 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)				0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

K = ion ratios did not meet criteria for positive identification of the analyte

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 36 - Puget Sound Truck Line Analytical Results Compared to SMS Sediment Quality Criteria

Sample ID	AETs		PSTL-BS-1a	PSTL-BS-1b	PSTL-BS-2
Sampling Date	LAET	2LAET	5/11/2011	5/11/2011	5/11/2011
Metals in mg/kg					
Arsenic	57	93	27.6	25	**75**
Cadmium	5.1	6.7	0.3	0.4	0.6 U
Chromium	260	270	27.3 J	22.2	20
Copper	390	390	37.1	39	54.2
Lead	450	530	27	49	11
Mercury	0.41	0.59	0.03	0.04	0.02 U
Silver	6.1	6.1	0.3 U	0.3 U	0.9 U
Zinc	410	960	231	366	217
Semivolatiles in ug/kg					
Chlorinated Hydrocarbons in ug/kg					
1,2,4-Trichlorobenzene	35	50	19 U	18 U	19 U
1,2-Dichlorobenzene	170	170	19 U	18 U	19 U
1,4-Dichlorobenzene	110	120	19 U	18 U	19 U
Acid Extractables in ug/kg					
2,4-Dimethylphenol	29	29	19 UJ	18 UJ	19 UJ
2-Methylphenol	63	63	19 U	18 U	19 U
4-Methylphenol	670	670	19 U	18 U	19 U
Benzoic acid	650	650	190 U	180 U	190 U
Benzyl alcohol	57	73	19 U	18 U	19 U
Pentachlorophenol	360	690	94 UJ	92 UJ	95 UJ
Phenol	420	1200	19 U	11 T	22
Phthalates in ug/kg					
Bis(2-ethylhexyl)phthalate	1300	1900	19	18	33
Butyl benzyl phthalate	63	900	19 U	18 U	19 U
Diethyl phthalate	200	200	19 U	18 U	19 U
Dimethyl phthalate	71	160	19 U	18 U	19 U
Di-n-butyl phthalate	1400	1400	19 U	18 U	19 U
Di-n-octyl phthalate	6200	6200	19 U	18 U	19 U
Miscellaneous Extractables in ug/kg					
Dibenzofuran	540	700	19 U	13 T	19 U
Hexachlorobenzene[a]	22	70	0.93 U	0.91 U	0.93 U
Hexachlorobutadiene[a]	11	120	0.93 U	0.91 U	0.93 U
N-Nitrosodiphenylamine	28	40	19 U	18 U	19 U
LPAHs in ug/kg					
2-Methylnaphthalene	670	1400	11 T	20	13 T
Acenaphthene	500	730	19 U	18 U	19 U
Acenaphthylene	1300	1300	19 U	18 U	19 U
Anthracene	960	4400	19 U	18 U	19 U
Fluorene	540	1000	19 U	18 U	19 U
Naphthalene	2100	2400	11 T	28	19 U
Phenanthrene	1500	5400	40	53	19 U
Total LPAHs [b]	5200	13000	51 J	89	19 U

Table 36 - Puget Sound Truck Line Analytical Results Compared to SMS Sediment Quality Criteria

Sample ID	AETs		PSTL-BS-1a	PSTL-BS-1b	PSTL-BS-2
Sampling Date	LAET	2LAET	5/11/2011	5/11/2011	5/11/2011
HPAHs in ug/kg					
Benzo(a)anthracene	1300	1600	15 T	18 U	19 U
Benzo(a)pyrene	1600	3000	17 JT	18 U	19 U
Benzo(g,h,i)perylene	670	720	25	11 T	10 T
Chrysene	1400	2800	24	12 T	46
Dibenzo(a,h)anthracene	230	540	19 U	18 U	19 U
Fluoranthene	1700	2500	40	34	16 T
Indeno(1,2,3-cd)pyrene	600	690	20	18 U	19 U
Pyrene	2600	3300	44	25	29
Total Benzofluoranthenes	3200	3600	43	20	23
Total HPAHs [b]	12000	17000	228 J	102 J	124 J
LPAHs (SIM) in ug/kg					
1-Methylnaphthalene			6	18	8.1
2-Methylnaphthalene	670	1400	10	52	20
Acenaphthene	500	730	4.8 U	4.5 U	4.8 U
Acenaphthylene	1300	1300	3.3 T	4.8	4.8 U
Anthracene	960	4400	2.8 T	7.4	4.8 U
Fluorene	540	1000	4.8 U	10	4.8 U
Naphthalene	2100	2400	9.2	50	5.5
Phenanthrene	1500	5400	15	77	43
Total LPAHs [b]	5200	13000	30.3 J	149.2	48.5
HPAHs (SIM) in ug/kg					
Benzo(a)anthracene	1300	1600	8.5	14	4.6 T
Benzo(a)pyrene	1600	3000	12	12	34
Benzo(g,h,i)perylene	670	720	15	17	12
Chrysene	1400	2800	14	20	60
Dibenz(a,h)anthracene	230	540	3.3 T	4.5 U	4.8 U
Fluoranthene	1700	2500	17	50	15
Indeno(1,2,3-cd)pyrene	600	690	9.6	12	6.2
Pyrene	2600	3300	18	36	35
Total Benzofluoranthenes	3200	3600	23	28	24
Total HPAHs [b]	12000	17000	120.4 J	189	190.8 J
Miscellaneous Extractables (SIM) in ug/kg					
Dibenzofuran	540	700	4.8 U	21	4.8 U
Pesticides in ug/kg					
4,4'-DDD			1.9 U	1.8 U	1.9 U
4,4'-DDE			1.9 U	1.8 U	1.9 U
4,4'-DDT			1.9 U	1.8 U	1.9 U
Aldrin			0.93 U	0.91 U	0.93 U
alpha-BHC (Benzene HexaChloride)			0.93 U	0.91 U	0.93 U
beta-BHC			0.93 U	0.91 U	0.93 U
cis-Chlordane			0.93 U	0.91 U	0.93 U
Dieldrin			1.9 U	1.8 U	1.9 U
alpha-Endosulfan			0.93 U	0.91 U	0.93 U
beta-Endosulfan			1.9 U	1.8 U	1.9 U
Endosulfan Sulfate			1.9 U	1.8 U	1.9 U

Table 36 - Puget Sound Truck Line Analytical Results Compared to SMS Sediment Quality Criteria

Sample ID	AETs		PSTL-BS-1a	PSTL-BS-1b	PSTL-BS-2
Sampling Date	LAET	2LAET	5/11/2011	5/11/2011	5/11/2011
Endrin			1.9 U	1.8 U	1.9 U
Endrin Aldehyde			1.9 U	1.8 U	1.9 U
gamma-BHC (Lindane)			0.93 U	0.91 U	0.93 U
Heptachlor			0.93 U	0.91 U	0.93 U
Heptachlor Epoxide			0.93 U	0.91 U	0.93 U
Hexachlorobenzene (HCB)			0.93 U	0.91 U	0.93 U
Hexachlorobutadiene			0.93 U	0.91 U	0.93 U
Toxaphene			93 U	91 U	93 U
trans-Chlordane			0.93 U	0.91 U	0.93 U
PCBs in ug/kg					
Aroclor 1016			3.8 U	3.6 U	3.9 U
Aroclor 1221			3.8 U	3.6 U	3.9 U
Aroclor 1232			5.7 U	3.6 U	3.9 U
Aroclor 1242			3.8 U	3.6 U	3.9 U
Aroclor 1248			3.8 U	5.4 U	3.9 U
Aroclor 1254			7.7	14	3.9 U
Aroclor 1260			9.9	12	3.9 U
Aroclor 1262			3.8 U	3.6 U	3.9 U
Aroclor 1268			3.8 U	3.6 U	3.9 U
Total PCBs	130	1000	17.6	26	3.9 U

Table 36 - Puget Sound Truck Line Analytical Results Compared to SMS Sediment Quality Criteria

Sample ID	AETs		PSTL-BS-3	PSTL-BS-4a	PSTL-BS-4b	PSTL-BS-5a	PSTL-BS-5b
Sampling Date	LAET	2LAET	5/11/2011	5/11/2011	5/11/2011	5/11/2011	5/11/2011
Metals in mg/kg							
Arsenic	57	93	**82**	18	15 U	16.9	19
Cadmium	5.1	6.7	0.5 U	0.5 U	0.6 U	1	0.8
Chromium	260	270	19	25	32	26.9	27
Copper	390	390	97.4	50.3	48.1	48.5	166
Lead	450	530	28	75	15	65	45
Mercury	0.41	0.59	0.03	0.04	0.03	0.06	0.05
Silver	6.1	6.1	0.7 U	0.7 U	0.9 U	0.3 U	0.9 U
Zinc	410	960	191	194	93	195	208
Semivolatiles in ug/kg							
Chlorinated Hydrocarbons in ug/kg							
1,2,4-Trichlorobenzene	35	50	18 U	19 U	19 U	19 U	19 U
1,2-Dichlorobenzene	170	170	18 U	19 U	19 U	19 U	19 U
1,4-Dichlorobenzene	110	120	18 U	19 U	19 U	19 U	19 U
Acid Extractables in ug/kg							
2,4-Dimethylphenol	29	29	18 UJ	19 UJ	19 UJ	19 UJ	19 UJ
2-Methylphenol	63	63	18 U	19 U	19 U	19 U	19 U
4-Methylphenol	670	670	18 U	19 U	19 U	19 U	19 U
Benzoic acid	650	650	180 U	190 UJ	190 U	190 U	190 U
Benzyl alcohol	57	73	18 U	19 U	19 U	19 U	19 U
Pentachlorophenol	360	690	91 UJ	93 UJ	97 UJ	95 UJ	97 UJ
Phenol	420	1200	18 U	19 U	19 U	19 U	19 U
Phthalates in ug/kg							
Bis(2-ethylhexyl)phthalate	1300	1900	18 U	16 T	19 U	28	18 T
Butyl benzyl phthalate	63	900	18 U	19 U	19 U	19 U	19 U
Diethyl phthalate	200	200	18 U	19 U	19 U	200 J	19 U
Dimethyl phthalate	71	160	18 U	19 U	19 U	19 U	19 U
Di-n-butyl phthalate	1400	1400	18 U	20	19 U	19 U	19 U
Di-n-octyl phthalate	6200	6200	18 U	19 U	19 U	19 U	19 U
Miscellaneous Extractables in ug/kg							
Dibenzofuran	540	700	18 U	19 U	19 U	19 U	19 U
Hexachlorobenzene[a]	22	70	0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
Hexachlorobutadiene[a]	11	120	0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
N-Nitrosodiphenylamine	28	40	18 U	19 U	19 U	19 U	19 U
LPAHs in ug/kg							
2-Methylnaphthalene	670	1400	18	19 U	19 U	9.5 T	14 T
Acenaphthene	500	730	18 U	19 U	19 U	19 U	19 U
Acenaphthylene	1300	1300	18 U	19 U	19 U	16 T	19 U
Anthracene	960	4400	18 U	19 U	19 U	10 T	19 U
Fluorene	540	1000	18 U	19 U	19 U	19 U	19 U
Naphthalene	2100	2400	18 U	19 U	19 U	9.5 T	15 T
Phenanthrene	1500	5400	18 U	28	73	56	26
Total LPAHs [b]	5200	13000	18 U	28	73	91.5 J	41 J

Table 36 - Puget Sound Truck Line Analytical Results Compared to SMS Sediment Quality Criteria

Sample ID	AETs		PSTL-BS-3	PSTL-BS-4a	PSTL-BS-4b	PSTL-BS-5a	PSTL-BS-5b
Sampling Date	LAET	2LAET	5/11/2011	5/11/2011	5/11/2011	5/11/2011	5/11/2011
HPAHs in ug/kg							
Benzo(a)anthracene	1300	1600	18 U	88	19 U	32	13 T
Benzo(a)pyrene	1600	3000	18 U	79 J	19 U	44 J	16 JT
Benzo(g,h,i)perylene	670	720	18 U	54	19 U	39	13 T
Chrysene	1400	2800	48	100	23	63 J	22
Dibenzo(a,h)anthracene	230	540	18 U	18 T	19 U	19 U	19 U
Fluoranthene	1700	2500	18 U	87	21	63	31
Indeno(1,2,3-cd)pyrene	600	690	18 U	42	19 U	18 T	19 U
Pyrene	2600	3300	18 U	95	33	98	39
Total Benzofluoranthenes	3200	3600	18 U	140	19 U	73	24
Total HPAHs [b]	12000	17000	48	703 J	77	430 J	158 J
LPAHs (SIM) in ug/kg							
1-Methylnaphthalene			19	4.2 T	4.9 U	9.1 J	7.7
2-Methylnaphthalene	670	1400	30	8	130	22 J	17
Acenaphthene	500	730	4.6 U	3.5 T	4.9 U	12	5.2
Acenaphthylene	1300	1300	4.6 U	2.8 T	4.9 U	20	6.9
Anthracene	960	4400	4.6 U	10	4.9 U	27	6.8
Fluorene	540	1000	4.6 U	4.6 U	4.9 U	6	3.9 T
Naphthalene	2100	2400	10	9.1	5.7	13 J	13
Phenanthrene	1500	5400	140	42	92	960	40
Total LPAHs [b]	5200	13000	150	67.4 J	97.7	1038 J	75.8 J
HPAHs (SIM) in ug/kg							
Benzo(a)anthracene	1300	1600	4.6 U	100	8.8	96	32
Benzo(a)pyrene	1600	3000	18	83	26	110	29
Benzo(g,h,i)perylene	670	720	8.8	58	11	56	18
Chrysene	1400	2800	56	120	26	140 J	42
Dibenz(a,h)anthracene	230	540	4.6 U	19	4.9 U	15	6.2
Fluoranthene	1700	2500	4.6 U	130	29	210	72
Indeno(1,2,3-cd)pyrene	600	690	4.6 U	45	5	44	16
Pyrene	2600	3300	4.6 U	120	41	220	71
Total Benzofluoranthenes	3200	3600	4.6 U	160	41	190	57
Total HPAHs [b]	12000	17000	82.8	835	187.8	1081	343.2
Miscellaneous Extractables (SIM) in ug/kg							
Dibenzofuran	540	700	4.6 U	4.4 T	4.9 U	20	8.3
Pesticides in ug/kg							
4,4'-DDD			1.8 U	1.8 U	1.8 U	9.4 U	1.9 U
4,4'-DDE			1.8 U	1.8 U	1.8 U	9.4 U	1.9 U
4,4'-DDT			1.8 U	1.8 U	1.8 U	10	1.9 U
Aldrin			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
alpha-BHC (Benzene HexaChloride)			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
beta-BHC			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
cis-Chlordane			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
Dieldrin			1.8 U	1.8 U	1.8 U	9.4 U	1.9 U
alpha-Endosulfan			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
beta-Endosulfan			1.8 U	1.8 U	1.8 U	9.4 U	1.9 U
Endosulfan Sulfate			1.8 U	1.8 U	1.8 U	9.4 U	1.9 U

Table 36 - Puget Sound Truck Line Analytical Results Compared to SMS Sediment Quality Criteria

Sample ID	AETs		PSTL-BS-3	PSTL-BS-4a	PSTL-BS-4b	PSTL-BS-5a	PSTL-BS-5b
Sampling Date	LAET	2LAET	5/11/2011	5/11/2011	5/11/2011	5/11/2011	5/11/2011
Endrin			1.8 U	1.8 U	1.8 U	9.4 U	1.9 U
Endrin Aldehyde			1.8 U	2.1	1.8 U	9.4 U	2.1
gamma-BHC (Lindane)			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
Heptachlor			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
Heptachlor Epoxide			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
Hexachlorobenzene (HCB)			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
Hexachlorobutadiene			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
Toxaphene			92 U	90 U	91 U	470 U	94 U
trans-Chlordane			0.92 U	0.9 U	0.91 U	4.7 U	0.94 U
PCBs in ug/kg							
Aroclor 1016			3.7 U	18 U	3.7 U	3.7 U	3.8 U
Aroclor 1221			3.7 U	18 U	3.7 U	3.7 U	3.8 U
Aroclor 1232			3.7 U	18 U	3.7 U	3.7 U	3.8 U
Aroclor 1242			3.7 U	18 U	3.7 U	3.7 U	3.8 U
Aroclor 1248			3.7 U	18 U	8.3 U	7.5 U	11 U
Aroclor 1254			6.5	27 U	14	32	31
Aroclor 1260			3.7 U	43	8.2	40	29
Aroclor 1262			3.7 U	18 U	3.7 U	3.7 U	3.8 U
Aroclor 1268			3.7 U	18 U	3.7 U	3.7 U	3.8 U
Total PCBs	130	1000	6.5	43	22.2	72	60

Table 36 - Puget Sound Truck Line Analytical Results Compared to SMS Sediment Quality Criteria

Sample ID	AETs		PSTL-BS-6a	PSTL-BS-6b	PSTL-BS-7
Sampling Date	LAET	2LAET	5/11/2011	5/11/2011	5/11/2011
Metals in mg/kg					
Arsenic	57	93	**69**	41	16
Cadmium	5.1	6.7	0.6 U	0.7 U	0.6 U
Chromium	260	270	39	29	30
Copper	390	390	66.8	70.8	82.7
Lead	450	530	52	36	81
Mercury	0.41	0.59	0.02 U	0.04	0.06
Silver	6.1	6.1	0.9 U	1 U	0.9 U
Zinc	410	960	221	227	152
Semivolatiles in ug/kg					
Chlorinated Hydrocarbons in ug/kg					
1,2,4-Trichlorobenzene	35	50	19 U	18 U	18 U
1,2-Dichlorobenzene	170	170	19 U	18 U	18 U
1,4-Dichlorobenzene	110	120	19 U	18 U	18 U
Acid Extractables in ug/kg					
2,4-Dimethylphenol	29	29	19 UJ	18 UJ	18 UJ
2-Methylphenol	63	63	19 U	18 U	18 U
4-Methylphenol	670	670	19 U	18 U	18 U
Benzoic acid	650	650	190 U	180 U	180 U
Benzyl alcohol	57	73	19 U	18 U	18 U
Pentachlorophenol	360	690	93 UJ	94 UJ	92 UJ
Phenol	420	1200	12 T	18 U	110
Phthalates in ug/kg					
Bis(2-ethylhexyl)phthalate	1300	1900	20	18 U	24
Butyl benzyl phthalate	63	900	19 U	18 U	18 U
Diethyl phthalate	200	200	19 U	18 U	18 U
Dimethyl phthalate	71	160	19 U	18 U	18 U
Di-n-butyl phthalate	1400	1400	19 U	18 U	11 T
Di-n-octyl phthalate	6200	6200	19 U	18 U	18 U
Miscellaneous Extractables in ug/kg					
Dibenzofuran	540	700	13 T	18 U	18 U
Hexachlorobenzene[a]	22	70	0.93 U	0.95 U	0.94 U
Hexachlorobutadiene[a]	11	120	0.93 U	0.95 U	0.94 U
N-Nitrosodiphenylamine	28	40	19 U	18 U	18 U
LPAHs in ug/kg					
2-Methylnaphthalene	670	1400	33	12 T	10 T
Acenaphthene	500	730	19 U	18 U	18 U
Acenaphthylene	1300	1300	19 U	18 U	18 U
Anthracene	960	4400	19 U	18 U	18 U
Fluorene	540	1000	19 U	18 U	18 U
Naphthalene	2100	2400	10 T	9.2 T	18 U
Phenanthrene	1500	5400	94	18 U	28
Total LPAHs [b]	5200	13000	104 J	9.2 J	28

Table 36 - Puget Sound Truck Line Analytical Results Compared to SMS Sediment Quality Criteria

Sample ID	AETs		PSTL-BS-6a	PSTL-BS-6b	PSTL-BS-7
Sampling Date	LAET	2LAET	5/11/2011	5/11/2011	5/11/2011
HPAHs in ug/kg					
Benzo(a)anthracene	1300	1600	19 U	18 U	18
Benzo(a)pyrene	1600	3000	10 JT	18 U	25 J
Benzo(g,h,i)perylene	670	720	22	21	25
Chrysene	1400	2800	16 T	20	27
Dibenzo(a,h)anthracene	230	540	19 U	18 U	18 U
Fluoranthene	1700	2500	23	17 T	31
Indeno(1,2,3-cd)pyrene	600	690	9.3 T	18 U	16 T
Pyrene	2600	3300	28	16 T	28
Total Benzofluoranthenes	3200	3600	22	24	42
Total HPAHs [b]	12000	17000	130.3 J	98 J	212 J
LPAHs (SIM) in ug/kg					
1-Methylnaphthalene			22	4.7 U	12
2-Methylnaphthalene	670	1400	58	270	35
Acenaphthene	500	730	14	4.7 U	4.6 U
Acenaphthylene	1300	1300	8	4.7 U	5.8
Anthracene	960	4400	22	19	12
Fluorene	540	1000	5.1	4.7 U	5.4
Naphthalene	2100	2400	18	8.2	13
Phenanthrene	1500	5400	110	27	49
Total LPAHs [b]	5200	13000	177.1	54.2	85.2
HPAHs (SIM) in ug/kg					
Benzo(a)anthracene	1300	1600	16	8.7	280
Benzo(a)pyrene	1600	3000	22	8.1	310
Benzo(g,h,i)perylene	670	720	54	18	200
Chrysene	1400	2800	24	21	320
Dibenz(a,h)anthracene	230	540	13	4.7 U	68
Fluoranthene	1700	2500	31	24	99
Indeno(1,2,3-cd)pyrene	600	690	30	10	180
Pyrene	2600	3300	35	25	130
Total Benzofluoranthenes	3200	3600	43	34	560
Total HPAHs [b]	12000	17000	268	148.8	2147
Miscellaneous Extractables (SIM) in ug/kg					
Dibenzofuran	540	700	22	4.7 U	4.6 U
Pesticides in ug/kg					
4,4'-DDD			1.9 U	1.9 U	1.9 U
4,4'-DDE			1.9 U	1.9 U	1.9 UJ
4,4'-DDT			1.9 U	1.9 U	1.9 U
Aldrin			0.93 U	0.95 U	0.94 UJ
alpha-BHC (Benzene HexaChloride)			0.93 U	0.95 U	0.94 UJ
beta-BHC			0.93 U	0.95 U	0.94 UJ
cis-Chlordane			0.93 U	0.95 U	0.94 UJ
Dieldrin			1.9 U	1.9 U	1.9 UJ
alpha-Endosulfan			0.93 U	0.95 U	0.94 UJ
beta-Endosulfan			1.9 U	1.9 U	1.9 UJ
Endosulfan Sulfate			1.9 U	1.9 U	1.9 UJ

Table 36 - Puget Sound Truck Line Analytical Results Compared to SMS Sediment Quality Criteria

Sample ID	AETs		PSTL-BS-6a	PSTL-BS-6b	PSTL-BS-7
Sampling Date	LAET	2LAET	5/11/2011	5/11/2011	5/11/2011
Endrin			1.9 U	1.9 U	1.9 UJ
Endrin Aldehyde			1.9 U	1.9 U	1.9 U
gamma-BHC (Lindane)			0.93 U	0.95 U	0.94 UJ
Heptachlor			0.93 U	0.95 U	0.94 UJ
Heptachlor Epoxide			0.93 U	0.95 U	0.94 UJ
Hexachlorobenzene (HCB)			0.93 U	0.95 U	0.94 U
Hexachlorobutadiene			0.93 U	0.95 U	0.94 U
Toxaphene			93 U	95 U	94 U
trans-Chlordane			0.93 U	0.95 U	0.94 UJ
PCBs in ug/kg					
Aroclor 1016			3.8 U	3.9 U	3.7 U
Aroclor 1221			3.8 U	3.9 U	3.7 U
Aroclor 1232			3.8 U	3.9 U	3.7 U
Aroclor 1242			3.8 U	3.9 U	3.7 U
Aroclor 1248			3.8 U	7.8 U	5.5 U
Aroclor 1254			13 U	16 U	9.1 U
Aroclor 1260			11	24	19
Aroclor 1262			3.8 U	3.9 U	3.7 U
Aroclor 1268			3.8 U	3.9 U	3.7 U
Total PCBs	130	1000	11	24	19

Notes:
Blank indicates no AET established for specific analyte.
Bolded value exceeds LAET.
Boxed value exceeds 2LAET.
Italicized value has detection limit that exceeds one or more criteria.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
a) Compounds are reported from the pesticides (EPA Method 8081) instead of SVOCs (EPA Method 8270) because EPA Method 8081 has a lower reporting limit for the compounds indicated.

b) Detected compound concentrations are summed to calculate the total LPAH and HPAH concentrations.

Table 37 - Puget Sound Truck Line Analytical Results Compared to LDW Risk Drivers

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	PSTL-BS-1a 5/11/2011	PSTL-BS-1b 5/11/2011	PSTL-BS-2 5/11/2011	PSTL-BS-3 5/11/2011	PSTL-BS-4a 5/11/2011	PSTL-BS-4b 5/11/2011
Arsenic in mg/kg	28	8	**27.6**	**25**	**75**	**82**	**18**	*15 U*
cPAHs TEQ in ug/kg [c]	900	7.3	**16.58**	**17.83**	**38.32**	**19.48**	**116.6**	**31.99**
Total PCBs in ug/kg [d]	240	2	**17.6**	**26**	*3.9 U*	**6.5**	**43**	**22.2**
Dioxin/Furans TEQ in pg/g [e]	25	2	**2.89**	**9.03**	1.69	**5.94**	**13.87**	**11.95**

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	PSTL-BS-5a 5/11/2011	PSTL-BS-5b 5/11/2011	PSTL-BS-6a 5/11/2011	PSTL-BS-6b 5/11/2011	PSTL-BS-7 5/11/2011
Arsenic in mg/kg	28	8	**16.9**	**19**	**69**	**41**	**16**
cPAHs TEQ in ug/kg [c]	900	7.3	**145.9**	**40.54**	**32.44**	**13.82**	**422**
Total PCBs in ug/kg [d]	240	2	**72**	**60**	**11**	**24**	**19**
Dioxin/Furans TEQ in pg/g [e]	25	2	**14.80**	**6.36**	**10.09**	**11.08**	**6.95**

Notes:
Boxed value exceeds Remedial Action Level.
Bolded value exceeds Natural Background Level.
Italics indicate reporting limit above level.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.

a) Remedial Action Levels for Alternative 5C, provided by Ecology as presented in the Draft Final Feasibility Study for the Lower Duwamish Waterway (LDWG 2010).

b) Natural Background Values based on Ocean Survey Vessel (OSV) Bold Data (LDWG 2010).

c) The cPAH TEQ concentration was calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270. The cPAH was calculated as the sum of each individual PAH concentration multiplied by the corresponding toxicity factor (TEF). When the individual PAH compound concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

d) Total PCBs were calculated by summing the detected values for the individual components. For individual samples in which none of the individual components were detected, the total value was given a value equal to the highest reporting limit of an individual component, and assigned a U-qualifier.

e) The TEQ was calculated as the sum of each dioxin/furan congener concentration multiplied by the corresponding TEF value. When the dioxin/furan congener concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

Table 38 - South Park Street End Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	SP-BS-1-1 5/12/2011	SP-BS-1-2 5/12/2011	SP-BS-2-1 5/12/2011	SP-BS-2-2 5/12/2011
Conventionals in %								
Total Solids					77.8	57.7	87.2	76.3
Total Organic Carbon					0.795	0.52	1.45	0.129
TPH in mg/kg								
Diesel Range Organics			200		8.8	6.6 U	35	6.5 U
Lube Oil			2,000		32	13 U	360	13 U
Gasoline Range Organics			30/100[e]		7.9 U	7.8 U	7.1 U	9.9 U
BTEX in ug/kg								
Benzene			0.0002	18,180	*20 U*	*19 U*	*18 U*	*25 U*
Ethyl Benzene			1.70	8,000,000	*20 U*	*19 U*	*18 U*	*25 U*
m,p-Xylene			200	16,000,000	40 U	39 U	35 U	50 U
o-Xylene			200	16,000,000	**1100**	**330**	**340**	**1200**
Toluene			698	6,400,000	20 U	19 U	18 U	25 U
Metals in mg/kg								
Arsenic	7		1.58E-04	20	**7.4**	**6.4**	**9**	**6.6**
Cadmium	1	26	0.001	80	*0.3 U*	*0.2 U*	**0.9**	*0.3 U*
Chromium	48	5,201	42	240	18.4	14.6	21.5	15.7
Copper	36	780	0.053	3,200	**26.8**	**24.3**	**56.4**	**20.1**
Lead	24	1,133	5.4	250	**9**	**6**	**116**	3 U
Mercury	0.07	0.41	2.70E-04		**0.03**	**0.04**	**0.06**	**0.09**
Silver		12	0.013	400	*0.4 U*	*0.4 U*	*0.3 U*	*0.4 U*
Zinc	85	327	2.029	24,000	**86**	**48**	**149**	**51**

Notes:

a) Natural Background Concentrations for the Puget Sound Area (Ecology 1994).

b) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

d) MTCA Method B levels except for lead and arsenic where Method A values are used. Values from CLARC Database.

e) 30 mg/kg with benzene, 100 mg/kg without benzene.

U = Not detected at reporting limit indicated.

J = Estimated value.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 39 - South Park Street End Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [c]	SP-BS-1-1 5/12/2011	SP-BS-1-2 5/12/2011	SP-BS-2-1 5/12/2011	SP-BS-2-2 5/12/2011
Semivolatiles in ug/kg							
Chlorinated Hydrocarbons in ug/kg							
1,2,4-Trichlorobenzene		0.40		*19 U*	*18 U*	*18 U*	*18 U*
1,2-Dichlorobenzene	67.6	3.79		*19 U*	*18 U*	*18 U*	*18 U*
1,3-Dichlorobenzene		275.20	7,200,000	19 U	18 U	18 U	18 U
1,4-Dichlorobenzene	92.0	0.41		*19 U*	*18 U*	*18 U*	*18 U*
2,4,6-Trichlorophenol				93 U	92 U	92 U	93 U
Acid Extractables in ug/kg							
2,4-Dimethylphenol	37	2.03		R	R	R	R
2 Methylphenol	91	2.69		*19 U*	*18 U*	*18 U*	*18 U*
4 Methylphenol	979	22.13		19 U	18 U	18 U	18 U
Benzoic acid	9,622	644.32		190 U	180 U	**650**	180 U
Benzyl alcohol	785	55.02	8,000,000	19 U	18 U	18 U	18 U
Pentachlorophenol	381	2.56	2,500	*93 UJ*	*92 UJ*	*92 UJ*	*93 UJ*
Phenol	733	23.88	24,000,000	19 U	18 U	**45**	18 U
Phthalates in ug/kg							
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	*90 U*	18 U	**140**	18 U
Butyl benzyl phthalate	100	3.95	526,000	**32**	*18 U*	**30**	*18 U*
Diethyl phthalate	3,157	199.78	64,000,000	19 U	18 U	18 U	18 U
Dimethyl phthalate	1,631	40.95		19 U	18 U	18 U	18 U
Di-n-butyl phthalate	5,003	81.36		19 U	18 U	18 U	18 U
Di-n-octyl phthalate	1,161	0.55		*19 U*	*18 U*	*18 U*	*18 U*
Miscellaneous Extractables in ug/kg							
Hexachlorobenzene	8.1	0.24	625	*19 U*	*18 U*	*18 U*	*18 U*
Hexachlorobutadiene	97	1,281	12,820	19 U	18 U	18 U	18 U
Hexachloroethane			71,429	19 U	18 U	18 U	18 U
N-Nitrosodiphenylamine		9.54	204,000	*19 U*	*18 U*	*18 U*	*18 U*
LPAHs							
2-Methylnaphthalene	833	43.21	320,000	19 U	18 U	18 U	18 U
Acenaphthene	330	16.75	4,800,000	*19 U*	*18 U*	*18 U*	*18 U*
Acenaphthylene	1,363	69.09		19 U	18 U	18 U	18 U
Anthracene	4,443	223.09	24,000,000	22	18 U	18 U	18 U
Fluorene	468	23.56	3,200,000	19 U	18 U	18 U	18 U
Naphthalene	2,197	0.47	1,600,000	*19 U*	*18 U*	*18 U*	*18 U*
Phenanthrene	2,019	101.38		90	18 U	39	18 U

Table 39 - South Park Street End Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [c]	SP-BS-1-1 5/12/2011	SP-BS-1-2 5/12/2011	SP-BS-2-1 5/12/2011	SP-BS-2-2 5/12/2011
HPAHs							
Benzo(a)anthracene	2,201	0.005	1,370	**110**	*18 U*	**26**	*18 U*
Benzo(a)pyrene	1,981	0.01	137	**99**	*18 U*	**32**	*18 U*
Benzo(g,h,i)perylene	620	31.00		**80**	18 U	**61**	18 U
Chrysene	2,202	0.27	137,000	**140**	*18 U*	**66**	*18 U*
Dibenzo(a,h)anthracene	240	0.07	137	**20**	*18 U*	*18 U*	*18 U*
Dibenzofuran		15.37	80,000	*19 U*	*18 U*	*18 U*	*18 U*
Fluoranthene	3,209	160.53	3,200,000	**180**	18 U	58	18 U
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**66**	*18 U*	**35**	*18 U*
Pyrene	20,058	684.43	2,400,000	190	18 U	61	18 U
Total Benzofluoranthenes	4,601	0.04		**210**	*18 U*	**110**	*18 U*
LPAHs (SIM)							
1-Methylnaphthalene				22	4.4 T	3.8 T	4.7 U
2-Methylnaphthalene	833	43.21	320,000	**50**	8.2	9.2	3 T
Acenaphthene	330	16.75	4,800,000	12	3.6 JT	2.5 T	7.4
Acenaphthylene	1,363	69.09		5.8	4.7 U	2.7 T	4.7 U
Anthracene	4,443	223.09	24,000,000	7.2	4.7 U	4.1 T	12
Fluorene	468	23.56	3,200,000	8.6	4.7 U	4.9 U	8.3
Naphthalene	2,197	0.47	1,600,000	**47**	**9**	**10**	**7.1**
Phenanthrene	2,019	101.38		57	11	34	**120**
HPAHs (SIM)							
Benzo(a)anthracene	2,201	0.005	1,370	**22**	*4.7 U*	**24**	**21**
Benzo(a)pyrene	1,981	0.01	137	**28**	*4.7 U*	**33**	**12**
Benzo(g,h,i)perylene	620	31.00		29	4.7 U	**54**	6.2
Chrysene	2,202	0.27	137,000	**56**	*4.7 U*	**56**	**34**
Dibenz(a,h)anthracene	240	0.07	137	**7.9**	*4.7 U*	**12**	*4.7 U*
Dibenzofuran		15.37	80,000	**16**	3.2 T	3.2 T	9.1
Fluoranthene	3,209	160.53	3,200,000	58	3.8 T	61	120
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**22**	*4.7 U*	**32**	**6.1**
Pyrene	20,058	684.43	2,400,000	51	3.2 T	58	96
Total Benzofluoranthenes	4,601	0.04		**120**	*4.7 U*	**83**	**29**

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

R = Data are not usable because of significant exceedance of QC criteria.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 40 - South Park Street End Analytical Results - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [c]	SP-BS-1-1 5/12/2011	SP-BS-1-2 5/12/2011	SP-BS-2-1 5/12/2011	SP-BS-2-2 5/12/2011
Pesticides in ug/kg							
4,4'-DDD		3.54	4,167	1.9 U	1.9 U	*9.4* U	2 U
4,4'-DDE		4.70	2,941	1.9 U	1.9 U	*9.4* U	2 U
4,4'-DDT		36.74	2,941	9.6	1.9 U	18	2 U
Aldrin		0.61	58.82	*0.97* U	*0.97* U	*4.7* UJ	*0.97* UJ
alpha-BHC (Benzene HexaChloride)		2.47		0.97 U	0.97 U	*4.7* U	0.97 U
beta-BHC		10.23		0.97 U	0.97 U	4.7 U	0.97 U
cis-Chlordane				0.97 U	0.97 U	4.7 U	0.97 U
Dieldrin		0.34	62.5	*1.9* U	*1.9* U	*9.4* U	*2* U
alpha-Endosulfan		20.24	480,000	0.97 U	0.97 U	4.7 U	0.97 U
beta-Endosulfan		20.24	480,000	1.9 U	1.9 U	9.4 UJ	2 UJ
Endosulfan Sulfate		20.24		1.9 U	1.9 U	9.4 U	2 U
Endrin		22.20	24,000	1.9 U	1.9 U	9.4 U	2 U
Endrin Aldehyde		22.20		1.9 U	1.9 U	9.4 UJ	2 UJ
gamma-BHC (Lindane)		0.36	24,000	*0.97* U	*0.97* U	*4.7* U	*0.97* U
Heptachlor		0.19	222	*0.97* U	*0.97* U	*4.7* U	*0.97* U
Heptachlor Epoxide		0.81	109.89	*1.4* U	*0.97* U	*4.7* U	*0.97* U
Hexachlorobenzene (HCB)	8.1	0.24	625	*0.97* U	*0.97* U	*4.7* U	*0.97* U
Hexachlorobutadiene	97	1,281	12,821	0.97 U	0.97 U	4.7 U	0.97 U
Toxaphene		0.06	909	*97* U	*97* U	*470* U	*97* U
trans-Chlordane				0.97 U	0.97 U	4.7 U	0.97 U
PCBs in ug/kg							
Aroclor 1016	242	1.77	5,600	*3.8* U	*3.9* U	*3.8* U	*3.8* U
Aroclor 1221		0.24		*3.8* U	*3.9* U	*3.8* U	*3.8* U
Aroclor 1232		120.00		3.8 U	3.9 U	3.8 U	3.8 U
Aroclor 1242		0.02		*3.8* U	*3.9* U	*3.8* U	*3.8* U
Aroclor 1248	241	1.02		*3.8* U	*3.9* U	*5.6* U	*3.8* U
Aroclor 1254	241	0.42	500	*15* U	*3.9* U	*38* U	*3.8* U
Aroclor 1260	240	4.77	500	**27**	3.9 U	**34**	3.8 U
Aroclor 1262				3.8 U	3.9 U	3.8 U	3.8 U
Aroclor 1268				3.8 U	3.9 U	3.8 U	3.8 U
TBT in ug/kg							
Tributyltin Ion				11	3.4 U	8.9	3.3 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 41 - South Park Street End Analytical Results - Dioxins and PBDEs

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Method B [c]	SP-BS-1-1 5/12/2011	SP-BS-1-2 5/12/2011	SP-BS-2-1 5/12/2011	SP-BS-2-2 5/12/2011
Dioxins in pg/g							
2,3,7,8-TCDD		3.02E-05		*0.625 UK*	*0.0807 UK*	**2.72**	*0.0958 UK*
1,2,3,7,8-PeCDD				2.8	0.253 T	4.73	0.496 T
1,2,3,4,7,8-HxCDD				3.45	0.195 T	4.45	0.391 T
1,2,3,6,7,8-HxCDD				8.69	0.366 T	16.5	0.938 T
1,2,3,7,8,9-HxCDD				7.04	0.437 T	9	0.801 T
1,2,3,4,6,7,8-HpCDD				150	4.74	352	12.2
OCDD				832	25.6	3080	74.9
2,3,7,8-TCDF				2.32	0.164 T	4.64	0.264 T
1,2,3,7,8-PeCDF				1.59 JT	0.177 UK	2.93	0.217 T
2,3,4,7,8-PeCDF				2.6	0.17 T	5.29	0.426 UK
1,2,3,4,7,8-HxCDF				4.2	0.253 T	7.66	0.889 T
1,2,3,6,7,8-HxCDF				5.21	0.212 T	6.48	0.491 T
1,2,3,7,8,9-HxCDF				1.18 T	0.0599 U	1.96 T	0.249 UK
2,3,4,6,7,8-HxCDF				6.66	0.26 T	11.8	1.11 T
1,2,3,4,6,7,8-HpCDF				78.2	2.13	164	2.37
1,2,3,4,7,8,9-HpCDF				3.55	0.103 U	6.69	0.281 UK
OCDF				109	2.13 T	492	2.75 T
Total TCDD				17	0.893	30.5	2.57
Total PeCDD				25.9	1.25	47.6	3.39
Total HxCDD				75.3	2.42	129	10.3
Total HpCDD				292	9.53	643	25.4
Total TCDF				45.2	2.05	135	6.07
Total PeCDF				88	2.52	279	26.1
Total HxCDF				120	3.63	241	15.4
Total HpCDF				154	3.63	536	5.73
PDBEs in ug/kg							
2,2',4-Tribromodiphenyl ether (PBDE-17)				1.8 U	0.5 U	2.1 U	0.5 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)				0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)				2 U	0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U	0.5 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)				0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)				0.5 U	0.6	0.5 U	0.5 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)				0.5 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)				0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)				0.5 U	0.5 U	0.9 U	0.5 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)				0.5 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)				0.5 U	0.5 U	0.5 U	0.5 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

K = ion ratios did not meet criteria for positive identification of the analyte

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 42 - South Park Street End Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		SP-BS-1-1	SP-BS-1-2	SP-BS-2-1	SP-BS-2-2
Sampling Date	LAET	2LAET	5/12/2011	5/12/2011	5/12/2011	5/12/2011
Metals in mg/kg						
Arsenic	57	93	7.4	6.4	9	6.6
Cadmium	5.1	6.7	0.3 U	0.2 U	0.9	0.3 U
Chromium	260	270	18.4	14.6	21.5	15.7
Copper	390	390	26.8	24.3	56.4	20.1
Lead	450	530	9	6	116	3 U
Mercury	0.41	0.59	0.03	0.04	0.06	0.09
Silver	6.1	6.1	0.4 U	0.4 U	0.3 U	0.4 U
Zinc	410	960	86	48	149	51
Semivolatiles in ug/kg						
Chlorinated Hydrocarbons in ug/kg						
1,2,4-Trichlorobenzene	35	50	19 U	18 U	18 U	18 U
1,2-Dichlorobenzene	170	170	19 U	18 U	18 U	18 U
1,4-Dichlorobenzene	110	120	19 U	18 U	18 U	18 U
Acid Extractables in ug/kg						
2,4-Dimethylphenol	29	29	R	R	R	R
2-Methylphenol	63	63	19 U	18 U	18 U	18 U
4-Methylphenol	670	670	19 U	18 U	18 U	18 U
Benzoic acid	650	650	190 U	180 U	650	180 U
Benzyl alcohol	57	73	19 U	18 U	18 U	18 U
Pentachlorophenol	360	690	93 UJ	92 UJ	92 UJ	93 UJ
Phenol	420	1200	19 U	18 U	45	18 U
Phthalates in ug/kg						
Bis(2-ethylhexyl)phthalate	1300	1900	90 U	18 U	140	18 U
Butyl benzyl phthalate	63	900	32	18 U	30	18 U
Diethyl phthalate	200	200	19 U	18 U	18 U	18 U
Dimethyl phthalate	71	160	19 U	18 U	18 U	18 U
Di-n-butyl phthalate	1400	1400	19 U	18 U	18 U	18 U
Di-n-octyl phthalate	6200	6200	19 U	18 U	18 U	18 U
Miscellaneous Extractables in ug/kg						
Dibenzofuran	540	700	19 U	18 U	18 U	18 U
Hexachlorobenzene[a]	22	70	0.97 U	0.97 U	4.7 U	0.97 U
Hexachlorobutadiene[a]	11	120	0.97 U	0.97 U	4.7 U	0.97 U
N-Nitrosodiphenylamine	28	40	19 U	18 U	18 U	18 U
LPAHs in ug/kg						
2-Methylnaphthalene	670	1400	19 U	18 U	18 U	18 U
Acenaphthene	500	730	19 U	18 U	18 U	18 U
Acenaphthylene	1300	1300	19 U	18 U	18 U	18 U
Anthracene	960	4400	22	18 U	18 U	18 U
Fluorene	540	1000	19 U	18 U	18 U	18 U
Naphthalene	2100	2400	19 U	18 U	18 U	18 U
Phenanthrene	1500	5400	90	18 U	39	18 U
Total LPAHs [b]	5200	13000	112	18 U	39	18 U
HPAHs in ug/kg						
Benzo(a)anthracene	1300	1600	110	18 U	26	18 U
Benzo(a)pyrene	1600	3000	99	18 U	32	18 U
Benzo(g,h,i)perylene	670	720	80	18 U	61	18 U
Chrysene	1400	2800	140	18 U	66	18 U
Dibenzo(a,h)anthracene	230	540	20	18 U	18 U	18 U
Fluoranthene	1700	2500	180	18 U	58	18 U
Indeno(1,2,3-cd)pyrene	600	690	66	18 U	35	18 U
Pyrene	2600	3300	190	18 U	61	18 U
Total Benzofluoranthenes	3200	3600	210	18 U	110	18 U
Total HPAHs [b]	12000	17000	1095	18 U	449	18 U
LPAHs (SIM) in ug/kg						
1-Methylnaphthalene			22	4.4 T	3.8 T	4.7 U
2-Methylnaphthalene	670	1400	50	8.2	9.2	3 T
Acenaphthene	500	730	12	3.6 JT	2.5 T	7.4

Table 42 - South Park Street End Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		SP-BS-1-1	SP-BS-1-2	SP-BS-2-1	SP-BS-2-2
Sampling Date	LAET	2LAET	5/12/2011	5/12/2011	5/12/2011	5/12/2011
Acenaphthylene	1300	1300	5.8	4.7 U	2.7 T	4.7 U
Anthracene	960	4400	7.2	4.7 U	4.1 T	12
Fluorene	540	1000	8.6	4.7 U	4.9 U	8.3
Naphthalene	2100	2400	47	9	10	7.1
Phenanthrene	1500	5400	57	11	34	120
Total LPAHs [b]	5200	13000	137.6	23.6 J	53.3 J	154.8
HPAHs (SIM) in ug/kg						
Benzo(a)anthracene	1300	1600	22	4.7 U	24	21
Benzo(a)pyrene	1600	3000	28	4.7 U	33	12
Benzo(g,h,i)perylene	670	720	29	4.7 U	54	6.2
Chrysene	1400	2800	56	4.7 U	56	34
Dibenz(a,h)anthracene	230	540	7.9	4.7 U	12	4.7 U
Fluoranthene	1700	2500	58	3.8 T	61	120
Indeno(1,2,3-cd)pyrene	600	690	22	4.7 U	32	6.1
Pyrene	2600	3300	51	3.2 T	58	96
Total Benzofluoranthenes	3200	3600	120	4.7 U	83	29
Total HPAHs [b]	12000	17000	393.9	7 J	413	324.3
Miscellaneous Extractables (SIM) in ug/kg						
Dibenzofuran	540	700	16	3.2 T	3.2 T	9.1
PCBs in ug/kg						
Aroclor 1016			3.8 U	3.9 U	3.8 U	3.8 U
Aroclor 1221			3.8 U	3.9 U	3.8 U	3.8 U
Aroclor 1232			3.8 U	3.9 U	3.8 U	3.8 U
Aroclor 1242			3.8 U	3.9 U	3.8 U	3.8 U
Aroclor 1248			3.8 U	3.9 U	5.6 U	3.8 U
Aroclor 1254			15 U	3.9 U	38 U	3.8 U
Aroclor 1260			27	3.9 U	34	3.8 U
Aroclor 1262			3.8 U	3.9 U	3.8 U	3.8 U
Aroclor 1268			3.8 U	3.9 U	3.8 U	3.8 U
Total PCBs	130	1000	27	3.9 U	34	3.8 U

Notes:
Blank indicates no AET established for specific analyte.
Bolded value exceeds LAET.
Italicized value has detection limit that exceeds one or more criteria.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
R = Data are not usable because of significant exceedance of QC criteria.
a) Compounds are reported from the pesticides (EPA Method 8081) instead of SVOCs (EPA Method 8270) because EPA Method 8081 has a lower reporting limit for the compounds indicated.
b) Detected compound concentrations are summed to calculate the total LPAH and HPAH concentrations.

Table 43 - South Park Street End Analytical Results Compared to LDW Risk Drivers

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	SP-BS-1-1 5/12/2011	SP-BS-1-2 5/12/2011	SP-BS-2-1 5/12/2011	SP-BS-2-2 5/12/2011
Arsenic in mg/kg	28	8	7.4	6.4	**9**	6.6
cPAHs TEQ in ug/kg [c]	900	7.3	**45.75**	3.31 U	**48.66**	**18.19**
Total PCBs in ug/kg [d]	240	2	**27**	*3.9 U*	**34**	*3.8 U*
Dioxin/Furans TEQ in pg/g [e]	25	2	**10.42**	0.62	**21.67**	1.29

Notes:

Boxed value exceeds Remedial Action Level.

Bolded value exceeds Natural Background Level.

Italics indicate reporting limit above level.

U = Not detected at the reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

a) Remedial Action Levels for Alternative 5C, provided by Ecology as presented in the Draft Final Feasibility Study for the Lower Duwamish Waterway (LDWG 2010).

b) Natural Background Values based on Ocean Survey Vessel (OSV) Bold Data (LDWG 2010).

c) The cPAH TEQ concentration was calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270. The cPAH was calculated as the sum of each individual PAH concentration multiplied by the corresponding toxicity factor (TEF). When the individual PAH compound concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

d) Total PCBs were calculated by summing the detected values for the individual components. For individual samples in which none of the individual components were detected, the total value was given a value equal to the highest reporting limit of an individual component, and assigned a U-qualifier.

e) The TEQ was calculated as the sum of each dioxin/furan congener concentration multiplied by the corresponding TEF value. When the dioxin/furan congener concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

Table 44 - Sea King Industrial Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	SKI-BS-1 5/10/2011	SKI-BS-2 5/10/2011	SKI-BS-3 5/10/2011	SKI-BS-4 5/10/2011	SKI-BS-5 5/10/2011	SKI-BS-6 5/10/2011
Conventionals in %										
Total Solids					83	78.7	79.4	73.6	69.7	76.8
Total Organic Carbon					1.29	0.137	0.82	2.81	0.952	0.971
TPH in mg/kg										
Diesel Range Organics			200		5.9 U	6.2 U	5.9 U	6.7 U	7.1 U	6.3 U
Lube Oil			2,000		12 U	28	12 U	13 U	15	13 U
Gasoline Range Organics			30/100[e]		7.4 U	7 U	6.8 U	7.3 U	9.4 U	7.2 U
BTEX in ug/kg										
Benzene			0.0002	18,180	*18 U*	*18 U*	*17 U*	*18 U*	*23 U*	*18 U*
Ethyl Benzene			1.70	8,000,000	*18 U*	*18 U*	*17 U*	*18 U*	*23 U*	*18 U*
m,p-Xylene			200	16,000,000	37 U	35 U	34 U	36 U	47 U	36 U
o-Xylene			200	16,000,000	20	18 U	100	72	23 U	18 U
Toluene			698	6,400,000	18 U	18 U	17 U	18 U	23 U	18 U
Metals in mg/kg										
Arsenic	7		1.58E-04	20	*5.5 U*	**14.4**	**12.7**	**19.7**	**13**	**8.7**
Cadmium	1	26	0.001	80	*0.2 U*	**0.4**	**0.3**	**0.6**	*0.3 U*	**0.4**
Chromium	48	5,201	42	240	10.9	30.3	32.1	**48.6**	27.7	26.5
Copper	36	780	0.053	3,200	**12.2**	**27.8**	**28**	**46.1**	**44.8**	**28.4**
Lead	24	1,133	5.4	250	2 U	**30**	**10**	**44**	**16**	**15**
Mercury	0.07	0.41	2.70E-04		*0.02 U*	**0.05**	**0.03**	**0.1**	**0.14**	**0.04**
Silver		12	0.013	400	*0.3 U*	*0.4 U*	*0.4 U*	*0.4 U*	*0.4 U*	*0.4 U*
Zinc	85	327	2.029	24,000	**32**	**72**	**59**	**122**	**50**	**63**

Notes:

a) Natural Background Concentrations for the Puget Sound Area (Ecology 1994).

b) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

d) MTCA Method B levels except for lead and arsenic where Method A values are used. Values from CLARC Database.

e) 30 mg/kg with benzene, 100 mg/kg without benzene.

U = Not detected at reporting limit indicated.

J = Estimated value.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 45 - Sea King Industrial Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	SKI-BS-1 5/10/2011	SKI-BS-2 5/10/2011	SKI-BS-3 5/10/2011	SKI-BS-4 5/10/2011	SKI-BS-5 5/10/2011	SKI-BS-6 5/10/2011
Semivolatiles in ug/kg									
Chlorinated Hydrocarbons in ug/kg									
1,2,4-Trichlorobenzene		0.40		*18 U*	*19 U*	*18 U*	*19 U*	*19 U*	*18 U*
1,2-Dichlorobenzene	67.6	3.79		*18 U*	*19 U*	*18 U*	*19 U*	*19 U*	*18 U*
1,3-Dichlorobenzene		275.20	7,200,000	18 U	19 U	18 U	19 U	19 U	18 U
1,4-Dichlorobenzene	92.0	0.41		*18 U*	*19 U*	*18 U*	*19 U*	*19 U*	*18 U*
2,4,6-Trichlorophenol				92 U	95 U	92 U	94 U	93 U	92 U
Acid Extractables in ug/kg									
2,4-Dimethylphenol	37	2.03		*18 UJ*	*19 UJ*	*18 UJ*	*19 UJ*	*19 UJ*	*18 UJ*
2 Methylphenol	91	2.69		*18 U*	*19 U*	*18 U*	*19 U*	*19 U*	*18 U*
4 Methylphenol	979	22.13		18 U	19 U	18 U	19 U	19 U	18 U
Benzoic acid	9622	644.32		180 UJ	190 UJ	180 UJ	130 JT	190 UJ	180 UJ
Benzyl alcohol	785	55.02	8,000,000	18 U	19 U	18 U	10 T	19 U	18 U
Pentachlorophenol	381	2.56	2,500	*92 U*	*95 U*	*92 U*	*94 UJ*	*93 UJ*	*92 UJ*
Phenol	733	23.88	24,000,000	18 U	19 U	18 U	10 T	19 U	18 U
Phthalates in ug/kg									
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	18 U	34 U	18 U	19 U	22 U	18 U
Butyl benzyl phthalate	100	3.95	526,000	*18 U*	**24**	*18 U*	*19 U*	*19 U*	*18 U*
Diethyl phthalate	3,157	199.78	64,000,000	18 U	19 U	18 U	19 U	19 U	18 U
Dimethyl phthalate	1,631	40.95		18 U	11 T	18 U	19 U	19 U	18 U
Di-n-butyl phthalate	5,003	81.36		18 U	19 U	18 U	19 U	19 U	18 U
Di-n-octyl phthalate	1,161	0.55		*18 U*	*19 U*	*18 U*	*19 U*	*19 U*	*18 U*
Miscellaneous Extractables in ug/kg									
Hexachlorobenzene	8.1	0.24	625	*18 U*	*19 U*	*18 U*	*19 U*	*19 U*	*18 U*
Hexachlorobutadiene	97	1281.15	12,820	18 *U*	19 *U*	18 *U*	19 *U*	19 *U*	18 *U*
Hexachloroethane			71,429	18 U	19 U	18 U	19 U	19 U	18 U
N-Nitrosodiphenylamine		9.54	204,000	*18 UJ*	*19 UJ*	*18 UJ*	*19 U*	*19 U*	*18 U*
LPAHs									
2-Methylnaphthalene	833	43.21	320,000	18 U	19 U	18 U	**98**	19 U	18 U
Acenaphthene	330	16.75	4,800,000	*18 U*	*19 U*	*18 U*	*19 U*	*19 U*	*18 U*
Acenaphthylene	1,363	69.09		18 U	19 U	18 U	19 U	19 U	18 U
Anthracene	4,443	223.09	24,000,000	18 U	11 T	18 U	19 U	19 U	18 U
Fluorene	468	23.56	3,200,000	18 U	19 U	18 U	19 U	19 U	18 U
Naphthalene	2,197	0.47	1,600,000	*18 U*	**14** T	*18 U*	**84**	*19 U*	*18 U*
Phenanthrene	2,019	101.38		18 U	86	18 U	79	19 U	18 U
HPAHs									
Benzo(a)anthracene	2,201	0.005	1,370	*18 U*	**45**	*18 U*	**10** T	*19 U*	*18 U*
Benzo(a)pyrene	1,981	0.01	137	*18 U*	**67**	*18 U*	*19 U*	*19 U*	*18 U*
Benzo(g,h,i)perylene	620	31.00		18 U	**68**	18 U	14 T	19 U	18 U
Chrysene	2,202	0.27	137,000	*18 U*	**79**	*18 U*	**25**	*19 U*	*18 U*
Dibenzo(a,h)anthracene	240	0.07	137	*18 U*	**17** T	*18 U*	*19 U*	*19 U*	*18 U*
Dibenzofuran		15.37	80,000	*18 U*	*19* U	*18 U*	**26**	*19 U*	*18 U*
Fluoranthene	3,209	160.53	3,200,000	18 UJ	130 J	18 UJ	38 J	19 UJ	18 UJ
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	*18 U*	**47**	*18 U*	*19 U*	*19 U*	*18 U*
Pyrene	20,058	684.43	2,400,000	18 U	130	18 U	30	19 U	18 U
Total Benzofluoranthenes	4,601	0.04		*18 U*	**140**	*18 U*	**29**	**11** T	*18 U*

Table 45 - Sea King Industrial Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	SKI-BS-1 5/10/2011	SKI-BS-2 5/10/2011	SKI-BS-3 5/10/2011	SKI-BS-4 5/10/2011	SKI-BS-5 5/10/2011	SKI-BS-6 5/10/2011
LPAHs (SIM)									
1-Methylnaphthalene				3 T	3.4 T	4.4 U	4.8 U	9.7	4.6 U
2-Methylnaphthalene	833	43.21	320,000	6.6	4.8	4.4 U	2.9 T	12	4.6 U
Acenaphthene	330	16.75	4,800,000	4.4 U	2.7 T	4.4 U	4.8 U	4.4 T	4.6 U
Acenaphthylene	1,363	69.09		4.4 U	3.2 T	4.4 U	4.8 U	3 T	4.6 U
Anthracene	4,443	223.09	24,000,000	4.4 U	7.7	4.4 U	4.8 U	3 T	4.6 U
Fluorene	468	23.56	3,200,000	4.4 U	2.3 T	4.4 U	4.8 U	4.8 U	4.6 U
Naphthalene	2,197	0.47	1,600,000	*4.4 U*	**12**	*4.4 U*	**4.3** T	**28**	**3.2** T
Phenanthrene	2,019	101.38		3.1 T	26	4.4 U	10	40	5
HPAHs (SIM)									
Benzo(a)anthracene	2,201	0.005	1,370	*4.4 U*	**21**	*4.4 U*	**8.2**	**11**	**3.7** T
Benzo(a)pyrene	1,981	0.01	137	*4.4 U*	**26**	**1.9** T	**9.2**	**9.2**	*4.6 U*
Benzo(g,h,i)perylene	620	31.00		4.4 U	24	3.6 T	9.5	12	3 T
Chrysene	2,202	0.27	137,000	**2.3** T	**41**	**4** T	**14**	**22**	**6.4**
Dibenz(a,h)anthracene	240	0.07	137	*4.4 U*	*4.5 U*	*4.4 U*	*4.8 U*	*4.8 U*	*4.6 U*
Dibenzofuran		15.37	80,000	4.4 U	3.6 T	4.4 U	4.8 U	8.6	4.6 U
Fluoranthene	3,209	160.53	3,200,000	2.4 T	43	2.4 T	18	34	7.2
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	*4.4 U*	**19**	**3.8** JT	**6.8**	**9.2**	**2.7** JT
Pyrene	20,058	684.43	2,400,000	2.9 T	51	2.8 T	20	29	7.4
Total Benzofluoranthenes	4,601	0.04		*4.4 U*	**62**	**12**	**20**	**26**	**8**

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

R = Data are not usable because of significant exceedance of QC criteria.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 46 - Sea King Industrial Analytical Results - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	SKI-BS-1 5/10/2011	SKI-BS-2 5/10/2011	SKI-BS-3 5/10/2011	SKI-BS-4 5/10/2011	SKI-BS-5 5/10/2011	SKI-BS-6 5/10/2011
Pesticides in ug/kg									
4,4'-DDD		3.54	4,167	1.8 U	*9.4 U*	1.8 U	2 U	1.9 U	1.9 U
4,4'-DDE		4.70	2,941	1.8 U	*9.4 U*	1.8 U	2 U	1.9 U	1.9 U
4,4'-DDT		36.74	2,941	1.8 U	9.4 U	1.8 U	3	1.9 U	1.9 U
Aldrin		0.61	58.82	*0.91 U*	*4.7 U*	*0.92 U*	*0.98 U*	*0.95 U*	*0.95 U*
alpha-BHC (Benzene HexaChloride)		2.47		0.91 U	*4.7 U*	0.92 U	0.98 U	0.95 U	0.95 U
beta-BHC		10.23		0.91 U	4.7 U	0.92 U	0.98 U	0.95 U	0.95 U
cis-Chlordane				0.91 U	4.7 U	0.92 U	0.98 U	0.95 U	0.95 U
Dieldrin		0.34	62.5	*1.8 U*	*9.4 U*	*1.8 U*	*2 U*	*1.9 U*	*1.9 U*
alpha-Endosulfan		20.24	480,000	0.91 U	4.7 U	0.92 U	0.98 U	0.95 U	0.95 U
beta-Endosulfan		20.24	480,000	1.8 U	9.4 U	1.8 U	2 U	1.9 U	1.9 U
Endosulfan Sulfate		20.24		1.8 U	9.4 U	1.8 U	2 U	1.9 U	1.9 U
Endrin		22.20	24,000	1.8 U	9.4 U	1.8 U	2 U	3.4	2.9
Endrin Aldehyde		22.20		1.8 U	9.4 U	1.8 U	2 U	1.9 U	1.9 U
gamma-BHC (Lindane)		0.36	24,000	*0.91 U*	*4.7 U*	*0.92 U*	*0.98 U*	*0.95 U*	*0.95 U*
Heptachlor		0.19	222	*0.91 U*	*4.7 U*	*0.92 U*	*0.98 U*	*0.95 U*	*0.95 U*
Heptachlor Epoxide		0.81	109.89	*0.91 U*	*4.7 U*	*1.5* U	*0.98 U*	*0.95 U*	*3.3* U
Hexachlorobenzene (HCB)	8.1	0.24	625	*0.91 U*	*4.7 U*	*0.92 U*	*0.98 U*	*0.95 U*	*0.95 U*
Hexachlorobutadiene	97	1,281	12,821	0.91 U	4.7 U	0.92 U	0.98 U	0.95 U	0.95 U
Toxaphene		0.06	909	*91 U*	*470 U*	*92 U*	*98 U*	*95 U*	*95 U*
trans-Chlordane				0.91 U	4.7 U	0.92 U	0.98 U	0.95 U	0.95 U
PCBs in ug/kg									
Aroclor 1016	242	1.77	5,600	*3.7 U*	*3.8 U*	*3.7 U*	*3.9 U*	*3.7 U*	*3.9 U*
Aroclor 1221		0.24		*3.7 U*	*3.8 U*	*3.7 U*	*3.9 U*	*3.7 U*	*3.9 U*
Aroclor 1232		120.00		3.7 U	3.8 U	3.7 U	3.9 U	3.7 U	3.9 U
Aroclor 1242		0.02		*3.7 U*	*3.8 U*	*3.7 U*	*3.9 U*	*3.7 U*	*3.9 U*
Aroclor 1248	241	1.02		*3.7 U*	*5.7 U*	**47**	*3.9 U*	*5.6 U*	*19 U*
Aroclor 1254	241	0.42	500	*3.7 U*	**15**	**26**	**5**	*19* U	**64**
Aroclor 1260	240	4.77	500	3.8	**28**	3.7 U	**6.6**	**73**	**9.6**
Aroclor 1262				3.7 U	3.8 U	3.7 U	3.9 U	3.7 U	3.9 U
Aroclor 1268				3.7 U	3.8 U	3.7 U	3.9 U	3.7 U	3.9 U
TBT in ug/kg									
Tributyltin Ion				3.2 U	2.5 T	3.2 U	3.6 U	3.4 U	3.3 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

P = Sample confirmation exceeded 40 percent on the two chromatographic columns

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 47 - Sea King Industrial Analytical Results - Dioxins and PBDEs

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	SKI-BS-1 5/10/2011	SKI-BS-2 5/10/2011	SKI-BS-3 5/10/2011	SKI-BS-4 5/10/2011	SKI-BS-5 5/10/2011	SKI-BS-6 5/10/2011
Dioxins in pg/g									
2,3,7,8-TCDD		3.02E-05		*0.0448 U*	*0.458 UK*	*0.149 UK*	**0.425** T	*0.281 UK*	*0.734 UK*
1,2,3,7,8-PeCDD				0.0522 U	1.53	0.371 T	1.12	1.02	1.96
1,2,3,4,7,8-HxCDD				0.128 UK	1.35 T	0.216 T	0.898 T	0.728 T	2.04
1,2,3,6,7,8-HxCDD				0.309 T	3.99	0.598 T	1.87 T	2.01	3.43
1,2,3,7,8,9-HxCDD				0.257 T	2.67	0.516 T	1.53 T	1.45 T	3.28
1,2,3,4,6,7,8-HpCDD				4.35	120	10.7	33.1	38.7	51.2
OCDD				32.4	979	106	244	223	248
2,3,7,8-TCDF				0.0952 UK	1.52	0.451 T	1.57	1.23	1.05
1,2,3,7,8-PeCDF				0.0397 U	0.834 T	0.223 T	0.751 T	0.604 T	0.616 T
2,3,4,7,8-PeCDF				0.0641 UK	0.987	0.243 UK	1.07	0.974 UK	1.13
1,2,3,4,7,8-HxCDF				0.128 UK	1.59 T	0.386 T	1.05 T	1.18 T	4.26
1,2,3,6,7,8-HxCDF				0.0423 U	1 T	0.181 T	0.717 T	0.89 T	1.31 T
1,2,3,7,8,9-HxCDF				0.0522 U	0.46 T	0.0683 U	0.355 UK	0.278 UK	0.8 T
2,3,4,6,7,8-HxCDF				0.0429 U	1.42 T	0.118 UK	1.14 T	1.47 T	0.237 U
1,2,3,4,6,7,8-HpCDF				0.783 U	13	0.831 UK	4.86	19.7	11.8
1,2,3,4,7,8,9-HpCDF				0.0756 U	1.03 T	0.0984 U	0.379 T	0.636 T	1.23 T
OCDF				1.59 T	23.5	0.837 T	8.22	27.2	13.5
Total TCDD				2.27	9.3	2.77	14.1	12.2	9.79
Total PeCDD				0.638	12.8	3.06	15.9	13.6	14.8
Total HxCDD				2.04	40.5	6.43	24.3	20.5	37.6
Total HpCDD				10.2	287	55.9	85.6	74.5	109
Total TCDF				0.494	28	7.13	24.5	26.5	20.4
Total PeCDF				0.999	28.2	1.51	20.8	31	19.2
Total HxCDF				0.89	27.1	2.36	16.3	24.9	29
Total HpCDF				1.77	38.5	1.26	12.5	44.5	30.2
PDBEs in ug/kg									
2,2',4-Tribromodiphenyl ether (PBDE-17)				0.4 U	3 U	0.5 U	0.5 U	5.8 U	1.6 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)				0.4 U	0.5 U	0.5 U	0.5 U	4.6 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)				0.4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

K = ion ratios did not meet criteria for positive identification of the analyte

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 48 - Sea King Industrial Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		SKI-BS-1	SKI-BS-2	SKI-BS-3	SKI-BS-4	SKI-BS-5	SKI-BS-6
Sampling Date	LAET	2LAET	5/10/2011	5/10/2011	5/10/2011	5/10/2011	5/10/2011	5/10/2011
Metals in mg/kg								
Arsenic	57	93	5.5 U	14.4	12.7	19.7	13	8.7
Cadmium	5.1	6.7	0.2 U	0.4	0.3	0.6	0.3 U	0.4
Chromium	260	270	10.9	30.3	32.1	48.6	27.7	26.5
Copper	390	390	12.2	27.8	28	46.1	44.8	28.4
Lead	450	530	2 U	30	10	44	16	15
Mercury	0.41	0.59	0.02 U	0.05	0.03	0.1	0.14	0.04
Silver	6.1	6.1	0.3 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Zinc	410	960	32	72	59	122	50	63
Semivolatiles in ug/kg								
Chlorinated Hydrocarbons in ug/kg								
1,2,4-Trichlorobenzene	35	50	18 U	19 U	18 U	19 U	19 U	18 U
1,2-Dichlorobenzene	170	170	18 U	19 U	18 U	19 U	19 U	18 U
1,4-Dichlorobenzene	110	120	18 U	19 U	18 U	19 U	19 U	18 U
Acid Extractables in ug/kg								
2,4-Dimethylphenol	29	29	18 UJ	19 UJ	18 UJ	19 UJ	19 UJ	18 UJ
2-Methylphenol	63	63	18 U	19 U	18 U	19 U	19 U	18 U
4-Methylphenol	670	670	18 U	19 U	18 U	19 U	19 U	18 U
Benzoic acid	650	650	180 UJ	190 UJ	180 UJ	130 JT	190 UJ	180 UJ
Benzyl alcohol	57	73	18 U	19 U	18 U	10 T	19 U	18 U
Pentachlorophenol	360	690	92 U	95 U	92 U	94 UJ	93 UJ	92 UJ
Phenol	420	1200	18 U	19 U	18 U	10 T	19 U	18 U
Phthalates in ug/kg								
Bis(2-ethylhexyl)phthalate	1300	1900	18 U	34 U	18 U	19 U	22 U	18 U
Butyl benzyl phthalate	63	900	18 U	24	18 U	19 U	19 U	18 U
Diethyl phthalate	200	200	18 U	19 U	18 U	19 U	19 U	18 U
Dimethyl phthalate	71	160	18 U	11 T	18 U	19 U	19 U	18 U
Di-n-butyl phthalate	1400	1400	18 U	19 U	18 U	19 U	19 U	18 U
Di-n-octyl phthalate	6200	6200	18 U	19 U	18 U	19 U	19 U	18 U
Miscellaneous Extractables in ug/kg								
Dibenzofuran	540	700	18 U	19 U	18 U	26	19 U	18 U
Hexachlorobenzene[a]	22	70	0.91 U	4.7 U	0.92 U	0.98 U	0.95 U	0.95 U
Hexachlorobutadiene[a]	11	120	0.91 U	4.7 U	0.92 U	0.98 U	0.95 U	0.95 U
N-Nitrosodiphenylamine	28	40	18 UJ	19 UJ	18 UJ	19 U	19 U	18 U
LPAHs in ug/kg								
2-Methylnaphthalene	670	1400	18 U	19 U	18 U	98	19 U	18 U
Acenaphthene	500	730	18 U	19 U	18 U	19 U	19 U	18 U
Acenaphthylene	1300	1300	18 U	19 U	18 U	19 U	19 U	18 U
Anthracene	960	4400	18 U	11 T	18 U	19 U	19 U	18 U
Fluorene	540	1000	18 U	19 U	18 U	19 U	19 U	18 U
Naphthalene	2100	2400	18 U	14 T	18 U	84	19 U	18 U
Phenanthrene	1500	5400	18 U	86	18 U	79	19 U	18 U
Total LPAHs [b]	5200	13000	18 U	111 J	18 U	163	19 U	18 U
HPAHs in ug/kg								
Benzo(a)anthracene	1300	1600	18 U	45	18 U	10 T	19 U	18 U
Benzo(a)pyrene	1600	3000	18 U	67	18 U	19 U	19 U	18 U
Benzo(g,h,i)perylene	670	720	18 U	68	18 U	14 T	19 U	18 U
Chrysene	1400	2800	18 U	79	18 U	25	19 U	18 U
Dibenzo(a,h)anthracene	230	540	18 U	17 T	18 U	19 U	19 U	18 U
Fluoranthene	1700	2500	18 UJ	130 J	18 UJ	38 J	19 UJ	18 UJ
Indeno(1,2,3-cd)pyrene	600	690	18 U	47	18 U	19 U	19 U	18 U
Pyrene	2600	3300	18 U	130	18 U	30	19 U	18 U
Total Benzofluoranthenes	3200	3600	18 U	140	18 U	29	11 T	18 U
Total HPAHs [b]	12000	17000	18 UJ	723 J	18 UJ	146 J	11 J	18 UJ

Table 48 - Sea King Industrial Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		SKI-BS-1	SKI-BS-2	SKI-BS-3	SKI-BS-4	SKI-BS-5	SKI-BS-6
Sampling Date	LAET	2LAET	5/10/2011	5/10/2011	5/10/2011	5/10/2011	5/10/2011	5/10/2011
LPAHs (SIM) in ug/kg								
1-Methylnaphthalene			3 T	3.4 T	4.4 U	4.8 U	9.7	4.6 U
2-Methylnaphthalene	670	1400	6.6	4.8	4.4 U	2.9 T	12	4.6 U
Acenaphthene	500	730	4.4 U	2.7 T	4.4 U	4.8 U	4.4 T	4.6 U
Acenaphthylene	1300	1300	4.4 U	3.2 T	4.4 U	4.8 U	3 T	4.6 U
Anthracene	960	4400	4.4 U	7.7	4.4 U	4.8 U	3 T	4.6 U
Fluorene	540	1000	4.4 U	2.3 T	4.4 U	4.8 U	4.8 U	4.6 U
Naphthalene	2100	2400	4.4 U	12	4.4 U	4.3 T	28	3.2 T
Phenanthrene	1500	5400	3.1 T	26	4.4 U	10	40	5
Total LPAHs [b]	5200	13000	3.1 J	53.9 J	4.4 U	14.3 J	78.4 J	8.2 J
HPAHs (SIM) in ug/kg								
Benzo(a)anthracene	1300	1600	4.4 U	21	4.4 U	8.2	11	3.7 T
Benzo(a)pyrene	1600	3000	4.4 U	26	1.9 T	9.2	9.2	4.6 U
Benzo(g,h,i)perylene	670	720	4.4 U	24	3.6 T	9.5	12	3 T
Chrysene	1400	2800	2.3 T	41	4 T	14	22	6.4
Dibenz(a,h)anthracene	230	540	4.4 U	4.5 U	4.4 U	4.8 U	4.8 U	4.6 U
Fluoranthene	1700	2500	2.4 T	43	2.4 T	18	34	7.2
Indeno(1,2,3-cd)pyrene	600	690	4.4 U	19	3.8 JT	6.8	9.2	2.7 JT
Pyrene	2600	3300	2.9 T	51	2.8 T	20	29	7.4
Total Benzofluoranthenes	3200	3600	4.4 U	62	12	20	26	8
Total HPAHs [b]	12000	17000	7.6 J	287	30.5 J	105.7	152.4	38.4 J
Miscellaneous Extractables (SIM) in ug/kg								
Dibenzofuran	540	700	4.4 U	3.6 T	4.4 U	4.8 U	8.6	4.6 U
PCBs in ug/kg								
Aroclor 1016			3.7 U	3.8 U	3.7 U	3.9 U	3.7 U	3.9 U
Aroclor 1221			3.7 U	3.8 U	3.7 U	3.9 U	3.7 U	3.9 U
Aroclor 1232			3.7 U	3.8 U	3.7 U	3.9 U	3.7 U	3.9 U
Aroclor 1242			3.7 U	3.8 U	3.7 U	3.9 U	3.7 U	3.9 U
Aroclor 1248			3.7 U	5.7 U	47	3.9 U	5.6 U	19 U
Aroclor 1254			3.7 U	15	26	5	19 U	64
Aroclor 1260			3.8	28	3.7 U	6.6	73	9.6
Aroclor 1262			3.7 U	3.8 U	3.7 U	3.9 U	3.7 U	3.9 U
Aroclor 1268			3.7 U	3.8 U	3.7 U	3.9 U	3.7 U	3.9 U
Total PCBs	130	1000	3.8	43	73	11.6	73	73.6

Notes:
Blank indicates no AET established for specific analyte.
Bolded value exceeds LAET.
Italicized value has detection limit that exceeds one or more criteria.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
a) Compounds are reported from the pesticides (EPA Method 8081) instead of SVOCs (EPA Method 8270) because EPA Method 8081 has a lower reporting limit for the compounds indicated.
b) Detected compound concentrations are summed to calculate the total LPAH and HPAH concentrations.

Table 49 - Sea King Industrial Analytical Results Compared to LDW Risk Drivers

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	SKI-BS-1 5/10/2011	SKI-BS-2 5/10/2011	SKI-BS-3 5/10/2011	SKI-BS-4 5/10/2011	SKI-BS-5 5/10/2011	SKI-BS-6 5/10/2011
Arsenic in mg/kg	28	8	5.5 U	**14.4**	**12.7**	**19.7**	**13**	**8.7**
cPAHs TEQ in ug/kg [c]	900	7.3	3.10	**36.84**	3.96	**13.08**	**14.28**	4.03
Total PCBs in ug/kg [d]	240	2	**3.8**	**43**	**73**	**11.6**	**73**	**73.6**
Dioxin/Furans TEQ in pg/g [e]	25	2	0.20	**5.12**	0.88	**3.24**	**2.90**	**5.03**

Notes:

Boxed value exceeds Remedial Action Level.

Bolded value exceeds Natural Background Level.

Italics indicate reporting limit above level.

U = Not detected at the reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

a) Remedial Action Levels for Alternative 5C, provided by Ecology as presented in the Draft Final Feasibility Study for the Lower Duwamish Waterway (LDWG 2010).

b) Natural Background Values based on Ocean Survey Vessel (OSV) Bold Data (LDWG 2010).

c) The cPAH TEQ concentration was calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270. The cPAH was calculated as the sum of each individual PAH concentration multiplied by the corresponding toxicity factor (TEF). When the individual PAH compound concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

d) Total PCBs were calculated by summing the detected values for the individual components. For individual samples in which none of the individual components were detected, the total value was given a value equal to the highest reporting limit of an individual component, and assigned a U-qualifier.

e) The TEQ was calculated as the sum of each dioxin/furan congener concentration multiplied by the corresponding TEF value. When the dioxin/furan congener concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

Table 50 - Hamm Creek Analytical Results - Conventionals, TPH, BTEX, and Metals

Sample ID Sampling Date	Natural Background for the Puget Sound Area [a]	Vadose Zone Soil Protective of SQS [b]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [c]	MTCA Soil Cleanup Level [d]	HC-BS-1 5/10/2011	HC-BS-2 5/10/2011	HC-BS-3 5/10/2011
Conventionals in %							
Total Solids					87.6	88.3	94.1
Total Organic Carbon					1.28	0.711	0.554
TPH in mg/kg							
Diesel Range Organics			200		8.9 U	8.6 U	8.7 U
Lube Oil			2,000		18 U	17 U	18 U
Gasoline Range Organics			30/100[e]		14 U	12 U	13 U
BTEX in ug/kg							
Benzene			0.0002	18,180	*35 U*	*30 U*	*33 U*
Ethyl Benzene			1.70	8,000,000	*35 U*	*30 U*	*33 U*
m,p-Xylene			200	16,000,000	70 U	60 U	66 U
o-Xylene			200	16,000,000	**230**	**780**	42
Toluene			698	6,400,000	35 U	30 U	33 U
Metals in mg/kg							
Arsenic	7		1.58E-04	20	*5.5 U*	**6.4**	**6.1**
Cadmium	1	26	0.001	80	*0.2 U*	**0.2**	**0.2**
Chromium	48	5201	42	240	11.7	12.1	11.8
Copper	36	780	0.053	3,200	**9.9**	**11.1**	**10.6**
Lead	24	1133	5.4	250	*2* U	3	3
Mercury	0.07	0.41	2.70E-04		0.02 U	0.02 U	0.02 U
Silver		12	0.013	400	*0.3 U*	*0.3 U*	*0.3 U*
Zinc	85	327	2.03	24,000	**33**	**38**	**38**

Notes:

a) Natural Background Concentrations for the Puget Sound Area (Ecology 1994).

b) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

d) MTCA Method B levels except for lead and arsenic where Method A values are used. Values from CLARC Database.

e) 30 mg/kg with benzene, 100 mg/kg without benzene.

U = Not detected at reporting limit indicated.

J = Estimated value.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 51 - Hamm Creek Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	HC-BS-1 5/10/2011	HC-BS-2 5/10/2011	HC-BS-3 5/10/2011
Semivolatiles in ug/kg						
Chlorinated Hydrocarbons in ug/kg						
1,2,4-Trichlorobenzene		0.40		*19 U*	*19 U*	*18 U*
1,2-Dichlorobenzene	67.6	3.79		*19* U	*19* U	*18* U
1,3-Dichlorobenzene		275.20	7,200,000	19 U	19 U	18 U
1,4-Dichlorobenzene	92.0	0.41		*19 U*	*19 U*	*18 U*
2,4,6-Trichlorophenol				96 U	95 U	92 U
Acid Extractables in ug/kg						
2,4-Dimethylphenol	37	2.03		*19 UJ*	*19 UJ*	*18 UJ*
2 Methylphenol	91	2.69		*19 U*	*19 U*	*18 U*
4 Methylphenol	979	22.13		19 U	19 U	18 U
Benzoic acid	9622	644.32		190 UJ	190 UJ	180 UJ
Benzyl alcohol	785	55.02	8,000,000	19 U	19 U	18 U
Pentachlorophenol	381	2.56	2,500	*96 UJ*	*95 UJ*	*92 UJ*
Phenol	733	23.88	24,000,000	18 T	19 U	18 U
Phthalates in ug/kg						
Bis(2-ethylhexyl)phthalate	941	47.08	71,429	19 U	19 U	18 U
Butyl benzyl phthalate	100	3.95	526,000	*19 U*	*19 U*	*18 U*
Diethyl phthalate	3157	199.78	64,000,000	15 T	12 T	18 U
Dimethyl phthalate	1631	40.95		19 U	19 U	18 U
Di-n-butyl phthalate	5003	81.36		19 U	19 U	18 U
Di-n-octyl phthalate	1161	0.55		*19 U*	*19 U*	*18 U*
Miscellaneous Extractables in ug/kg						
Hexachlorobenzene	8.1	0.24	625	*19 U*	*19 U*	*18 U*
Hexachlorobutadiene	97	1,281	12,820	19 U	19 U	18 U
Hexachloroethane			71,429	19 U	19 U	18 U
LPAHs						
2-Methylnaphthalene	833	43.21	320,000	19 U	19 U	18 U
Acenaphthene	330	16.75	4,800,000	*19 U*	*19 U*	*18 U*
Acenaphthylene	1,363	69.09		19 U	19 U	18 U
Anthracene	4,443	223.09	24,000,000	19 U	19 U	18 U
Fluorene	468	23.56	3,200,000	19 U	19 U	18 U
Naphthalene	2,197	0.47	1,600,000	*19 U*	*19 U*	*18 U*
Phenanthrene	2,019	101.38		19 U	19 U	18 U
HPAHs						
Benzo(a)anthracene	2,201	0.005	1,370	*19 U*	*19 U*	*18 U*
Benzo(a)pyrene	1,981	0.01	137	*19 U*	*19 U*	*18 U*
Benzo(g,h,i)perylene	620	31.00		19 U	19 U	18 U
Chrysene	2,202	0.27	137,000	*19 U*	*19 U*	*18 U*
Dibenzo(a,h)anthracene	240	0.07	137	*19 U*	*19 U*	*18 U*
Dibenzofuran		15.37	80,000	*19 U*	*19 U*	*18 U*
Fluoranthene	3,209	160.53	3,200,000	19 UJ	19 UJ	18 UJ
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	*19 U*	*19 U*	*18 U*
Pyrene	20,058	684.43	2,400,000	19 U	19 U	18 U
Total Benzofluoranthenes	4,601	0.04		*19 U*	*19 U*	*18 U*
N-Nitrosodiphenylamine		9.54	204,000	*19 U*	*19 U*	*18 U*

Table 51 - Hamm Creek Analytical Results - Semivolatile Organic Compounds

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	HC-BS-1 5/10/2011	HC-BS-2 5/10/2011	HC-BS-3 5/10/2011
LPAHs (SIM)						
1-Methylnaphthalene				4.9 U	3.3 T	3.9 T
2-Methylnaphthalene	833	43.21	320,000	4.9 U	3.7 T	4 T
Acenaphthene	330	16.75	4,800,000	4.9 U	4.8 U	4.8 U
Acenaphthylene	1,363	69.09		4.9 U	4.8 U	4.8 U
Anthracene	4,443	223.09	24,000,000	4.9 U	4.8 U	4.8 U
Fluorene	468	23.56	3,200,000	3.4 T	4.8 U	4.8 U
Naphthalene	2,197	0.47	1,600,000	*4.9* U	*4.8* U	*4.8* U
Phenanthrene	2,019	101.38		8.2	7.9	8.7
HPAHs (SIM)						
Benzo(a)anthracene	2,201	0.005	1,370	**2.9** T	**2.9** T	*4.8* U
Benzo(a)pyrene	1,981	0.01	137	**3.1** T	*4.8* U	**3.3** T
Benzo(g,h,i)perylene	620	31.00		3.9 T	4.8 U	4.8 U
Chrysene	2,202	0.27	137,000	**4.5** T	**5.2**	**4.8**
Dibenz(a,h)anthracene	240	0.07	137	*4.9* U	*4.8* U	*4.8* U
Dibenzofuran		15.37	80,000	4.9 U	4.8 U	4.8 U
Fluoranthene	3,209	160.53	3,200,000	4.9	5.6	4.9
Indeno(1,2,3-cd)pyrene	680	0.06	1,370	**2.8** T	*4.8* U	*4.8* U
Pyrene	20,058	684.43	2,400,000	5.5	6.2	5
Total Benzofluoranthenes	4,601	0.04		**7.9**	**7.7**	**6.7**

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

R = Data are not usable because of significant exceedance of QC criteria.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 52 - Hamm Creek Analytical Results - Pesticides, PCBs, and TBT

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	HC-BS-1 5/10/2011	HC-BS-2 5/10/2011	HC-BS-3 5/10/2011
Pesticides in ug/kg						
4,4'-DDD		3.54	4167	1.9 U	1.9 U	2 U
4,4'-DDE		4.70	2941	1.9 U	1.9 U	2 U
4,4'-DDT		36.74	2941	1.9 U	1.9 U	2 U
Aldrin		0.61	58.82	*0.94 U*	*0.96 U*	*0.98 U*
alpha-BHC (Benzene HexaChloride)		2.47		0.94 U	0.96 U	0.98 U
beta-BHC		10.23		0.94 U	0.96 U	0.98 U
cis-Chlordane				0.94 U	0.96 U	0.98 U
Dieldrin		0.34	62.5	*1.9 U*	*1.9 U*	*2 U*
alpha-Endosulfan		20.24	480000	0.94 U	0.96 U	0.98 U
beta-Endosulfan		20.24	480000	1.9 U	1.9 U	2 U
Endosulfan Sulfate		20.24		1.9 U	1.9 U	2 U
Endrin		22.20	24000	1.9 U	1.9 U	2 U
Endrin Aldehyde		22.20		1.9 U	1.9 U	2 U
gamma-BHC (Lindane)		0.36	24000	*0.94 U*	*0.96 U*	*0.98 U*
Heptachlor		0.19	222	*0.94 U*	*0.96 U*	*0.98 U*
Heptachlor Epoxide		0.81	109.89	*0.94 U*	*0.96 U*	*0.98 U*
Hexachlorobenzene (HCB)	8.1	0.24	625	*0.94 U*	*0.96 U*	*0.98 U*
Hexachlorobutadiene	97	1281.15	12821	0.94 U	0.96 U	0.98 U
Toxaphene		0.06	909	*94 U*	*96 U*	*98 U*
trans-Chlordane				0.94 U	0.96 U	0.98 U
PCBs in ug/kg						
Aroclor 1016	242	1.77	5600	*3.9 U*	*3.8 U*	*3.9 U*
Aroclor 1221		0.24		*3.9 U*	*3.8 U*	*3.9 U*
Aroclor 1232		120.00		3.9 U	3.8 U	3.9 U
Aroclor 1242		0.02		*3.9 U*	*3.8 U*	*3.9 U*
Aroclor 1248	241	1.02		*3.9 U*	*3.8 U*	*3.9 U*
Aroclor 1254	241	0.42	500	*3.9 U*	*3.8 U*	*3.9 U*
Aroclor 1260	240	4.77	500	3.9 U	3.8 U	3.9 U
Aroclor 1262				3.9 U	3.8 U	3.9 U
Aroclor 1268				3.9 U	3.8 U	3.9 U
TBT in ug/kg						
Tributyltin Ion				3.8 U	3.7 U	3.4 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 53 - Hamm Creek Analytical Results - Dioxins and PBDEs

Sample ID Sampling Date	Vadose Zone Soil Protective of SQS [a]	Most Stringent Soil Screening Level to Protect Potable Ground Waters [b]	MTCA Soil Cleanup Level [c]	HC-BS-1 5/10/2011	HC-BS-2 5/10/2011	HC-BS-3 5/10/2011
Dioxins in pg/g						
2,3,7,8-TCDD		3.02E-05		*0.0535 U*	*0.0748 UK*	*0.121 UK*
1,2,3,7,8-PeCDD				0.406 T	0.48 T	0.818 T
1,2,3,4,7,8-HxCDD				0.388 T	0.474 T	0.821 T
1,2,3,6,7,8-HxCDD				0.779 UK	0.949 T	1.42 T
1,2,3,7,8,9-HxCDD				0.465 UK	0.783 T	1.29 T
1,2,3,4,6,7,8-HpCDD				13.8	15	22
OCDD				95.9	92.3	118
2,3,7,8-TCDF				0.165 UK	0.234 T	0.271 UK
1,2,3,7,8-PeCDF				0.088 U	0.193 T	0.172 UK
2,3,4,7,8-PeCDF				0.207 T	0.219 T	0.306 UK
1,2,3,4,7,8-HxCDF				0.378 T	0.833 T	1.07 T
1,2,3,6,7,8-HxCDF				0.0783 U	0.299 T	0.464 T
1,2,3,7,8,9-HxCDF				0.0979 U	0.207 T	0.174 UK
2,3,4,6,7,8-HxCDF				0.264 UK	0.354 T	0.494 T
1,2,3,4,6,7,8-HpCDF				2.61	3.35	3.99
1,2,3,4,7,8,9-HpCDF				0.168 U	0.219 UK	0.382 T
OCDF				3.78 T	5.39	4.86 T
Total TCDD				3.05	3.31	4.05
Total PeCDD				1.91	2.53	7.55
Total HxCDD				3.63	9.1	15.7
Total HpCDD				35.4	30	43.2
Total TCDF				1.32	2.96	3.67
Total PeCDF				2.08	4.7	7.09
Total HxCDF				4.32	6.77	10.3
Total HpCDF				5.51	7.91	9.26
PDBEs in ug/kg						
2,2',4-Tribromodiphenyl ether (PBDE-17)				0.5 U	0.5 U	0.5 U
2,4,4'-Tribromodiphenyl ether (PBDE-28)				0.5 U	0.5 U	0.5 U
2,2',4,4'-Tetrabromodiphenyl ether (PBDE-47)				0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U
2,3',4,4'-Tetrabromodiphenyl ether (PBDE-66)				0.5 U	0.5 U	0.5 U
2,2,3,4,4-Pentabromodiphenyl ether (PBDE-85)				0.5 U	0.5 U	0.5 U
2,2',4,4',5-Pentabromodiphenyl ether (PBDE-99)				0.5 U	0.5 U	0.5 U
2,2',4,4',6-Pentabromodiphenyl ether (PBDE-100)				0.5 U	0.5 U	0.5 U
2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE-138)				0.5 U	0.5 U	0.5 U
2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE-153)				0.5 U	0.5 U	0.5 U
2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE-154)				0.5 U	0.5 U	0.5 U
2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE-183)				0.5 U	0.5 U	0.5 U

Notes:

a) Soil screening levels protective of sediment provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

b) Most stringent soil standard to protect potable groundwater without potable surface water screening levels provided by Ecology in "Draft LDW Preliminary Screening Levels v12r7.xls" on April 13, 2011.

c) For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used. Values from CLARC Database.

U = Not detected at reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

K = ion ratios did not meet criteria for positive identification of the analyte

Values that exceed the most stringent soil standard to protect potable groundwater are bolded.

Values that exceed screening levels protective of sediment standards are boxed.

Values that exceed MTCA Method B (Human Health Criteria) are shaded.

Italicized value has detection limit that exceeds one or more criteria.

Blank indicates sample not analyzed for specific analyte or no criteria available.

Table 54 - Hamm Creek Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		HC-BS-1	HC-BS-2	HC-BS-3
Sampling Date	LAET	2LAET	5/10/2011	5/10/2011	5/10/2011
Metals in mg/kg					
Arsenic	57	93	5.5 U	6.4	6.1
Cadmium	5.1	6.7	0.2 U	0.2	0.2
Chromium	260	270	11.7	12.1	11.8
Copper	390	390	9.9	11.1	10.6
Lead	450	530	2 U	3	3
Mercury	0.41	0.59	0.02 U	0.02 U	0.02 U
Silver	6.1	6.1	0.3 U	0.3 U	0.3 U
Zinc	410	960	33	38	38
Semivolatiles in ug/kg					
Chlorinated Hydrocarbons in ug/kg					
1,2,4-Trichlorobenzene	35	50	19 U	19 U	18 U
1,2-Dichlorobenzene	170	170	19 U	19 U	18 U
1,4-Dichlorobenzene	110	120	19 U	19 U	18 U
Acid Extractables in ug/kg					
2,4-Dimethylphenol	29	29	19 UJ	19 UJ	18 UJ
2-Methylphenol	63	63	19 U	19 U	18 U
4-Methylphenol	670	670	19 U	19 U	18 U
Benzoic acid	650	650	190 UJ	190 UJ	180 UJ
Benzyl alcohol	57	73	19 U	19 U	18 U
Pentachlorophenol	360	690	96 UJ	95 UJ	92 UJ
Phenol	420	1200	18 T	19 U	18 U
Phthalates in ug/kg					
Bis(2-ethylhexyl)phthalate	1300	1900	19 U	19 U	18 U
Butyl benzyl phthalate	63	900	19 U	19 U	18 U
Diethyl phthalate	200	200	15 T	12 T	18 U
Dimethyl phthalate	71	160	19 U	19 U	18 U
Di-n-butyl phthalate	1400	1400	19 U	19 U	18 U
Di-n-octyl phthalate	6200	6200	19 U	19 U	18 U
Miscellaneous Extractables in ug/kg					
Dibenzofuran	540	700	19 U	19 U	18 U
Hexachlorobenzene[a]	22	70	0.94 U	0.96 U	0.98 U
Hexachlorobutadiene[a]	11	120	0.94 U	0.96 U	0.98 U
N-Nitrosodiphenylamine	28	40	19 U	19 U	18 U
LPAHs in ug/kg					
2-Methylnaphthalene	670	1400	19 U	19 U	18 U
Acenaphthene	500	730	19 U	19 U	18 U
Acenaphthylene	1300	1300	19 U	19 U	18 U
Anthracene	960	4400	19 U	19 U	18 U
Fluorene	540	1000	19 U	19 U	18 U
Naphthalene	2100	2400	19 U	19 U	18 U
Phenanthrene	1500	5400	19 U	19 U	18 U
Total LPAHs [b]	5200	13000	19 U	19 U	18 U

Table 54 - Hamm Creek Analytical Results Compared to AET Sediment Quality Criteria

Sample ID	AETs		HC-BS-1	HC-BS-2	HC-BS-3
Sampling Date	LAET	2LAET	5/10/2011	5/10/2011	5/10/2011
HPAHs in ug/kg					
Benzo(a)anthracene	1300	1600	19 U	19 U	18 U
Benzo(a)pyrene	1600	3000	19 U	19 U	18 U
Benzo(g,h,i)perylene	670	720	19 U	19 U	18 U
Chrysene	1400	2800	19 U	19 U	18 U
Dibenzo(a,h)anthracene	230	540	19 U	19 U	18 U
Fluoranthene	1700	2500	19 UJ	19 UJ	18 UJ
Indeno(1,2,3-cd)pyrene	600	690	19 U	19 U	18 U
Pyrene	2600	3300	19 U	19 U	18 U
Total Benzofluoranthenes	3200	3600	19 U	19 U	18 U
Total HPAHs [b]	12000	17000	19 UJ	19 UJ	18 UJ
LPAHs (SIM) in ug/kg					
1-Methylnaphthalene			4.9 U	3.3 T	3.9 T
2-Methylnaphthalene	670	1400	4.9 U	3.7 T	4 T
Acenaphthene	500	730	4.9 U	4.8 U	4.8 U
Acenaphthylene	1300	1300	4.9 U	4.8 U	4.8 U
Anthracene	960	4400	4.9 U	4.8 U	4.8 U
Fluorene	540	1000	3.4 T	4.8 U	4.8 U
Naphthalene	2100	2400	4.9 U	4.8 U	4.8 U
Phenanthrene	1500	5400	8.2	7.9	8.7
Total LPAHs [b]	5200	13000	11.6 J	7.9	8.7
HPAHs (SIM) in ug/kg					
Benzo(a)anthracene	1300	1600	2.9 T	2.9 T	4.8 U
Benzo(a)pyrene	1600	3000	3.1 T	4.8 U	3.3 T
Benzo(g,h,i)perylene	670	720	3.9 T	4.8 U	4.8 U
Chrysene	1400	2800	4.5 T	5.2	4.8
Dibenz(a,h)anthracene	230	540	4.9 U	4.8 U	4.8 U
Fluoranthene	1700	2500	4.9	5.6	4.9
Indeno(1,2,3-cd)pyrene	600	690	2.8 T	4.8 U	4.8 U
Pyrene	2600	3300	5.5	6.2	5
Total Benzofluoranthenes	3200	3600	7.9	7.7	6.7
Total HPAHs [b]	12000	17000	35.5 J	27.6 J	24.7 J
Miscellaneous Extractables (SIM) in ug/kg					
Dibenzofuran	540	700	4.9 U	4.8 U	4.8 U
PCBs in ug/kg					
Aroclor 1016			3.9 U	3.8 U	3.9 U
Aroclor 1221			3.9 U	3.8 U	3.9 U
Aroclor 1232			3.9 U	3.8 U	3.9 U
Aroclor 1242			3.9 U	3.8 U	3.9 U
Aroclor 1248			3.9 U	3.8 U	3.9 U
Aroclor 1254			3.9 U	3.8 U	3.9 U
Aroclor 1260			3.9 U	3.8 U	3.9 U
Aroclor 1262			3.9 U	3.8 U	3.9 U
Aroclor 1268			3.9 U	3.8 U	3.9 U
Total PCBs	130	1000	3.9 U	3.8 U	3.9 U

Notes:
Blank indicates no AET established for specific analyte.
Bolded value exceeds LAET.
Italicized value has detection limit that exceeds one or more criteria.
U = Not detected at the reporting limit indicated.
J = Estimated value.
T = Value is between the MDL and MRL.
a) Compounds are reported from the pesticides (EPA Method 8081) instead of SVOCs (EPA Method 8270) because EPA Method 8081 has a lower reporting limit for the compounds indicated.
b) Detected compound concentrations are summed to calculate the total LPAH and HPAH concentrations.

Table 55 - Hamm Creek Analytical Results Compared to LDW Risk Drivers

Sample ID Sampling Date	Remedial Action Levels [a]	Natural Background (95% UCL) [b]	HC-BS-1 5/10/2011	HC-BS-2 5/10/2011	HC-BS-3 5/10/2011
Arsenic in mg/kg	28	8	5.5 U	6.4	6.1
cPAHs TEQ in ug/kg [c]	900	7.3	4.75	3.99	4.74
Total PCBs in ug/kg [d]	240	2	*3.9 U*	*3.8 U*	*3.9 U*
Dioxin/Furans TEQ in pg/g [e]	25	2	0.86	1.22	1.81

Notes:

Boxed value exceeds Remedial Action Level.

Bolded value exceeds Natural Background Level.

Italics indicate reporting limit above level.

U = Not detected at the reporting limit indicated.

J = Estimated value.

T = Value is between the MDL and MRL.

a) Remedial Action Levels for Alternative 5C, provided by Ecology as presented in the Draft Final Feasibility Study for the Lower Duwamish Waterway (LDWG 2010).

b) Natural Background Values based on Ocean Survey Vessel (OSV) Bold Data (LDWG 2010).

c) The cPAH TEQ concentration was calculated using data reported from EPA Method 8270 SIM because this method has significantly lower reporting limits than EPA Method 8270. The cPAH was calculated as the sum of each individual PAH concentration multiplied by the corresponding toxicity factor (TEF). When the individual PAH compound concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

d) Total PCBs were calculated by summing the detected values for the individual components. For individual samples in which none of the individual components were detected, the total value was given a value equal to the highest reporting limit of an individual component, and assigned a U-qualifier.

e) The TEQ was calculated as the sum of each dioxin/furan congener concentration multiplied by the corresponding TEF value. When the dioxin/furan congener concentration was reported as not detected, the TEF was multiplied by half the reporting limit.

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Source: Base map prepared from DeLorme Topo 7.0, 2007.

0 2000 4000

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Vicinity Map

17800-17 11/11

HARTCROWSER

Figure
1

EAL 11/7/11 1780017-001.dwg

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Source: Base map prepared from Google Earth Pro, 2010.

0 2500 5000

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Lower Duwamish Waterway Bank Sampling Sites

17800-17 1/12

HARTCROWSER

Figure
2

EAL 01/30/12 1780017-002.dwg

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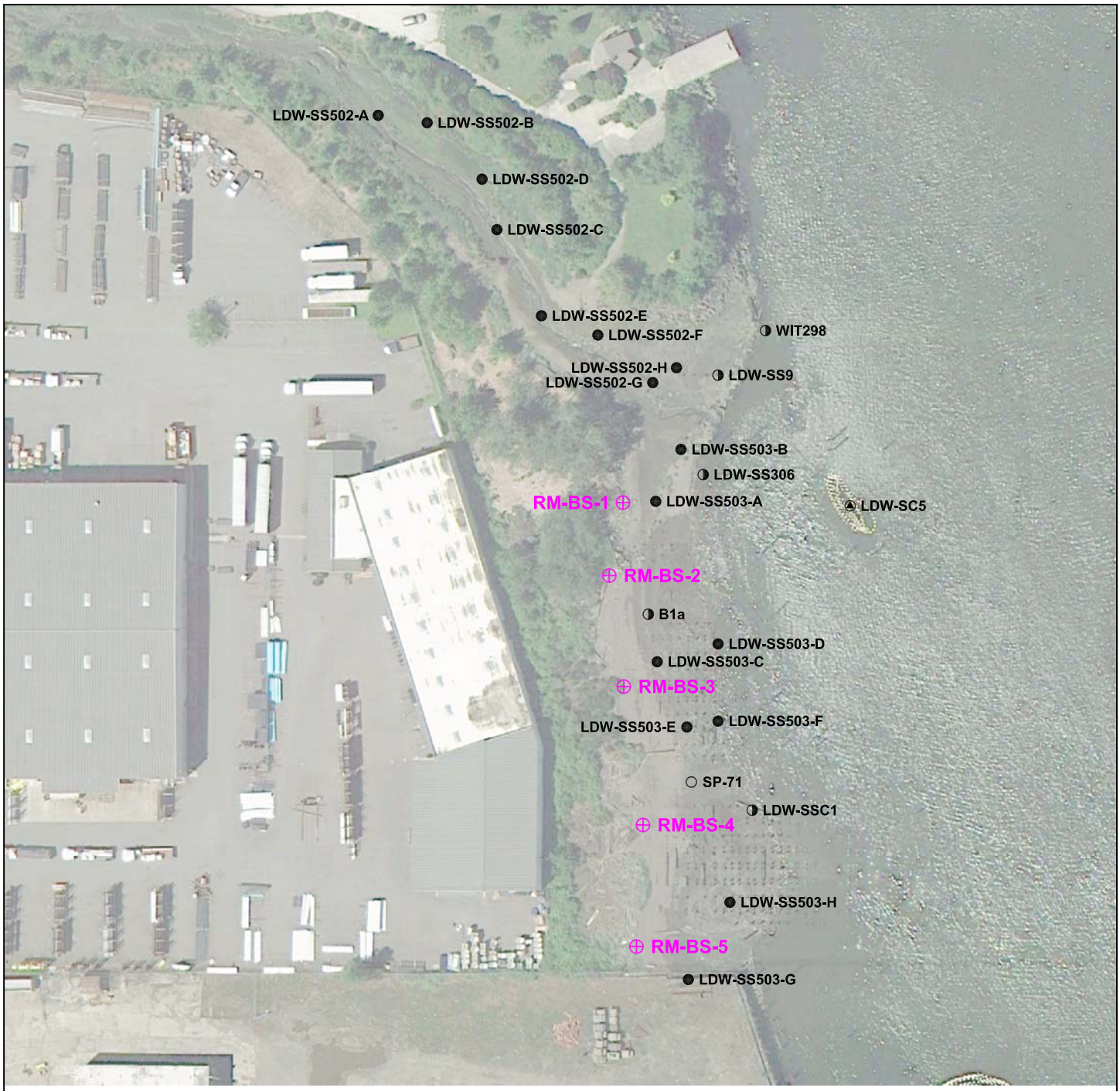

Source: Base map prepared from Google Earth Pro, 2010.

RM-BS-1 ⊕ Bank Sample Location and Number

Previous Investigation Sample Location and Number

LDW-SS503-G ● Dioxin/Furan Composite Subsample (Windward 2010b)

LDW-SSC1 ◑ Surface Sediment (Windward 2010a)

LDW-SC5 ▲ Subsurface Sediment (Windward 2010a)

SP-71 ○ Seep (Windward 2010a)

0 100 200

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Bank Sampling Location Plan
Riverside Marina

17800-17 11/11

HARTCROWSER

Figure
3

EAL 11/7/11 1780017-003.dwg

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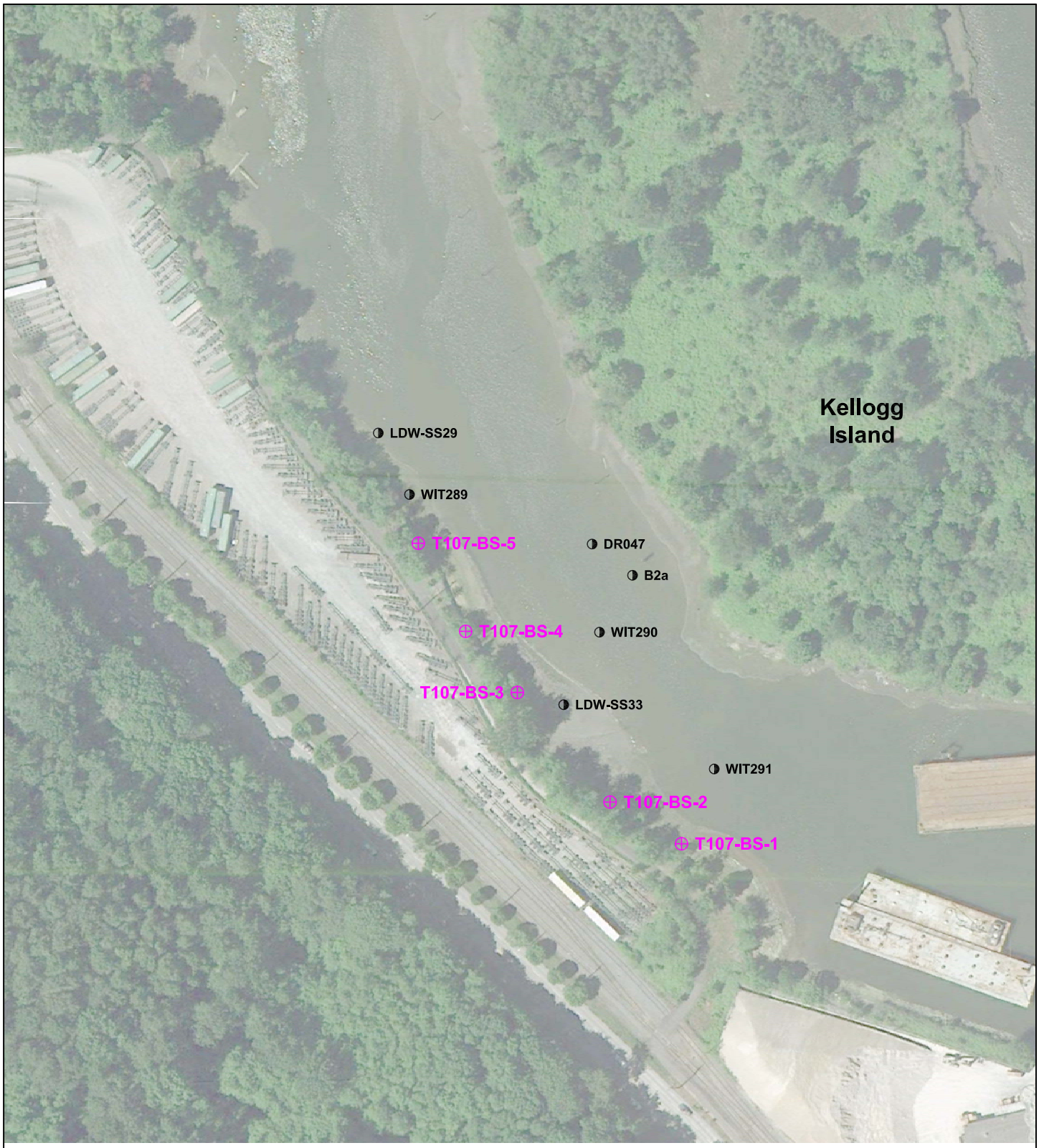

Source: Base map prepared from Google Earth Pro, 2010.

T107-BS-1 ⊕ Bank Sample Location and Number

Previous Investigation Sample Location and Number

LDW-SS29 ◑ Surface Sediment (Windward 2010a)

0 150 300

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Bank Sampling Location Plan
T-107 CKD

17800-17 11/11

HARTCROWSER

Figure
4

EAL 11/7/11 1780017-004.dwg

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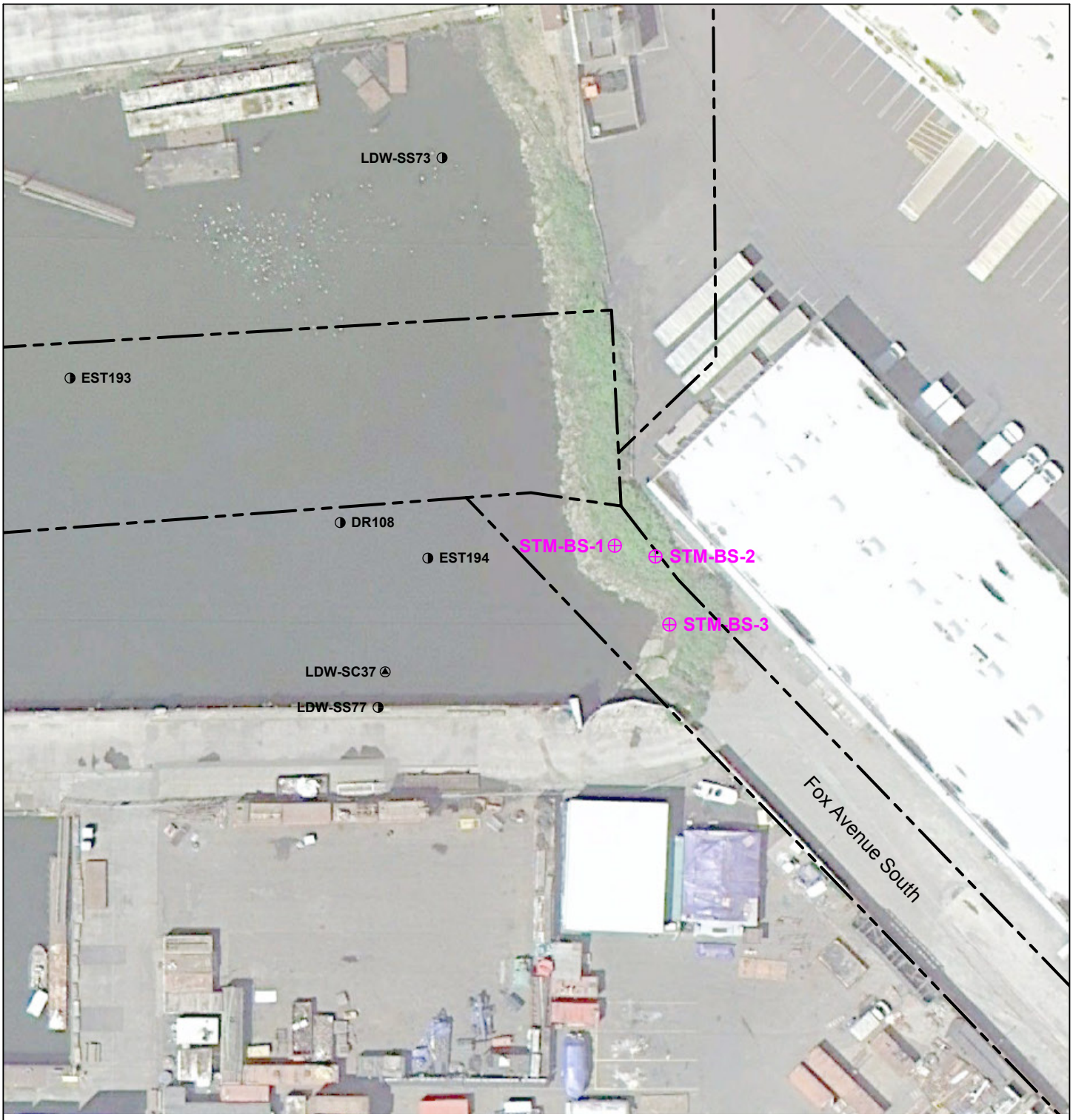

Source: Base map prepared from Google Earth Pro, 2010.

STM-BS-1 Bank Sample Location and Number

Previous Investigation Sample Location and Number

LDW-SSC1 Surface Sediment (Windward 2010a)

LDW-SC37 Subsurface Sediment (Windward 2010a)

Property Line

0 100 200

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Bank Sampling Location Plan
Fox Avenue South Street End

17800-17 1/12

HARTCROWSER

Figure
5

EAL 01/30/12 1780017-005.dwg

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Source: Base map prepared from Google Earth Pro, 2010.

BT-BS-1 ⊕ Bank Sample Location and Number

Previous Investigation Sample Location and Number

LDW-SS85 ◑ Surface Sediment (Windward 2010a)

0 100 200

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Bank Sampling Location Plan
Boyer-Trotsky Street End

17800-17 11/11

HARTCROWSER

Figure
6

EAL 11/7/11 1780017-006.dwg

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Source: Base map prepared from Google Earth Pro, 2010.

SIM-BS-1 ⊕ Bank Sample Location and Number

Previous Investigation Sample Location and Number

LDW-SS333 ◑ Surface Sediment (Windward 2010a)

0 60 120

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Bank Sampling Location Plan
Seattle Iron & Metals

17800-17 11/11

HARTCROWSER

Figure
7

EAL 11/7/11 1780017-007.dwg

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Source: Base map prepared from Google Earth Pro, 2010.

PSTL-BS-7 ⊕ Bank Sample Location and Number

Previous Investigation Sample Location and Number

LDW-SS333 ◑ Surface Sediment (Windward 2010a)

Property Line

0 120 240

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Bank Sampling Location Plan
Puget Sound Truck Lines

17800-17 1/12

HARTCROWSER

Figure
8

EAL 01/30/12 1780017-008.dwg

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Source: Base map prepared from Google Earth Pro, 2010.

SP-BS-1 ⊕ Bank Sample Location and Number

Previous Investigation Sample Location and Number

WST332 ◑ Surface Sediment (Windward 2010a)

SB-5 ▲ Subsurface Sediment (Windward 2010a)

0 100 200

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Bank Sampling Location Plan
South Park Street End

17800-17 11/11

HARTCROWSER

Figure
9

EAL 11/7/11 1780017-009.dwg

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Source: Base map prepared from Google Earth Pro, 2010.

⊕ Bank Sample Location

Previous Investigation Sample Location and Number

LDW-SSC1 ◑ Surface Sediment (Windward 2010a)

SP-41 ○ Seep (Windward 2010a)

0 100 200

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Bank Sampling Location Plan
Sea King Industrial

17800-17 11/11

HARTCROWSER

Figure
10

EAL 11/7/11 1780017-010.dwg

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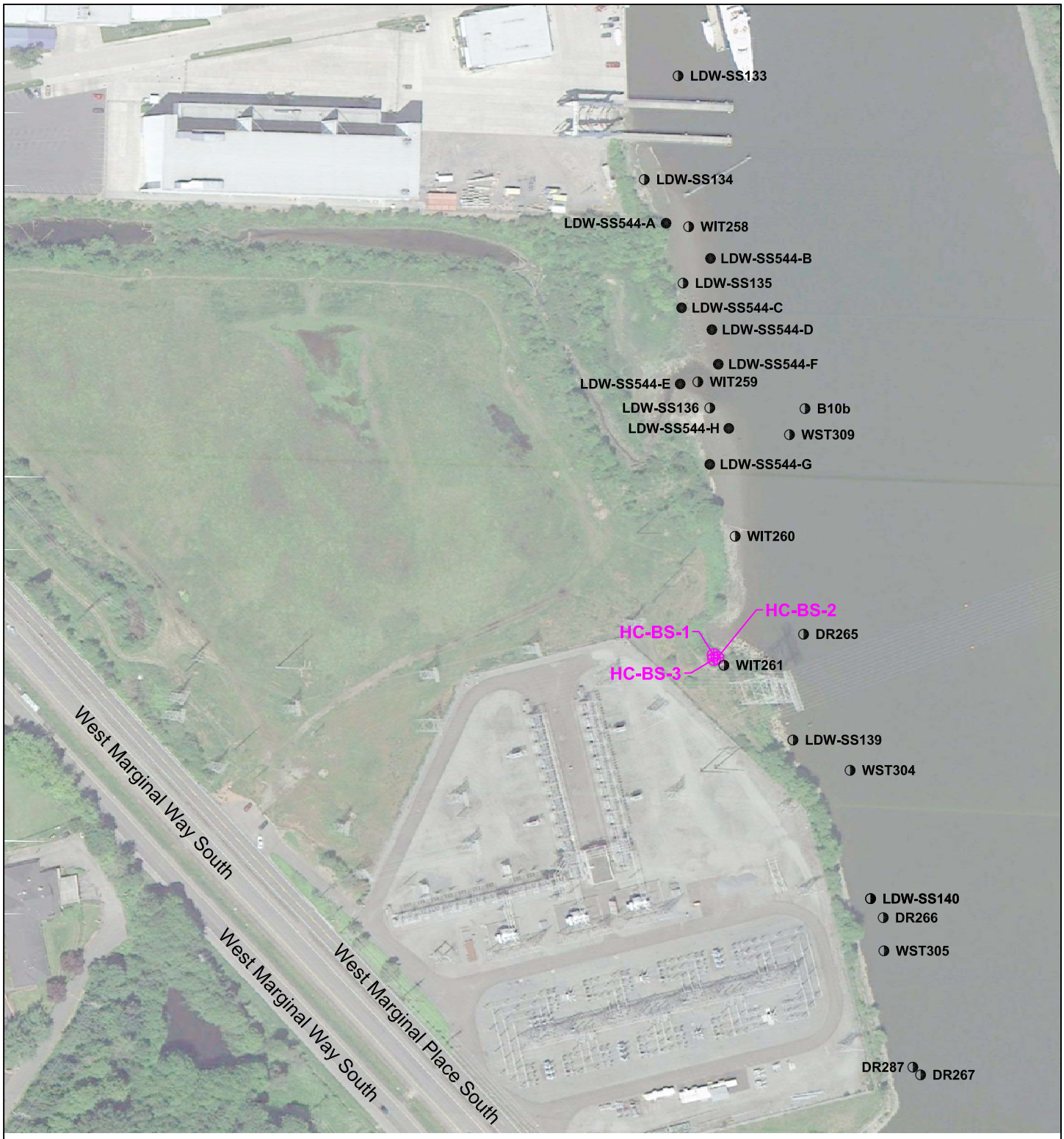

Source: Base map prepared from Google Earth Pro, 2010.

HC-BS-1 ⊕ Bank Sample Location and Number

Previous Investigation Sample Location and Number

LDW-SS544-B ● Dioxin/Furan Composite Subsample (Windward 2010b)

LDW-SS140 ◑ Surface Sediment (Windward 2010a)

0 200 400

Scale in Feet

N

Lower Duwamish Waterway
Seattle, Washington

Bank Sampling Location Plan
Hamm Creek

17800-17 11/11

HARTCROWSER

Figure
11

EAL 11/7/11 1780017-011.dwg

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APPENDIX A
FIELD METHODS AND EXPLORATION LOGS

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APPENDIX A
FIELD METHODS AND EXPLORATION LOGS

This appendix documents the field activities and processes Hart Crowser used to collect the soil samples and to evaluate the nature and quality of the soil at each of the project sites addressed by this report. The work was completed in general accordance with the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP), dated April 21, 2011 (Hart Crowser 2011b).

General Field Activities

Bank Soil Sampling. Soil samples were collected for chemical analysis from depths of approximately 0 to 10 cm. Because of the variability of soil types, a variety of tools were used to collect soil samples. Typically, clean tools and/or clean (new) disposable nitrile gloves were used. In most instances the material was then placed directly into a precleaned, appropriately preserved, laboratory-supplied sample jar. Volatile samples (including NWTPH-Gx and BTEX) were collected using EPA Method 5035 procedures.

In locations where hard, consolidated, and/or cemented material was encountered, a rock hammer was used to remove material from the bank face. The material was collected in a clean stainless steel bowl and then transferred, using clean tools and/or clean (new) disposable nitrile gloves into the appropriate sample jars.

Samples were classified in general accordance with ASTM D 2488 (Table A-1). Sample coordinates and approximate elevation are presented in Table A-1. The elevation of the sample was determined by estimating the height above the LDW in the field and correlating it to the elevation of the LDW using a tide chart.

Direct-Push Probes. SP-1 and SP-2 were advanced to depths of 12 feet below ground surface (bgs), on May 12, 2010. ESN Northwest of Olympia, Washington, completed the push-probe explorations using a truck mounted 2-inch-diameter probe. A field geologist from Hart Crowser observed the probing and collected the soil samples.

Soil samples were collected using a 2-inch stainless steel probe lined with an acetate plastic sleeve sampler pushed by the push-probe rig. Soil samples were generally collected at 4-foot intervals. Samples were classified in general accordance with ASTM D 2488 and were screened for potential soil contamination.

The density/consistency of the soils (presented parenthetically on the probe logs to indicate their having been estimated) is based on visual observation and probe reaction. Detailed logs were prepared of each probe. The probe logs are presented on Figures A-2 and A-3.

The exploration logs show our interpretation of the drilling, sampling, and testing data. The logs indicate the depth where the soil changes. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on Figure A-1 - Key to Exploration Logs. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Soil Screening and Analysis. Field screening results were used as a general guideline to identify potential contamination in soil samples. In addition, field screening results were used as a basis for selecting soil samples for chemical analysis.

Soil samples were field screened for evidence of contamination using: (1) visual examination; (2) sheen screening; and (3) headspace vapor screening using a photoionization detector (PID). The effectiveness of field screening varies with temperature, moisture content, organic content, soil type, and age of the contaminant. The presence or absence of a sheen or headspace vapors does not necessarily indicate the presence or absence of contamination.

Visual examination consists of inspecting the soil for stains that may indicate contamination. Visual screening is generally more effective when contamination is related to contamination such as heavy petroleum hydrocarbons, or when concentrations are high.

Water sheen testing involved placing a small volume of soil in a pan of water and observing the water surface for signs of sheen. Sheens were classified as follows:

No Sheen (NS)	No visible sheen on water surface.
Slight Sheen (SS)	Light colorless film, spotty to globular; spread was irregular, not rapid, areas of no sheen remain, film dissipates rapidly.
Moderate Sheen (MS)	Light to heavy film, may have some color or iridescence, globular to stringy, spread was irregular to flowing; few remaining areas of no sheen on water surface.

Heavy Sheen (HS)	Heavy colorful film with iridescence; stringy, spread was rapid; sheen flows off the sample; most of the water surface might be covered with sheen.

Headspace vapor screening may indicate the presence of volatile organic vapors and involved placing a soil sample in a plastic sample bag. Air was captured in the bag and the bag was shaken to expose the soil to the air trapped in the bag. The probe of the PID was inserted in the bag and the instrument measured the concentration of organic vapors in the air removed from the sample headspace. The highest vapor reading was recorded for each sample. The PID measures concentrations in ppm (parts per million) and is calibrated to isobutylene. The PID is typically designed to quantify organic vapors concentrations in the range of 0 to 1,000 ppm.

The results of field screening were recorded on the explorations logs at the end of this appendix.

Laboratory Analysis and Sample Handling. Soil samples collected during the May 2011 sampling event were submitted to Analytical Resources, Inc. (ARI) of Tukwila, Washington, for chemical analysis. Samples were delivered by courier to the laboratory under chain of custody protocols.

Soil, groundwater, and sediment samples were analyzed for the following constituents:

- Semivolatile organic compounds (SVOCs);
- Polychlorinated biphenyls (PCBs);
- Pesticides;
- Total petroleum hydrocarbons (TPH) including gasoline, diesel, and heavy-oil ranges;
- Metals (As, Cd, Cr, Cu, Pb, Hg, Ag, Zn);
- Total organic carbon (TOC);
- Tributyltin (TBT);
- Dioxins and furans; and
- Polybrominated diethyl ethers (PBDEs).

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Table A-1: Surface Soil Sample Descriptions

Sample Number	Latitude (WGS 84)		Longitude (WGS 84)		Sample Date	Time	Sheen	PID (ppm)	Height above water	Approximate Elevation	Visual Soil Description
RM-BS-1	N	47.5670784	W	122.3505014	5/12/2011	1:20 PM	NS	< 1.0	5	12.5	Moist, dark gray to dark brown, sandy GRAVEL.
RM-BS-2	N	47.5669436	W	122.3505339	5/12/2011	1:30 PM	NS	< 1.0	5	12.5	Damp, brown, sandy GRAVEL to gravelly SAND.
RM-BS-3	N	47.5667385	W	122.3504915	5/12/2011	1:40 PM	NS	< 1.0	5	12.5	Damp, gray-brown, SAND.
RM-BS-4	N	47.5664843	W	122.3504314	5/12/2011	1:55 PM	NS	< 1.0	5	12.5	Damp, gray-brown, gravelly SAND and slightly silty SAND.
RM-BS-5	N	47.5662593	W	122.3504411	5/12/2011	2:55 PM	NS	< 1.0	5.5	12.5	Damp, gray, SAND.
T107-BS-1	N	47.5556764	W	122.3480792	40673	9:35 AM	NS	< 1.0	4.5	12.5	Damp, to moist, light gray, very silty fine SAND, with possible ash
T107-BS-2	N	47.5557956	W	122.3483986	5/10/2011	9:55 AM	NS	< 1.0	4.5	12.5	Damp, light gray, cemented silty SAND, trace gravel
T107-BS-3	N	47.5561163	W	122.3488171	5/10/2011	10:15 AM	NS	< 1.0	4.5	12.5	Moist to wet, gray with orange iron staining, very silty SAND, possibly ash
T107-BS-4	N	47.5562969	W	122.3490491	5/10/2011	10:30 AM	NS	< 1.0	4.5	12.5	Damp, light gray with orange iron staining, slightly sandy GRAVEL, with possible concrete (Fill).
T107-BS-5	N	47.5565573	W	122.3492633	5/10/2011	10:20 AM	NS	< 1.0	4.5	12.5	Damp, light gray, very silty fine SAND
STM-BS-1	N	47.5425188	W	122.3299718	5/10/2011	2:20 PM	NS	< 1.0	7	10.5	Moist, drak brown, silty sandy GRAVEL, with scattered roots (Fill).
STM-BS-2	N	47.5425088	W	122.3299027	5/10/2011	2:30 PM	NS	< 1.0	8	11.5	Wet to moist, dark brown, sandy GRAVEL, trave silt, with scattered debris including brick fragments (Fill).
STM-BS-3	N	47.5424296	W	122.3298761	5/10/2011	2:50 PM	NS	< 1.0	6	9.5	Moist to wet, red-brown to brown and gray, silty gravelly SAND, with debris (Fill).
BT-BS-1	N	47.5388331	W	122.3310443	5/12/2011	11:40 AM	NS	< 1.0	5.5	12.5	Damp to moist, brown, sandy GRAVEL, trace silt, with scattered debris including concrete and brick.
BT-BS-2	N	47.5388470	W	122.3310325	5/12/2011	11:50 AM	NS	< 1.0	3	10	Damp to moist, brown, sandy GRAVEL, trace silt, with scattered debris including concrete and brick (Fill).
BT-BS-3	N	47.5389137	W	122.3311721	5/12/2011	12:00 PM	NS	< 1.0	5.5	13	Damp to moist, brown, sandy GRAVEL, trace silt, with scattered debris including concrete and brick (Fill).
BT-BS-4	N	47.5389250	W	122.3311481	5/12/2011	12:10 PM	NS	< 1.0	3.5	11	Damp to moist, brown, sandy GRAVEL, trace silt, with scattered debris including concrete and brick (Fill).
SIM-BS-1	N	47.5372166	W	122.3259485	5/11/2011	11:30 AM	NS	< 1.0	6.5-7.5	13.5-14.5	Dry, light gray, cemented sandy GRAVEL, with abundant debris including brick, wires, and possible slag (Fill).
SIM-BS-2	N	47.5371976	W	122.3259318	5/11/2011	11:35 AM	NS	< 1.0	6	13	Dry, light gray, cemented sandy GRAVEL, with abundant debris including brick, wires, and possible slag (Fill).
SIM-BS-3	N	47.5371655	W	122.3258701	5/11/2011	11:50 AM	NS	< 1.0	4.5	12	Dry, light gray, cemented sandy GRAVEL, with abundant debris including brick, wires, and possible slag (Fill).
SIM-BS-4	N	47.5371554	W	122.3258051	5/11/2011	12:00 PM	NS	< 1.0	4.3	11.8	Dry, light gray, cemented sandy GRAVEL, with abundant debris including brick, wires, and possible slag (Fill).
PSTL-BS-1a	N	47.5356189	W	122.3233721	5/11/2011	9:40 AM	NS	1.5	8	13	Dry to damp, light brown, slightly gravelly SAND, with abundant debris including plastic, brick, metal, and concrete (Fill).
PSTL-BS-1b	N	47.5356189	W	122.3233721	5/11/2011	9:50 AM	NS	0.3	5	10	Dry to damp, light brown, slightly gravelly SAND, with abundant debris (Fill).
PSTL-BS-2	N	47.5356837	W	122.3236615	5/11/2011	10:10 AM	NS	< 1.0	7	12	Dry, white-gray, cemented silty SAND, concrete like (Fill).

Table A-1: Surface Soil Sample Descriptions

Sample Number	Latitude (WGS 84)		Longitude (WGS 84)		Sample Date	Time	Sheen	PID (ppm)	Height above water	Approximate Elevation	Visual Soil Description
PSTL-BS-3	N	47.5359233	W	122.3240003	5/11/2011	10:30 AM	NS	< 1.0	6.5	12	Light gray, cemented silty gravelly SAND, with abundant concrete (Fill).
PSTL-BS-4a	N	47.5360740	W	122.3242152	5/11/2011	1:30 PM	NS	< 1.0	9	15.5	Dry, white, gray and brown, silty sandy GRAVEL, with scattered roots and debris (Fill).
PSTL-BS-4b	N	47.5360740	W	122.3242112	5/11/2011	1:35 PM	NS	< 1.0	7	13.5	Dry to damp, white, chalky, hard substance with gravel (Fill).
PSTL-BS-5a	N	47.5362139	W	122.3244176	5/11/2011	1:50 PM	NS	< 1.0	9.5	15.5	Dry, gray-brown, silty sandy GRAVEL, with scattered debris (Fill).
PSTL-BS-5b	N	47.5362056	W	122.3244255	5/11/2011	2:00 PM	NS	< 1.0	7.5	13.5	Dry, white, gray, cemented silty sandy GRAVEL (Fill).
PSTL-BS-6a	N	47.5364534	W	122.3247686	5/11/2011	2:15 PM	NS	< 1.0	7.5	13.5	Dry, light brown to light gray, cemented powdery silty, sandy GRAVEL (Fill).
PSTL-BS-6b	N	47.5364534	W	122.3247686	5/11/2011	2:20 PM	NS	< 1.0	3.5	9	Moist, white, red and brown, cemeneted sandy GRAVEL and gravelly SAND (Fill).
PSTL-BS-7	N	47.5365927	W	122.3250156	5/11/2011	2:35 PM	NS	< 1.0	7	12	Dry, gray, cemeneted sandy GRAVEL, with hard white substance (Fill).
SP-BS-1a	N	47.5290095	W	122.3152846	5/12/2011	10:10 AM	NS	< 1.0	6	16	(See Push Probe Log)
SP-BS-1b	N	47.5290095	W	122.3152846	5/12/2011	10:15 AM	NS	< 1.0	2	12	(See Push Probe Log)
SP-BS-2a	N	47.5291071	W	122.3153683	5/12/2011	9:35 AM	NS	< 1.0	6	16	(See Push Probe Log)
SP-BS-2b	N	47.5291071	W	122.3153683	5/12/2011	9:45 AM	NS	< 1.0	2	12	(See Push Probe Log)
SKI-BS-1	N	47.5220288	W	122.3089332	5/10/2011	1:20 PM	NS	< 1.0	4	11	Moist, brown, SAND, trace silt, with abundant root.
SKI-BS-2	N	47.5217206	W	122.3088071	5/10/2011	1:10 PM	NS	< 1.0	4	11	Moist, brown to red-brown with red-orange moddeled, gravelly silty SAND, with scattered organics (Fill).
SKI-BS-3	N	47.5215097	W	122.3087890	5/10/2011	12:55 PM	NS	< 1.0	4	11	Wet to moist, gray, gravelly silty SAND and sandy SILT, with scattered organics
SKI-BS-4	N	47.5213947	W	122.3087736	5/10/2011	12:45 PM	NS	< 1.0	4	11	Wet to moist, brown, slightly gravelly sandy SILT and silty SAND
SKI-BS-5	N	47.5208356	W	122.3085433	5/10/2011	12:20 PM	NS	< 1.0	4	11	Moist to wet, brown with red-brown modeled, silty SAND to sandy SILT, trace gravel, scattered roots.
SKI-BS-6	N	47.5206719	W	122.3084860	5/10/2011	12:10 PM	NS	< 1.0	4	11	Wet to moist,silty gravelly SAND to sandy GRAVEL (Fill).
HC-BS-1	N	47.5154376	W	122.3065692	5/10/2011	11:30 AM	NS	< 1.0	3	11.5	Moist, dark brown, slightly silty SAND.
HC-BS-2	N	47.5154297	W	122.3065447	5/10/2011	11:40 AM	NS	< 1.0	4	12.5	Moist, brown, slightly silty SAND.
HC-BS-3	N	47.5154239	W	122.3065647	5/10/2011	11:50 AM	NS	< 1.0	5.5	14	Moist, brown, slightly silty SAND.

Notes:

NS - No Sheen erate Sheen

SS - Slight Shea vy Sheen

NA - Not Available

Key to Exploration Logs

Sample Description

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

Sampling Test Symbols

☒	Split Spoon (2.0" O.D.)	⊠	Grab (Jar)
◥	Split Spoon (3.0" O.D.)	□	Bag
◧	Shelby Tube (Pushed)	▥	Cuttings

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE			GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

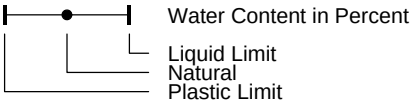
Moisture

Dry Little perceptible moisture
Damp Some perceptible moisture, likely below optimum
Moist Likely near optimum moisture content
Wet Much perceptible moisture, likely above optimum

Minor Constituents	Estimated Percentage
Trace	<5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Laboratory Test Symbols

GS	Grain Size Classification
CN	Consolidation
UU	Unconsolidated Undrained Triaxial
CU	Consolidated Undrained Triaxial
CD	Consolidated Drained Triaxial
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



PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	In Situ Density in PCF

Groundwater Indicators

Groundwater Level on Date or (ATD) At Time of Drilling

Groundwater Seepage (Test Pits)

Sample Key

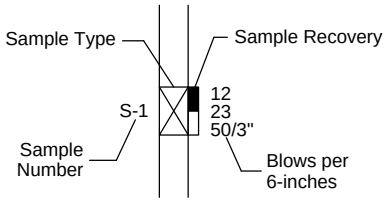


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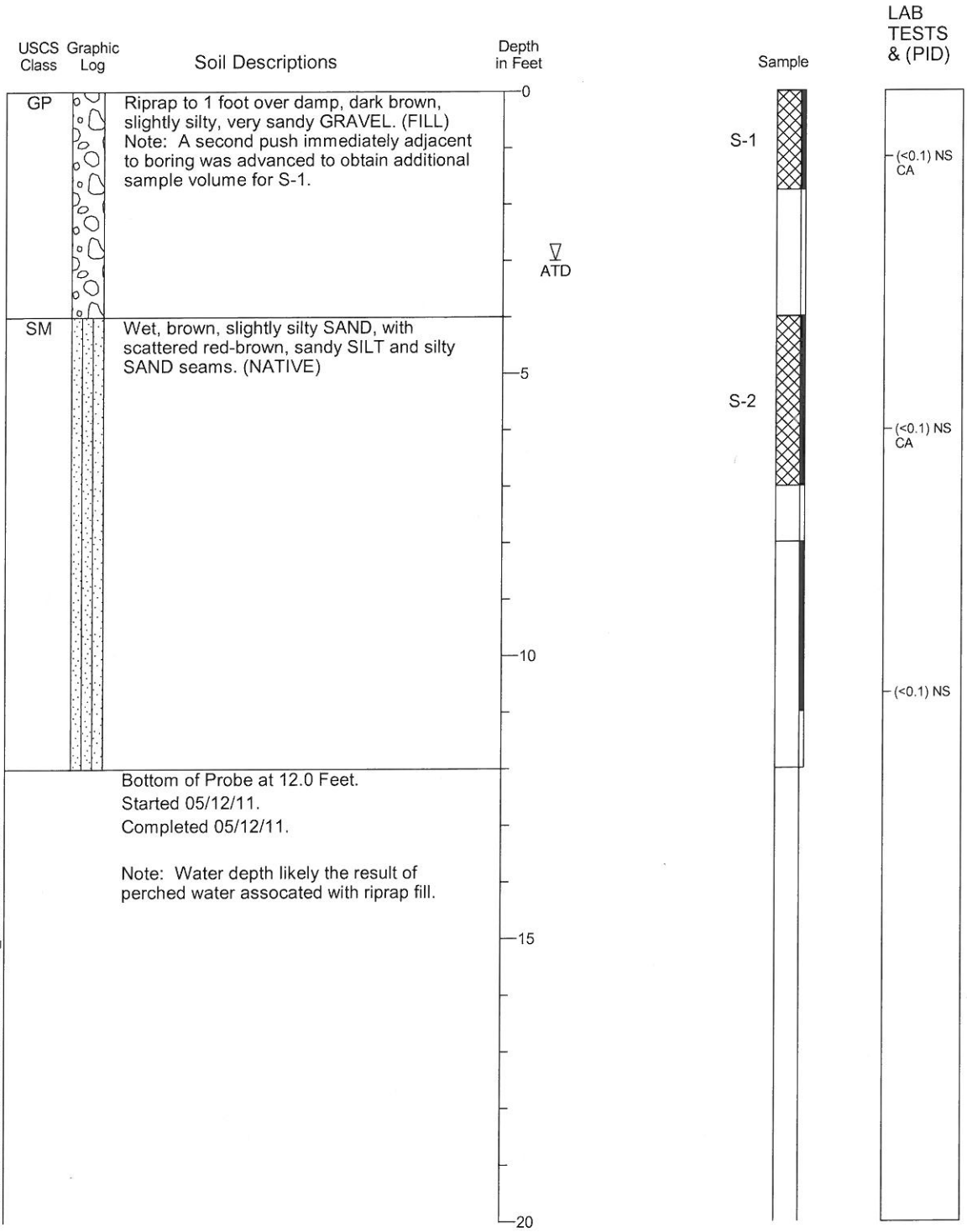
Figure A-1

1733032-PP.GPJ

Push Probe Log SP-1

Location: W 122.315311 N 47.529032
Approximate Ground Surface Elevation: 16 Feet
Horizontal Datum: WGS 84
Vertical Datum: MSL

Drill Equipment: Push Probe
Sample Type: 4' Acetate Liner
Hole Diameter: 2 inches
Logged By: P. Cordell Reviewed By: A. Goodwin



PUSH PROBE LOG-ENV 1733032-PP.GPJ HC_CORP.GDT 11/3/11

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

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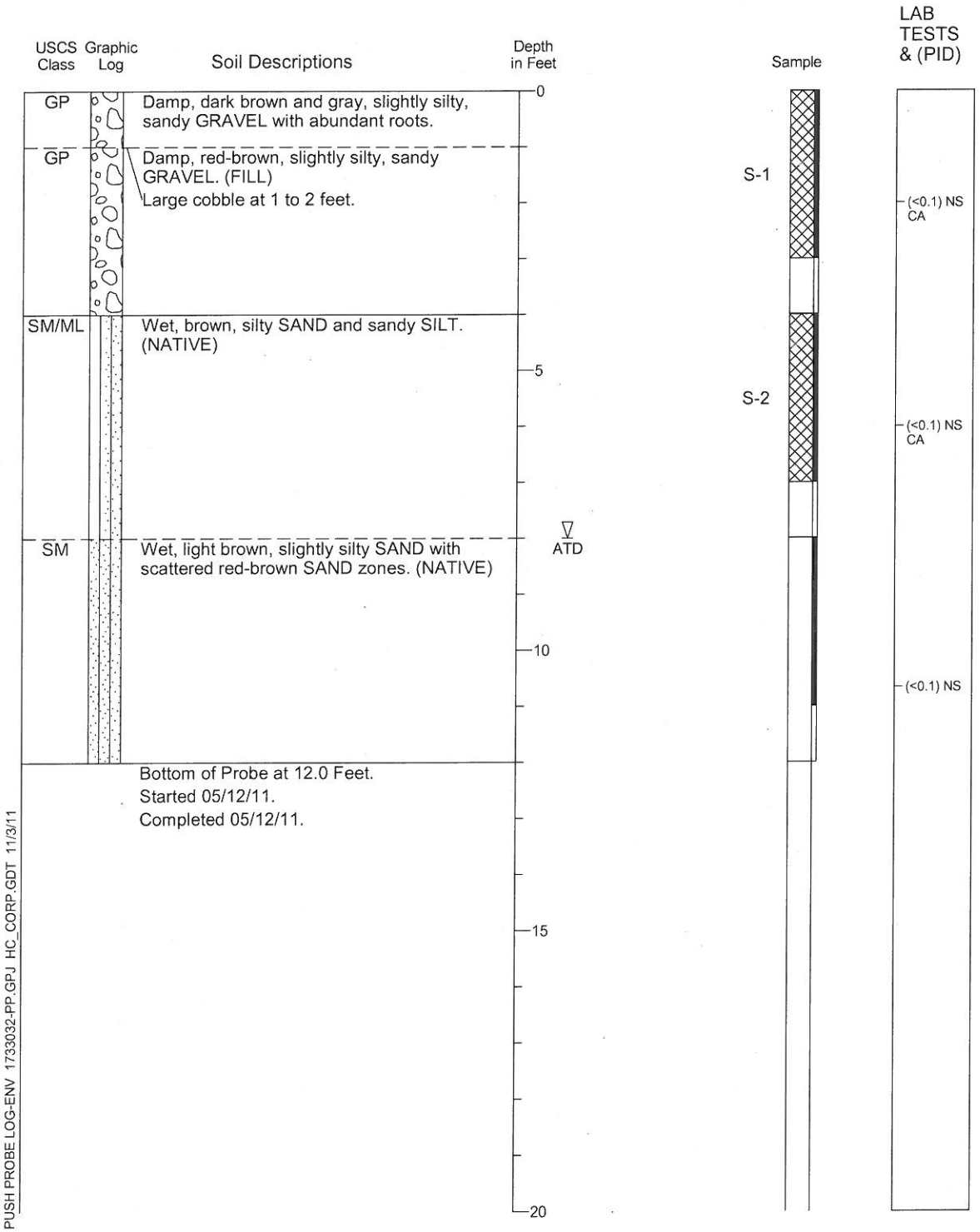
Figure A-2

Push Probe Log SP-2

Location: W 122.315398 N 47.529130
Approximate Ground Surface Elevation: 16 Feet
Horizontal Datum: WGS 84
Vertical Datum: MSL

Drill Equipment: Push Probe
Sample Type: 4' Acetate Liner
Hole Diameter: 2 inches
Logged By: P. Cordell Reviewed By: A. Goodwin



PUSH PROBE LOG-ENV 1733032-PP.GPJ HC_CORP.GDT 11/3/11

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

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Figure A-3

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APPENDIX B
CHEMICAL DATA QUALITY REVIEW AND LABORATORY REPORTS

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APPENDIX B
CHEMICAL DATA QUALITY REVIEW AND CHEMISTRY LABORATORY REPORTS

Forty-five soil samples and three trip blanks were collected from May 10 to 12, 2011. The samples were submitted to Analytical Resources, Inc. (ARI), in Tukwila, WA, for chemical analysis. The sample analytical results were reported as ARI Job Nos. SW27, SW60, and SW75.

Three samples from batch SW60 (PSTL-BS-2, PSTL-BS-3, and PSTL-BS-4b) were crushed at the laboratory to reduce the particle size prior to extraction and analysis. Two rinsate blank water samples associated with batch SW60 were analyzed and reported under ARI job number SX03.

Quality assurance/quality control (QA/QC) reviews of laboratory procedures were performed on an ongoing basis by the laboratory. Hart Crowser performed the data review, using laboratory quality control results summary sheets and raw data, as required, to ensure they met data quality objectives for the project. Data review followed the format outlined in the National Functional Guidelines for Organic Superfund Data Review (EPA 2008), National Functional Guidelines for Inorganic Superfund Data Review (EPA 2010), and the National Functional Guidelines for Chlorinated Dioxin/Furan Data Review (EPA 2005) modified to include specific criteria of the individual analytical methods. The following criteria were evaluated in the standard data quality review process:

- Holding times;
- Method blanks;
- Surrogate recoveries;
- Matrix spike/matrix spike duplicate (MS/MSD) recoveries;
- Laboratory duplicate relative percent differences (RPDs);
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) recoveries;
- Labeled compound recoveries;
- Ongoing precision and accuracy sample recoveries (OPR);
- Laboratory replicate relative standard deviation (RSD);
- Internal Standard recoveries (where applicable);
- Calibration criteria (where applicable); and
- Reporting limits (RL).

The data were generally determined to be acceptable for use, as qualified. Results for the analyte 2,4-dimethylphenol in samples SP-BS-1-1, SP-BS-1-2, SP-BS-2-1, SP-BS-2-2, BT-BS-1, BT-BS-2, BT-BS-3, BT-BS-4, RM-BS-1, RM-BS-2, RM-BS-3, RM-BS-4, and RM-BS-5 were rejected based on failing LCS recoveries.

Full laboratory reports are presented at the end of this appendix. Results of the data reviews, organized by analysis class, follow.

CHEMICAL DATA QUALITY REVIEW FOR BANK SOIL SAMPLES

Sample Receiving Discrepancies

The following discrepancies were identified for ARI Job No. SW27:

- **Sample Trip Blank 1.** One VOA vial, prepared by the laboratory, contained small air bubbles. The sample results were not qualified.

- **Sample T107-BS-2.** One 4-ounce jar was received empty. Sufficient sample volume was available from other containers for requested analyses.

- **Sample STM-BS-1.** The VOA vials were not labeled. The laboratory was able to identify the sample through process of elimination.

- **VOC Vials.** The field sampler placed extra labels on the pre-weighed VOA vials and covered up the VOA vial weight measurements. The vials were reweighed to account for weight of the extra label.

The following discrepancies were identified for ARI Job No. SW60:

- **Temperature.** Two cooler temperatures were received at temperatures slightly below the recommended 2.0 to 6.0°C range. The other two coolers were within range. Low temperatures would not significantly affect soil samples, and the sample results were not qualified.

The following discrepancies were identified for ARI Job No. SW75:

- **Temperature.** Two cooler temperatures were received at temperatures slightly below the recommended 2.0 to 6.0°C range. The other two coolers were within range. Low temperatures would not significantly affect soil samples, and the sample results were not qualified.

- **Extra Samples.** There were five ziplock bags containing soil that were included in the cooler and not marked on the Chain of Custody. The bagged samples were mistakenly shipped to the laboratory. The laboratory did not analyze these bagged samples.

- **Sample Trip Blank.** Three of the four VOA trip blank vials, prepared by the laboratory, contained small air bubbles. No sample results were qualified.

Total Solids

Analytical Methods

Total solids were determined by modified EPA Method 160.3.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination.

Laboratory Replicate Sample Analysis

The relative standard deviation between replicate measurements met quality control limits.

Total Organic Carbon

Analytical Methods

Total organic carbon was determined by modified EPA Method 9060.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable. Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors.

Blank Contamination

There was no method blank contamination.

Laboratory Control Sample (LCS) and Duplicate (LCSD) Recoveries

The LCS recovery was within laboratory control limits.

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Recoveries

The MS/MSD recoveries were within laboratory control limits.

Standard Reference Material (SRM) Recovery

SRM recoveries were within quality control limits.

Laboratory Replicate Sample Analysis

The relative standard deviation between replicate measurements met quality control limits.

Initial Calibration Curves (ICALs) and Continuing Calibration Verification Checks (CCVs)

The ICALs and CCVs were within acceptance criteria.

Metals

Analytical Methods

Soil samples for mercury were prepared and analyzed by Cold Vapor Atomic Absorption (CVAA) following EPA Method 7471A. Soil samples for arsenic, cadmium, chromium, copper, lead, silver, and zinc were prepared by EPA Method 3050B and analyzed by Inductively Coupled Plasma (ICP) following EPA Method 6010B.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reporting limits were acceptable. Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors.

Blank Contamination

There was no method blank contamination.

LCS and LCSD Recoveries

LCS recoveries were within method control limits.

MS and MSD Recoveries

The MS recoveries were within method control limits with the following exceptions:

- **PSTL-BS-1a (MS).** The recovery for zinc was qualified by the laboratory with "H," as the spiking amount was less than four times the amount in the source sample. The recovery was within control limits, and no results were qualified.

- **T107-BS-1 (MS).** The recovery for zinc was qualified by the laboratory with "H," as the spiking amount was less than four times the amount in the source sample. The recovery was within control limits, and no results were qualified.

Laboratory Duplicate Sample Analysis

The relative percent differences (RPDs) between replicate measurements met quality control limits or were not applicable if the sample and duplicate were less than five times the reporting limit with the following exception:

- **PSTL-BS-1a Dup.** The RPD for chromium exceeds 20 percent. Results for chromium in the source sample PSTL-BS-1a were qualified as estimated and flagged "J."

ICAL and CCVs

The ICALs and CCVs were within acceptance criteria.

Diesel- and Motor Oil-Range Hydrocarbons

Analytical Methods

Soil samples were prepared by EPA Method 3546 (microwave) and the extracts were acid and silica gel cleaned. The samples were analyzed by Gas Chromatograph fitted with a Flame Ionization Detector (GC/FID) following the NWTPH-Dx method.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reporting limits were acceptable. Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors.

Blank Contamination

There was no method blank contamination.

Surrogate Recovery

Surrogate recoveries were within laboratory control limits.

LCS and LCSD Recoveries

LCS and LSCD recoveries were within laboratory control limits.

MS and MSD Recoveries

MS and MSD recoveries were within laboratory control limits.

ICAL and CCV

The ICALs and CCVs were within acceptance criteria for analytes of interest.

Gasoline-Range Hydrocarbons/BTEX Compounds

Analytical Methods

Samples were analyzed for gasoline by GC/FID following the NWTPH-Gx method. Samples were analyzed for BTEX compounds by gas chromatograph fitted with a photoionization detector (GC/PID) following modified EPA Method 8021B.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reporting limits were acceptable. Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors.

Blank Contamination

There was no method or trip blank contamination.

Surrogate Recovery

Surrogate recoveries were within laboratory control limits.

LCS and LCSD Recoveries

LCS/LCSD recoveries were within laboratory control limits.

MS and MSD Recoveries

MS/MSD recoveries were within laboratory control limits.

ICAL and CCV

The ICALs and CCVs were within acceptance criteria.

Additional Sample Comments

Samples PSTL-BS-1a, PSTL-BS-1b, PSTL-BS-2, PSTL-BS-3, SIM-BS-1, SIM-BS-2, SIM-BS-3, SIM-BS-4, PSTL-BS-4a, PSTL-BS-4b, PSTL-BS-5a, PSTL-BS-5b, PSTL-BS-6a, PSTL-BS-6b, PSTL-BS-7, HC-BS-1, HC-BS-2, HC-BS-3, SKI-BS-4, SKI-BS-3, SKI-BS-1,

STM-BS-1, STM-BS-2, SP-BS-1-1, SP-BS-1-2, SP-BS-2-1, SP-BS-2-2, BT-BS-1, BT-BS-2, BT-BS-3, BT-BS-4, RM-BS-1, RM-BS-2, RM-BS-3, RM-BS-4, and RM-BS-5 had questionable detections for o-xylene as a result of retention time shifts, and were noted by the analyst as possible false positives. Review of the retention time windows using ICALs and CCVs shows that the detections fall within the retention time window for o-xylene. Sample results were not qualified.

Dioxins/Furans

Analytical Methods

Soil samples submitted for dioxins/furans analysis were prepared and analyzed by EPA Method 1613B.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors. Detections that were between the RL and the Estimated Detection Limit (EDL) were qualified by the laboratory as estimated (J). The J qualifiers were changed to T to be consistent with Ecology's Environmental Information Management (EIM) database.

Blank Contamination

The method blanks had detections for multiple analytes between the EDL and the RL. The laboratory qualified detections in the associated samples with B if they were less than five times the method blank value. Method blank results that did not meet ion ratio criteria (qualified as EMPC) were qualified as non-detected (U). The detections in the associated samples were evaluated and results modified as follows:

- **MB-051711.** The method blank had detections between the EDL and RL that met ion criteria for:
  - 1,2,3,4,6,7,8-HpCDF – 0.254 ng/kg
  - OCDD – 2.49 ng/kg
  - Total HpCDF – 0.254 ng/kg

Results for those analytes in the associated samples that were between the EDL and the RL were qualified as non-detected (U) at the value reported by the laboratory.

- T107-BS-2: 1,2,3,4,6,7,8-HpCDF
- T107-BS-3: 1,2,3,4,6,7,8-HpCDF
- T107-BS-4: 1,2,3,4,6,7,8-HpCDF
- T107-BS-5: 1,2,3,4,6,7,8-HpCDF
- SKI-BS-3: 1,2,3,4,6,7,8-HpCDF
- SKI-BS-1: 1,2,3,4,6,7,8-HpCDF

Results for those analytes in associated samples with detections above the RL and greater than five times the amount in the method blank (ten times for OCDD and OCDF) were not qualified and had the B qualifier removed (if present):

- T107-BS-2: OCDD
- T107-BS-3: OCDD
- T107-BS-4: OCDD
- T107-BS-5: OCDD
- HC-BS-1: 1,2,3,4,6,7,8-HpCDF and OCDD
- HC-BS-2: 1,2,3,4,6,7,8-HpCDF and OCDD
- HC-BS-3: 1,2,3,4,6,7,8-HpCDF and OCDD
- SKI-BS-6: 1,2,3,4,6,7,8-HpCDF and OCDD
- SKI-BS-5: 1,2,3,4,6,7,8-HpCDF and OCDD
- SKI-BS-4: 1,2,3,4,6,7,8-HpCDF and OCDD
- SKI-BS-3: OCDD
- SKI-BS-2: 1,2,3,4,6,7,8-HpCDF and OCDD
- SKI-BS-1: OCDD
- STM-BS-1: 1,2,3,4,6,7,8-HpCDF and OCDD
- STM-BS-2: 1,2,3,4,6,7,8-HpCDF and OCDD

Results for those analytes in associated samples with detections above the RL and less than five times the amount in the method blank (ten times for OCDD and OCDF) were qualified as non-detected (U) at the value reported by the laboratory:

- T107-BS-1: OCDD

The method blank had a detection for 1,2,3,4,6,7,8-HpCDD between the EDL and RL that did not meet ion criteria. Detections for that analyte in the associated samples that were less than five times the amount in the method

blank were qualified with B by the laboratory. The B qualifier was removed from associated sample T107-BS-1.

- **MB-051911.** The method blank had detections between the EDL and the RL for 1,2,3,4,6,7,8-HpCDF and OCDD that did not meet ion criteria. Detections for those analytes in the associated samples were not qualified by the laboratory.

- **MB-052311.** The method blank had detections between the EDL and RL that met ion criteria for:
  - 1,2,3,4,7,8-HxCDF - 0.198 ng/kg
  - 1,2,3,4,6,7,8-HpCDF – 0.350 ng/kg
  - Total TCDF – 0.208 ng/kg
  - Total TCDD – 0.066 ng/kg
  - Total PeCDF – 0.268 ng/kg
  - Total HxCDF – 0.198 ng/kg
  - Total HpCDF – 0.350 ng/kg
  - Total HpCDD – 0.380 ng/kg

Results for those analytes in the associated samples that were between the EDL and the RL were qualified as non-detected (U) at the value reported by the laboratory.

- PSTL-BS-1a: 1,2,3,4,7,8-HxCDF
- PSTL-BS-2: 1,2,3,4,7,8-HxCDF
- SIM-BS-4: 1,2,3,4,7,8-HxCDF

Results for those analytes in associated samples with detections above the RL and greater than five times the amount in the method blank (ten times for OCDD and OCDF) were not qualified and had the B qualifier removed (if present):

- PSTL-BS-1a: 1,2,3,4,6,7,8-HpCDF
- PSTL-BS-1b: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF
- PSTL-BS-2: 1,2,3,4,6,7,8-HpCDF
- SIM-BS-2: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF
- SIM-BS-1: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF
- SIM-BS-3: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF
- SIM-BS-4: 1,2,3,4,6,7,8-HpCDF
- PSTL-BS-4a: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF
- PSTL-BS-4b: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF
- PSTL-BS-5a: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF
- PSTL-BS-5b: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF

- PSTL-BS-6a: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF
- PSTL-BS-6b: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF
- PSTL-BS-7: 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF

The method blank had detections for 2,3,4,7-TCDF, 2,3,7,8-TCDD, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,6,7,8-HpCDD and OCDD between the EDL and RL that did not meet ion criteria. Detections for those analytes in the associated samples that were less than five times the amount in the method blank were qualified with B by the laboratory. The B qualifiers for those analytes were removed from associated samples PSTL-BS-1a, PSTL-BS-1b, PSTL-BS-2, SIM-BS-1, SIM-BS-3, SIM-BS-4, PSTL-BS-4b, PSTL-BS-5b, and PSTL-BS-6a.

- **MB-052711.** The method blank had detections between the EDL and RL that met ion criteria for:
  - 2,3,7,8-TCDF - 0.254 ng/kg
  - 1,2,3,7,8-PeCDF - 0.427 ng/kg
  - 2,3,4,7,8-PeCDF - 0.208 ng/kg
  - 1,2,3,7,8-PeCDD - 0.161 ng/kg
  - 1,2,3,4,7,8-HxCDF - 0.561 ng/kg
  - 1,2,3,7,8,9-HxCDD – 0.161 ng/kg
  - 1,2,3,4,6,7,8-HpCDF - 0.682 ng/kg
  - 1,2,3,4,6,7,8-HpCDD - 0.444 ng/kg
  - OCDD - 1.32 ng/kg
  - Total TCDF – 0.910 ng/kg
  - Total TCDD – 0.134 ng/kg
  - Total PeCDF – 1.49 ng/kg
  - Total PeCDD - 0.288 ng/kg
  - Total HxCDF – 0.982 ng/kg
  - Total HxCDD - 0.278 ng/kg
  - Total HpCDF – 0.682 ng/kg
  - Total HpCDD – 0.444 ng/kg

Results for those analytes in the associated samples that were between the EDL and the RL were qualified as non-detected (U) at the value reported by the laboratory.

- PSTL-BS-3: 1,2,3,7,8-PeCDF

Results for those analytes in associated samples with detections above the RL and greater than five times the amount in the method blank (ten times for OCDD and OCDF) were not qualified and had the B qualifier removed (if present):

- PSTL-BS-3: 2,3,7,8-TCDF, 2,3,4,7,8-PeCDF, 1,2,3,7,8-PeCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,6,7,8-HpCDD, and OCDD

Results for those analytes in associated samples with detections above the RL and less than five times the amount in the method blank (ten times for OCDD and OCDF) were qualified as non-detected (U) at the value reported by the laboratory:

- PSTL-BS-3: 1,2,3,4,7,8-HxCDF

The method blank had detections for 1,2,3,6,7,8-HxCDF, 1,2,3,4,7,8-HxCDD, and 1,2,3,6,7,8-HxCDD between the EDL and RL that did not meet ion criteria. Detections for those analytes in the associated samples that were less than five times the amount in the method blank were qualified with B by the laboratory. The B qualifiers for those analytes were removed from associated samples PSTL-BS-3.

Labeled Compound Recoveries

The labeled compound recoveries were within control limits.

Ongoing Precision and Recovery (OPR)

OPR recoveries were within control limits.

ICAL and CCVs

The ICALs and CCVs were within acceptance criteria.

Sample Qualifiers

Multiple compounds in the samples were qualified by the laboratory as estimated maximum possible concentrations (EMPC) when ion abundance ratios were outside quality control limits. The EMPC qualifiers were reported as non-detect (U) for individual analytes and results qualified as UK in the following samples:

- T107-BS-1: 1,2,3,7,8-PeCDD, 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, and 1,2,3,6,7,8-HxCDD
- T107-BS-2: 2,3,7,8-TCDF, 1,2,3,7,8,9-HxCDD, and 1,2,3,4,6,7,8-HpCDF
- T107-BS-3: 2,3,7,8-TCDD, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, and OCDF

- T107-BS-4: 2,3,7,8-TCDF, 2,3,7,8-TCDD, 1,2,3,7,8-PeCDF, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDF, 1,2,3,4,7,8-HxCDD, and 1,2,3,4,7,8,9-HpCDF
- T107-BS-5: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDF, 1,2,3,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDD, and 1,2,3,4,6,7,8-HpCDF
- HC-BS-1: 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 2,3,7,8-TCDF, and 2,3,4,6,7,8-HxCDF
- HC-BS-2: 2,3,7,8-TCDD and 1,2,3,4,7,8,9-HpCDF
- HC-BS-3: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDF, 2,3,7,8-TCDF, 2,3,4,7,8-PeCDF, and 1,2,3,7,8,9-HxCDF
- SKI-BS-6: 2,3,7,8-TCDD
- SKI-BS-5: 2,3,7,8-TCDD, 2,3,4,7,8-PeCDF, and 1,2,3,7,8,9-HxCDF
- SKI-BS-4: 1,2,3,7,8,9-HxCDF
- SKI-BS-3: 2,3,7,8-TCDD, 2,3,4,7,8-PeCDF, 2,3,4,6,7,8-HxCDF, and 1,2,3,4,6,7,8-HpCDF
- SKI-BS-2: 2,3,7,8-TCDD
- SKI-BS-1: 2,3,7,8-TCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, and 1,2,3,4,7,8-HxCDD
- STM-BS-1: 2,3,7,8-TCDD and 1,2,3,4,7,8,9-HpCDF
- PSTL-BS-1a: 2,3,7,8-TCDD
- PSTL-BS-1b: 2,3,7,8-TCDD
- PSTL-BS-2: 2,3,7,8-TCDD
- PSTL-BS-3: 2,3,7,8-TCDD
- SIM-BS-1: 2,3,7,8-TCDD
- SIM-BS-2: 2,3,7,8-TCDD
- SIM-BS-3: 2,3,7,8-TCDD and 1,2,3,4,7,8,9-HpCDF
- SIM-BS-4: 2,3,7,8-TCDD
- PSTL-BS-4a: 2,3,7,8-TCDD
- PSTL-BS-4b: 2,3,7,8-TCDD
- PSTL-BS-5a: 2,3,7,8-TCDD
- PSTL-BS-5b: 2,3,7,8-TCDD
- PSTL-BS-6a: 2,3,7,8-TCDD
- PSTL-BS-6b: 2,3,7,8-TCDD
- PSTL-BS-7: 2,3,7,8-TCDD
- SP-BS-1-1: 2,3,7,8-TCDD
- SP-BS-1-2: 2,3,7,8-TCDD and 1,2,3,7,8-PeCDF
- SP-BS-2-2: 2,3,7,8-TCDD, 2,3,4,7,8-PeCDF, 1,2,3,7,8,9-HxCDF, and 1,2,3,4,7,8,9-HpCDF
- BT-BS-1: 2,3,7,8-TCDD
- BT-BS-3: 2,3,7,8-TCDD
- RM-BS-1: 2,3,7,8-TCDD
- RM-BS-3: 2,3,7,8-TCDD, 1,2,3,6,7,8-HxCDD, and 1,2,3,4,7,8,9-HpCDF
- RM-BS-4: 2,3,7,8-TCDD

- RM-BS-5: 2,3,7,8-TCDD
- STM-BS-3: 2,3,7,8-TCDD

Multiple compounds were qualified by the laboratory with X based interferences from polychlorinated diphenyl ethers. The X qualifiers were changed to J (estimated) in the following samples:

- SM-BS-1: 1,2,3,7,8-PeCDF
- SP-BS-1-1: 1,2,3,7,8-PeCDF
- RM-BS-1: 1,2,3,7,8-PeCDF
- RM-BS-2: 1,2,3,7,8-PeCDF

Pesticides

Analytical Methods

The samples were extracted by EPA Method 3546 (microwave), and the extracts were sulfur and silica gel cleaned. The samples were analyzed by GC/ECD following EPA Method 8081.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors. Reported detection limits were acceptable with the following exceptions:

- **SKI-BS-6, SIM-BS-2, SP-BS-1-1, BT-BS-2, and SKI-BS-3.** The reporting limit was elevated for heptachlor epoxide due to matrix interferences, and qualified as "Y." The Y qualifier was changed to "U".

- **SIM-BS-1.** The reporting limit was elevated for heptachlor epoxide and 4,4-DDE due to matrix interferences, and qualified as "Y". The Y qualifier was changed to "U".

- **SP-BS-2-1 and BT-BS-2.** The samples were analyzed at dilution due to high levels of target analytes. Reporting limits were raised due to the dilution.

- **STM-BS-1, STM-BS-2, STM-BS-3, PSTL-BS-5a, BT-BS-3, BT-BS-4, BT-BS-1, and SKI-BS-2.** These samples were analyzed at dilutions, and the reporting limits were raised due to the dilutions.

Blank Contamination

There was no method blank contamination.

Surrogate Recoveries

Surrogate recoveries are within laboratory control limits with the following exceptions:

- **STM-BS-1, STM-BS-2, BT-BS-4, and STM-BS-3.** The surrogate DCBP was not reported as a result of matrix interferences. The recoveries for the surrogate TCMX for those samples were within control, and sample results were not qualified.

- **SKI-BS-1.** The recovery for surrogate TCMX was below control limits on the STX-CLP2 column, while the recovery for the surrogate DCBP exceeded the control limits on the STX-CLP1 column. The surrogate results were reported from the passing columns. The sample results were not detected above the reporting limit and not qualified.

- **PSTL-BS-5a, BT-BS-1, and BT-BS-3.** The recoveries for surrogate DCBP exceeded the control limit, while the recoveries for surrogate TCMX were within control limits. The sample results were not qualified.

LCS and LCSD Recoveries

The LCS recoveries were within laboratory control limits.

MS and MSD Recoveries

The MS/MSD recoveries were within laboratory control limits with the following exception:

- **RM-BS-2 MS/MSD.** The recoveries for endosulfan II and 4,4-DDT in the MSD were below the control limits, but within the control limits in the MS. The recoveries for cis-chlordane exceeded the control limit in the MS, but were within control limits in the MSD. As the recoveries were within control for one of the quality control samples, the source sample results were not qualified.

- **PSTL-BS-7 MS/MSD.** The recoveries for alpha-BHC, beta-BHC, gamma-BHC, heptachlor, aldrin, heptachlor epoxide, endosulfan I, 4,4-DDE, endrin, trans-chlordane, and cis-chlordane were below the control limits in the MS and MSD. The RPDs for gamma-BHC and endosulfan I exceeded the control limit. The analytes dieldrin, endosulfan sulfate, and endosulfan II were not recovered in the MS or MSD. The LCS and LCSD recoveries were within control, implying matrix effects. The results for alpha-BHC, beta-BHC, gamma-BHC, heptachlor, aldrin, heptachlor epoxide, endosulfan I, 4,4-DDE, endrin, trans-chlordane, cis-chlordane, dieldrin, endosulfan sulfate and endosulfan II in source sample PSTL-BS-7 were qualified as estimated (J).

Internal Standards

Internal standards were within acceptance criteria with the following exceptions:

- **SKI-BS-1.** The hexabromobiphenyl (HBBP) internal standard exceeded acceptance criteria on STX-CLP1 column, but was within acceptance criteria on the STX-CLP2 column. The associated analytes were non-detect and reported from STX-CLP2 column without qualification.

- **STM-BS-3.** The HBBP internal standard exceeded acceptance criteria on both columns. The HBBP internal standard is associated with endrin, 4,4-DDD, endosulfan II, 4,4-DDT, endrin aldehyde, methoxychlor, endosulfan sulfate, endrin ketone, toxaphene, and DCBP. A high bias in the internal standard leads to a low bias in the associated analytes. The target analytes endrin, 4,4-DDD, endosulfan II, 4,4-DDT, endrin aldehyde, endosulfan sulfate, toxaphene, and DCBP were qualified as estimated (J) in STM-BS-3.

- **BT-BS-4.** The HBBP internal standard exceeded acceptance criteria on the STX-CLP1 column, but passed on the STX-CLP2 column. The associated analytes were not detected above the reporting limit and reported from STX-CLP2 column without qualification.

- **PSTL-BS-2 and PSTL-BS-3.** The HBBP internal standard was below acceptance criteria on STX-CLP2 column, but was within acceptance criteria on the STX-CLP1 column. Associated analytes were not detected above the reporting limit, and reported from STX-CLP1 column and not qualified.

ICAL and CCV

The ICALs were within acceptance criteria.

The CCVs were within control limits with the following exceptions:

- **CCV 06/03/11 at 1028.** The recoveries for methoxychlor failed high on both columns. The recovery for Heptachlor failed high on the STX-CLP2 column, but passed on the STX-CLP1 column. As methoxychlor was not a target analyte, results were not reported or qualified in the associated samples. Associated sample results were non-detect for heptachlor, and the results were reported from the passing column and not qualified.

- **CCV 06/03/11 at 1446.** The recoveries for methoxychlor and heptachlor failed high on both columns. As methoxychlor was not a target analyte, results were not reported or qualified in the associated samples. Associated sample results were non-detect for heptachlor, and as the bias was high the results were not qualified.

- **CCV 06/06/11 at 1743.** The recoveries for methoxychlor and heptachlor failed high on the STX-CLP1 column, but passed on the STX-CLP2 column. As methoxychlor was not a target analyte, results were not reported or qualified in the associated samples. Associated sample results were non-detect for heptachlor, and the results were reported from the passing column and not qualified.

- **Closing CCV 06/06/11 at 2201.** The recoveries for endosulfan II and 4,4-DDT failed low on the STX-CLP1 column. The recoveries for aldrin, endrin, endosulfan II, endosulfan sulfate, 4,4-DDT, methoxychlor, endrin ketone, endrin aldehyde, gamma-chlordane, and alpha-chlordane failed low on the STX-CLP2 column. The samples were reanalyzed on 06/07/11 with similar results on the CCV. As the samples were analyzed by the internal standard method, and the prior CCV passed, the samples were reported from the 06/06/11 sequence, and not qualified.

- **Closing CCV 06/06/11 at 2243.** The DDT breakdown check exceeded 15 percent on both columns. The endrin breakdown check exceeded 15 percent on the STX-CLP2 column. As the associated samples were analyzed by the internal standard method, the closing CCV and breakdown check were not applicable, and no results were qualified.

- **Closing CCV 06/06/11 at 2259.** The recovery for 4,4-DDD failed high on STX-CLP1 column, but passed on the STX-CLP2 column. The recoveries for endosulfan I, dieldrin, 4,4-DDE, methoxychlor, gamma-chlordane, and alpha-chlordane failed low on the STX-CLP2 column but passed on the STX-CLP1 column. As methoxychlor was not a target analyte, results were not reported or qualified in the associated samples. As the associated samples were analyzed by the internal standard method, the closing CCV was not applicable, and no results were qualified.

- **CCV 06/08/11 at 1518.** The recoveries for heptachlor and methoxychlor failed high on both columns. As methoxychlor was not a target analyte, results were not reported or qualified in the associated samples. Associated sample results were non-detect for heptachlor, and the results were reported from the passing column and not qualified. Heptachlor recoveries in the LCS and LCSD were within control limits and were not qualified.

- **CCV 06/08/11 at 1936.** The recoveries for aldrin, endosulfan II, and endrin aldehyde failed low on both columns. The recoveries for 4,4-DDT and DCBP failed low on the STX-CLP2 column, but passed on the STX-CLP1 column. Results for aldrin, endosulfan II and endrin aldehyde were qualified as estimated (J) in the associated samples (SP-BS-2-1, SP-BS-2-2, BT-BS-1, BT-BS-2, BT-BS-3, BT-BS-4, RM-BS-1, and RM-BS-2). The result for 4,4-DDT in sample SP-BS-2-1 was reported from the STX-CLP2 column by the laboratory, with a value of 21 ug/kg. This result was corrected to the value reported from the STX-CLP1 column of 18 ug/kg. Results for 4,4-DDT that were non-detect were reported from the passing column and not qualified (SP-BS-2-2, BT-BS-1, BT-BS-2, BT-BS-3, BT-BS-4, RM-BS-1, and RM-BS-2). The surrogate DCBP was reported from the STX-CLP2 column in BT-BS-1, BT-BS-3 and BT-BS-2 rather than the passing column, as it recovered high on the STX-CLP1 column. The surrogate DCBP was not reported from either column in sample BT-BS-4, as it recovered high on both columns. The recoveries for the surrogate TCMX were within control for these samples, and results not qualified.

- **CCV 06/08/11 at 2336.** The DDT and endrin breakdown checks exceeded 15 percent on both columns. The results for 4,4-DDT, 4,4-DDD, 4,4-DDE, endrin, and endrin aldehyde were qualified as estimated (J) in the associated samples (RM-BS-3, RM-BS-4, and RM-BS-5).

- **CCV 06/08/11 at 2354.** The recoveries for endrin, endosulfan II, endosulfan sulfate, 4,4-DDT, methoxychlor, endrin ketone, and endrin aldehyde failed low on the STX-CLP1 column, while the recovery for 4,4-DDD failed high on the STX-CLP1 column. The recoveries for aldrin, endrin, 4,4-DDT, methoxychlor, endrin ketone, endrin aldehyde, gamma-chlordane, alpha-chlordane, and DCBP failed low on the STX-CLP2 column. As methoxychlor, gamma-chlordane, alpha-chlordane, and endrin ketone were not target analytes, results were not reported or qualified in the associated samples. The results for endrin, 4,4-DDT, and endrin aldehyde were qualified as estimated (J) in the associated samples (RM-BS-3, RM-BS-4, and RM-BS-5). The results for endosulfan II, endosulfan sulfate, 4,4-DDD, and aldrin were non-detect in the associated samples, and were reported from the passing

column and not qualified. The recoveries for the surrogate DCBP were reported from the passing column.

- **CCV 06/09/11 at 0011.** The recovery for toxaphene failed low on both columns. The results for toxaphene in the associated samples (RM-BS-3, RM-BS-4, and RM-BS-5) were qualified as estimated (J).

- **Closing CCV 06/09/11 at 0154.** The DDT and endrin breakdown checks exceeded 15 percent on both columns. As the associated samples were analyzed by the internal standard method, the closing CCV and breakdown check were not applicable, and no results were qualified.

- **Closing CCV 06/09/11 at 0211.** The recoveries for aldrin, endrin, endosulfan II, endosulfan sulfate, 4,4-DDT, methoxchlor, endrin ketone, and endrin aldehyde failed low on the STX-CLP1 column, while the recovery for 4,4-DDD failed high on the STX-CLP1 column. The recoveries for aldrin, endrin, endosulfan sulfate, 4,4-DDT, methoxychlor, endrin ketone, endrin aldehyde, and alpha-chlordane failed low on the STX-CLP2 column. As the associated samples were analyzed by the internal standard method, the closing CCV and breakdown check were not applicable, and no results were qualified.

- **Closing CCV 06/09/11 at 0228.** The recovery for toxaphene failed low on both columns. As the associated samples were analyzed by the internal standard method, the closing CCV and breakdown check were not applicable, and no results were qualified.

Sample Qualifiers

- **RM-BS-1.** The result for endrin was qualified with P by the laboratory as sample confirmation exceeded 40 percent on the two chromatographic columns. The P qualifier was changed to JP.

Polybrominated Diphenyl Ethers (PBDEs)

Analytical Methods

The samples were extracted by EPA Method 3546 (microwave) and the extracts were silica gel cleaned. The samples were analyzed by GC/ECD following EPA Method 8082.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors. Reported detection limits were acceptable with the following exceptions:

- **PSTL-BS-1a.** The reporting limits for PBDE-47 and PBDE-153 were elevated as a result of matrix interferences, and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **SIM-BS-1.** The reporting limits for PBDE-17, PBDE-154, and PBDE-183 were elevated as a result of matrix interferences, and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **SIM-BS-2.** The reporting limits for PBDE-17 and PBDE-183 were elevated as a result of matrix interferences, and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **SKI-BS-6, SKI-BS-2, and SIM-BS-3.** The reporting limit for PBDE-17 was elevated as a result of matrix interferences, and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **SIM-BS-4, PSTL-BS-5a, PSTL-BS-5b, SP-BS-1-1, BT-BS-2, SKI-BS-5, and PSTL-BS-4a.** The reporting limits for PBDE-17 and PBDE-47 were elevated as a result of matrix interferences and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **PSTL-BS-1b and PSTL-BS-7.** The reporting limit for PBDE-47 was elevated as a result of matrix interferences, and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **PSTL-BS-6b.** The reporting limit for PBDE-100 was elevated as a result of matrix interferences and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **STM-BS-1.** The reporting limits for PBDE-17, PBDE-47, PBDE-99, PBDE-138, PBDE-153, and PBDE-183 were elevated as a result of matrix interferences and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **STM-BS-2 and RM-BS-5.** The reporting limits for PBDE-17, PBDE-47, and PBDE-138 were elevated as a result of matrix interferences and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **STM-BS-3.** The reporting limits for PBDE-99 and PBDE-138 were elevated as a result of matrix interferences and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **SP-BS-2-1.** The reporting limits for PBDE-17 and PBDE-153 were elevated as a result of matrix interferences and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **RM-BS-1.** The reporting limits for PBDE-17, PBDE-138, and PBDE-183 were elevated as a result of matrix interferences, and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **RM-BS-4.** The reporting limit for PBDE-153 was elevated as a result of matrix interferences, and qualified by the laboratory with "Y." The Y qualifier was changed to U.

- **STM-BS-3, BT-BS-1, BT-BS-4, and BT-BS-3.** These samples were analyzed at dilutions, based on extract color and viscosity. The reporting limits were raised as a result of the dilutions.

Blank Contamination

There was no method blank contamination.

Surrogate Recoveries

Surrogate recoveries are within default laboratory control limits with the following exceptions:

- **RM-BS-2.** Surrogate recoveries in the initial analysis were below control limits. The sample was re-extracted within holding time, and surrogate recoveries were within control. The results were reported from the re-extraction without qualification.

LCS and LCSD Recoveries

LCS and LCSD recoveries were within default laboratory control limits with the following exceptions:

- **LCS/LCSD-052511.** The recoveries were within default laboratory control limits. The RPD for PBDE-99 exceeded 35 percent. As recoveries were within control, the associated sample results were not qualified.

MS and MSD Recoveries

The MS/MSD recoveries were within default laboratory control limits with the following exception:

- **PSTL-BS-6b MS/MSD.** The recoveries for PBDE-47 were below the default control limit in the MS, but were within the control limit in the MSD. The recoveries for PBDE-99 were below the default control limit in the MS and MSD. The result for PBDE-138 was qualified with P as the analyte differed by 40 percent between the chromatographic columns. Results for PBDE-47 were not qualified, as the MSD was within default control limits. Results for PBDE-99 in the source sample were qualified as estimated (J). The result for PBDE-138 in the MS was changed to JP.

Internal Standards

Internal standards were within acceptance criteria with the following exception:

- **BT-BS-2.** The 1-bromo-2-nitrobenzene internal standard was outside acceptance criteria on the ZB35 column but passed on the ZB5 column. The sample results were reported from passing column without qualification.

ICAL and CCV

The ICALs were within acceptance criteria.

The CCVs were within control limits with the following exception:

- **CCV 06/07/11 at 1831.** The recoveries for PBDE-100, PBDE-99, PBDE-85, PBDE-154, PBDE-153, and PBDE-138 failed low on the ZB35 column but passed on the ZB5 column. Those analytes were reported from the passing column in the associated samples (BT-BS-4, RM-BS-1, RM-BS-2, RM-BS-3, RM-BS-4, and RM-BS-5) and the results were not qualified. The results for the MS/MSD were reported from the ZB5 column with exception of PBDE-138, which was reported from the ZB35 column, as a result of inflated recoveries from interferences. The MS/MSD recoveries for PBDE-138 were calculated as 129 and 126 percent, which were within default control limits. The sample results were not qualified.

Sample Qualifiers

- **SIM-BS-1 and SIM-BS-2.** The results for PBDE-100 were qualified with P by the laboratory as sample confirmation exceeded 40 percent on the two chromatographic columns. The P qualifier was changed to JP.

Polychlorinated Biphenyls (PCBs)

Analytical Methods

The samples were extracted by EPA Method 3546 (microwave) following PSEP modifications to attain lower RLs, and the extracts were acid, sulfur, and silica gel cleaned. The samples were analyzed by GC fitted with an Electron Capture Detector (GC/ECD) following EPA Method 8082.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors. Reported detection limits were acceptable with the following exceptions:

- **PSTL-BS-1a.** The reporting limit for Aroclor 1232 was raised as a result of chromatographic interferences. The laboratory qualified the analyte with "Y." The "Y" qualifier was changed to "U."

- **RM-BS-4, RM-BS-5, PSTL-BS-1b, PSTL-BS-4b, PSTL-BS-5a, PSTL-BS-5b, SIM-BS-1, BT-BS-2, SRM IRM-911, BT-BS-4, SKI-BS-6, and SKI-BS-2.** The reporting limit for Aroclor 1248 was raised as a result of chromatographic interferences. The laboratory qualified the analyte with "Y." The "Y" qualifier was changed to "U."

- **PSTL-BS-6b, PSTL-BS-7, SP-BS-2-1, RM-BS-1, BT-BS-3, and SKI-BS-5.** The reporting limits for Aroclors 1248 and 1254 were elevated as a result of chromatographic interferences. The laboratory qualified the analytes with "Y." The "Y" qualifier was changed to "U."

- **PSTL-BS-4a, PSTL-BS-6a, SP-BS-1-1, RM-BS-2, BT-BS-1, STM-BS-1 and STM-BS-2.** The reporting limit for Aroclor 1254 was elevated as a result of

chromatographic interferences. The laboratory qualified the analyte with "Y." The "Y" qualifier was changed to "U."

- **BT-BS-2, STM-BS-1, STM-BS-2, and STM-BS-3.** These samples were analyzed at dilution as a result of high levels of target analytes. The reporting limits were raised based on the dilutions.

Sample results between the method detection limit and the reporting limit were qualified by the laboratory as estimated (J). The "J" qualifiers were changed to "T" to be consistent with Ecology's EIM database.

Blank Contamination

There was no method blank contamination.

Surrogate Recoveries

Surrogate recoveries were within default laboratory control limits with the following exception:

- **STM-BS-2.** The surrogate DCBP was not reported as a result of matrix interferences and co-eluting compounds. The surrogate TCMX was within control limits, and sample results were not qualified.

LCS and LCSD Recoveries

LCS and LCSD recoveries were within default laboratory control limits.

MS and MSD Recoveries

The MS/MSD recoveries were within default laboratory control limits.

Standard Reference Material (SRM) Recoveries

An SRM was analyzed and reported, though not requested in the Sampling and Analysis Plan. The SRM was not evaluated.

Internal Standards

Internal standards were within acceptance criteria with the following exception:

- **SKI-BS-5.** The hexabromobiphenyl internal standard was outside acceptance criteria on the ZB35 column, but within acceptance criteria on the ZB5

column. An analyst note indicates that the internal standard was double spiked. The double spike was taken into account during data calculation. Sample results were reported from the passing column, and were not qualified.

ICAL and CCV

The ICALs were within acceptance criteria. The CCVs were within control limits with the following exception:

- **Closing CCV 6/7/11 at 0529.** The recovery for Aroclor 1260 failed low on the ZB5 column but passed on the ZB35 column. As the associated samples were analyzed by the internal standard method, sample results were not affected by the closing CCV, and results were not qualified.

Sample Qualifiers

- **Sample BT-BS-4.** The result for Aroclor 1260 was qualified with P by the laboratory as sample confirmation exceeded 40 percent on the two chromatographic columns. The P qualifier was changed to JP.

Semivolatile Organic Compounds (SVOCs)

Analytical Methods

The samples were extracted by EPA Method 3546 (microwave) following Puget Sound Estuarine Protocol (PSEP) modifications to attain lower RLs. The samples were analyzed by GC fitted with a mass spectrometer (GC/MS) following EPA Method 8270D.

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors. Sample results between the method detection limit and the reporting limit were qualified by the laboratory as estimated (J). The "J" qualifiers were changed to "T" to be consistent with Ecology's Environmental Information Management (EIM) database.

The sample STM-BS-3 was analyzed at 3-fold and 20-fold dilutions as a result of high concentrations of target analytes present. Reporting limits were raised based on the dilution.

The samples T107-BS-1 and T107-BS-3 were analyzed at a 300-fold dilution and the reporting limits were raised based on the dilution.

Blank Contamination

The method blanks were non-detect with the following exceptions:

- **MB-052511.** The MB had detections for bis(2-ethylhexyl)phthalate and diethylphthalate between the method detection limit and the reporting limit. The analyte diethylphthalate was non-detect in the associated samples and the results were not qualified. The detections for bis(2-ethylhexyl)phthalate in the associated samples (SP-BS-1-1, SP-BS-1-2, SP-BS-2-1, SP-BS-2-2, BT-BS-1, BT-BS-2, BT-BS-3, BT-BS-4, RM-BS-1, RM-BS-2, RM-BS-3, RM-BS-4, and RM-BS-5) were flagged with "B" by the laboratory. Samples (SP-BS-1-2, SP-BS-2-2, and RM-BS-3) that were non-detect for bis(2-ethylhexyl)phthalate were not qualified. Samples (SP-BS-1-1, BT-BS-1, BT-BS-3, BT-BS-4, RM-BS-1, RM-BS-2, RM-BS-4, and RM-BS-5) that contained concentrations of bis(2-ethylhexyl)phthalate that were less than five times the concentration in the method blank, were qualified as non-detect, and the "B" qualifier changed to "U". Samples (SP-BS-2-1 and BT-BS-2) that contained concentrations of bis(2-ethylhexyl)phthalate that were greater than five times the concentration in the method blank, had the B qualifier removed.

- **MB-052311.** The MB had a detection for bis(2-ethylhexyl)phthalate between the method detection limit and the reporting limit. The detections for bis(2-ethylhexyl)phthalate in the associated samples (T107-BS-1, T107-BS-2, T107-BS-3, T107-BS-4, T107-BS-5, HC-BS-1, HC-BS-2, HC-BS-3, SKI-BS-6, SKI-BS-5, SKI-BS-4, SKI-BS-3, SKI-BS-2, SKI-BS-1, STM-BS-1, STM-BS-2, and STM-BS-3) were flagged with "B" by the laboratory. Samples (T107-BS-1, T107-BS-2, T107-BS-3, T107-BS-5, HC-BS-1, HC-BS-2, HC-BS-3, SKI-BS-6, SKI-BS-4, SKI-BS-3, and SKI-BS-1) that were non-detect for bis(2-ethylhexyl)phthalate were not qualified. Samples (T107-BS-4, SKI-BS-5, SKI-BS-2, and STM-BS-1) that contained concentrations of bis(2-ethylhexyl) phthalate that were less than five times the concentration in the method blank, were qualified as non-detect, and the "B" qualifier changed to "U". Samples (STM-BS-2 and STM-BS-3) that contained concentrations of bis(2-ethylhexyl)phthalate that were greater than five times the concentration in the method blank, had the B qualifier removed.

Surrogate Recoveries

Surrogate recoveries were within laboratory control limits with the following exceptions:

- **PSTL-BS-3 and PSTL-BS-4b.** The recovery for the surrogate 2,4,6-tribromophenol was below the control limit. As the remaining surrogates were within control, sample results were not qualified.

- **RM-BS-3.** The recovery for the surrogate 2,4,6-tribromophenol was below the control limit. As the remaining surrogates were within control, sample results were not qualified.

- **T107-BS-1 and T107-BS-3.** The recoveries for the surrogates were not reported based on the 300-fold dilution. Sample results were not qualified.

- **T107-BS-4.** The recovery for the surrogate 2-fluorophenol was below the control limit. The remaining surrogates were within control. After reviewing the chromatogram, the surrogate failed low as a result of matrix interferences and the results were not qualified.

- **HC-BS-1.** The recoveries for the surrogates 2-fluorophenol and 2,4,6-tribromophenol were below the control limits. The remaining surrogates were within control. As the surrogate 2-fluorophenol failed as a result of matrix interferences, and two of the remaining acid surrogates were within control, the sample results were not qualified.

- **T107-BS-5.** The surrogates d5-phenol, 2-fluorophenol, 2,4,6-tribromophenol, and d4-2-chlorophenol were below the control limits. Since all acid surrogates failed, all acid analytes were qualified as estimated (J/UJ) in the sample.

LCS and LCSD Recoveries

LCS and LCSD recoveries were within default laboratory control limits with the following exceptions:

- **LCS/LCSD-052411.** The recoveries for 2,4-dimethylphenol failed low in the LCS and LCSD. The RPD for 2,4-dimethylphenol exceeded the control limit. The results for 2,4-dimethylphenol were qualified as estimated (J/UJ) in the associated samples (PSTL-BS-1a, PSTL-BS-1b, PSTL-BS-2, PSTL-BS-3, SIM-BS-1, SIM-BS-2, SIM-BS-3, SIM-BS-4, PSTL-BS-4a, PSTL-BS-4b, PSTL-BS-5a, PSTL-BS-5b, PSTL-BS-6a, PSTL-BS-6b, and PSTL-BS-7).

- **LCS/LCSD-052511.** The recoveries for 2,4-dimethylphenol failed low in the LCS and LCSD, with less than 10 percent recovery in the LCS. The RPD for benzyl alcohol and 2,4-dimethylphenol exceeded 35 percent. As the recoveries for benzyl alcohol were within control limits, the results for benzyl alcohol were not qualified. The results for 2,4-dimethylphenol in the associated samples (SP-BS-1-1, SP-BS-1-2, SP-BS-2-1, SP-BS-2-2, BT-BS-1, BT-BS-2, BT-BS-3, BT-BS-4, RM-BS-1, RM-BS-2, RM-BS-3, RM-BS-4, and RM-BS-5) were rejected and flagged "R."

- **LCS/LCSD-052311.** The recoveries for 2,4-dimethylphenol failed low in the LCS and LCSD. Results for 2,4-dimethylphenol were qualified as estimated (J/UJ) in the associated samples (T107-BS-1, T107-BS-2, T107-BS-3, T107-BS-4, HC-BS-1, HC-BS-2, HC-BS-3, SKI-BS-6, SKI-BS-5, SKI-BS-4, SKI-BS-3, SKI-BS-2, SKI-BS-1, STM-BS-1, STM-BS-2, and STM-BS-3).

MS and MSD Recoveries

The MS/MSD recoveries were within default laboratory control limits with the following exceptions:

- **PSTL-BS-4a MS/MSD.** The recoveries for 2,4-dimethylphenol and benzoic acid were below the default control limits in both the MS and MSD. The analyte 1,2,4-trichlorobenzene was below the default control limit in the MS. The results for 2,4-dimethylphenol and benzoic acid were qualified as estimated (J) in the source sample. The result for 1,2,4-trichlorobenzene was not qualified as it was within control limits in the MSD.

- **RM-BS-3 MS/MSD.** The recoveries for 2,4-dimethylphenol were below the default control limits (less than 10 percent) in the MS and MSD. The recovery for 2-methylphenol was below control limits in the MSD but within control limits in the MS. The source sample was non-detect for 2,4-dimethylphenol and the result was rejected and qualified as R based on LCS failures. The result for 2-methylphenol was not qualified as it was within control limits in the MS.

Internal Standard

Internal standards were within acceptance criteria.

ICAL and CCV

The ICALs were within acceptance criteria with the following exception:

- **ICAL 051211.** The analyte fluoranthene was outside acceptance criteria in the initial calibration. The laboratory qualified detections for fluoranthene in the associated samples with "Q." Fluoranthene results in associated samples (T107-BS-1, T107-BS-2, T107-BS-3, T107-BS-4, T107-BS-5, HC-BS-1, HC-BS-2, HC-BS-3, SKI-BS-6, SKI-BS-5, SKI-BS-4, SKI-BS-3, SKI-BS-2, SKI-BS-1, STM-BS-1, STM-BS-2, and STM-BS-3) were qualified as estimated (J).

The CCVs were within control limits with the following exceptions:

- **CCV 6/3/11 at 1129.** The recoveries for 1,2,4-trichlorobenzene, hexachlorobutadiene, hexachlorobenzene, and 3,3'-dichlorobenzidine failed high, while the recoveries for hexachlorocyclopentadiene, 4,6-dinitro-2-methylphenol, benzidine, 2,4-dinitrophenol, benzoic acid and pentachlorophenol failed low. As 3,3'-dichlorobenzidine, hexachlorocyclopentadiene, 4,6-dinitro-2-methylphenol, benzidine, and 2,4-dinitrophenol were not target analytes, results were not reported or qualified in the associated samples. The results for 1,2,4-trichlorobenzene, hexachlorobutadiene, and hexachlorobenzene were non-detect in the associated samples and the results were not qualified based on the high bias. The results for pentachlorophenol and benzoic acid were qualified as estimated and flagged "J" in the associated samples (T107-BS-2, T107-BS-4, HC-BS-1, HC-BS-2, HC-BS-3, SKI-BS-6, SKI-BS-5, and SKI-BS-4) as a result of the low bias.

- **CCV 6/3/11 at 1241.** The recoveries for 4-methylphenol, hexachlorobutadiene, dimethylphthalate, 3-nitroaniline, diethylphthalate, 4-nitroaniline, butylbenzylphthalate, benzo(a)pyrene, and terphenyl-d14 failed high, while the recoveries for hexachlorocyclopentadiene and pentachlorophenol failed low. As hexachlorocyclopentadiene, 3-nitroaniline, and 4-nitroaniline were not target analytes, results were not reported or qualified in the associated samples. Detections for the target analytes in the associated samples (PSTL-BS-1a, PSTL-BS-1b, PSTL-BS-2, PSTL-BS-3, SIM-BS-1, SIM-BS-2, SIM-BS-3, SIM-BS-4, PSTL-BS-4a, PSTL-BS-4b, PSTL-BS-5a, PSTL-BS-5b, PSTL-BS-6a, PSTL-BS-6b, and PSTL-BS-7) were qualified by the laboratory with "Q". The Q qualifier was changed to "J." The target analytes 4-methylphenol, hexachlorobutadiene, dimethylphthalate, diethylphthalate, butylbenzylphthalate, and benzo(a)pyrene that were non-detect in the associated samples were not qualified, as the bias was high. The results for pentachlorophenol were qualified as estimated and flagged "J" in the associated samples. The results for the surrogate terphenyl-d14 were within control limits and were not qualified.

- **CCV 6/6/11 at 1142.** The recoveries for 1,2,4-trichlorobenzene, hexachlorobutadiene, 4-bromophenyl-phenylether, hexachlorobenzene, 3,3'-dichlorobenzidine, and 2,4,6-tribromophenol failed high, while the recoveries for benzoic acid, hexachlorocyclopentadiene, 2,4-dinitrophenol, 4,6-dinitro-2-methylphenol, N-nitrosodimethylamine, benzidine, and pyridine failed low. As 4-bromophenyl-phenylether, 3,3'-dichlorobenzidine, hexachlorocyclopentadiene, 2,4-dinitrophenol, 4,6-dinitro-2-methylphenol, N-nitrosodimethylamine, benzidine, and pyridine were not target analytes, results were not reported or qualified in the associated samples. The results for 1,2,4-trichlorobenzene, hexachlorobutadiene, and hexachlorobenzene were non-detect in the associated samples and the results were not qualified based on the high bias. The results for benzoic acid were qualified as estimated and flagged "J" in the associated samples (T107-BS-1, T107-BS-2, T107-BS-3, SKI-BS-3, SKI-BS-2, SKI-BS-1, STM-BS-1, STM-BS-2, and STM-BS-3.) The results for the surrogate 2,4,6-tribromophenol were within control limits in the associated samples and were not qualified.

- **CCV 6/7/11 at 1115.** The recoveries for 1,2,4-trichlorobenzene, hexachlorobutadiene, 4-bromophenyl-phenylether, hexachlorobenzene, 3,3'-dichlorobenzidine, and 2,4,6-tribromophenol failed high, while the recoveries for benzoic acid, hexachlorocyclopentadiene, 2,4-dinitrophenol, 4,6-dinitro-2-methylphenol, N-nitrosodimethylamine, benzidine, pyridine, and azobenzene failed low. As 4-bromophenyl-phenylether, 3,3'-dichlorobenzidine, hexachlorocyclopentadiene, 2,4-dinitrophenol, 4,6-dinitro-2-methylphenol, N-nitrosodimethylamine, benzidine, pyridine, and azobenzene were not target analytes, results were not reported or qualified in the associated samples. The results for 1,2,4-trichlorobenzene, hexachlorobutadiene, and hexachlorobenzene were non-detect in the associated samples and the results were not qualified based on the high bias. Results for benzoic acid were qualified as estimated and flagged "J" in the associated sample (STM-BS-3 20-fold dilution). The results for the surrogate 2,4,6-tribromophenol were within control limits in the associated sample and were not qualified.

- **CCV 6/7/11 at 1144.** The recoveries for 2-chlorophenol, 2-methylphenol, 2,4-dichlorophenol, dimethylphthalate, terphenyl-d14, and carbazole failed high, while the recoveries for hexachlorocyclopentadiene, 2,4-dinitrophenol, PCP, and benzidine failed low. As hexachlorocyclopentadiene, 2,4-dinitrophenol, benzidine, 2-chlorophenol, and carbazole were not target analytes, results were not reported or qualified in the associated samples. Detections for the target analytes in the associated samples (MB, LCS, LCSD, SP-BS-1-1, SP-BS-1-2, SP-BS-2-1, SP-BS-2-2, BT-BS-1, BT-BS-2, BT-BS-3) were qualified by the laboratory with "Q." The Q qualifier was changed to "J."

Target analytes 2-methylphenol and dimethylphthalate were non-detect in the associated samples and were not qualified. The results for PCP in the associated samples were qualified as estimated and flagged "J" based on the low bias. The results for the surrogate terphenyl-d14 were within control limits in the associated samples and were not qualified.

- **CCV 6/8/11 at 1529.** The recoveries for 2,4-dichlorophenol and 1,2,4-trichlorobenzene failed high, while the recoveries for hexachlorocyclopentadiene, 3-nitroaniline, 2,4-dinitrophenol, 4-nitrophenol, pentachlorophenol (PCP), 3,3'-dichlorobenzidine, aniline, and benzidine failed low. As 2,4-dichlorophenol, 3-nitroaniline, 3,3'-dichlorobenzidine, 4-nitrophenol, hexachlorocyclopentadiene, 2,4-dinitrophenol, benzidine, and aniline were not target analytes, results were not reported or qualified in the associated samples. Detections for 1,2,4-trichlorobenzene and PCP in the associated samples (BT-BS-4, RM-BS-1, RM-BS-2, RM-BS-3, RM-BS-4, RM-BS-5, MS/MSD, and T107-BS-5) were qualified by the laboratory with "Q." The results for 1,2,4-trichlorobenzene were non-detect for the associated samples and were not qualified based on the high bias. The results for PCP in the associated samples (BT-BS-4, RM-BS-1, RM-BS-2, RM-BS-3, RM-BS-4, RM-BS-5, and T107-BS-5) were qualified as estimated and flagged "J" based on the low bias.

Polycyclic Aromatic Hydrocarbons (PAHs)

Analytical Methods

The samples were extracted by EPA Method 3546 (microwave). The samples were analyzed by GC/MS with Selected Ion Monitoring (SIM) following EPA Method SW8270D-SIM.

Sample Holding Times

The samples were prepared and analyzed within holding time limits for frozen samples.

Laboratory Detection Limits

Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors. Sample results between the method detection limit and the reporting limit were qualified by the laboratory as estimated (J). The "J" qualifiers were changed to "T" to be consistent with Ecology's EIM database.

Samples BT-BS-2, PSTL-BS-5a, T107-BS-1, STM-BS-1, STM-BS-2, STM-BS-3, and RM-BS-1 were analyzed undiluted and at dilutions based on high concentrations of target analytes. The analytes that were over-range at the instrument for the undiluted analysis were reported from the diluted analysis and not qualified.

Blank Contamination

There was no method blank contamination.

Surrogate Recoveries

Surrogate recoveries are within laboratory control limits with the following exceptions:

- **Sample T107-BS-1.** The recovery of the surrogate d10-2-methylnaphthalene exceeded the control limit for the original analysis, but was within control limits in the diluted analysis. The remaining surrogate was within control limits in both analyses. Sample results were not qualified.

- **Samples STM-BS-2 and STM-BS-3.** The samples were analyzed at dilution, and surrogate results were not reported for the diluted analyses. In the undiluted analyses, the surrogates were within control limits, and results were not qualified.

LCS and LCSD Recoveries

The LCS and LCSD recoveries were within laboratory control limits.

MS and MSD Recoveries

The MS/MSD recoveries were within laboratory control limits with the following exception:

- **PSTL-BS-5a MS/MSD.** The recoveries for 2-methylnaphthalene exceeded the control limit in the MSD, but were within the control limit in the MS. The RPDs for naphthalene, 2-methylnaphthalene, and 1-methylnaphthalene exceeded 35 percent. The recoveries for pyrene, chrysene, and fluoranthene were below the control limit in the MS and MSD. The recoveries for phenanthrene were not reported in the MS and MSD. The recoveries for benzo(a)anthracene and benzo(a)pyrene were below the control limit in the MSD, but within control limits in the MS. The levels of phenanthrene, fluoranthene, and pyrene in the source sample exceeded the spiking amount, and the results for those analytes were not qualified. As the

recoveries for benzo(a)anthracene and benzo(a)pyrene were within control limits in the MS, results in the source sample were not qualified. The results for chrysene, naphthalene, 2-methylnaphthalene, and 1-methylnaphthalene in sample PSTL-BS-5a were qualified as estimated and flagged "J."

- **BT-BS-1 MS/MSD.** The recovery for phenanthrene exceeded the control limit in the MS, but was within the control limit in the MSD. The recoveries for fluoranthene, total benzofluoranthenes, and chrysene were below the control limits in the MSD, but within the control limits in the MS. The recovery for pyrene was not reported in the MSD, but was within the control limit in the MS. The recoveries for benzo(a)pyrene, dibenz(ah)anthracene, and indeno(123-cd)pyrene were below the control limit in the MS and MSD. The recoveries for benzo(ghi)perylene were not reported in the MS or MSD. The RPDs for pyrene and benzo(ghi)perylene were not applicable, as recoveries were not reported for the MS and/or the MSD. The concentrations of phenanthrene, fluoranthene, total benzofluoranthenes, chrysene, pyrene, benzo(ghi)perylene, and benzo(a)pyrene in the source sample exceeded the spiking amount, and the results for those analytes were not qualified. The results for dibenz(ah)anthracene and indeno(123-cd)pyrene were qualified as estimated and flagged "J" in the source sample.

Internal Standards

Internal standards were within acceptance criteria.

ICAL and CCVs

The ICALs and CCVs were within acceptance criteria.

Sample Qualifiers

- **SP-BS-1-2.** The result for acenaphthene was qualified by the laboratory with M based on low spectral match. The M qualifier was changed to J.

Tributyl Tin (TBT)

Analytical Methods

The samples were extracted by EPA Method 3546 (microwave). The samples were analyzed by GC/MS-SIM following Krone (1988).

Sample Holding Times

The samples were prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable. Reported detection limits and analytical results were adjusted for moisture content and any required dilution factors.

The sample RM-BS-3 was analyzed undiluted and at a 3-fold dilution based on a failing internal standard. The results were reported from the dilution, and the reporting limit was elevated based on dilution.

Blank Contamination

There was no method blank contamination.

Surrogate Recoveries

Surrogate recoveries are within default laboratory control limits with the following exception:

- **PSTL-BS-3.** The recovery for the surrogate tripropyltinchloride was below the control limit. The remaining surrogate was within control limits, and sample results were not qualified.

LCS and LCSD Recoveries

LCS and LCSD recoveries were within default laboratory control limits.

MS and MSD Recoveries

The MS/MSD recoveries were within default laboratory control limits.

Internal Standards

Internal standards were within acceptance criteria with the following exception:

- **RM-BS-3.** The internal standards tetrapentyltin and p-terphenyl-d14 were below acceptance criteria in the undiluted analysis. The sample was re-analyzed at dilution with passing internal standards, and results were reported from the reanalysis without qualification.

ICAL and CCV

The ICALs and CCVs were within acceptance criteria.

CHEMICAL DATA QUALITY REVIEW FOR LABORATORY EQUIPMENT RINSATE BLANK SAMPLE

Three samples (PSTL-BS-2, PSTL-BS-3, and PSTL-BS-4b) were collected on May 11, 2011, and submitted to Analytical Resources Laboratory (ARI) in Tukwila, WA, for analysis. The samples were submitted as part of ARI Job No. SW60. These three samples required crushing to reduce the particle size prior to extraction and analysis to be consistent with MTCA requirements. The samples were prepared at the laboratory on May 12, 2011. The jaw crusher and related equipment were vacuumed, washed with Citranox detergent, rinsed with deionized water, then rinsed with isopropyl alcohol and allowed to dry completely before each sample was crushed. After each sample was crushed it was poured back into its original sample container. Deionized water was used to rinse the rock crusher, and the rinse water was collected in a decontaminated 4L glass bottle. The rinsate was then separated into the appropriate sample containers for each analysis as a Rinsate Blank. The results were reported in ARI Job No. SX03.

QA/QC reviews of laboratory procedures were performed on an ongoing basis by the laboratory. Hart Crowser performed the data review, using laboratory quality control results summary sheets and raw data, as required, to ensure they met data quality objectives for the project. Data review followed the format outlined in the National Functional Guidelines for Inorganic Data Review (EPA 2010) and National Functional Guidelines for Organic Superfund Data Review (EPA 2008) modified to include specific criteria of the individual analytical methods. The following criteria were evaluated in the standard data quality review process:

- Holding times;
- Method blanks;
- Surrogate recoveries;
- Matrix spike/matrix spike duplicate (MS/MSD) recoveries;
- Laboratory duplicate relative percent differences (RPDs);
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) recoveries;
- Internal Standard recoveries;
- Calibration criteria (where applicable); and
- Reporting limits (RL).

The data were determined to be acceptable for use, as qualified. Full laboratory reports are presented at the end of this appendix. Results of the data reviews, organized by analysis class, follow.

Total Organic Carbon (TOC)

Analytical Methods

Total organic carbon was determined by EPA Method 415.1.

Sample Holding Times

The sample was prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination.

The rinsate blank had detection for TOC above the reporting limit. The concentrations of TOC in the three associated samples (PSTL-BS-2, PSTL-BS-3, and PSTL-BS-4b) were much greater than the concentration in the rinsate blank, and no sample results were qualified.

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Recoveries

The MS/MSD recoveries were within laboratory control limits.

Standard Reference Material (SRM) Recovery

SRM recoveries were within quality control limits.

Laboratory Duplicate Sample Analysis

The RPD between replicate measurements met quality control limits.

ICAL and CCV

The ICALs and CCVs were within acceptance criteria.

Metals

Analytical Methods

Total mercury was prepared and analyzed following EPA Method 7470A. Total metals for arsenic, cadmium, chromium, copper, lead, silver, and zinc were prepared and analyzed following EPA Method 200.8.

Sample Holding Times

The sample was prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination.

The rinsate blank had detections for zinc and copper at or just above the reporting limit. The concentrations in the associated samples (PSTL-BS-2, PSTL-BS-3, and PSTL-BS-4b) were much greater than the concentrations in the rinsate blank, and no sample results were qualified.

LCS and LCSD Recoveries

LCS recoveries were within method control limits.

ICAL and CCV

The ICALs and CCVs were within acceptance criteria.

Diesel- and Motor Oil-Range Hydrocarbons

Analytical Methods

The sample was prepared by EPA Method 3510C (separatory funnel) and the extract was acid and silica gel cleaned. The sample was analyzed by GC/FID following the NWTPH-Dx method.

Sample Holding Times

The sample was prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination.

The rinsate blank had a detection above the reporting limit for motor oil. The concentrations of motor oil in the three associated samples (PSTL-BS-2, PSTL-BS-3, and PSTL-BS-4b) were much greater than the concentration in the rinsate blank, and no sample results were qualified.

Surrogate Recovery

Surrogate recoveries were within laboratory control limits.

LCS and LCSD Recoveries

LCS and LSCD recoveries were within laboratory control limits.

ICAL and CCV

The ICALs and CCVs were within acceptance criteria.

Gasoline-Range Hydrocarbons/BTEX Compounds

Analytical Methods

The sample was analyzed for gasoline by GC/FID following the NWTPH-Gx method. The sample was analyzed for BTEX compounds following EPA Method 8021B Modified.

Sample Holding Times

The sample was analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination. There was no rinsate blank contamination.

Surrogate Recovery

Surrogate recoveries were within laboratory control limits.

LCS and LCSD Recoveries

LCS and LCSD recoveries were within laboratory control limits.

ICAL and CCV

The ICALs and CCVs were within acceptance criteria.

Semivolatile Organic Compounds (SVOCs)

Analytical Methods

The sample was extracted by EPA Method 3520C (liquid-liquid extraction). The sample was analyzed by GC/MS following EPA Method SW8270D.

Sample Holding Times

The sample was prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination. There was no rinsate blank contamination.

Surrogate Recoveries

The surrogate recoveries were within laboratory control limits.

LCS and LCSD Recoveries

The LCS and LCSD recoveries were within laboratory control limits with the following exceptions:

- **LCS/LCSD-051911.** The recoveries for N-nitrosodiphenylamine, benzo(a)pyrene, and butylbenzylphthalate failed low in the LCSD, but were within control limits in the LCS. The recoveries for pentachlorophenol, fluoranthene, chrysene, and phenanthrene failed high in the LCS and LCSD. The recoveries for anthracene and benzo(a)anthracene failed high in the LCS, but were within control limits in the LCSD. The RPDs for benzyl alcohol, 2,4-dimethylphenol, acenaphthylene, n-nitrosodiphenylamine, butylbenzylphthalate, benzo(a)pyrene, and benzo(ghi)perylene exceeded the QAPP control limit of 35 percent and the laboratory control limit of 40 percent. The associated sample, Rinsate Blank, was non-detect for all analytes, and sample results were not qualified for RPD failures, or high bias recoveries. As all low bias recoveries were within control limits for either the LCS or LCSD, sample results were not qualified.

Internal Standards

Internal standards were within acceptance criteria.

ICAL and CCV

The ICALs were within method acceptance criteria.

The CCVs were within control limits with the following exceptions:

- **CCV 05/24/11 at 2134.** The target analyte acenaphthene did not meet the minimum relative response factor criteria, but was within control limits. The associated quality control samples method blank, LCS, and LCSD were not qualified.

- **CCV 05/31/11 at 1256.** The target analyte acenaphthene did not meet the minimum relative response factor criteria, but was within control limits. The target analyte 2,4-dinitrophenol failed low. As 2,4-dinitrophenol was not a target analyte, results were not reported or qualified in the associated

sample. The result for acenaphthene was qualified as estimated (J) in the associated sample Rinsate Blank.

Polycyclic Aromatic Hydrocarbons (PAHs)

Analytical Methods

The sample was extracted by EPA Method 3510C (separatory funnel). The sample was analyzed by GC/MS following EPA Method 8270D-SIM.

Sample Holding Times

The sample was prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

The method blank was non-detect with the following exceptions:

- **MB-052111.** The MB had detections for naphthalene, indeno(123-cd)pyrene, dibenz(ah)anthracene, benzo(ghi)perylene, and total benzofluoranthenes above the reporting limit. The MB had detections for 2-methylnaphthalene and benzo(a)pyrene below the reporting limit. The associated sample, Rinsate Blank, had a detection for naphthalene above the reporting limits that was qualified by the laboratory with "B." The result for naphthalene in Rinsate Blank was less than five times the amount in the method blank, and the B qualifier was changed to U.

The Rinsate Blank was non-detect with the following exception:

- **Rinsate Blank.** The Rinsate Blank had a detection for naphthalene above the reporting limits that was qualified by the laboratory with "B." The result for naphthalene in Rinsate Blank was less than five times the amount in the method blank, and the B qualifier was changed to U.

Surrogate Recoveries

Surrogate recoveries were within laboratory control limits.

LCS and LCSD Recoveries

LCS and LCSD were within laboratory control limits

Internal Standards

Internal standards were within acceptance criteria.

ICAL and CCV

The ICALs and CCVs were within acceptance criteria.

Pesticides

Analytical Methods

The sample was extracted by EPA Method 3510C (separatory funnel). The sample was analyzed by GC/ECD following EPA Method 8081.

Sample Holding Times

The sample was prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination. There was no rinsate blank contamination.

Surrogate Recoveries

Surrogate recoveries are within laboratory control limits.

LCS and LCSD Recoveries

The LCS and LCSD recoveries were within laboratory control limits with the following exceptions:

- **LCS/LCSD-052111.** The recoveries for alpha-BHC failed low in both the LCS and LCSD. The results for alpha-BHC are qualified as estimated (J) in the associated sample, Rinsate Blank.

Internal Standards

Internal standards were within acceptance criteria.

ICAL and CCV

The ICALs were within acceptance criteria.

The CCVs were within control limits with the following exceptions:

- **CCV 6/6/11 at 1451.** The analyte methoxychlor failed high on the STX-CLP1 column but passed on STX-CLP2 column. As methoxychlor was not a target analyte, associated sample results were not qualified.

- **Closing CCV 6/6/11 at 1743.** The analytes heptachlor and methoxychlor failed high on the STX-CLP1 column but passed on the STX-CLP2 column. As methoxychlor was not a target analyte, associated sample results were not qualified. As the associated samples were analyzed by the internal standard method, sample results were not affected by the closing CCV, and results were not qualified.

Polychlorinated Biphenyls (PCBs)

Analytical Methods

The sample was extracted by EPA Method 3510C (separatory funnel). The sample was analyzed by GC/ECD following EPA Method 8082.

Sample Holding Times

The sample was prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination. There was no rinsate blank contamination.

Surrogate Recoveries

Surrogate recoveries were within laboratory control limits.

LCS and LCSD Recoveries

LCS and LCSD recoveries were within laboratory control limits.

Internal Standards

Internal standards were within acceptance criteria.

ICAL and CCVs

The ICALs and CCVs were within acceptance criteria.

Polybrominated Diphenyl Ethers (PBDEs)

Analytical Methods

The sample was extracted by EPA Method 3510C (separatory funnel). The sample was analyzed by GC-ECD following EPA Method 8082.

Sample Holding Times

The sample was prepared and analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination. There was no rinsate blank contamination.

Surrogate Recoveries

Surrogate recoveries are within default laboratory control limits.

LCS and LCSD Recoveries

LCS and LCSD were within default laboratory control limits.

Internal Standards

Internal standards were within acceptance criteria.

ICAL and CCVs

The ICALs and CCVs were within acceptance criteria.

Dioxins/Furans

Analytical Methods

The sample was prepared and analyzed by EPA Method 1613B.

Sample Holding Times

The sample was prepared and analyzed within holding time limits.

Laboratory Detection Limits

Detections that were between the RL and the Estimated Detection Limit (EDL) were qualified by the laboratory as estimated (J). J qualifiers were changed to T to be consistent with Ecology's EIM database.

Multiple analytes in the sample were qualified by the laboratory as estimated maximum potential concentration (EMPC), and which did not meet the identification criteria. Those results were qualified as non-detect, and the qualifier was changed to UK.

Blank Contamination

The method blank had detections for multiple analytes between the EDL and the RL. The detections in the associated sample were evaluated and results modified as follows:

- **MB-052511.** The method blank had detections between the EDL and RL that met ion criteria for:
  - 2,3,7,8-TCDF – 0.632 pg/L
  - OCDD – 4.08 pg/L

Results for those analytes in associated samples with detections above the RL and greater than five times the amount in the method blank (ten times for OCDD and OCDF) were not qualified and had the B qualifier removed (if present):

- Rinsate Blank: OCDD

The rinsate blank was non-detect with the following exceptions:

- **Rinsate Blank.** The rinsate blank had detections for 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,6,7,8-HpCDD, and OCDD below the reporting limit. Concentrations for those analytes in the associated samples (PSTL-BS-2, PSTL-BS-3, and PSTL-BS-4b) were above the reporting limit. The concentrations in the samples were compared to the concentrations in the rinsate blank in the final extract volume and determined to be greater than 10 times the amount in the rinsate blank. Sample results were not qualified based on rinsate blank contamination.

Labeled Compound Recoveries

The labeled compound recoveries were within control limits.

Ongoing Precision and Recovery (OPR)

OPR recoveries were within control limits.

ICAL and CCVs

The ICALs and CCVs were within acceptance criteria.

Sample Qualifiers

Multiple analytes in the sample were qualified by the laboratory as EMPC when ion abundance ratios were outside quality control limits. The EMPC qualifiers were reported as non-detect (U) for individual analytes and results qualified as UK in the following sample:

- **Rinsate Blank.** 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,7,8,9-HxCDF, and OCDF.

Volatile Organic Compounds (VOCs)

Analytical Methods

The sample was analyzed by GC/MS following EPA Method 8260C.

Sample Holding Times

The sample was analyzed within holding time limits.

Laboratory Detection Limits

Reported detection limits were acceptable.

Blank Contamination

There was no method blank contamination.

The rinsate blank contained methylene chloride above the reporting limit. Methylene chloride was used as a cleaner for the crushing equipment. As the crushed samples were not analyzed for VOCs, no qualification was made.

Surrogate Recoveries

Surrogate recoveries are within laboratory control limits.

LCS and LCSD Recoveries

The LCS and LCSD were within laboratory control limits with the following exceptions:

- **LCS/LCSD-051911.** The LCS and LCSD exceeded control limits for dichlorodifluoromethane and tert-butylbenzene. The associated sample, Rinsate Blank, was non-detect for those analytes, and the results were not qualified.

Internal Standards

Internal standards were within acceptance criteria.

ICAL and CCV

The ICALs were within method acceptance criteria.

The CCVs were within control limits with the following exception:

- **CCV 5/19/11 at 1117.** The recovery for naphthalene failed low. Results for naphthalene were qualified as estimated (J) in the associated sample (Rinsate Blank).

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