SAND COVER MONITORING PLAN
PORT OF SEATTLE
TERMINAL 115

Prepared for

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June 2009

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LIST OF ACRONYMS AND ABBREVIATIONS

%R	percent recovery
ASTM	American Society of Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	chain-of-custody
cm	centimeter
cy	cubic yards
DDT	dichlorodiphenyltrichloroethane
DGPS	differential global positioning system
DMMP	Dredged Material Management Program
DMMU	Dredged Material Management Unit
DV	Data Validation
DQO	Data Quality Objective
Ecology	Washington State Department of Ecology
EIM	electronic information management
EPA	U.S. Environmental Protection Agency
FC	Field Coordinator
GC/MS	gas chromatograph/mass spectrometer
GPS	global positioning system
HAZWOPER	Hazardous Waste Operations and Emergency Response
HPAH	high-molecular-weight polycyclic aromatic hydrocarbon
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
MDL	method detection limit
MLLW	mean lower low water
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
NAD	North American Datum
NOAA	National Oceanographic and Atmospheric Administration

NIST	National Institute of Standards and Technology
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Port	Port of Seattle
PFD	Personal flotation device
Plan	Sand Cover Monitoring Plan
PQL	practical quantitation limit
PSEP	Puget Sound Estuary Program
QA/QC	Quality Assurance/Quality Control
RI/FS	remedial investigation/feasibility study
RL	reporting limits
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SC Manager	Sediment Characterization Manager
SDG	sample delivery group
SL	screening level
SMS	Sediment Management Standard
SOP	Standard Operating Procedure
SQS	Sediment Quality Standard
SRM	Standard Reference Material
T-115	Terminal 115
TEQ	Toxic Equivalent
USACE	U.S. Army Corps of Engineers

1 INTRODUCTION

The Port of Seattle (Port) proposes to conduct maintenance dredging to re-establish adequate depth to accommodate barge loading and unloading and to support new construction at the Berth 1 facilities at Terminal 115 (T-115), which includes the removal of existing wooden Pier B, fabrication of a new loading ramp (Ramp 1), and construction of a sheet pile wall. T-115 is located at 6700 West Marginal Way Southwest in the City of Seattle, along the western shore of the Duwamish River (Figure 1). The required project dredge depth is -16.5 feet mean lower low water (MLLW) with 2 feet of allowable overdepth to allow the placement of a 1-foot minimum thickness post-dredge clean sand layer to provide an interim clean surface. The site is located in the joint Model Toxics Control Act (MTCA)/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Lower Duwamish Waterway Group (LDWG) Superfund site. The LDWG—which includes the Port, City of Seattle, King County, and the Boeing Company—has agreed to conduct a remedial investigation/feasibility study (RI/FS) for the entire Lower Duwamish Waterway (LDW), which includes the T-115 site.

1.1 Site Description

T-115 includes approximately 70 acres of upland yard space, a 1,200-lineal-foot main pier, and a 400-lineal-foot finger pier (where Berth 1 is located). T-115 supports marine uses such as receipt and shipment of bulk cargo using deep-draft vessels, barge cargo operation, repair and maintenance of cargo shipping container, cargo warehouse activities, warehouse and storage of metal and wood construction materials, and vessel outfitting, maintenance, and repair. Several stormwater outfalls are present near the site (shown in Figure 2). SWD1 on Figure 2 represents a City of Seattle 72-inch storm drain. SWD2 and SWD3 are approximately 30-inch stormwater outfalls that primarily drain the Northland Services and Northwest Container Services properties. The Port proposes to dredge up to 3,000 cubic yards (cy) of material from Berth 1.

1.2 Sediment Testing History

Sediment characterization was conducted in 2008 to determine whether the proposed dredge sediment was suitable for disposal at the Elliott Bay open-water disposal site or requires upland landfill disposal. Sediment sampling was accomplished by collecting and processing

sediment cores. Testing and evaluation of cores from within the dredge prism were conducted in accordance with the Dredged Material Management Program (DMMP) guidelines. Sampling and processing were carried out in accordance with the *Sampling and Analysis Plan* (SAP; Anchor 2008a).

Sediment cores were collected on February 14, 2008. The target depth was -19 feet MLLW, which comprised an initial design depth of -15 feet MLLW, 1 foot of allowable overdredge, and an additional 3 feet for the collection of three 1-foot-increment Z-layer samples. Chemistry results were reported in the *Terminal 115 Sediment Characterization Report* (Anchor 2008b) and chemistry analysis results are displayed in Table 1. Concentrations of multiple detected polycyclic aromatic hydrocarbon (PAH) compounds and polychlorinated biphenyls (PCBs) and the undetected reporting limits for dichlorodiphenyltrichloroethane (DDT) in composite samples from the cores exceeded the DMMP screening levels (SLs). Concentrations of benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and bis(2-ethylhexyl)phthalate exceeded their respective SLs in composite samples. Toxic Equivalent (TEQ) values for dioxin/furans in all composite samples were greater than the maximum TEQ values for the Elliott Bay open-water disposal site.

Results of the sediment characterization indicate that after dredging is complete, portions of the newly exposed sediment surface could have elevated concentrations of some Sediment Quality Standards (SQS) chemicals of concern. Chemicals of concern detected at levels above SQS in the upper Z-layer samples during dredge material characterization include several high-molecular-weight polycyclic aromatic hydrocarbon (HPAH) compounds, dimethylphthalate, undetected levels of DDT, and PCB. Dioxins and furans were also detected in the Z-layer samples. In order to comply with anti-degradation policies of the State of Washington, the Port proposes to dredge the bottom to an elevation between -16.5 and -18.5 feet MLLW and place a 1-foot sand cover over the exposed surface.

1.3 Monitoring Plan Overview

It is important to note that the intended purpose of the clean sand layer is to improve the surface conditions of the dredged area, in order to meet the state's anti-degradation policy. The sand cover is not intended to act as a permanent engineered isolation layer that is stable

against any erosive forces, but rather to provide clean sediment that will help isolate and mix over time with the underlying subsurface sediment.

The purpose of this Sand Cover Monitoring Plan (Plan) is to describe, in detail, the monitoring methods used to measure placement and performance of the sand cover at T-115. Specifically, this Plan describes sand cover placement bathymetric surveys used to verify that the minimum 1-foot thickness is achieved and sampling and chemical analyses of the sand cover after placement. An overview of each of the monitoring elements is described in the following sections.

1.3.1 Bathymetric Surveys

To verify that the required thickness of sand cover is placed after dredging, pre- and post-sand cover placement bathymetric surveys will be conducted. Bathymetric surveys will also be conducted 6 months, 1 year, and 3 years following cover placement. The complete description of this scope of work is in Section 4.

1.3.2 Clean Sand Cover Monitoring

Sediment samples of sand cover will be collected as soon as practical (within 2 weeks) after the sand cover placement to establish baseline surface chemical concentrations and to confirm that minimal mixing of the sand cover with the underlying subsurface sediment occurred during sand cover placement. Grab samples will be taken again 1 year and 3 years following cover placement to observe changes to chemical concentrations over time. The complete description of this scope of work is in Section 5.

2 PROJECT MANAGEMENT

This section identifies key project personnel positions, describes the rationale for conducting the monitoring studies, identifies the studies to be performed and their respective schedules, outlines project Data Quality Objectives (DQOs) and criteria, lists training and certification requirements for sampling personnel, and describes documentation and record keeping procedures. Roles and responsibilities are identified in the following sections. With the exception of the Port Project Manager, specific individuals are not identified, since this work is not under contract at this time.

2.1 Project Organization and Team Member Responsibilities

Functional responsibilities of the team members, as well as laboratory project managers, are described in the following sections.

2.1.1 Project Management

2.1.1.1 Port Project Manager

The Port Project Manager, Jon Sloan, is responsible for ensuring that the scheduled monitoring is conducted as planned, project DQOs are met, and appropriate parties are informed of the monitoring results in a timely manner.

2.1.1.2 Sediment Characterization Manager

The Sediment Characterization Manager (SC Manager) will report to the Port Project Manager. The SC Manager will act as the direct line of communication between the contractor and the Port and is responsible for implementing activities described in this Plan. The SC Manager will also be responsible for production of work plans, producing all project deliverables, and performing the administrative tasks needed to ensure timely and successful completion of these studies. The SC Manager will provide the overall programmatic guidance to support staff and will ensure that all documents, procedures, and project activities meet the objectives contained within this Plan. The SC Manager will also be responsible for resolving project concerns or conflicts related to technical matters. The SC Manager will notify the Port of any long-term changes in core personnel.

2.1.2 Field Coordination

The Field Coordinator (FC) is responsible for technical and Quality Assurance/Quality Control (QA/QC) oversight. The FC will ensure that appropriate protocols for sample collection, preservation, and holding times are observed and will submit environmental samples to the designated laboratories for chemical and physical analyses.

2.1.3 Quality Assurance/Quality Control

The QA/QC manager will provide QA oversight for both the field sampling and laboratory programs, ensuring that samples are collected and documented appropriately, coordinating with the analytical laboratories, ensuring data quality, overseeing data validation, and supervising project QA coordination. Independent third-party data review and validation will be performed.

2.1.4 Laboratory Project Management

The Laboratory Project Manager will oversee all laboratory operations associated with the receipt of the sediment samples, DMMP chemical/physical analyses, and laboratory report preparation for this project. The Laboratory Manager will review all laboratory reports and prepare case narratives, describing any anomalies and exceptions that occurred during analysis.

2.1.5 Data Validation Manager

The Data Validation (DV) Manager and will oversee all validation efforts on the final data packages. The DV Manager will be responsible for reviewing this Plan, along with U.S. Environmental Protection Agency (EPA) *Test Methods for the Evaluation of Solid Waste: Physical/Chemical Methods,* 3rd Edition (EPA 1986), *EPA Contract Laboratory Program National Functional Guidelines for Data Review* (EPA 1999, 2004) and *EPA Region 9 Superfund Data Evaluation/Validation Guidance R9QA/006.1* (EPA 2001), to ensure all data verification and data validation criteria are met.

The analytical testing laboratories will be responsible for the following:

- Perform the methods outlined in this Plan, including those methods referenced for

each analytical procedure
- Follow documentation, custody, and sample logbook procedures
- Implement QA/QC procedures required by Puget Sound Estuary Program (PSEP; PSEP 1986, 1997a, and 1997b) or other guidelines
- Meet all reporting and QA/QC requirements
- Deliver electronic data files as specified in this Plan
- Meet turnaround times for deliverables as described in this Plan
- Allow EPA and the QA/QC contractor to perform laboratory and data audits

2.1.6 Data Management

The Data Manager will compile field observations and analytical data into a database, review the data for completeness and consistency, append the database with qualifiers assigned by the data validator, and ensure that the data obtained is in a format suitable for inclusion in the Washington State Department of Ecology electronic information management (EIM) database.

The Data Manager is also responsible for providing the analytical data to the Port in a format that is compatible with the Port's Analytical Chemistry electronic data deliverable specification. Sample locations will be provided in the Washington State North American Datum (NAD) 83 coordinate system and delivered to the Port in Microsoft Excel. The Port's contact for data transmittals is Seaport Data Manager Hillary Ritenburg at (206) 728-3161.

2.2 Special Training Requirements/Certifications

For sample collection and preparation tasks, it is important that field crews are trained in standardized data collection requirements, so that the data collected are consistent among the field crew. All field crew are fully trained in the collection and processing of subsurface sediment core samples, decontamination protocols, and chain-of-custody (COC) procedures.

In addition, the 29 CFR 1910.120 Occupational Safety and Health Administration (OSHA) regulations require training to provide employees with the knowledge and skills enabling them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and

Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet the OSHA regulations.

2.3 Documentation and Records

This project will require central project files to be maintained. Project records will be stored and maintained in a secure manner. Each project team member is responsible for filing all necessary project information or providing it to the person responsible for the filing system. Individual team members may maintain files for individual tasks, but must provide such files to the central project files upon completion of each task. A project-specific index of file contents is to be kept with the project files. Hard copy documents will be kept on file throughout the duration of the project, and all electronic data will be maintained in the database.

2.3.1 Field Observation

All documents generated during the field effort are controlled documents that become part of the project file. Field team members will keep a record of significant events, observations, and measurements in a field log. All field activities will be recorded in a bound, paginated field logbook maintained by the FC or his designee for each activity. Field logbooks will be the main source of field documentation for all field activities. The on-site field representative will record in the field logbook information pertinent to the investigation program. The sampling documentation will contain information on each sample collected, and will include at a minimum the following information:

- Project name
- Field personnel on site
- Facility visitors
- Weather conditions
- Field observations and any deviations from this Plan
- Date and time sample collected
- Sampling method and description of activities
- Identification of equipment used
- Deviations from the Plan
- Conferences associated with field sampling activities

The person recording information in the log book will initial each page. In general, sufficient information will be recorded during sampling so that reconstruction of the event can occur without relying on the memory of the field personnel.

The field logbooks will be permanently bound and durable for adverse field conditions. All pages will be numbered consecutively. All pages will remain intact, and no page will be removed for any reason. Notes will be taken in indelible, waterproof blue or black ink. Errors will be corrected by crossing out with a single line, dating, and initialing. The front and inside of each field logbook will be marked with the project name, number, and logbook number. The field logbooks will be stored in the project files when not in use and upon completion of each sampling event.

2.3.2 Laboratory Records

Analytical data records will be retained by each laboratory and in the central project files. The laboratories will provide electronic copies of the reports and keep hard copies on file. For all analyses, the data reporting requirements will include those items necessary to complete data validation, including copies of all raw data.

2.3.2.1 Chemistry Data for Sediment Sample

The analytical laboratories will be responsible for internal checks on sample handling and analytical data report, and will correct errors identified during the QA review. The analytical laboratory will be required, where applicable, to report the following:

- **Project Narrative.** This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary should discuss, but not be limited to: QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered—actual or perceived—and their resolutions will be documented in as much detail as appropriate.
- **Chain-of-Custody Records**. Legible copies of the COC forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include all sample shipping container temperatures measured at the time of sample receipt.

- **Sample Results.** The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:
  - Field sample identification code and the corresponding laboratory identification code
  - Sample matrix
  - Date of sample extraction
  - Date and time of analysis
  - Weight and/or volume used for analysis
  - Final dilution volumes or concentration factor for the sample
  - Identification of the instrument used for analysis
  - Method detection limits (MDLs)
  - Method reporting limits accounting for sample-specific factors (e.g., dilution, total solids)
  - Analytical results with reporting units identified
  - Data qualifiers and their definitions
  - A computer disk with the data in the specified format
- **QA/QC Summaries**. This section will contain the results of the laboratory QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results (see above). No recovery or blank corrections will be made by the laboratory. The required summaries are listed below; additional information may be requested.
- **Calibration Data Summary.** This summary will report the concentrations of the initial calibration and daily calibration standards and the date and time of analysis. The response factor, percent relative standard deviation, percent difference, and retention time for each analyte will be listed, as appropriate. Results for standards to indicate instrument sensitivity will be documented.
- **Internal Standard Area Summary.** The stability of internal standard areas will be reported.
- **Method Blank Analysis.** The method blank analyses associated with each sample and the concentration of all compounds of interest identified in these blanks will be reported.
- **Surrogate Spike Recovery.** This will include all surrogate spike recovery data for organic compounds. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed.

- **Matrix Spike (MS) Recovery** This will report all MS recovery data for organic and metal compounds. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed. The relative percent difference (RPD) for all duplicate analyses will be included.
- **Matrix Duplicate.** This will include the percent recovery and associated RPD for all matrix duplicate analyses.
- **Laboratory Control Sample.** All laboratory control sample recovery data for organic and metal compounds will be reported. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed. The RPD for all duplicate analyses will be included.
- **Relative Retention Time.** This will include a report of the relative retention time of each analyte detected in the samples for both primary and conformational analyses.
- **Original Data.** Legible copies of the original data generated by the laboratory will include:
  - Sample extraction, preparation, identification of extraction method used, and cleanup logs
  - Instrument specifications and analysis logs for all instruments used on days of calibration and analysis
  - Reconstructed ion chromatograms for all samples, standards, blanks, calibrations, spikes, replicates, and reference materials
  - Enhanced spectra of detected compounds with associated best-match spectra for each sample
  - Printouts of full scan chromatograms and quantitation reports for each instrument used, including reports for all samples, standards, blanks, calibrations, spikes, replicates, and reference materials
  - Original data quantification reports for each sample
  - Original data for blanks and samples not reported

All instrument data shall be fully restorable at the laboratory from electronic backup. Laboratories will be required to maintain all records relevant to project analyses for a minimum of 7 years. Data validation reports will be maintained in the central project files with the analytical data reports.

2.3.3 Data Reduction

Data reduction is the process by which original data (analytical measurements) are converted or reduced to a specified format or unit to facilitate analysis of the data. Data reduction requires that all aspects of sample preparation that could affect the test result, such as sample volume analyzed or dilutions required, be taken into account in the final result. It is the laboratory analyst's responsibility to reduce the data, which are subjected to further review by the Laboratory Manager, the SC Manager, the QA/QC Manager, and independent reviewers. Data reduction may be performed manually or electronically. If performed electronically, all software used must be demonstrated to be true and free from unacceptable error.

2.3.4 Reporting

A Technical Memorandum will be prepared and submitted to the agencies for review and approval. The Technical Memorandum will document the results of the sampling and analysis program and, at a minimum, will contain the following information:

- A statement of the purpose of the investigation.
- A summary of the field sampling, field data, and laboratory analytical procedures. Deviations, whether intended or unintended, will be documented. Failure to meet sampling or data quality objectives of sufficient magnitude to lead to rejection of results will be well documented, as necessary.
- A general vicinity map showing the location of the site with respect to familiar landmarks and a sampling station map. Coordinates will be reported in an accompanying table for all stations. All geographical coordinates submitted to Ecology for inclusion in the EIM database will be in the NAD 83, North Zone.
- Chemical analysis results data tables summarizing chemical and conventional variables, as well as all pertinent QA/QC data.
- An interpretation of the results against the DMMP interpretive criteria.
- Copies of complete laboratory data packages, as appendices or attachments.
- Laboratory QA/QC reports, as appendices or attachments.
- Copies of applicable sections of the field log, as appendices or attachments.
- Copies of signed COC forms, as appendices or attachments.
- Copies of validation reports and/or findings.

Chemistry data will be presented with accompanying regulatory criteria. Data exceeding the regulatory criteria will be highlighted or boxed, rather than shaded, to allow for photocopying.

3 DREDGING AND SAND COVER PLACEMENT PROCEDURES

The berthing area will be dredged as shown in Figure 3. Material will be removed using a clamshell dredge deployed from a derrick. Dredged material will be placed on a barge and allowed to dewater. The dredged material will then be transferred to shipping containers on shore and transported to an appropriate landfill by truck or rail car.

After dredging is completed, the contractor will conduct a bathymetric survey of the dredge cut surface to ensure the design elevations have been obtained. The clean sand cover will then be placed over the dredged areas within Berth 1 of Terminal 115. The placement of clean sand cover shall be conducted in a careful and well-executed manner to avoid displacing the subsurface sediment and causing resuspension of contaminated sediment that could recontaminate the surface of the clean sand cover. Care will also be taken to avoid significant mounding that could result in areas within the cover that exceed a maximum elevation of -15 feet MLLW or result in areas with no clean sand cover.

3.1 Sand Cover Material Testing

The construction plans require the selected contractor to obtain materials meeting specific physical and chemical criteria. Prior to placement of cover material, a composite sample will be formed from several samples of the proposed sand cover material. The cover material will be tested for the full suite of Sediment Management Standard (SMS) chemicals. This testing is not part of this plan since the chemical requirements for this material are covered in the project design documents. This information will provide baseline information on the quality of the sand cover material used for this project.

4 BATHYMETRIC SURVEYS

Bathymetric surveys will be conducted during construction to verify proper placement of the cover material and to verify the sand cover material has remained in place following cover placement. As described in section 1.3.1, bathymetric monitoring will be conducted at the site prior to and following placement of the cover material to verify adequate placement of cover material in the dredged areas. The bathymetric survey results will be compared to verify that the minimum cover thickness of 1 foot was achieved.

In addition, bathymetric surveys will be conducted 6 months, 1 year, and 3 years following cover placement. Results of these surveys will be compared to results from the survey immediately following cover placement and from previous surveys. Table 2 summarizes the schedule for bathymetric surveys.

Bathymetric surveys will be conducted with equipment that meets or exceeds the requirements and accuracy for U.S. Army Corps of Engineers (USACE) Class 1 surveys (USACE 1994). The bathymetric survey vessel will be equipped with a differential global positioning system (DGPS) coverable of plus or minus 2 meters 96FT0 linear horizontal resolution and a high-resolution multi-frequency depth sounder with a vertical accuracy of plus or minus 0.15 meters (6 inches). Use of a multi-beam depth sounder will be recommended to the contractor. If a single tranducer system is used, spacing between transects should not be more than 9 meters (30 feet) apart. Regardless of equipment, several cross transects should be conducted to increase survey accuracy. Data will be recorded electronically and downloaded to a back up system at the end of each day.

5 SAND COVER SAMPLE COLLECTION, PROCESSING, AND HANDLING PROCEDURES

Sediment samples of cover material will be collected using a power grab 2 weeks to 1 month after the sand cover is placed to verify cover thickness and that minimal mixing of the clean sand and underlying material occurred during cover placement. The power grab is capable of collecting sediments to a depth of 1 foot (30 centimeters [cm]). Grab samples will be taken again 1 year and 3 years following sand cover placement (see Table 2) to observe changes to surface chemistry concentrations.

Power grab samples that penetrate to approximately 30 cm through the sand cover will be collected at two locations within each Dredged Material Management Unit (DMMU) for a total of four sample locations. These grab locations are depicted on Figure 3 but may be re-located based upon the results of the bathymetric surveys. Final sample locations will be determined in coordination with EPA and Ecology. Table 3 summarizes the collection locations and testing/archiving of the sediment grab samples.

Samples from the grab comprising the surface sediment interval (0 to 10 cm) will be taken from each grab and placed in a stainless steel container. The material will be homogenized and the homogenized material from individual stations placed into jars and submitted to the laboratory for analysis. Homogenized material will be placed into appropriate containers and stored at approximately 4°C prior to transfer to the analytical laboratory. Transfer will be under standard COC procedures.

The remaining cover material below the surficial sediment (10 to 20 and 20 to 30 cm intervals) at each station will be archived individually to preserve the spatial integrity of the samples as described above. Decisions regarding whether to analyze archived cover material samples will depend on analytical results, surficial sediments, and bathymetry and decisions regarding the analysis of archived materials will be made in consultation with EPA and Ecology.

5.1 Sampling Schedule and Platform

Surface sediment sample collection will be conducted from a research vessel equipped with a hydraulic winch and power grab.

5.2 Station Positioning

Horizontal positioning will be determined by the onboard DGPS based on target coordinates shown in Table 3. Measured station positions will be converted to latitudinal and longitudinal coordinates (NAD 83) to the nearest 0.1 second. The accuracy of measured and recorded horizontal coordinates will be within 2 meters.

The mudline elevation of each sampling station relative to MLLW will be determined by algebraically combining the measured depth with tide data obtained from the nearest National Oceanographic and Atmospheric Administration's (NOAA) automated tide gage.

5.3 Station and Sample Identification

Each surface sediment sample will be assigned a unique alphanumeric identifier according to the following method:

- Each location will be identified by T115, and a number 01 through 04, identifying the station identifier (e.g., T115-04).
- Individual sediment samples at each location will be identified by the same alphanumeric used to identify the station followed by a matrix identifier of SG, a letter designation to indicate depth where A is for the 0 to 10 cm interval, B for the 10 to 20 cm interval, and C for the 20 to 30 cm interval, and the six digit date code YYMMDD format (e.g., T115-04-SG-B-090601 represents the 10-20 cm layer of the sample collected from Station T115-04 on June 1, 2009).

The homogenization duplicate collected from one sample will be labeled T115-XX-SG-A-YYMMDD, where XX is the station identifier plus 50, A is the sample depth, and the date is appended in the YYMMDD format.

5.4 Station Locations

Four station locations are proposed and shown in Figure 3. These stations will coincide with the stations where core samples are to be collected prior to cover placement.

5.5 Field Equipment

The following items will be needed in the field for sediment collection:

- This Plan
- Field sampling sheets
- Study area maps
- Field notebooks and pens/sharpies/pencils
- Cellular phone
- Digital camera
- White board and pen
- Global positioning system (GPS)
- Stainless-steel bowls and spoons
- Tape measure
- Lead line
- Alconox detergent
- Scrub brushes
- Distilled water
- Spray bottles for distilled water
- Coolers
- Powder-free exam gloves
- Steel toed rubber boots
- Duct tape
- Ziploc bags
- Aluminum foil
- Paper towels
- First aid kit
- Powergrab equipment
- Wet ice
- Personal flotation devices (PFD)
- Hard hats
- Safety glasses

- Foul weather gear
- Waterproof labels
- Clear packing tape
- Box cutters
- Bubble wrap
- COC forms
- Sample jars
- Custody seals
- Cooler temperature blanks

Prior to mobilization, this list will be consulted to ensure all equipment is available and pre-cleaned. As part of the mobilization process, each item will be double-checked by the FC.

5.6 Grab Collection and Processing Procedures

Surface sediment samples for cover thickness confirmation and laboratory analyses will be collected for physical and chemical testing using a van Veen grab sampler in accordance with PSEP (1997a and 1997b) and *Sediment Sampling and Analysis Plan Appendix* (Ecology 2008) protocols. The sampler utilizes a modified hydraulic hinged jaw assembly for sample collection of 0 to 30 cm. Upon contact with sediments, the jaws are drawn shut to collect the sample. The sampler is used to collect large volume, surface sediment samples. Samples will be collected in the following manner:

1. Vessel will maneuver to proposed location.
2. Jaw assembly will be decontaminated and deployed.
3. The winch cable to the grab sampler will be drawn taut and vertical.
4. Location of the cable hoist will be measured and recorded by the location control personnel.
5. The jaw assembly will be closed to collect the sediment sample to a penetration depth of approximately 30 cm.
6. The sediment sample will be retrieved aboard the vessel and evaluated against the following PSEP acceptability criteria:
   - Grab sampler is not overfilled (i.e., sediment surface is not against the top of sampler)

- Sediment surface is relatively flat, indicating minimal disturbance or winnowing (For the wood debris characterization samples, acceptable grab samples will allow for minor surface disturbance)
- Overlying water is present, indicating minimal leakage
- Overlying water has low turbidity, indicating minimal sample disturbance
- Desired penetration depth is achieved

7. Overlying water will be siphoned off and stainless steel trowels or similar devices will be used to collect samples from 0 to 10 cm, 10 to 20 cm, and 20 to 30 cm sediment layers from inside the sampler, taking care not to collect sediment in contact with the sides/surface of the sampler.
8. The collected sediment will be placed in a stainless steel mixing container. When sufficient sample volume has been collected, the sediment will be homogenized using a stainless steel spoon.
9. Homogenized sediment will be placed immediately into appropriate pre-cleaned, pre-labeled sample containers and placed immediately on ice to maintain the samples at 4°± 2°C for transport to the laboratory.

5.6.1 Sample Containers for Analysis

The contract laboratory will provide certified, pre-cleaned, EPA-approved containers for all samples. Prior to shipping, the analytical laboratory will add preservative, where required, according to PSEP protocols. Table 4 lists the required sample sizes, containers, preservatives and hold times.

5.6.2 Grab Equipment Decontamination

All equipment and instruments used that are in direct contact with the sediment collected for analysis must be made of glass or stainless steel, and will be cleaned prior to each day's use and between sampling events. All working surfaces and instruments will be thoroughly cleaned, decontaminated, and covered with aluminum foil to minimize outside contamination between sampling events. Decontamination of all items will follow PSEP protocols. The decontamination procedure is:

- Pre-wash rinse with tap or site water
- Wash with solution of tap water and Alconox soap (brush)

- Rinse with tap water
- Rinse three times with distilled water
- Cover (no contact) all decontaminated items with aluminum foil
- Store in clean, closed container for next use

Disposable gloves will be discarded after processing each station and replaced prior to handling decontaminated instruments or work surfaces.

5.7 Sample Transport and Chain of Custody Procedures

COC procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form. Each sample will be represented on a COC form the day it is collected. All data entries will be made using indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, then dating and initialing the change. Blank lines/spaces on the COC form will be lined-out and dated and initialed by the individual maintaining custody.

A COC form will accompany each cooler of samples to the analytical laboratory. Each person who has custody of the samples will sign the COC form and ensure that the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the project files. All containerized sediment samples will be transported to the analytical laboratory after preparation is complete, using the following specific sample shipping procedures:

- Each cooler or container containing the sediment samples to be analyzed will be delivered to the laboratory within 24 hours of being sealed.
- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to ensure positive identification.
- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.
- A sufficient amount of ice will be double-bagged in sealable plastic bags and placed within the cooler.
- A sealed envelope containing COC forms will be enclosed in a plastic bag and taped to the inside lid of the cooler.

The persons transferring custody of the sample containers will sign the COC form upon transfer of sample possession to the analytical laboratory. The receiver will record the condition of the samples and COC forms will be used internally by the lab to track sample handling and final disposal.

5.8 Waste Management

All sediment remaining after sampling will be washed overboard at the collection site prior to moving to the next sampling station. Any sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site.

All disposable sampling materials and personal protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, will be placed in heavy-duty garbage bags or other appropriate containers.

6 CHEMICAL/CONVENTIONAL SEDIMENT ANALYSIS

This section summarizes the target physical and chemical analyses. Chemical/physical testing will be performed by Ecology-accredited laboratories. All chemical and physical testing will adhere to the most recent PSEP QA/QC procedures (PSEP 1997b) and PSEP analysis protocols. If more current analytical methods are available, the laboratory will use these methods.

6.1 Analytical Methods

All sample analyses will be conducted in accordance with Ecology-approved methods. Prior to analysis, all samples will be maintained according to the appropriate holding times and temperatures for each analysis (Table 4). Table 5 presents the proposed analytes, the analytical methods to be used, and the targeted reporting limits for the evaluation of sediment and field QA/QC samples. The analytical laboratory will prepare a detailed report in accordance with the Plan to be included as an appendix in the Sediment Evaluation Data Report.

Prior to the analysis of the samples, the laboratory will calculate MDLs for each analyte of interest, where applicable. Method reporting limits will be at or below the sediment criteria specified in Table 5, if technically feasible. To achieve the required reporting limits, some modifications to the methods may be necessary. These modifications from the specified analytical methods will be provided by the laboratory at the time of establishing the laboratory contract, and must be approved by Ecology prior to implementation.

In completing chemical analyses for this project, the laboratories are expected to meet the following minimum requirements:

- Adhere to the methods outlined in this Plan, including methods referenced for each analytical procedure
- Provide a detailed discussion to any modifications made to approved analytical methods (e.g., Standard Operating Procedures [SOPs])
- Deliver scanned and electronic data as specified
- Meet reporting requirements for deliverables
- Meet turnaround times for deliverables

- Implement QA/QC procedures, including the Plan data quality requirements, laboratory QA requirements, and performance evaluation testing requirements
- Allow laboratory and data audits to be performed, if deemed necessary

6.2 Chemical Analysis of Sediments

The parameters used to assess data quality are precision, accuracy, representativeness, comparability, completeness, and sensitivity. Table 6 lists specific DQOs for laboratory chemical analyses of sediment samples. These parameters are discussed in more detail in this section.

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling, and in laboratory analysis. The American Society of Testing and Materials (ASTM; ASTM 2002) recognizes two levels of precision:

- **Repeatability**. The random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions
- **Reproducibility.** The random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material

In the laboratory, "within-batch" precision is measured using replicate sample or QC analyses and is expressed as the RPD between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches.

Field precision will be evaluated by the collection of one blind field duplicate for chemistry samples at one randomly selected location. Field chemistry duplicate precision will be screened against a RPD of 50 percent for sediment samples. However, no data will be qualified based solely on field homogenization duplicate precision.

Precision measurements can be affected by the nearness of a chemical concentration to the MDL, where the percent error (expressed as RPD) increases. The equation used to express precision is as follows:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2)/2}$$

where:

RPD	=	relative percent difference
C1	=	larger of the two observed values
C2	=	smaller of the two observed values

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of laboratory-fortified blanks, standard reference materials, and standard solutions. In addition, laboratory-fortified (i.e., matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery (%R) of the measured value, relative to the true or expected value. If a measurement process produces results for which the mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories utilize several QC measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples, and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

Laboratory accuracy will be evaluated against quantitative MS and surrogate spike recovery performance criteria provided by the laboratory. Accuracy can be expressed as a percentage of the true or reference value, or as a %R in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

$$\%R = 100\% \times (S-U)/Csa$$

where:

%R	=	percent recovery
S	=	measured concentration in the spiked aliquot
U	=	measured concentration in the unspiked aliquot
Csa	=	actual concentration of spike added

Field accuracy will be controlled by adherence to sample collection procedures outlined in this Plan.

Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias assessments for environmental measurements are made using personnel, equipment, and spiking materials or reference materials as independent as possible from those used in the calibration of the measurement system. When possible, bias assessments should be based on analysis of spiked samples rather than reference materials so that the effect of the matrix on recovery is incorporated into the assessment. A documented spiking protocol and consistency in following that protocol are important to obtaining meaningful data quality estimates.

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For the T-115 site, the list of analytes has been identified to provide a comprehensive assessment of the potential chemicals in the Z-layer sediments within the dredge prism following dredging activities of the proposed dredge operation. Comparability expresses the confidence with which one data set can be evaluated in relation to another data set. For this program, comparability of data will be established through the use of standard analytical methodologies and reporting formats, and of common traceable calibration and reference materials.

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

$$C = \frac{\text{(Number of acceptable data points) x 100}}{\text{(Total number of data points)}}$$

The DQO for completeness for all components of this project is 90 percent. Data that have been qualified as estimated because the QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as rejected will not be considered valid for the purpose of assessing completeness.

Analytical sensitivities must be consistent with or lower than the regulated criteria values as listed in Table 5 in order to demonstrate compliance with this Plan. When they are achievable, target detection limits specified in this Plan will be at least a factor of two less than the analyte's corresponding regulated criteria value.

The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. Laboratory practical quantitation limits (PQLs) or reporting limits (RLs) are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. Laboratory MDLs and RLs will be used to evaluate the method sensitivity and/or applicability prior to the acceptance of a method for this program.

The sample-specific MDL and RL will be reported by the laboratory and will take into account any factors relating to the sample analysis that might decrease or increase the reporting limit (e.g., dilution factor, percent moisture, sample volume, and sparge volume). In the event that the MDL and RL are elevated for a sample due to matrix interferences and subsequent dilution or reduction in the sample aliquot, the data will be evaluated by the SC Manager and the laboratory to determine if an alternative course of action is required or possible. If this situation cannot be resolved readily (i.e., detection limits less than criteria are achieved), the appropriate parties will be contacted to discuss an acceptable resolution.

6.3 Quality Assurance/Quality Control

Field and laboratory activities must be conducted in such a manner that the results meet specified quality objectives and are fully defensible. Guidance for QA/QC is derived from the protocols developed for the PSEP (1997a, and b), EPA (1986), the EPA Contract Laboratory Program (EPA 1999), and the cited methods.

6.3.1 Field Quality Control Samples

Field QA samples will be collected along with the environmental samples. Field QA samples are useful in identifying possible problems resulting from sample collection or sample processing in the field. The collection of field QA includes the collection of a sample homogenization duplicate. Field QA samples will also include the collection of additional sample volume at one location, to ensure that the laboratory has sufficient sample volume to run the program-required analytical QA/QC samples for analysis as specified in Table 7. All field QA samples will be documented in the field logbook and verified by the QA/QC Manager or designee.

6.3.2 Chemical Analysis Quality Control

Laboratory QC procedures, where applicable, include initial and continuing instrument calibrations, standard reference materials, laboratory control samples, matrix replicates, MSs, surrogate spikes (for organic analyses), and method blanks. Table 7 lists the frequency of analysis for laboratory QA/QC samples, and Table 4 summarizes the DQOs for precision, accuracy, and completeness.

Results of the QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the QA/QC Manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

6.3.2.1 Laboratory Instrument Calibration and Frequency

An initial calibration will be performed on each laboratory instrument to be used daily or per batch for inorganic analyses and after each major interruption to the analytical instrument,

and when any ongoing calibration does not meet method control criteria for organic analyses. A calibration verification sample will be analyzed following each initial calibration and will meet method criteria prior to analysis of samples. Continuing calibrations will be analyzed daily prior to any sample analysis to track instrument performance for gas chromatograph/mass spectrometer (GC/MS) methods. The frequency of continuing calibration will be one for every 10 samples for inorganic and GC methods. If the ongoing continuing calibration is out of control, the analysis must come to a halt until the source of the control failure is eliminated or reduced to meet control specifications. All project samples analyzed while instrument calibration was out of control will be reanalyzed.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to or following continuing calibration verifications at the instrument for each type of applicable analysis.

6.3.2.2 Laboratory Duplicates/Replicates

Analytical duplicates and replicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates and replicates are subsamples of the original sample that are prepared and analyzed as a separate sample.

6.3.2.3 Matrix Spikes and Matrix Spike Duplicates

Analysis of MS samples provides information on the extraction efficiency of the method on the sample matrix. By performing matrix spike duplicate (MSD) analyses, information on the precision of the method is also provided for organic analyses.

6.3.2.4 Method Blanks

Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must contain less than five times the method detection limit of any single target analyte/compound. If a laboratory method blank exceeds this criterion for any analyte/compound, and the concentration of the analyte/compound in any of the samples is less than five times the concentration found in

the blank, analyses must stop and the source of contamination must be eliminated or reduced.

6.3.2.5 Laboratory Control Samples

Laboratory control samples are analyzed to assess possible laboratory bias at all stages of sample preparation and analysis. The laboratory control sample is a matrix-dependent spiked sample prepared at the time of sample extraction along with the preparation of sample and matrix spikes. The laboratory control sample will provide information on the precision of the analytical process, and when analyzed in duplicate, will provide accuracy information as well.

6.3.2.6 Laboratory Deliverables

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. Data quality will be assessed based on PSEP protocols (PSEP 1997b) by considering the following:

- Holding times
- All compounds of interest reported
- Reporting limits
- Surrogate spike results
- MS/MSD results
- Blank spikes
- Laboratory control samples/laboratory control sample duplicates
- Standard reference material results
- Method blanks
- Detection limits

6.4 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

This section describes procedures for testing, inspection, and maintenance of field and laboratory equipment.

6.4.1 Field Equipment

In accordance with the QA program, the FC will be responsible for verifying that required maintenance has been performed prior to using the equipment in the field.

The FC or subcontractor responsible for navigation will confirm proper operation of the navigation equipment. This verification may consist of internal diagnostics or visiting a location with known coordinates to confirm the coordinates indicated by the navigation system. No other field equipment requires testing or calibration. The winch line and vibracore sampler will be inspected for fraying, loose connections, and any other applicable mechanical problems. Any problems will be noted in the field logbook and corrected prior to continuing sampling operations.

6.4.2 Laboratory Instruments/Equipment

In accordance with the QA program, the laboratory shall maintain an inventory of instruments and equipment and the frequency of maintenance will be based on the manufacturer's recommendations and/or previous experience with the equipment.

The laboratory preventative maintenance program, as detailed in their QA Plan, is organized to maintain proper instrument and equipment performance, and to prevent instrument and equipment failure during use. The program considers instrumentation; equipment and parts that are subject to wear, deterioration, or other changes in operational characteristics; the availability of spare parts;, and the frequency at which maintenance is required. Any equipment that has been overloaded, has been mishandled, gives suspect results, or has been determined to be defective will be taken out of service, tagged with the discrepancy noted, and stored in a designated area until the equipment has been repaired. After repair, the equipment will be tested to ensure that it is in proper operational condition. The appropriate parties will be promptly notified in writing if defective equipment casts doubt on the validity of analytical data. The appropriate parties will also be notified immediately regarding any delays due to instrument malfunctions that could impact holding times.

Laboratories will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. All maintenance records will be checked according

to the schedule on an annual basis and recorded by the responsible individual. The Laboratory QA/QC Manager, or designee, shall be responsible for verifying compliance.

6.5 Instrument/Equipment Calibration and Frequency

Proper calibration of equipment and instrumentation is an integral part of the process that provides quality data. Instrumentation and equipment used to generate data must be calibrated at a frequency that ensures sufficient and consistent accuracy and reproducibility.

As part of their QC program, laboratories perform two types of calibrations. A periodic calibration is performed at prescribed intervals (i.e., balances, drying ovens, refrigerators and thermometers), and operational calibrations are performed daily, at a specified frequency, or prior to analysis (i.e., initial calibrations) according to method requirements. Calibration procedures and frequencies are discussed in the laboratory QA Plan. Calibrations are discussed in the laboratory SOPs for analyses.

The Laboratory QA/QC Manager will be responsible for ensuring that the laboratory instrumentation is calibrated in accordance with specifications. Implementation of the calibration program shall be the responsibility of the respective laboratory Group Supervisors. Recognized procedures (EPA, ASTM, or manufacturer's instructions) shall be used when available.

Physical standards (i.e., weights or certified thermometers) shall be traceable to nationally recognized standards such as the National Institute of Standards and Technology (NIST). Chemical reference standards shall be NIST Standard Reference Materials (SRMs) or vendor certified materials traceable to these standards.

The calibration requirements for each method and respective corrective actions shall be accessible, either in the laboratory SOPs or the laboratory's QA Plan for each instrument or analytical method in use. All calibrations shall be preserved on electronic media.

6.6 Inspection/Acceptance Requirements for Supplies and Consumables

Inspection and acceptance of field supplies, including laboratory-prepared sampling bottles, will be performed by the FC. All primary chemical standards and standard solutions used in this project in the laboratory will be traceable to documented, reliable, commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities found in the standard will be documented.

6.7 Data Management

Field data sheets will be checked for completeness and accuracy by the FC prior to delivery to the Data Manager. All data generated in the field will be documented on hard copy and provided to the office Data Manager, who is responsible for the data's entry into the database. All manually entered data will be checked by a second party. Field documentation will be filed in the main project file after data entry and checking are complete.

Laboratory data will be provided to the Data Manager in the EQuIS or another pre-authorized electronic format. Laboratory data, provided electronically and loaded into the database, will undergo a 10 percent check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually or applied using a validator-generated electronic data deliverables. The accuracy of all manually entered data will be 100 percent verified by a second party. Data tables and reports will be exported into Microsoft Excel tables.

7 ASSESSMENTS AND OVERSIGHT

7.1 Compliance Assessments and Response Actions

EPA, Ecology, or their designees may observe field activities during each sampling event, as needed. If situations arise where there is an inability to follow the Plan's methods precisely, the SC Manager will determine the appropriate actions or consult EPA and Ecology if the issue is significant.

7.1.1 Compliance Assessments

Laboratory and field performance audits consist of on-site reviews of QA systems and equipment for sampling, calibration, and measurement. Laboratory audits will not be conducted as part of this study; however, all laboratory audit reports will be made available to the project QA/QC Manager upon request. The laboratory is required to have written procedures addressing internal QA/QC; these procedures have been submitted and will be reviewed by the project QA/QC Manager to ensure compliance with the Plan. The laboratory must ensure that personnel engaged in sampling and analysis tasks have appropriate training. The laboratory will, as part of the audit process, provide for consultant's review written details of any and all method modifications planned.

7.1.2 Response Actions for Field Sampling

The FC will be responsible for correcting equipment malfunctions during the field sampling effort. The project QA/QC Manager will be responsible for resolving situations identified by the FC that may result in noncompliance with this Plan. All corrective measures will be immediately documented in the field logbook.

7.1.3 Corrective Action for Laboratory Analyses

The laboratory is required to comply with their SOPs. The Laboratory Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this Plan. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

The Laboratory Manager will be notified immediately if any QC sample exceeds the project-specified control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. The Laboratory Manager will document the corrective action taken in a memorandum submitted to the QA/QC Manager within 5 days of the initial notification. A narrative describing the anomaly, the steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, and re-extraction) will be submitted with the data package in the form of a cover letter.

7.2 Reports to Management

QA reports to management include verbal status reports, written reports on field sampling activities and laboratory processes, data validation reports, and final project reports. These reports shall be the responsibility of the QA/QC Manager.

Progress reports will be prepared by the FC following each sampling event. The project QA/QC Manager will also prepare progress reports after the sampling is completed and samples have been submitted for analysis, when information is received from the laboratory, and when analysis is complete. The status of the samples and analysis will be indicated with emphasis on any deviations from the Plan. A data report will be written after validated data are available for each sampling event. These reports will be delivered electronically to the SC Manager.

8 DATA VALIDATION AND USABILITY

8.1 Data Validation

During the validation process, analytical data will be evaluated for method QC and laboratory QC compliance, and its validity and applicability for program purposes will be determined. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

Data validation includes signed entries by the field and laboratory technicians on field data sheets and laboratory datasheets, respectively; review for completeness and accuracy by the FC and Laboratory Manager; review by the Data Manager for outliers and omissions; and the use of QC criteria to accept or reject specific data. All data will be entered into the EQuIS database and a raw data file printed. Ten percent verification of the database raw data file and 100 percent verification of the validation qualifiers will be performed by a second data manager or designee. Any errors found will be corrected on the raw data printout sheet. After the raw data is checked, the top sheet will be marked with the date the check is completed and the initials of the person doing the checking. Any errors in the raw data file will be corrected, and the database established.

All laboratory data will be reviewed and verified to determine whether all DQOs have been met and that appropriate corrective actions have been taken, when necessary. The project QA/QC Manager or designee will be responsible for the final review of all data generated from analyses of samples.

The first level of review will take place in the laboratory as the data are generated. The laboratory department manager or designee will be responsible for ensuring that the data generated meet minimum QA/QC requirements and that the instruments were operating under acceptable conditions during generation of data. DQOs will also be assessed at this point by comparing the results of QC measurements with pre-established criteria as a measure of data acceptability.

The analysts and/or laboratory department manager will prepare a preliminary QC checklist for each parameter and for each sample delivery group (SDG) as soon as analysis of an SDG has been completed. Any deviations from the DQOs listed on the checklist will be brought to the attention of the Laboratory Manager to determine whether corrective action is needed and to determine the impact on the reporting schedule.

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. Data quality will be assessed by a reviewer using current Functional Guidelines data validation requirements (EPA 1999) by considering the following:

- Holding times
- Initial calibrations
- Continuing calibrations
- Method blanks
- Surrogate recoveries
- Detection limits
- Reporting limits
- Laboratory control samples
- MS/MSD samples
- Laboratory replicates
- SRM results

The data will be validated in accordance with the project specific DQOs described above and listed in Table 4, analytical method criteria, and the laboratory's internal performance standards based on their SOPs and all data, including dioxin and furan data, will be fully validated (i.e., an EPA Level 4 validation will be performed).

The results of the data quality review, including text assigning qualifiers in accordance with the EPA National Functional Guidelines and a tabular summary of qualifiers, will be generated by the Data Manager and submitted to the project QA/QC Manager for final review and confirmation of the validity of the data (EPA 1999, 2004). A copy of the validation report will be submitted by the QA/QC Manager and will be presented as an appendix to the Sediment Data Evaluation Report.

8.2 Reconciliation with Data Quality Objectives

The QA/QC Manager will review data after each survey to determine if DQOs have been met. If data do not meet the project's specifications, the QA/QC Manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors, and will suggest corrective action. It is expected that the problem would be able to be corrected by retraining, revision of techniques, or replacement of supplies/equipment; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA/QC Manager will recommend appropriate modifications. Any revisions will require approval by Ecology.

9 DATA INTERPRETATION AND REPORTING

Monitoring results will be summarized in technical memorandums that will be prepared and submitted to EPA and Ecology within 60 days of receipt of laboratory data from the post-construction 2-week, 1-year, and 3-year sampling events (Table 2). Because sources of potential chemical of concern in the vicinity of the site may not be controlled prior to completion of the project, monitoring will focus on observing the quality of cover material over time.

Monitoring data will be used to evaluate cover performance by the following measures:

- Minimization of chemical migration from underlying sediments to cover materials at concentrations greater than SQS
- Maintenance of a cover thickness sufficient to minimize chemical migration from underlying sediments with a target maintained cover thickness of 1 foot

Meeting these measures would indicate the cover is maintaining its physical integrity and that it continues to limit exposure of marine organisms to the chemicals that might be present in the material underlying the cover. Surface sediment chemistry results of the cover material will be used to assess recontamination potential.

Cover thickness will be determined from a combination of both bathymetric survey and grab profile information. Bathymetry measurements will have an accuracy of at least plus or minus 15 cm (or 6 inches) as required by this Plan, but actual surveys may have even greater accuracies e.g., 8 cm or 3 inches). Regardless, this information by itself may not be sufficient to accurately assess the thickness of the cover. Rather, it will be a general indication of potential "thin" areas, particularly during the construction process where those thin areas can be corrected before construction equipment leaves the site. This general bathymetry information will be supported by grab profile information.

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TABLES

Table 1
Sediment Characterization Results

Location	Dredged Material Management Program Criteria			S1	S1	S1	S1	S2	S2	S2	S2	S2	S2	S2
Sample				T115-S1-CS-0803	T115-S1-01-ZA-0803	T115-S1-02-ZA-0803	T115-S1-02-ZB-0803	T115-S2-CS-0803	T115-S2-01-ZA-0803	T115-S2-01-ZB-0803	T115-S2-01-ZC-0803	T115-S2-02-ZA-0803	T115-S2-02-ZB-0803	T115-S2-02-ZC-0803
Sample Date	Screening Level	Bioaccumulation Trigger	Maximum Level	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08
Depth				Composite	-15.5 to -16.5 ft	-16 to -17 ft	-17 to -18 ft	Composite	-15.7 to -16.7 ft	-16.7 to -17.7 ft	-17.7 to -18.7 ft	-17.1 to -18.1 ft	-18.1 to -19.1 ft	-19.1 to -20.1 ft
Conventionals (mg/kg)														
Sulfide	--	--	--	**3420**	**1220**	**196**	--	**1800**	**2390**	--	--	**2460**	--	--
Conventionals (mg-N/kg)														
Ammonia	--	--	--	**24**	**10.2**	**37.6**	--	**53.7**	**32.6**	--	--	**51.7**	--	--
Conventionals (pct)														
Total organic carbon	--	--	--	**2.59**	**2.08**	**1.98**	**1.92**	**1.84**	**2.23**	**1.89**	**5.25**	**1.6**	**5.02**	**3.53**
Total Solids	--	--	--	**53.9**	**69.4**	**55.1**	**66.5**	**53.5**	**69.1**	**78.5**	**78.4**	**61.4**	**60.1**	**68.9**
Total solids (preserved)	--	--	--	**48.6**	**75.3**	**53**	--	**62.9**	**61.3**	--	--	**57.5**	--	--
Total volatile solids	--	--	--	**6.87**	**3.32**	**7.34**	--	**7.63**	**4.6**	--	--	**6.36**	--	--
Grain Size (pct)														
Gravel	--	--	--	**28.6**	**66.6**	**4.3**	**0.8**	**10.6**	**63.2**	**41**	**45.1**	**3.7**	**22.7**	**25.4**
Sand	--	--	--	**22.7**	**19.8**	**13.9**	**11.2**	**25**	**21.8**	**38**	**43**	**31.6**	**43.9**	**51.2**
Silt	--	--	--	**36.6**	**10**	**61.8**	**62.9**	**48.6**	**9.7**	**15.6**	**8.1**	**50.7**	**24.3**	**16.3**
Clay	--	--	--	**12**	**3.7**	**19.8**	**25.3**	**15.8**	**5.4**	**5.3**	**3.8**	**14.1**	**9.1**	**7.1**
Fines (Silt + Clay)	--	--	--	**48.6**	**13.7**	**81.6**	**88.1**	**64.4**	**15.1**	**20.9**	**12**	**64.7**	**33.3**	**23.4**
Metals (mg/kg)														
Antimony	150	--	200	10 UJ	7 UJ	9 UJ	7 U	9 UJ	20 U	20 U	20 U	8 UJ	8 U	7 U
Arsenic	57	507.1	700	**10**	7 U	**9**	**8**	**14**	20 U	**20**	**20**	**13**	**12**	**12**
Cadmium	5.1	11.3	14	**0.6**	**0.4**	**0.5**	**0.3**	**0.7**	**0.8**	**0.9**	0.6 U	**0.7**	**0.6**	**0.5**
Chromium	--	267	--	**36**	**25.4**	**32.5**	**28.8**	**33.4**	**51**	**34**	**32**	**32.1**	**31.1**	**38.5**
Copper	390	1027	1300	**79.5**	**72.8**	**55.7**	**42.1**	**78.8**	**71.9**	**77.2**	**61.8**	**64.1**	**56.4**	**51.5**
Lead	450	975	1200	**60**	**46**	**27**	**18**	**53**	**133**	**71**	**71**	**58**	**68**	**76**
Mercury	0.41	1.5	2.3	**0.21**	**0.11**	**0.16**	**0.13**	**0.21**	**0.17**	**0.1**	**0.08**	**0.17**	**0.13**	**0.1**
Nickel	140	370	370	**30**	**29**	**29**	**23**	**26**	**36**	**27**	**31**	**35**	**29**	**32**
Selenium	--	3	--	**0.4**	**0.4**	**0.6**	0.3 U	**0.5**	0.3 U	0.2 U	0.2 U	0.3 U	0.3 U	0.3 U
Silver	6.1	6.1	8.4	0.6 U	0.4 U	0.5 U	0.4 U	0.5 U	1 U	0.9 U	0.9 U	0.5 U	0.5 U	0.4 U
Zinc	410	2783	3800	**155**	**96**	**115**	**88**	**188**	**266**	**213**	**212**	**172**	**179**	**195**
Organometallic Compounds (µg/L)														
Tributyltin (ion)	0.15	0.15	--	0.019 U	**0.03**	0.019 U	--	**0.024**	**0.19**	--	--	0.019 U	--	--
LPAHs (µg/kg)														
Total LPAH [(1)]	5200	--	29000	**2339**	**37**	**873**	**156**	**715**	**284**	**212**	**488**	**883 J**	**869**	**1049**
Naphthalene	2100	--	2400	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	**12 J**	20 U	**58**
Acenaphthylene	560	--	1300	**330**	19 U	**85 J**	**21 J**	**62 J**	**38**	20 U	**24**	**110 J**	**58**	**50**
Acenaphthene	500	--	2000	**79**	19 U	**28 J**	20 UJ	**28 J**	20 U	20 U	**35**	**36 J**	**35**	**81**
Fluorene	540	--	3600	**220**	19 U	**40 J**	20 UJ	**55 J**	**17 J**	20 U	**39**	**55 J**	**66**	**130**
Phenanthrene	1500	--	21000	**510**	**26**	**500 J**	**86 J**	**320 J**	**99**	**160**	**280**	**390 J**	**440**	**430**
Anthracene	960	--	13000	**1200**	**11 J**	**220 J**	**49 J**	**250 J**	**130**	**52**	**110**	**280 J**	**270**	**300**
2-Methylnaphthalene	670	--	1900	20 U	19 U	**9.9 J**	20 UJ	20 U	20 U	20 U	20 U	**11 J**	20 U	20 U

Table 1
Sediment Characterization Results

Location	Dredged Material Management Program Criteria			S1	S1	S1	S1	S2	S2	S2	S2	S2	S2	S2
Sample				T115-S1-CS-0803	T115-S1-01-ZA-0803	T115-S1-02-ZA-0803	T115-S1-02-ZB-0803	T115-S2-CS-0803	T115-S2-01-ZA-0803	T115-S2-01-ZB-0803	T115-S2-01-ZC-0803	T115-S2-02-ZA-0803	T115-S2-02-ZB-0803	T115-S2-02-ZC-0803
Sample Date	Screening Level	Bioaccumulation Trigger	Maximum Level	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08
Depth				Composite	-15.5 to -16.5 ft	-16 to -17 ft	-17 to -18 ft	Composite	-15.7 to -16.7 ft	-16.7 to -17.7 ft	-17.7 to -18.7 ft	-17.1 to -18.1 ft	-18.1 to -19.1 ft	-19.1 to -20.1 ft
HPAHs (µg/kg)														
Total HPAH	12000	--	69000	**122960**	**588**	**19485 J**	**4138 J**	**10710**	**5278**	**2969**	**5478**	**11540 J**	**11830**	**15220**
Fluoranthene	1700	4600	30000	**47000**	**120**	**7400 J**	**1000 J**	**2400**	**650**	**330**	**730**	**2000 J**	**1200**	**1100**
Pyrene	2600	11980	16000	**34000**	**140 J**	**5500 J**	**1400 J**	**2900**	**1500**	**1100**	**1600**	**3300 J**	**4600**	**8500**
Benzo(a)anthracene	1300	--	5100	**6800**	**37**	**1200 J**	**360 J**	**800 J**	**400**	**140**	**370**	**570 J**	**680**	**740**
Chrysene	1400	--	21000	**16000**	**63**	**2600 J**	**350 J**	**1300**	**550**	**220**	**600**	**1600 J**	**1500**	**1300**
Total Benzofluoranthenes (b, j, k) [(2)]	3200	--	9900	**14200**	**134**	**1780 J**	**590 J**	**1890 J**	**1560**	**760**	**1390**	**2500 J**	**2400**	**2100**
Benzo(a)pyrene	1600	--	3600	**3400**	**49**	**560 J**	**240 J**	**720 J**	**420**	**260**	**520**	**820 J**	**940**	**1000**
Indeno(1,2,3-cd)pyrene	600	--	4400	**730**	**19 J**	**190 J**	**94 J**	**280 J**	**92**	**69**	**120**	**330 J**	**210**	**200**
Dibenzo(a,h)anthracene	230	--	1900	**300**	19 U	**85 J**	**21 J**	**130 J**	**47**	**28**	**48**	**150 J**	**110**	**110**
Benzo(g,h,i)perylene	670	--	3200	**530**	**26 J**	**170 J**	**83 J**	**290 J**	**59**	**62**	**100**	**270 J**	**190**	**170**
Chlorinated Hydrocarbons (µg/kg)														
1,3-Dichlorobenzene	170	--	--	20 U	19 U	20 U	20 UJ	20 U	20 U	20 UJ	20 UJ	20 U	20 UJ	20 UJ
1,4-Dichlorobenzene	110	--	120	20 U	19 U	20 U	20 UJ	20 U	20 U	20 UJ	20 UJ	20 U	20 UJ	20 UJ
1,2-Dichlorobenzene	35	--	110	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
1,2,4-Trichlorobenzene	31	--	64	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Hexachlorobenzene	22	168	230	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Phthalates (µg/kg)														
Dimethylphthalate	71	--	1400	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	**77 J**	**24**	20 U
Diethylphthalate	200	--	1200	20 U	19 U	**37 J**	20 UJ	**38 J**	20 U	20 U	20 U	20 U	20 U	20 U
Di-n-butylphthalate	1400	--	5100	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	**22**	20 U	**25**	20 U
Butylbenzylphthalate	63	--	970	**13 J**	**16 J**	**17 J**	20 UJ	**45 J**	20 U	**25**	20 U	**34 J**	**27**	20 U
Bis(2-Ethylhexyl)phthalate	1300	--	8300	**410**	**150**	**260 J**	**110 J**	**6700 J**	**1000**	**490**	**920**	**1000 J**	**1300**	**490**
Di-n-octylphthalate	6200	--	6200	**13 J**	19 U	20 U	20 UJ	**42 J**	**38**	**20**	20 U	**12 J**	20 U	20 U
Phenols (µg/kg)														
Phenol	420	--	1200	30 U	19 U	**22 J**	20 UJ	**68 J**	46 U	20 U	20 U	**37 J**	**22**	**20**
2-Methylphenol	63	--	77	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	**33**
4-Methylphenol	670	--	3600	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
2,4-Dimethylphenol	29	--	210	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Pentachlorophenol	400	504	690	99 U	97 U	99 U	99 UJ	99 U	99 U	**160**	99 U	99 U	99 U	98 U
Miscellaneous Extractables (µg/kg)														
Benzyl alcohol	57	--	870	20 U	19 U	20 U	20 UJ	20 U	20 U	20 UJ	20 UJ	20 U	20 UJ	20 UJ
Benzoic acid	650	--	760	200 U	190 U	200 U	200 UJ	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Dibenzofuran	540	--	1700	**41**	19 U	**20 J**	20 UJ	**22 J**	**10 J**	20 U	**25**	**27 J**	**35**	**62**
Hexachloroethane	1400	--	14000	20 U	19 U	20 U	20 UJ	20 U	20 U	20 UJ	20 UJ	20 U	20 UJ	20 UJ
Hexachlorobutadiene	29	--	270	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
n-Nitroso-di-phenylamine	28	--	130	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U

Table 1
Sediment Characterization Results

Location	Dredged Material Management Program Criteria			S1	S1	S1	S1	S2	S2	S2	S2	S2	S2	S2
Sample				T115-S1-CS-0803	T115-S1-01-ZA-0803	T115-S1-02-ZA-0803	T115-S1-02-ZB-0803	T115-S2-CS-0803	T115-S2-01-ZA-0803	T115-S2-01-ZB-0803	T115-S2-01-ZC-0803	T115-S2-02-ZA-0803	T115-S2-02-ZB-0803	T115-S2-02-ZC-0803
Sample Date	Screening Level	Bioaccumulation Trigger	Maximum Level	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08
Depth				Composite	-15.5 to -16.5 ft	-16 to -17 ft	-17 to -18 ft	Composite	-15.7 to -16.7 ft	-16.7 to -17.7 ft	-17.7 to -18.7 ft	-17.1 to -18.1 ft	-18.1 to -19.1 ft	-19.1 to -20.1 ft
Volatile Organics (µg/kg)														
Trichloroethene	160	--	1600	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
Tetrachloroethene	57	--	210	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
Ethylbenzene	10	--	50	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
m,p-Xylene	--	--	--	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
o-Xylene	--	--	--	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
Total Xylene [3]	40	--	160	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
Pesticides (µg/kg)														
Total DDT [4]	6.9	50	69	9.9 U	3.9 U	9.9 U	2 U	9.9 U	9.9 U	2 U	2 U	9.9 U	2 U	7 U
4,4'-DDD	--	--	--	9.9 U	3.9 U	9.9 U	2 U	9.9 U	9.9 U	2 U	2 U	9.9 U	2 U	2 U
4,4'-DDE	--	--	--	9.9 U	3.9 U	9.9 U	2 U	9.9 U	9.9 U	2 U	2 U	9.9 U	2 U	7 U
4,4'-DDT	--	--	--	9.9 U	3.9 U	9.9 U	2 U	9.9 U	9.9 U	2 U	2 U	9.9 U	2 U	2 U
Aldrin	10	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--
Total Chlordane [5]	10	37		9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	140 U	--	--
alpha-Chlordane (cis-Chlordane)	--	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--
gamma-Chlordane (trans, beta-Chlordane	--	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--
cis-Nonachlor	--	--	--	9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	9.9 U	--	--
Oxychlordane	--	--	--	9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	140 U	--	--
trans-Nonachlor	--	--	--	9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	130 U	--	--
Dieldrin	10	--	--	9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	9.9 U	--	--
Heptachlor	10	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--
gamma-BHC (Lindane)	10	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--
PCBs (mg/kg OC)														
Total PCB	--	38	--	**5.4**	**4.1**	**6.4**	**4.1**	**9.3**	**13.3**	**14**	**3.4**	**11.4**	**6.5**	**6.6**
PCBs (µg/kg)														
Total PCB	130	--	3100	**141**	**86**	**126**	**78**	**172**	**297**	**264**	**177**	**182**	**324**	**234**
Aroclor 1016	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1221	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1232	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1242	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1248	--	--	--	**35**	20 U	**33**	20 U	**41**	**53**	**34**	20 U	**42**	**74**	**54**
Aroclor 1254	--	--	--	**63**	**46**	**55**	**44**	**77**	**94**	**90**	**67**	**68**	**100**	**90**
Aroclor 1260	--	--	--	**43**	**40**	**38**	**34**	**54**	**150**	**140**	**110**	**72**	**150 J**	**90**
Aroclor 1262	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1268	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U

Table 1
Sediment Characterization Results

Location	Dredged Material Management Program Criteria			S1	S1	S1	S1	S2	S2	S2	S2	S2	S2	S2
Sample				T115-S1-CS-0803	T115-S1-01-ZA-0803	T115-S1-02-ZA-0803	T115-S1-02-ZB-0803	T115-S2-CS-0803	T115-S2-01-ZA-0803	T115-S2-01-ZB-0803	T115-S2-01-ZC-0803	T115-S2-02-ZA-0803	T115-S2-02-ZB-0803	T115-S2-02-ZC-0803
Sample Date	Screening Level	Bioaccumulation Trigger	Maximum Level	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08
Depth				Composite	-15.5 to -16.5 ft	-16 to -17 ft	-17 to -18 ft	Composite	-15.7 to -16.7 ft	-16.7 to -17.7 ft	-17.7 to -18.7 ft	-17.1 to -18.1 ft	-18.1 to -19.1 ft	-19.1 to -20.1 ft
Dioxin/Furans (TEQ)														
ITEF TEQ (ND = 0; EMPC = 0)				23.2	14.3	17.9	54.1	29.9	38.6	33.3	28.3	31.2	41.5	31.2
Dioxin/Furans (pg/g)														
1,2,3,4,6,7,8-HpCDD	--	--	--	**615**	**349**	**532**	**2040**	**845 J**	**1110**	**1010**	**865**	**816**	**1130**	**938**
1,2,3,4,6,7,8-HpCDF	--	--	--	**73.9**	**46.3**	**44.9**	**60.3**	**91.4**	**99.4**	**82.6**	**74.1**	**85.7**	**90.8**	**66.4**
1,2,3,4,7,8,9-HpCDF	--	--	--	**6.23**	**3.77**	**3.62**	**3.96**	**7.46**	**7.52**	**5.73**	**6.12**	**7.18**	**8.34**	**6.07**
1,2,3,4,7,8-HxCDD	--	--	--	**4.53**	**2.88**	**3.08**	**5.02**	**5.07**	**7.47**	**5.72**	**5.1**	**5.37**	**4.91**	**4.29**
1,2,3,4,7,8-HxCDF	--	--	--	**9.72**	**5.87**	**5.57**	**8.2**	**10.3**	**10.4**	**7.74**	**7.78**	**9.95**	**8.96**	**6.67**
1,2,3,6,7,8-HxCDD	--	--	--	**20.6**	**13.9**	**13.4**	**46.8**	**22.1**	**35.9**	**33.7**	**22.3**	**22.1**	**22.3**	**18.4**
1,2,3,6,7,8-HxCDF	--	--	--	**3.59**	**2.4 J**	**2.06 J**	**3.1**	**3.71**	**5.06**	**4.38**	**4.39**	**4.04**	**3.66**	**2.78**
1,2,3,7,8,9-HxCDD	--	--	--	**10.6**	**8.51**	**6.46**	**8.27**	**10.9**	**17.8**	**14.1**	**10.9**	**11.9**	**10.8**	**8.59**
1,2,3,7,8,9-HxCDF	--	--	--	**2.05 J**	**1.37 J**	**1.36 J**	**4.16**	**2.23**	**2.75**	**2.57**	**2.2 J**	**2.38 J**	**2.11 J**	**1.59 J**
1,2,3,7,8-PeCDD	--	--	--	**2.51**	**2.11 J**	**1.47 J**	**1.22 J**	**2.53**	**4.14**	**3.24**	**2.61**	**2.69**	**2.44 J**	**1.95 J**
1,2,3,7,8-PeCDF	--	--	--	**1.54 J**	**0.944 J**	**0.977 J**	**2.3 J**	**1.57 J**	**2.16 J**	**1.95 J**	**1.49 J**	**1.6 J**	**1.52 J**	**1.25 J**
2,3,4,6,7,8-HxCDF	--	--	--	**5.08**	**3.43**	**3.09**	**5.31**	**5.48**	**7.39**	**7.08**	**6.59**	**5.73**	**5.81**	**4.13**
2,3,4,7,8-PeCDF	--	--	--	**4.57**	**2.91**	**3.13**	**5.32**	**5.14**	**5.91**	**5.29**	**4.54**	**5.1**	**4.54**	**3.58**
2,3,7,8-TCDD	--	--	--	**0.724**	**0.605**	**0.486 J**	**0.443 J**	**0.614**	**0.894**	**0.649**	**0.485**	**0.659**	**0.619**	**0.456 J**
2,3,7,8-TCDF	--	--	--	**1.61**	**1.03**	**1.16**	**1.25**	**1.9**	**2.01**	**1.77**	**1.35**	**1.92**	**1.71**	**1.46**
OCDD	--	--	--	**5850**	**3110**	**5470**	**20900 J**	**9430 J**	**11200 J**	**9340 J**	**8400**	**10800 J**	**18600 J**	**12700 J**
OCDF	--	--	--	**242**	**134**	**157**	**127**	**363**	**302**	**234**	**241**	**313**	**444**	**299**

Notes:

Detected concentration is greater than the DMMP SL criterion

Detected concentration is greater than the DMMP BT criterion

Detected concentration is greater than the DMMP ML criterion

Non-detected concentration is greater than one or more of the DMMP criteria

J Estimated value

U Compound analyzed, but not detected above detection limit

UJ Compound analyzed, but not detected above estimated detection limit

-- No criteria

Bold Detected result

(1) 2-Methylnapthalene is not included in the sum of LPAHs

(2) Benzo(j)fluoranthene is included in the total of benzo(b&k)fluoranthenes

(3) Total xylene is the sum of o-, m-, p- isomers

(4) Total DDT consists of the sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT

(5) Total Chlordane includes alpha-chlordane (cis-chlordane), beta-chlordane (trans-chlordane, gamma-chlordane), cis-nonaclor, trans-nonaclor and oxychlordane

Table 2
Data Collection and Reporting Schedule

	Pre-Cover Placement (i.e, post-dredge)	Post-Cover Placement (within 2 weeks)	6 months Post-Cover Placement	1 Year Post-Cover Placement	3 Years Post-Cover Placement
Bathymetric Survey	X		X	X	X
Cover Material Sampling	SMS List, Grain Size, TOC	PAH and Dioxins/Furans in surficial sediments; Archive 10-20 cm and 20-30 cm cover intervals		PAH and Dioxins/Furans in surficial sediments; Archive 10-20 cm and 20-30 cm cover intervals	PAH and Dioxins/Furans in surficial sediments; Archive 10-20 cm and 20-30 cm cover intervals
Tech Memo (Chemical Analyses and Bathymetric Survey Results)		X	X	X	X

Table 3
Sample Location and Sample Matrix Summary for Sediment Grab Samples

Station ID	Station Coordinates (Washington SP NAD 83 North Zone) Northing (ft)	Easting (ft)	Depth Below Mudline (cm)	Parameter Container Preservative / Laboratory Sample ID	Dioxin/Furan 8-oz WM-G NA	PAHs 8-oz WM-G NA	TS, TOC 8-oz WM-G NA	Grain Size 16-oz Plastic NA	Archive 16-oz WM-G Frozen
Surface Grab Sediments									
T115-SG-01	202059.5	1268795	0-10	T115-SG-01-A-YYMMDD	X	X	X	X	X
			10-20	T115-SG-01-B-YYMMDD					X
			20-30	T115-SG-01-C-YYMMDD					X
T115-SG-02	202142.5	1268767	0-10	T115-SG-02-A-YYMMDD	X	X	X	X	X
			10-20	T115-SG-02-B-YYMMDD					X
			20-30	T115-SG-02-C-YYMMDD					X
T115-SG-03	202244.8	1268733	0-10	T115-SG-03-A-YYMMDD					X
			10-20	T115-SG-03-B-YYMMDD					X
			20-30	T115-SG-03-C-YYMMDD					X
T115-SG-04	202375.7	1268689	0-10	T115-SG-04-A-YYMMDD	X	X	X	X	X
			10-20	T115-SG-04-B-YYMMDD					X
			20-30	T115-SG-04-C-YYMMDD					X
Field Homogenization Duplicate				T115-SG-XX(+50)-A-YYMMDD	X	X	X	X	X

Notes:

SG	Sediment grab
PAH	Polycyclic aromatic hydrocarbons
TOC	Total organic carbon
WM-G	Wide mouth glass jar
TS	Total solids
TOC	Total organic carbon
NA	Not applicable

Table 4
Guidelines for Sample Handling and Storage

Parameter	Sample Size	Container Size and Type[a]	Holding Time	Preservative
Polycyclic Aromatic Hydrocarbons	150 g	16-oz Glass	14 days until extraction	Cool/4°C
			1 year until extraction	Freeze/-18°C
			40 days after extraction	Cool/4°C
Dioxins/Furans	150 g	8-oz Glass	1 year to extraction	Freeze/-18°C
			1 year after extraction	Freeze/-18°C
Total solids	50 g	4-oz Glass	14 days	Cool/4°C
			6 months	Freeze/-18°C
Total organic carbon	125 g	from TS/TVS container	14 days	Cool/4°C
			6 months	Freeze/-18°C
Grain size	500 g	16-oz Glass	6 months	Cool/4°C

Notes:

a All sample containers will have lids with teflon inserts.

Table 5
Parameters for Analysis, Evaluation Criteria, Methods, and Practical Quantitation Limits

Parameter	Dredged Material Management Program Criteria		Maximum Level	Analytical Method	Practical Quantitation Limit
	Screening Level	Bioaccumulation Trigger			
Conventional Parameters, %					
Gravel	---	---	---	PSEP	0.1
Sand	---	---	---	PSEP	0.1
Silt	---	---	---	PSEP	0.1
Clay	---	---	---	PSEP	0.1
Fines	---	---	---	PSEP	0.1
Total solids	---	---	---	PSEP	0.1
Total organic carbon	---	---	---	PSEP	0.1
Polycyclic Aromatic Hydrocarbons, ug/kg dry weight					
Total LPAH	5200	---	29000		
Naphthalene	2100	---	2400	8270C SIM	5
Acenaphthylene	560	---	1300	8270C SIM	5
Acenaphthene	500	---	2000	8270C SIM	5
Fluorene	540	---	3600	8270C SIM	5
Phenanthrene	1500	---	21000	8270C SIM	5
Anthracene	960	---	13000	8270C SIM	5
2-Methylnaphthalene[a]	670	---	1900	8270C SIM	5
Total HPAHs	12000	---	69000		
Fluoranthene	1700	4600	30000	8270C SIM	5
Pyrene	2600	11980	16000	8270C SIM	5
Benzo(a)anthracene	1300	---	5100	8270C SIM	5
Chrysene	1400	---	21000	8270C SIM	5
Total benzo(b+k)fluoranthenes	3200	---	9900	8270C SIM	5
Benzo(a)pyrene	1600	---	3600	8270C SIM	5
Indeno(1,2,3-cd)pyrene	600	---	4400	8270C SIM	5
Dibenz(a,h)anthracene	230	---	1900	8270C SIM	5
Benzo(g,h,i)perylene	670	---	3200	8270C SIM	5

Table 5
Parameters for Analysis, Evaluation Criteria, Methods, and Practical Quantitation Limits

Parameter	Dredged Material Management Program Criteria		Maximum Level	Analytical Method	Practical Quantitation Limit
	Screening Level	Bioaccumulation Trigger			
Dioxin/Furans, ng/kg dry weight					
Dioxins					
2,3,7,8-TCDD	---	---	---	1613B	1
1,2,3,7,8-PeCDD	---	---	---	1613B	5
1,2,3,4,7,8-HxCDD	---	---	---	1613B	5
1,2,3,6,7,8-HxCDD	---	---	---	1613B	5
1,2,3,7,8,9-HxCDD	---	---	---	1613B	5
1,2,3,4,6,7,8-HpCDD	---	---	---	1613B	5
OCDD	---	---	---	1613B	10
Furans					
2,3,7,8-TCDF	---	---	---	1613B	1
1,2,3,7,8-PeCDF	---	---	---	1613B	5
2,3,4,7,8,-PeCDF	---	---	---	1613B	5
1,2,3,4,7,8-HxCDF	---	---	---	1613B	5
1,2,3,6,7,8-HxCDF	---	---	---	1613B	5
1,2,3,7,8,9-HxCDF	---	---	---	1613B	5
2,3,4,6,7,8-HxCDF	---	---	---	1613B	5
1,2,3,4,6,7,8-HpCDF	---	---	---	1613B	5
1,2,3,4,7,8,9-HpCDF	---	---	---	1613B	5
OCDF	---	---	---	1613B	10

Notes:

a 2-Methylnapthalene is not included in the sum of LPAHs.

Table 6
Data Quality Objectives

Parameter	Precision	Accuracy	Completeness
Grain size	± 20% RPD	NA	90%
Total organic carbon	± 20% RPD	65-135% R	90%
Total solids	± 20% RPD	NA	90%
Dioxin/Furans	± 50% RPD	50-140% R	90%
Polycyclic Aromatic Hydrocarbons	± 50% RPD	50-140% R	90%

Notes:

RPD Relative percent difference

R Recovery

Table 7
Laboratory QA/QC Sample Analysis Summary

Analysis Type	Initial Calibration	Ongoing Calibration	Replicates	Matrix Spikes	SRM/LCS	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes
Grain size	Each batch [a]	NA	1 per 20 samples	NA	NA	NA	NA	NA
Total solids	Each batch [b]	NA	1 per 20 samples	NA	NA	NA	NA	NA
Total organic carbon	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	NA
Dioxin/Furans	As needed [c]	Every 12 hours	NA[d]	NA[d]	1 per 20 samples	NA[d]	1 per 20 samples	NA[d]
Polycyclic Aromatic Hydrocarbons	As needed [c]	Every 12 hours	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample

Notes:

a Calibration and certification of drying ovens and weighing scales are conducted bi-annually.

b Initial calibration verification and calibration blank must be analyzed at the beginning of each batch.

c Initial calibrations are considered valid until the ongoing continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.

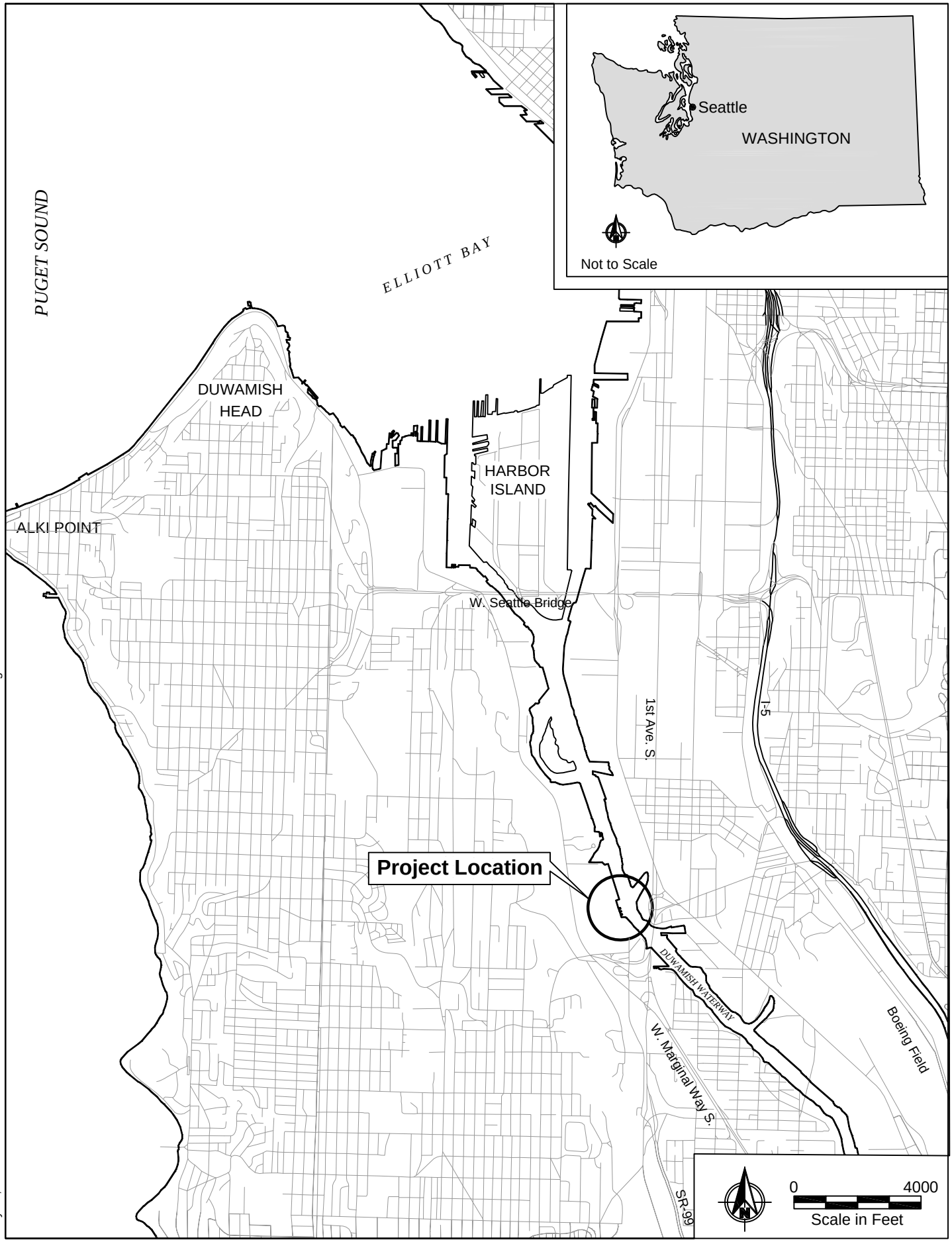
d Isotope dilution required per method

NA Not applicable

SRM Standard reference material

LCS Laboratory control sample

FIGURES



May 18, 2009 11:42am cdavidson K:\Jobs\070003-Port of Seattle\07000302 T-115\07000302001.dwg FIG 1

ANCHOR QEA

Figure 1
Vicinity Map
Terminal 115
Port of Seattle

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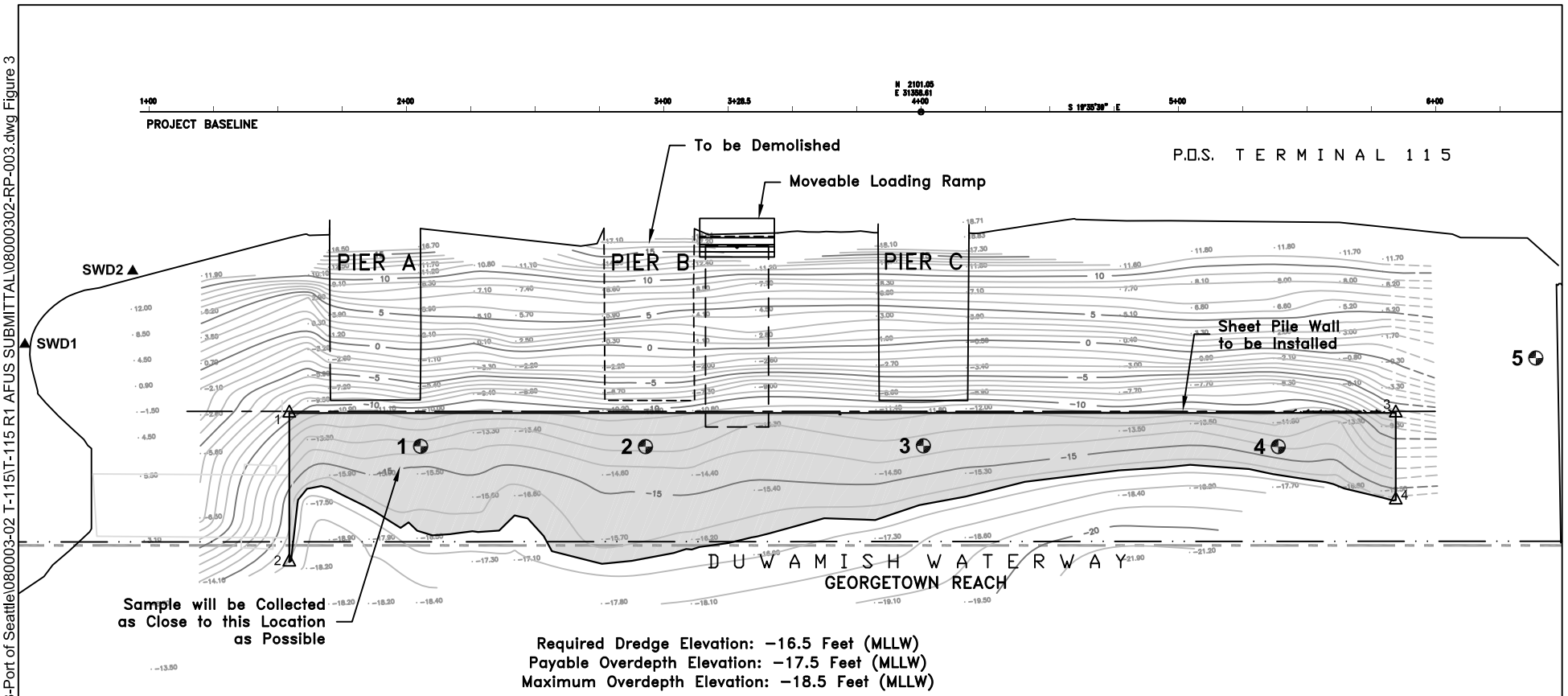
ANCHOR QEA

0 50 100 200

Scale in Feet

N

Figure 2
Previous Sediment Characterization Sampling Locations
Port of Seattle Terminal 115



Source: Bathymetry based on POS survey dated October 28, 2007. Additional lead line survey conducted by Sunchasers (2008) to define upper slope.
Horizontal Datum: Washington State Plane North, NAD83.
Vertical Datum: Mean Lower Low Water (MLLW).

1 Proposed Sample Location

Proposed Dredge Cut

SWD1 Outfall (Approximate)

Sample Locations		
Number	Easting	Northing
1	1268794.5	202059.5
2	1268767.0	202142.5
3	1268732.5	202244.8
4	1268689.1	202375.7

0 50
Scale in Feet

Apr 16, 2009 3:15pm cdavidson K:\Jobs\080003-Port of Seattle\080003-02 T-115\T-115 R1 AFUS SUBMITTAL\08000302-RP-003.dwg Figure 3

ANCHOR QEA

Figure 3
Proposed Sample Locations
Port of Seattle Terminal 115