

Table 4-3. Summary of samples to be collected from Oakland Bay.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2 NH3	TVS	Lipids	PB210	Cs137	Bioassay
OB-01-SS-00	Surface	X	X		X	X	X			X	X					X
OB-01-SC-12	Subsurface	P	P		P	P				P	P					
OB-02-SS-00	Surface	X	X		X	X	X			X	X					X
OB-02-SC-12	Subsurface	P	P		P	P				P	P					
OB-03-SS-00	Surface	X	X		X	X	X			X	X					X
OB-03-SC-12	Subsurface	P	P		P	P				P	P					
OB-04-SS-00	Surface	X	X		X	X	X			X	X					X
OB-04-SC-12	Subsurface	P	P		P	P				P	P					
OB-05-SS-00	Surface	X	X		X	X	X			X	X					X
OB-05-SC-12	Subsurface	P	P		P	P				P	P					
OB-06-SS-00	Surface	X	X		X	X	X	X		X	X					X
OB-06-SC-12	Subsurface	P	P		P	P				P	P					
OB-07-SS-00	Surface	X	X		X	X	X			X	X					X
OB-07-SC-12	Subsurface	P	P		P	P				P	P					
OB-08-SS-00	Surface	X	X		X	X	X			X	X					X
OB-08-SC-12	Subsurface	P	P		P	P				P	P					
OB-09-SS-00	Surface	X	X		X	X	X			X	X					X
OB-09-SC-12	Subsurface	P	P		P	P				P	P					
OB-10-SS-00	Surface	X	X		X	X	X			X	X					X
OB-10-SC-12	Subsurface	P	P		P	P				P	P					
OB-11-SS-00	Surface	X	X		X	X	X			X	X					X
OB-11-SC-12	Subsurface	P	P		P	P				P	P					
OB-12-SS-00	Surface	X	X		X	X	X	X		X	X					X
OB-12-SC-12	Subsurface	P	P		P	P				P	P					
OB-13-RI-04	Sediment Core													X	X	
OB-14-RI-04	Sediment Core													X	X	
OB-15-TS-00	Tissue		X			X	X			X			X			

Table 4-3 (continued). Summary of samples to be collected from Oakland Bay.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2 NH3	TVS	Lipids	PB210	Cs137	Bioassay
OB-15-SS-00	Surface	X	X			X	X			X	X					
OB-16-TS-00	Tissue		X			X	X			X			X			
OB-16-SS-00	Surface	X	X			X	X			X	X					
OB-17-TS-00	Tissue		X			X	X			X			X			
OB-17-SS-00	Surface	X	X			X	X			X	X					
OB-18-TS-00	Tissue		X			X	X			X			X			
OB-18-SS-00	Surface	X	X			X	X			X	X					
OB-19-TS-00	Tissue		X			X	X			X			X			
OB-19-SS-00	Surface	X	X			X	X			X	X					
OB-20-TS-00	Tissue		X			X	X			X			X			
OB-20-SS-00	Surface	X	X			X	X			X	X					
OB-21-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X				
OB-21-WC-12	Wood Waste	X	X	X	X	X				X	X	X				
OB-21-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P
OB-22-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X				
OB-22-WC-12	Wood Waste	X	X	X	X	X				X	X	X				
OB-22-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P
OB-23-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X				
OB-23-WC-12	Wood Waste	X	X	X	X	X				X	X	X				
OB-23-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P
Background Samples																
BG-01-SS-00	Surface	X	X		X	X	X	X	X	X	X					X
BG-01-SC-12	Subsurface	X	X		X	X			X	X	X					X
BG-01-TS-00	Tissue		X			X	X			X			X			
Archived Samples																
OB-01-SC-01	Subsurface															
OB-01-SC-23	Subsurface															
OB-01-SC-34	Subsurface															
OB-02-SC-01	Subsurface															

Table 4-3 (continued). Summary of samples to be collected from Oakland Bay.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2 NH3	TVS	Lipids	PB210	Cs137	Bioassay
OB-02-SC-23	Subsurface															
OB-02-SC-34	Subsurface															
OB-03-SC-01	Subsurface															
OB-03-SC-23	Subsurface															
OB-03-SC-34	Subsurface															
OB-04-SC-01	Subsurface															
OB-04-SC-23	Subsurface															
OB-04-SC-34	Subsurface															
OB-05-SC-01	Subsurface															
OB-05-SC-23	Subsurface															
OB-05-SC-34	Subsurface															
OB-06-SC-01	Subsurface															
OB-06-SC-23	Subsurface															
OB-06-SC-34	Subsurface															
OB-07-SC-01	Subsurface															
OB-07-SC-23	Subsurface															
OB-07-SC-34	Subsurface															
OB-08-SC-01	Subsurface															
OB-08-SC-23	Subsurface															
OB-08-SC-34	Subsurface															
OB-09-SC-01	Subsurface															
OB-09-SC-23	Subsurface															
OB-09-SC-34	Subsurface															
OB-10-SC-01	Subsurface															
OB-10-SC-23	Subsurface															
OB-10-SC-34	Subsurface															
OB-11-SC-01	Subsurface															
OB-11-SC-23	Subsurface															
OB-11-SC-34	Subsurface															

Table 4-3 (continued). Summary of samples to be collected from Oakland Bay.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2 NH3	TVS	Lipids	PB210	Cs137	Bioassay
OB-12-SC-01	Subsurface															
OB-12-SC-23	Subsurface															
OB-12-SC-34	Subsurface															
OB-21-WC-01	Wood Waste															
OB-21-WC-23	Wood Waste															
OB-21-WC-34	Wood Waste															
OB-22-WC-01	Wood Waste															
OB-22-WC-23	Wood Waste															
OB-22-WC-34	Wood Waste															
OB-23-WC-01	Wood Waste															
OB-23-WC-23	Wood Waste															
OB-23-WC-34	Wood Waste															
BG-01-SB-01	Subsurface															
BG-01-SB-23	Subsurface															
BG-01-SB-34	Subsurface															

^a Example of sample ID: OB-13-RI-04 = Oakland Bay, Station 13, Radioisotope, 0-4 foot interval. Additional identifiers: SC = sediment core; SS = surface sediment; TS = tissue; WC = wood waste core; WS = wood waste surface. See Section 6.1.1.

^b PCBs analyzed as Aroclors for sediment and wood waste samples; PCBs analyzed as Aroclors and congeners for tissue and co-located surface sediment samples.

Bioassay = Sediment Management Standards acute and chronic tests

Ce137 = Cesium-137

Dioxin/furan = 2,3,7,8-substituted isomers and congeners

Metals = Antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc

P = For sediment cores, 1-2 foot interval samples analyzed pending surface sample results. For wood waste cores, a total of six of the 13 sediment samples collected beneath wood waste will be analyzed for chemistry and bioassay based on field decisions.

Pb210 = Lead-210

PCB = Polychlorinated biphenyls

Resin = Wood waste indicator compounds, e.g., guaiacols and fatty acids

Pest = Chlorinated pesticides

SVOC = Semi-volatile organic compounds

TBT = Tributyl tin

TOC = Total organic carbon

TPH = Total petroleum hydrocarbons as NWTPH-HCID (hydrocarbon identification)

TVS = Total volatile solids

X = Samples submitted for laboratory analysis.

XX = Sample interval (depth) to be determined in the field.

4.2.3 Bioassays

Bioassays will be conducted to determine the extent of acute and chronic toxicity of sensitive test organisms to contaminants found in Oakland Bay sediments. The 12 surface sediment samples collected across Oakland Bay will be submitted for toxicity testing. In addition, sediment collected beneath six of the 13 wood waste sample locations (10 in Shelton Harbor and three in Oakland Bay, described above) will be submitted for toxicity testing. The six sediment samples selected for toxicity testing will be collected from beneath a range of wood waste depths (thin to thick) identified in the field based on recovery of wood waste in cores and whether underlying sediment is encountered. Toxicity tests to be conducted on Oakland Bay sediments and wood waste include amphipod mortality, juvenile polychaete growth, and bivalve larvae development. Details on toxicity testing methodology are provided in Section 7.2.

4.2.4 Tissue Samples

Bivalves will be collected from six intertidal stations within Oakland Bay to evaluate bioaccumulative and toxic COPCs in tissue. One station will be located at Oakland Bay Recreational Tidelands (station OB-16) and one at Chapman Cove (station OB-15; Figure 4-2); four other locations will be established at areas commonly used for shellfish harvesting based on local input (e.g., the Squaxin Island Tribe). Samples from all stations will be analyzed for tissue COPCs. A surface sediment sample will be collected at each station and submitted for the same analyses as well as ancillary testing (e.g., TOC). The chemical analyte list, analytical methods, target detection limits, and comparative criteria are discussed in Section 7.1.

4.3 Shelton Harbor

The study consists of a non-random design that utilizes a tiered analysis approach to spatially characterize sediment conditions across the harbor. Sampling stations are placed at locations with potential and/or known point and non-point sources, as well as a few locations selected to characterize conditions. Sediment chemistry analyses, wood waste chemistry analyses, bioassay toxicity analyses (both sediment and wood waste), and biota tissue analyses will be completed concurrently. Although a 4-foot core will be collected at each sediment sampling station, only the 1-2 foot deep portion will be analyzed. The remainder of subsurface sediment and wood waste cores (depths other than the 1-2 ft deep interval) will be archived and frozen for possible future analysis. A summary of sample location rationale for Shelton Harbor is presented in Table 4-4 and a summary of sample analyses is presented in Table 4-5. Sampling locations within Shelton Harbor are presented on Figures 4-3 and 4-4.

4.3.1 Sediment

The Data Gaps report identified 26 pipe discharge locations in and around Shelton Harbor that have conveyed stormwater or industrial waste into the harbor, with 15 locations situated along the harbor shoreline. This study will focus on nine shoreline discharge locations (stations SH-1, SH-2, SH-4 to SH-6, and SH-9 to SH-12) based on previous sampling performed and the

Table 4-4. Rationale for samples to be collected in Shelton Harbor.

Sample ID ^a	Description ^b	Sample Justification
SH-01-SS-00	Surface	Located near Shelton Marina. COPCs (SVOCs, pesticides, PCB, TPH, metals, and dioxin/furans) and butyltins. Bioassay to assess sediment toxicity on benthic organisms.
SH-01-SC-12	Subsurface	Located near Shelton Marina. COPCs (SVOCs, pesticides, PCB, TPH, and metals) and butyltins.
SH-02-SS-00	Surface	Located near former bulk fuel storage with known releases. COPCs (SVOCs, pesticides, PCB, TPH, metals, and dioxin/furans) and butyltins. Bioassay to assess sediment toxicity on benthic organisms.
SH-02-SC-12	Subsurface	Located near former bulk fuel with known releases. COPCs (SVOCs, pesticides, PCB, TPH, and metals) and butyltins.
SH-03-SS-00	Surface	Shelton Creek – potential point source to Shelton Harbor. Analyze for COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-03-SC-12	Subsurface	Shelton Creek – potential point source to Shelton Harbor. Analyze for COPCs (SVOCs, pesticides, PCB, and metals).
SH-04-SS-00	Surface	Outfall location. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-04-SC-12	Subsurface	Outfall location. COPCs (SVOCs, pesticides, PCB, and metals).
SH-05-SS-00	Surface	Outfall location. COPCs (SVOCs, pesticides, PCB, TPH, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-05-SC-12	Subsurface	Outfall location. COPCs (SVOCs, pesticides, PCB, and metals).
SH-06-SS-00	Surface	Outfall location. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-06-SC-12	Subsurface	Outfall location. COPCs (SVOCs, pesticides, PCB, and metals).
SH-07-SS-00	Surface	Goldsborough Creek – potential point source to Shelton Harbor. Analyze for COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-07-SC-12	Subsurface	Goldsborough Creek – potential point source to Shelton Harbor. Analyze for COPCs (SVOCs, pesticides, PCB, and metals).
SH-08-SS-00	Surface	Goldsborough Creek – potential point source to Shelton Harbor. Analyze for COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-08-SC-12	Subsurface	Goldsborough Creek – potential point source to Shelton Harbor. Analyze for COPCs (SVOCs, pesticides, PCB, and metals).
SH-09-SS-00	Surface	Outfall location. COPCs (SVOCs, pesticides, PCB, TPH, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-09-SC-12	Subsurface	Outfall location. COPCs (SVOCs, pesticides, PCB, and metals).
SH-10-SS-00	Surface	Outfall location. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.

Table 4-4 (continued). Rationale for samples to be collected in Shelton Harbor.

Sample ID ^a	Description ^b	Sample Justification
SH-10-SC-12	Subsurface	Outfall location. COPCs (SVOCs, pesticides, PCB, and metals).
SH-11-SS-00	Surface	Outfall location. COPCs (SVOCs, pesticides, PCB, TPH, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-11-SC-12	Subsurface	Outfall location. COPCs (SVOCs, pesticides, PCB, and metals).
SH-12-SS-00	Surface	Outfall location. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-12-SC-12	Subsurface	Outfall location. COPCs (SVOCs, pesticides, PCB, and metals).
SH-13-SS-00	Surface	Shelton and Goldsborough Creeks confluence in Shelton Harbor. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
SH-13-SC-12	Subsurface	Shelton and Goldsborough Creeks confluence in Shelton Harbor. COPCs (SVOCs, pesticides, PCB, and metals).
SH-14-RI-04	Sediment Core	Sediment core dating. Collect along edge of alluvial flume at mouth of Johns Creek.
SH-15-TS-00	Tissue	Located near center of Shelton Harbor. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, and dioxin/furans) for HHRA/ERA assessment.
SH-15-SS-00	Surface	Co-located surface sediment sample. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, PCBs as Aroclors, and dioxin/furans) for HHRA/ERA assessment.
SH-16-TS-00	Tissue	Located along northwest shoreline of Shelton Harbor near Simpson Timber. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, and dioxin/furans) for HHRA/ERA assessment.
SH-16-SS-00	Surface	Co-located surface sediment sample. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, PCBs as Aroclors, and dioxin/furans) for HHRA/ERA assessment.
SH-17-TS-00	Tissue	Located offshore from former Evergreen Fuels facility. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, and dioxin/furans) for HHRA/ERA assessment.
SH-17-SS-00	Surface	Co-located surface sediment sample. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, PCBs as Aroclors, and dioxin/furans) for HHRA/ERA assessment.
SH-18-WS-00	Wood Waste	Strata Area 8. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-18-WC-12	Wood Waste	Strata Area 8. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-18-WC-XX	Subsurface	Strata Area 8. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.

Table 4-4 (continued). Rationale for samples to be collected in Shelton Harbor.

Sample ID ^a	Description ^b	Sample Justification
SH-19-WS-00	Wood Waste	Strata Area 7. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-19-WC-12	Wood Waste	Strata Area 7. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-19-WC-XX	Subsurface	Strata Area 7. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.
SH-20-WS-00	Wood Waste	Strata Area 3. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-20-WC-12	Wood Waste	Strata Area 3. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-20-WC-XX	Subsurface	Strata Area 3. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.
SH-21-WS-00	Wood Waste	Strata Area 9. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-21-WC-12	Wood Waste	Strata Area 9. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-21-WC-XX	Subsurface	Strata Area 9. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.
SH-22-WS-00	Wood Waste	Strata Area 6. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-22-WC-12	Wood Waste	Strata Area 6. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-22-WC-XX	Subsurface	Strata Area 6. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.
SH-23-WS-00	Wood Waste	Strata Area 1. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-23-WC-12	Wood Waste	Strata Area 1. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-23-WC-XX	Subsurface	Strata Area 1. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.

Table 4-4 (continued). Rationale for samples to be collected in Shelton Harbor.

Sample ID ^a	Description ^b	Sample Justification
SH-24-WS-00	Wood Waste	Strata Area 4. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-24-WC-12	Wood Waste	Strata Area 4. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-24-WC-XX	Subsurface	Strata Area 4. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.
SH-25-WS-00	Wood Waste	Strata Area 5. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-25-WC-12	Wood Waste	Strata Area 5. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-25-WC-XX	Subsurface	Strata Area 5. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.
SH-26-WS-00	Wood Waste	Strata Area 2. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-26-WC-12	Wood Waste	Strata Area 2. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-26-WC-XX	Subsurface	Strata Area 2. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.
SH-27-WS-00	Wood Waste	Outer Shelton Harbor boundary. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides, PCBs, and dioxin/furans) for HHRA/ERA assessment.
SH-27-WC-12	Wood Waste	Outer Shelton Harbor boundary. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment.
SH-27-WC-XX	Subsurface	Outer Shelton Harbor boundary. Potential COPCs (SVOCs, wood resin, and metals) for characterization of area (wood debris). PBT (chlorinated pesticides and PCBs) for HHRA/ERA assessment. Potential bioassay to assess sediment toxicity on benthic organisms.

^a Example of sample ID: SH-14-RI-04 = Shelton Harbor, Station 14, Radioisotope, 0-4 foot interval. Additional identifiers: SC = sediment core; SS = surface sediment; TS = tissue; WC = wood waste core; WS = wood waste surface. XX = depth to be determined in the field. See Section 6.1.1.

^b Description of matrix: surface or subsurface sediment, wood waste, or tissue.

Table 4-5. Summary of samples to be collected from Shelton Harbor.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2/ NH3	TVS	Lipids	PB210	Cs137	Bioassay
SH-01-SS-00	Surface	X	X		X	X	X	X	X	X	X					X
SH-01-SC-12	Subsurface	X	X		X	X		X	X	X	X					
SH-02-SS-00	Surface	X	X		X	X	X	X	X	X	X					X
SH-02-SC-12	Subsurface	X	X		X	X		X	X	X	X					
SH-03-SS-00	Surface	X	X		X	X	X			X	X					X
SH-03-SC-12	Subsurface	X	X		X	X				X	X					
SH-04-SS-00	Surface	X	X		X	X	X			X	X					X
SH-04-SC-12	Subsurface	X	X		X	X				X	X					
SH-05-SS-00	Surface	X	X		X	X	X	X		X	X					X
SH-05-SC-12	Subsurface	X	X		X	X				X	X					
SH-06-SS-00	Surface	X	X		X	X	X			X	X					X
SH-06-SC-12	Subsurface	X	X		X	X				X	X					
SH-07-SS-00	Surface	X	X		X	X	X			X	X					X
SH-07-SC-12	Subsurface	X	X		X	X				X	X					
SH-08-SS-00	Surface	X	X		X	X	X			X	X					X
SH-08-SC-12	Subsurface	X	X		X	X				X	X					
SH-09-SS-00	Surface	X	X		X	X	X	X		X	X					X
SH-09-SC-12	Subsurface	X	X		X	X				X	X					
SH-10-SS-00	Surface	X	X		X	X	X			X	X					X
SH-10-SC-12	Subsurface	X	X		X	X				X	X					
SH-11-SS-00	Surface	X	X		X	X	X	X		X	X					X
SH-11-SC-12	Subsurface	X	X		X	X				X	X					
SH-12-SS-00	Surface	X	X		X	X	X			X	X					X
SH-12-SC-12	Subsurface	X	X		X	X				X	X					

Table 4-5 (continued). Summary of samples to be collected from Shelton Harbor.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2/ NH3	TVS	Lipids	PB210	Cs137	Bioassay
SH-13-SS-00	Surface	X	X		X	X	X			X	X					X
SH-13-SC-12	Subsurface	X	X		X	X				X	X					
SH-14-RI-04	Sediment Core													X	X	
SH-15-TS-00	Tissue		X			X	X			X			X			
SH-16-TS-00	Tissue		X			X	X			X			X			
SH-16-SS-00	Surface	X	X			X	X			X	X					
SH-17-TS-00	Tissue		X			X	X			X			X			
SH-17-SS-00	Surface	X	X			X	X			X	X					
SH-18-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X				
SH-18-WC-12	Wood Waste	X	X	X	X	X				X	X	X				
SH-18-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P
SH-19-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X				
SH-19-WC-12	Wood Waste	X	X	X	X	X				X	X	X				
SH-19-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P
SH-20-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X				
SH-20-WC-12	Wood Waste	X	X	X	X	X				X	X	X				
SH-20-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P
SH-21-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X				
SH-21-WC-12	Wood Waste	X	X	X	X	X				X	X	X				
SH-21-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P
SH-22-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X				
SH-22-WC-12	Wood Waste	X	X	X	X	X				X	X	X				
SH-22-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P
SH-23-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X				

Table 4-5 (continued). Summary of samples to be collected from Shelton Harbor.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2/ NH3	TVS	Lipids	PB210	Cs137	Bioassay	
SH-23-WC-12	Wood Waste	X	X	X	X	X				X	X	X					
SH-23-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P	
SH-24-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X					
SH-24-WC-12	Wood Waste	X	X	X	X	X				X	X	X					
SH-24-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P	
SH-25-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X					
SH-25-WC-12	Wood Waste	X	X	X	X	X				X	X	X					
SH-25-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P	
SH-26-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X					
SH-26-WC-12	Wood Waste	X	X	X	X	X				X	X	X					
SH-26-WC-XX	Subsurface	P	P	P	P	P				P	P	P				P	
SH-27-WS-00	Wood Waste	X	X	X	X	X	X			X	X	X					
SH-27-WC-12	Wood Waste	X	X	X	X	X				X	X	X					
SH-27-SC-01	Subsurface	P	P	P	P	P				P	P	P				P	
Archive Samples																	
SH-01-SC-01	Subsurface																
SH-01-SC-23	Subsurface																
SH-01-SC-34	Subsurface																
SH-02-SC-01	Subsurface																
SH-02-SC-23	Subsurface																
SH-02-SC-34	Subsurface																
SH-03-SC-01	Subsurface																
SH-03-SC-23	Subsurface																

Table 4-5 (continued). Summary of samples to be collected from Shelton Harbor.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2/ NH3	TVS	Lipids	PB210	Cs137	Bioassay
SH-03-SC-34	Subsurface															
SH-04-SC-01	Subsurface															
SH-04-SC-23	Subsurface															
SH-04-SC-34	Subsurface															
SH-05-SC-01	Subsurface															
SH-05-SC-23	Subsurface															
SH-05-SC-34	Subsurface															
SH-06-SC-01	Subsurface															
SH-06-SC-23	Subsurface															
SH-06-SC-34	Subsurface															
SH-07-SC-01	Subsurface															
SH-07-SC-23	Subsurface															
SH-07-SC-34	Subsurface															
SH-08-SC-01	Subsurface															
SH-08-SC-23	Subsurface															
SH-08-SC-34	Subsurface															
SH-09-SC-01	Subsurface															
SH-09-SC-23	Subsurface															
SH-09-SC-34	Subsurface															
SH-10-SC-01	Subsurface															
SH-10-SC-23	Subsurface															
SH-10-SC-34	Subsurface															
SH-11-SC-01	Subsurface															
SH-11-SC-23	Subsurface															
SH-11-SC-34	Subsurface															
SH-12-SC-01	Subsurface															

Table 4-5 (continued). Summary of samples to be collected from Shelton Harbor.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2/ NH3	TVS	Lipids	PB210	Cs137	Bioassay
SH-12-SC-23	Subsurface															
SH-12-SC-34	Subsurface															
SH-13-SC-01	Subsurface															
SH-13-SC-23	Subsurface															
SH-13-SC-34	Subsurface															
SH-18-WC-01	Wood Waste															
SH-18-WC-23	Wood Waste															
SH-18-WC-34	Wood Waste															
SH-19-WC-01	Wood Waste															
SH-19-WC-23	Wood Waste															
SH-19-WC-34	Wood Waste															
SH-20-WC-01	Wood Waste															
SH-20-WC-23	Wood Waste															
SH-20-WC-34	Wood Waste															
SH-21-WC-01	Wood Waste															
SH-21-WC-23	Wood Waste															
SH-21-WC-34	Wood Waste															
SH-22-WC-01	Wood Waste															
SH-22-WC-23	Wood Waste															
SH-22-WC-34	Wood Waste															
SH-23-WC-01	Wood Waste															
SH-23-WC-23	Wood Waste															
SH-23-WC-34	Wood Waste															
SH-24-WC-01	Wood Waste															
SH-24-WC-23	Wood Waste															

Table 4-5 (continued). Summary of samples to be collected from Shelton Harbor.

Sample ID ^a	Description	TOC/ GS	SVOC	Resin	Pest	PCB ^b	Dioxin/ Furan	TPH	TBT	Metal	S2/ NH3	TVS	Lipids	PB210	Cs137	Bioassay
SH-24-WC-34	Wood Waste															
SH-25-WC-01	Wood Waste															
SH-25-WC-23	Wood Waste															
SH-25-WC-34	Wood Waste															
SH-26-WC-01	Wood Waste															
SH-26-WC-23	Wood Waste															
SH-26-WC-34	Wood Waste															

^a Example of sample ID: SH-14-RI-04 = Shelton Harbor, Station 14, Radioisotope, 0-4 foot interval. Additional identifiers: SC = sediment core; SS = surface sediment; TS = tissue; WC = wood waste core; WS = wood waste surface. See Section 6.1.1.

^b PCBs analyzed as Aroclors for sediment and wood waste samples; PCBs analyzed as Aroclors and congeners for tissue and co-located surface sediment samples.

Bioassay = Sediment Management Standards acute and chronic tests

Ce137 = Cesium-137

Dioxin/furan = 2,3,7,8-substituted isomers and congeners

Metals = Antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc

P = For sediment cores, 1-2 foot interval samples analyzed pending surface sample results. For wood waste cores, a total of six of the 13 sediment samples collected beneath wood waste will be analyzed for chemistry and bioassay based on field decisions.

Pb210 = Lead-210

PCB = Polychlorinated biphenyls

Resin = Wood waste indicator compounds, e.g., guaiacols and fatty acids

Pest = Chlorinated pesticides

SVOC = Semi-volatile organic compounds

TBT = Tributyltin

TOC = Total organic carbon

TPH = Total petroleum hydrocarbons as NWTPH-HCID (hydrocarbon identification)

TVS = Total volatile solids

X = Samples submitted for laboratory analysis.

XX = Sample interval (depth) to be determined in the field.

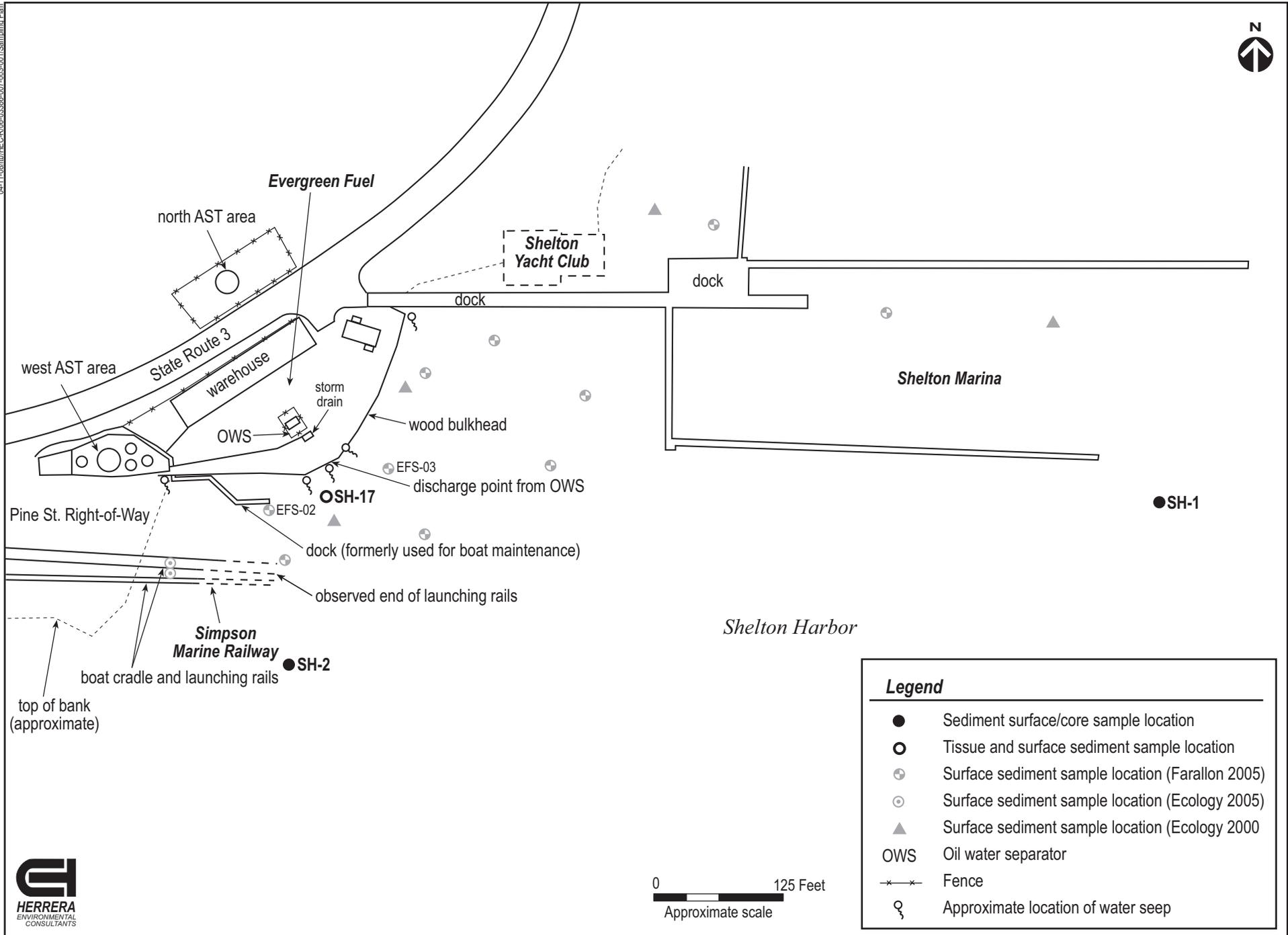


Figure 4-4. Sediment and tissue sample locations (to be collected) at the former Evergreen Fuel site, Shelton, Washington.



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clustering of mapped discharge points. An additional four sample stations (stations SH-3, SH-7, SH-8, and SH-13) will address Goldsborough and Shelton Creek discharges into the north and central portions of the harbor. Samples from all of these locations will be analyzed for the broad spectrum of industrial discharge COPCs, with petroleum hydrocarbon screening and TBT analyses at selected locations. Surface samples will also be analyzed for dioxins/furans. Surface samples also will be submitted for bioassay testing.

4.3.1.1 Surface Sediment Samples

Representative surface sediment (0 to 10 cm) samples will be collected at 13 locations within Shelton Harbor (Figures 4-3 and 4-4). An aliquot from each location will be homogenized and submitted to each laboratory for chemical analysis.

The chemical analyte list, analytical methods, target detection limits, and comparative criteria are discussed in Section 7.1.

4.3.1.2 Subsurface Sediment Cores

Sediment cores will be collected to determine the vertical extent of potential contamination at point source discharge locations. Core sampling locations will be co-located at the 13 surface sediment locations (Figure 4-2). Cores will be advanced to 4 ft below the surface using a Vibracore sampler. If a pocket of wood waste is encountered, cores will be advanced up to 12 ft. Cores will be divided into 1 ft intervals, with the 1-2 ft interval submitted to the laboratory for chemical analysis. The remaining 1-ft intervals will be collected and submitted to the laboratory as archived samples. Core collection and evaluation will also include a physical description of the stratigraphy. The chemical analyte list, analytical methods, target detection limits, and comparative criteria are discussed in Section 7.1.

4.3.2 Wood Waste

Wood waste cores will be collected to help measure the vertical extent of wood waste in areas of historical log rafting and other wood handling activities. Accumulations of wood waste have been identified across the entire harbor, as defined by nine sub-areas (strata) in the Ecology 2000 Reconnaissance Survey. A resistivity geophysical survey will be conducted across the harbor to map wood waste thickness. One sample station will be established in each of the nine strata established in the earlier survey (SH-18 to SH-26) at the location with the greatest estimated wood waste thickness. A tenth station (SH-27) will be sampled outside the original reconnaissance survey strata to help establish the extent of wood waste within Shelton Harbor. One surface and one core interval sample will be collected at each of these locations (Figure 4-3). Samples from these ten stations will be analyzed for industrial and wood waste COPCs. Surface samples will also be analyzed for dioxins/furans.

Subsurface cores will be advanced to the bottom of the wood waste to a maximum depth of 12 ft. The subsurface cores will be individually composited into discrete 1-ft intervals, up to the vertical extent of wood waste debris. The samples collected from the 1-2 ft interval will be analyzed for wood waste COPCs. The remaining sample intervals will be archived. If

encountered, the first 1 ft of native sediment beneath the wood waste will be collected and analyzed for industrial and wood waste COPCs. Bioassay samples will be collected and may be submitted for some of the sediment samples, as described in the following section.

4.3.3 Bioassays

Bioassays will be conducted to determine the extent of acute and chronic toxicity of sensitive test organisms to contaminants found in Shelton Harbor sediments. The 13 surface sediment samples collected across Shelton Harbor will be submitted for toxicity testing. In addition, sediment collected beneath six of the 13 wood waste sample locations (10 in Shelton Harbor, described above, and three in Oakland Bay) will be submitted for toxicity testing. The six sediment samples selected for toxicity testing will be collected from beneath a range of wood waste depths (thin to thick) identified in the field based on recovery of wood waste in cores and whether underlying sediment is encountered. Toxicity tests to be conducted on Shelton Harbor sediments and wood waste include amphipod mortality, juvenile polychaete growth, and bivalve larvae development. Details on toxicity testing methodology are provided in Section 7.2.

4.3.4 Tissue Samples

Bivalves will be collected from three intertidal stations within Shelton Harbor to evaluate bioaccumulative and toxic COPCs in tissue. Two stations will be located near the confluence of Shelton and Goldsborough Creeks (stations SH-15 and SH-16) and a third station will be located near the Pine Street right of way that provides public access to the harbor (station SH-17; see Figure 4-3). Samples from all stations will be analyzed for tissue COPCs. A surface sediment sample will be collected at each station and submitted for the same analyses as well as ancillary testing (e.g., TOC). The chemical analyte list, analytical methods, target detection limits, and comparative criteria are discussed in Section 7.1.

4.4 Hammersley Inlet

The study consists of a non-random design to spatially characterize sediment conditions in the western portion of Hammersley Inlet. Sampling stations are placed at locations with potential for sediment redistribution from Shelton Harbor and Oakland Bay, at locations associated with WWTP outfalls, and in areas where tissue samples may be collected. Sediment chemistry analyses, bioassay toxicity analyses, and biota tissue analyses will be completed concurrently. A surface sediment sample will be collected at each station and submitted for analyses. In addition, a 4-foot sediment core will be collected at each sediment sampling station. All core samples will be archived for potential future analyses, based on the results of the surface sample testing. A summary of sample location rationale for Hammersley Inlet is presented in Table 4-6 and a summary of sample analyses is presented in Table 4-7. Sampling locations within Hammersley Inlet are presented on Figure 4-2.

4.4.1 Hammersley Inlet Sediment

The Data Gaps report did not identify any creeks discharging to the inlet or any sites with documented or potential releases of hazardous substances (including log rafting). Sampling stations have been established at locations with natural sediment accumulation. Four stations will be sampled along the shoreline and study area boundary of the inlet to evaluate conditions resulting from fluvial redistribution processes (stations HI-2 to HI-5). Two additional discharge points associated with the former and existing WWTPs located at the transition area between Shelton Harbor, Oakland Bay, and Hammersley Inlet will also be sampled (stations HI-1 and HI-6). Samples from all of these locations will be analyzed for the broad spectrum of industrial discharge COPCs. Surface samples will also be analyzed for dioxins/furans. Sediment samples to be collected at tissue sample stations are discussed in Section 4.4.3.

4.4.1.1 Surface Sediment Samples

Representative surface sediment (0 to 10 cm) samples will be collected at six locations within Hammersley Inlet (Figures 4-2 and 4-3). An aliquot from each location will be homogenized, composited, and submitted to each laboratory for chemical analysis.

The chemical analyte list, analytical methods, target detection limits, and comparative criteria are discussed in Section 7.1.

4.4.1.2 Subsurface Sediment Cores

Sediment cores will be collected to determine the following:

- The vertical extent of potential contamination in depositional areas

Core sampling locations will be co-located at the six surface sediment locations, and will be 4 ft in depth (Figures 4-2 and 4-3). Cores will be advanced to 4 ft below the surface using a Vibracore sampler. If pockets of wood waste are encountered, cores will be advanced to 12 ft. Cores will be archived and submitted for chemical analysis based on surface sediment results. Core collection and evaluation will also include a physical description of the stratigraphy. The chemical analyte list, analytical methods, target detection limits, and comparative criteria are discussed in Section 7.1.

4.4.2 Bioassays

Bioassays will be conducted to determine the extent of acute and chronic toxicity of sensitive test organisms to contaminants found in Hammersley Inlet sediments. The six surface sediment samples collected across Hammersley Inlet will be submitted for toxicity testing. Toxicity tests will include amphipod mortality, juvenile polychaete growth, and bivalve larvae development. Details on toxicity testing methodology are provided in Section 7.2.

Table 4-6. Rationale for samples to be collected from Hammersley Inlet.

Sample ID ^a	Description ^b	Sample Justification
HI-01-SS-00	Surface	WWTP outfall. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
HI-01-SC-12	Subsurface	WWTP outfall. COPCs (SVOCs, pesticides, PCB, and metals). Samples analyzed based on surface sample sediment results.
HI-02-SS-00	Surface	Located near Munson Point – characterize study area. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
HI-02-SC-12	Subsurface	Located near Munson Point – characterize study area. COPCs (SVOCs, pesticides, PCB, and metals). Samples analyzed based on surface sample sediment results.
HI-03-SS-00	Surface	Located near Eagle Point – characterize study area. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
HI-03-SC-12	Subsurface	Located near Eagle Point – characterize of study area. COPCs (SVOCs, pesticides, PCB, and metals). Samples analyzed based on surface sample sediment results.
HI-04-SS-00	Surface	Located near Millers Point – extent of study area. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
HI-04-SC-12	Subsurface	Located near Millers Point – extent of study area. COPCs (SVOCs, pesticides, PCB, and metals). Samples analyzed based on surface sample sediment results.
HI-05-SS-00	Surface	Located across inlet from Millers Point – extent of study area. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
HI-05-SC-12	Subsurface	Located across inlet from Millers Point – extent of study area. COPCs (SVOCs, pesticides, PCB, and metals). Samples analyzed based on surface sample sediment results.
HI-06-SS-00	Surface	WWTP outfall. COPCs (SVOCs, pesticides, PCB, metals, and dioxin/furans). Bioassay to assess sediment toxicity on benthic organisms.
HI-06-SC-12	Subsurface	WWTP outfall. COPCs (SVOCs, pesticides, PCB, and metals). Samples analyzed based on surface sample sediment results.
HI-07-TS-00	Tissue	Located near Eagle Point. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, and dioxin/furans) for HHRA/ERA assessment.
HI-07-SS-00	Surface	Co-located surface sediment sample. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, PCBs as Aroclors, and dioxin/furans) for HHRA/ERA assessment.

Table 4-6 (continued). Rationale for samples to be collected from Hammersley Inlet.

Sample ID ^a	Description ^b	Sample Justification
HI-08-TS-00	Tissue	Located at Munson Point. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, and dioxin/furans) for HHRA/ERA assessment.
HI-08-SS-00	Surface	Co-located surface sediment sample. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, PCBs as Aroclors, and dioxin/furans) for HHRA/ERA assessment.
HI-09-TS-00	Tissue	Location TBD. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, and dioxin/furans) for HHRA/ERA assessment.
HI-09-SS-00	Surface	Co-located surface sediment sample. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, PCBs as Aroclors, and dioxin/furans) for HHRA/ERA assessment.
HI-10-TS-00	Tissue	Location TBD. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, and dioxin/furans) for HHRA/ERA assessment.
HI-10-SS-00	Surface	Co-located surface sediment sample. COPCs (SVOCs and metals) for delineation of site. PBT (PCB congeners, PCBs as Aroclors, and dioxin/furans) for HHRA/ERA assessment.

^a Example of sample ID: HI-01-SS-00 = Hammersley Inlet, Station 01, Surface Sediment, 0-10 cm interval. Additional identifiers: SC = sediment core; SS = surface sediment; TS = tissue; WC = wood waste core; WS = wood waste surface. See Section 6.1.1.

^b Description of matrix: surface or subsurface sediment, wood waste, or tissue.