PORT OF FRIDAY HARBOR
ALBERT JENSEN AND SONS INC. BOATYARD AND MARINA
FRIDAY HARBOR, WA

MODEL TOXICS CONTROL ACT (MTCA)
AGREED ORDER NO. DE 18071

IN-WATER REMEDIAL INVESTIGATION REPORT

APPENDIX A: DRAFT IN-WATER SEDIMENT CHARACTERIZATION REPORT

Prepared for
The Port of Friday Harbor
Friday Harbor, WA

Prepared by
Leon Environmental, LLC
Seattle, WA

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LEON
Environmental, LLC

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Executive Summary

The objective of the State of Washington, Department of Ecology (Ecology) and the Port of Friday Harbor (Port) under Agreed Order No. DE 18071 (AO 18071) is to provide for remedial action at the Albert Jensen & Sons Inc. site (Facility Site ID 42226979) (Site or Jensen's) where there has been a release or threatened release of hazardous substances. The Site is located at 1293 Turn Point Road, Friday Harbor, San Juan County, Washington, 98250.

The work under the AO 18071 involves conducting a Remedial Investigation (RI) and Feasibility Study (FS), conducting interim actions if required or agreed to by Ecology, and preparing a preliminary Draft Cleanup Action Plan (DCAP) to select a cleanup alternative. The purpose of the RI/FS, and preliminary DCAP for the Site, is to provide sufficient data, analysis, and evaluations to enable Ecology to select a cleanup alternative for the Site.

This Draft In-Water Sediment Characterization Report (Report) was prepared as part of the In-Water RI Report in compliance with Washington Administrative Code (WAC) 173-340-350 and WAC 173-204-550. The purpose of the sediment investigation was to collect and analyze the data gaps identified in the RI Workplan (L-E, 2022) and refine the nature and extent of sediment contamination exceeding preliminary MTCA cleanup levels, preliminary Sediment Management Standards (SMS) cleanup levels, and other regulatory requirements. The RI Workplan was developed collaboratively by the Port and Ecology.

The investigation followed guidance provided in Ecology's current Sediment Cleanup User's Manual (SCUM) (Ecology 2021). Sampling followed current Puget Sound Estuary Program (PSEP) protocols. Sediment samples were analyzed for the contaminants of potential concern (COPCs) and conventional sediment parameters described in the In-Water Sampling and Analysis Plan (SAP), which is included as Appendix D of the RI Workplan. After the RI Workplan was finalized, a new Site management team at Ecology required changes to the SAP in March 2023, which were noted in an informal SAP addendum (L-E, 2023). This Report summarizes results from the sediment characterization effort completed between March 20-23, 2023.

The sampling team collected samples at twenty-one (21) locations. Exceedances of SMS criteria were measured at five (5) locations. Analytes exceeding SMS criteria included: dioxin/furans, polychlorinated biphenyls (PCBs), and mercury.

Under the final RI Workplan, Ecology and the Port agreed to use Dredge Material Management Program (DMMP) criteria to screen tributyltin (TBT) and total chlordane, which do not have SMS criteria. TBT exceeded DMMP criteria at one (1) location; however, subsequent toxicity testing required by Ecology as part of the March 2023 SAP addendum passed SMS criteria.

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Abbreviations and Acronyms

AO 18701	Agreed Order Number 18701
ARI	Analytical Resources, Inc
AET	Apparent Effects Threshold
BT	Bioaccumulation trigger
COC	chain-of-custody
COPCs	Contaminants of Potential Concern
CCV	Continuing Calibration Verification
CSL	Cleanup Screening Level
County	San Juan County
DCAP	Draft Cleanup Action Plan
DGPS	Differential Global Positioning System
DMMP	Dredged Material Management Program
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FBI	Friedman and Bruya, Inc
HPAHs	High-Molecular-Weight Polycyclic Aromatic Hydrocarbons
IPG	Integrated Planning Grant
Jensen's	Albert Jensen and Sons Inc. Boatyard and Marina
L-E	Leon Environmental, LLC
LPAHs	Low-Molecular-Weight Polycyclic Aromatic Hydrocarbons
MDL	Method Detection Limit
MTCA	Model Toxics Control Act
OC	Organic Carbon
PCB	polychlorinated biphenyl
PMA	Port Management Agreement
Port	Port of Friday Harbor
PQL	Practical Quantitation limit
PSEP	Puget Sound Estuary Program
QA	quality assurance
QC	quality control
Report	Draft In-Water Sediment Characterization Report
RAG	Remedial Action Grant
RI	Remedial Investigation
RCW	Revised Code of Washington
SAP	Sampling and Analysis Plan
SL	Screening Level
SCO	Sediment Cleanup Objective
SCUM	Sediment Cleanup User's Manual
SMARM	Sediment Management Annual Review Meeting
Site	Albert Jensen and Sons Inc. Boatyard and Marina
SMS	Sediment Management Standards
SQS	sediment quality standards
SVOC	semivolatile organic compound
TOC	total organic carbon

Town	Town of Friday Harbor
TEQ	Toxicity equivalency
TBT	Tributyltin
WAC	Washington Administrative Code
WDNR	Washington State Department of Natural Resources
WE	Whatcom Environmental

1. Introduction and Background Information

The Port of Friday Harbor (Port) plans to clean up the historic contamination at Albert Jensen & Sons Inc. Boatyard and Marina (Site or Jensen's) and to revitalize and expand existing uses at this industrial facility, which serves as a community and economic hub.

The Site is located at 1293 Turn Point Road, on the southern shore of Shipyard Cove, on San Juan Island, San Juan County (County). Turn Point Road provides a direct connection from the Town of Friday Harbor (Town) to the Site, which is located approximately 1.5 miles southeast of downtown. Turn Point Road continues to the east to Kansas Cove and then becomes Pear Point Road as it follows the Island's southern shoreline to circle back to the Town via Argyle Ave.

The Site is located entirely within Shipyard Cove, a relatively shallow embayment that faces northward on the east side of San Juan Island. Shipyard Cove is generally protected by Brown Island; however, the Site is exposed to roughly 2.5 miles of fetch from a northerly direction (Figure 1-1, Vicinity Map & Figure 1-2 Site Map).

1.1 Site History

The Port purchased the Site from Albert Jensen & Sons, Inc. with the intent to address existing environmental concerns. The property encompasses one parcel (351341005000) of approximately 4.8 acres of upland with 652 linear feet of shoreline, and approximately 5 acres of aquatic lands currently managed under Port Management Agreement (PMA No. 20-080023) with the Washington State Department of Natural Resources (WDNR). The Site is partially developed, is currently underutilized due to impaired Site conditions. Surrounding land uses include industrial, commercial, and residential development. The Port also owns and operates Shipyard Cove Marina and a barge ramp, which are located immediately to the northwest of Jensen's. The Port operates Jensen's and Shipyard Cove Marina as a single facility, which it refers to as Jensen's Shipyard Cove Facility. Residential properties with private docks extend along the shoreline to the northeast of Jensen's.

1.1.1 Past Conditions and Land Use

Over a century of industrial uses contributed to legacy contamination measured in Site soils and marine sediments. Anecdotal evidence suggests that Site operations began as early as 1910. Originally, wooden boats were manufactured at the Site, but when wooden boats were phased out in the middle of the 20th century, the Site use transitioned from shipbuilding to boat repair and maintenance.

According to Ecology (Ecology 2024), the San Juan Historical Society reports that in the early 1940s a local entrepreneur started a shipyard business employing 15 men year round who build wooden boats for fishing, towing, and other uses. A large part of the business focused on hauling local fishing boats out of the water and lined up along the beach for winter maintenance and repairs. The business repaired, serviced, and returned boats to the water one at a time until all were ready for the start of fishing season.

During World War 2, the shipyard held a contract to build military barges. The Site also contained a log dump for San Juan Island logging industry. Logs would be branded on the end, dumped into the water and formed into log booms to be towed to lumber mills around Puget Sound.

Additional facilities, include a marina extending from Jensen's central shoreline into deeper intertidal and subtidal areas, and an upland fill area along the western property boundary extending from the upland into shallow intertidal areas, were built sometime between 1941 and 1972. Jensen's shipyard activities

that likely contributed to detected contaminants include antifouling paint application and removal, mechanical and general maintenance work over water and land, and treatment of wooden boats using pesticides. Other facilities that operated on Site previously include a former underground gasoline storage tank, a machine shop that was also used for hazardous chemical storage, a small dump site, and marine railways.

1.1.2 Current Conditions, Land Use, and Contamination Sources

Jensen's is partially developed and is used currently as a boat maintenance facility and shipyard (Figure 1-3, Existing Conditions). Based on the needs of the Friday Harbor community, the Port plans to maintain and expand current facility operations.

This in-water sediment investigation was focused around the active boatyard and marina areas. Jensen's is zoned as Rural Industrial, which allows for light industrial, light manufacturing, and some institutional uses.

Boatyard: The existing boatyard is located in the southern section of the Site, within the western portion of the upland parcel. It encompasses approximately 1.5 acres of active work areas, including boat storage, a laydown area, and a wash pad. Seven buildings are associated with current boatyard operations: an office/retail building, a machine shop, storage buildings, a water treatment building through which water from the wash pad is circulated and then discharged into an evaporating pond on Site, and a small shed. The boatyard infrastructure also includes a 35-ton travel lift. The travel lift pier extends into the probable sediment cleanup area; therefore, the Port is in the process of removing the travel lift pier and replacing it with a new haul out pier located in the adjacent Shipyard Cove Marina section of the Port's larger Jensen's Shipyard Cove Facility.

The marine services provided at the boatyard include haul-out, pressure wash, bottom paint, light mechanical, chandlery and parts, and boat storage. The boatyard area has several areas where maintenance was deferred by the prior owner. Ongoing releases from the degraded structures (e.g., visible sheen associated with the creosote pilings) have been observed. The Port is working to address these issues as work under AO 18071 proceeds. For example, the Port installed sleeves around the travel lift pier pilings, which are reducing the extent to which piling creosote is exposed to marine waters.

The shoreline along the active boatyard area is characterized by vertical structures and steep berms. The boat pullout area consists of two piers supported by creosote-treated piling (the travel lift pier), ecology blocks, and a concrete wall. A deteriorating overwater dock and Jensen's main walkway pier are located immediately east of the existing boat pullout area. The shoreline here is a stacked ecology block bulkhead, through which uncharacterized upland fill material is sloughing into intertidal areas. Along the western property line, a fill area partially contained by a failing creosote-treated bulkhead extends from the uplands out into intertidal area. This bulkhead is in an advanced state of failure, acting as a source of creosote-treated wood debris and allowing uncharacterized fill to spill into intertidal areas. The intertidal areas here are barren of vegetation except for sparce, non-native species.

Marina: Jensen's continues to operate an active marina that occupies the deeper intertidal and subtidal areas of the Site. The existing marina includes approximately 30 slips.

The original marina included: a concrete floating breakwater; a system of solid decking floats built primarily form treated-wood and open-cell Styrofoam float boxes; creosote-treated wood piles and dolphins; an elevated pier and wave wall constructed of creosote-treated wood; treated-wood and metal

ramps connecting the float and elevated pier system; covered multi-slip moorage and an individual boathouse built with metal roofs and sides; and a main walkway pier constructed of treated wood.

Marina infrastructure underwent extensive repair and replacement under federal, state, and local emergency authorizations in 2021 after a winter storm drastically damage an already failing marina. The Port obtained 'after-the-fact' permits for this repair and replacement work after the most critical marina infrastructure was restored. Of the original marina infrastructure, only the original main walkway pier and portions of the concrete breakwater remain. Nearly all of the permitted reconstruction work is complete. In addition to the original main walkway pier, current marina structures include a new system of floats and floating finger piers consisting of steel piles and fully grated floats, and various standalone piles and dolphins. Replacement covered moorage has been completed using steel frames and transparent polycarbonate roofing. The permitted replacements for the original covered moorage were built without side walls and features clear roofs to allow light penetration.

The entire shoreline area, extending from intertidal elevations out to at least shallow subtidal depths, is heavily impacted with a substantial volume of debris, including concrete, tires, metal (motors, small parts, etc.), plastic, and other general rubbish. Within the former boathouse areas, there appears to be some debris present on the seafloor, including tires that can be observed from the marina floats.

The aquatic substrate along both Jensen's active boatyard and undeveloped area is heavily impacted with a substantial volume of debris, including concrete, tires, metal (motors, small parts, etc.), plastic and other general rubbish. This debris is observed extending from intertidal elevations out to at least shallow subtidal depths.

1.2 Regulatory Framework

Agreed Order No. DE 18071 (AO 18071) was issued pursuant to the Model Toxics Control Act (MTCA), RCW 70.105D.050(1). AO 18071 requires the Port to perform a Remedial Investigation and Feasibility Study (RI/FS) and to prepare a DCAP, addressing both upland and in-water contamination for the Site. Ecology and the Port have a verbal and written agreement that the upland and in-water RI report will be separated into two reports. This In-Water Sediment Characterization Report (Report) was prepared as part of the In-Water RI Report in compliance with WAC 173-340-350 and WAC 173-204-550 to provide sufficient information to define the nature and extent of contamination within the in-water area of the Site. This Report summarizes the results of sediment characterization work performed in accordance with the original In-Water Sampling and Analysis Plan (SAP) provided in the approved RI Work Plan (L-E 2022) and subsequently amended by Ecology (L-E 2023).

1.3 Previous Sediment Investigations

The Port commissioned prior sediment investigations as part of the preliminary planning process it implemented when it acquired the Site for the purposes of remediating and redeveloping the facility. The Port completed additional work and investigations under an Integrated Planning Grant (IPG). Additional data and information evaluated in this Report were acquired from publicly available information sources. References for these prior investigations and existing information sources are cited in Table 1-1 below.

Table 1-1. Previous Sediment Investigation.

Author	Year	Report
Washington Department of Ecology	2001	Concentrations of Selected Chemicals in Sediments from Harbors in the San Juan Islands
Whatcom Environmental Services	2017	Sediment Sampling and Analysis Plan, Jensen's Shipyard and Marina, 1293 Turn Point Road, Friday Harbor, Washington
Whatcom Environmental Services	2018	Initial Investigation Report, Jensen's Shipyard, 1293 Turn Point Road, Friday Harbor, Washington
Whatcom Environmental Services	2018	Sediment Investigation, Sediment Sampling and Analysis Plan, Jensen's Shipyard and Marina, 1293 Turn Point Road, Friday Harbor, Washington
Whatcom Environmental Services	2018	Draft Sediment Data Report, Jensen's Shipyard and Marina, 1293 Turn Point Road, Friday Harbor, Washington
Whatcom Environmental Services	2018	Draft Remedial Investigation Report, Jensen's Shipyard and Marina, 1293 Turn Point Road, Friday Harbor, Washington

2. In-Water Sampling and Analysis Overview

This sediment investigation generally adhered to the original SAP (L-E 2022), as amended by Ecology (L-E, 2023). The SAP is based upon guidance provided in the current SCUM (Ecology 2021).

2.1 Objectives and Design of the In-Water Investigation

The objective for this sediment remedial investigation is to address identified data gaps in the RI Workplan (L-E 2022) and refine the nature and extent of sediment contamination exceeding preliminary MTCA cleanup levels, preliminary Sediment Management Standards (SMS) cleanup standards, and other regulatory requirements. This sediment investigation is focused on Jensen's in-water areas, which include the intertidal and subtidal areas where Ecology and the Port defined as potential data gaps. The purpose for this effort is to:

- Establish vertical profiles of chemical concentrations in areas where surface sediments exceed SQS chemical criteria.
- Delineate the vertical and horizontal extent of dioxins/furans beyond the surface concentrations measured along the central marina shoreline, which may correlate with observed polychlorinated biphenyl (PCB) surface exceedances.
- Focus PCB analysis on areas showing benthic exceedances in surface sediments to facilitate subsequent background/human health evaluations.
- Delineate the vertical and horizontal extent of pesticides measured in surface sediments.

The in-water investigation focused on defining the nature and extent of potential sediment contamination, and generally followed guidance provided in Ecology's current SCUM (Ecology 2021). Sampling and analysis procedures followed current Puget Sound Estuary Program (PSEP) protocols. In-water sampling efforts for the RI are complete.

This sediment characterization effort collected samples from a range of depth intervals at 21 sampling locations. Although the SAP specified collecting 5-ft cores, the sampling vessel provider supplied longer core tubes. Core samples (samples as deep as 0 - 8 ft) were collected from thirteen (13) sampling locations and surface sediment grab samples (sample depth of 0 – 10 cm) were collected from fifteen (15) sampling locations (Figure 2-1, Sampling Station Locations). Samples were analyzed for contaminants of potential concern (COPCs) identified during the Port's prior surface sediment characterization effort (see Table 1-1) and the conventional sediment parameters necessary for the interpretation of chemical and bioassay results.

2.2 Chemical Analytes and Biological Tests

Sediment samples were analyzed for known COPCs (WE 2018c) and conventional sediment parameters. COPCs identified in previous sediment investigations, conventional parameters, bioassay testing criterion, and rationale for sample location and analysis are described in the SAP (L-E 2022). The nature and extent of Site contaminants is generally defined by the sediment chemical concentrations measured during this investigation and refined by biological toxicity testing performed at eight (8) grab sample locations (Figure 2-1). The results of this sediment characterization effort are generally consistent with the conceptual site model established in the RI Work Plan (L-E 2022).

2.3 Sample Collection, Processing, and Handling

Field sampling was conducted from March 20 – 23, 2023. Sampling generally adhered to the methods and protocols described in the SAP (L-E 2022, L-E 2023). Staff from CRETE Consulting (CRETE), Gravity Marine Consulting (Gravity), and NewFields Sediment Management and Marine Sciences (NewFields) performed

the sample collection and processing work. Rusty Jones (CRETE) served as the sampling event field lead, led sample processing, prepared sample processing notes, and delivered samples to the analytical laboratory. Leon Delwiche, Sarah Benson, and John Nakayama (NewFields) oversaw sample collection and prepared field notes. Ed Sloan and Kyle Sanders (Gravity) operated the sampling vessel, assisted with sample collection, and recorded sample locations.

The field team recorded sample locations using Gravity's differential global positioning system (DGPS). Table 2-1 summarizes the 2018 Whatcom Environmental Services (WE) samples and the proposed 2023 sample location coordinates. Table 2-2 summarizes the actual sediment sample location coordinates, which are illustrated in Figure 2-1.

Table 2-1. Previous (WE 2018c) and Proposed Sediment Sample Location Coordinates

Sample Station	Sample Type[1]	Northing (ft.)	Easting (ft.)	Latitude (NAD83)	Longitude (NAD83)
SED-1	Core + Grab[2]	564577.70	1115755.95	48.52749080	-122.998782
SED-2	N/A	564595.96	1116041.40	48.52756284	-122.997607
SED-3	Core + Grab[2]	564437.42	1115844.30	48.52711326	-122.998401
SED-4	N/A	564340.59	1115603.42	48.52682935	-122.999384
SED-5	Core + Grab[2]	564288.64	1115797.22	48.52670196	-122.998578
SED-6	N/A	564283.69	1115905.01	48.52669671	-122.998133
SED-7	Core + Grab[2]	564115.38	1115473.10	48.52620222	-122.999895
SED-8	Core	564090.06	1115530.40	48.52613728	-122.999656
SED-9	Core	564057.95	1115594.68	48.52605424	-122.999387
SED-10	Core	564036.61	1115682.78	48.52600256	-122.999021
SED-11	Core + Grab[2]	564045.21	1115718.42	48.52602889	-122.998875
SED-12	Core	564032.00	1115777.80	48.52599726	-122.998628
SED-13	N/A	563999.37	1115675.97	48.52590001	-122.999045
SED-14	Core + Grab[2]	564162.12	1115715.16	48.52634897	-122.998902
SED-15	Grab[2]	564161.08	1115609.68	48.52633799	-122.999337
SED-16	N/A	564180.22	1115513.50	48.52638300	-122.999736
SED-17	N/A	564168.18	1115436.07	48.52634403	-123.000054
SED-18	Grab	564576.19	1115694.41	48.52748193	-122.999036
SED-19	Grab	564614.89	1115813.31	48.52759713	-122.998550
SED-20	Grab	564476.99	1115906.18	48.52722643	-122.998151
SED-21	Grab	564365.82	1115754.91	48.52691016	-122.998762
SED-22	Grab	564369.34	1115891.42	48.52693033	-122.998199
SED-23	Grab	564245.50	1115708.47	48.52657691	-122.998939
SED-24	Grab	564233.54	1115835.82	48.52655396	-122.998413
SED-25	Core	564116.04	1115602.23	48.52621399	-122.999362
SED-26	Core	564106.18	1115687.36	48.52619356	-122.999010
SED-27	Core + Grab[2]				

Notes:

1. All 2018 sampling locations (WE 2018c) are summarized above; however, sample locations that are not proposed for re-sampling are indicated as N/A.
2. Grab sample to archive additional sediment for potential bioassay testing.

Table 2-2. Actual Sediment Sample Location Coordinates

Sample Station	Sample Type[1]	Northing (ft.)	Easting (ft.)	Latitude (NAD83)	Longitude (NAD83)
SED-1	Core	564582.60	1115762.17	48.52750471	-122.99875692
SED-1	Grab	564579.85	1115752.29	48.52749641	-122.99879736
SED-2	N/A	564595.96	1116041.40	48.52756284	-122.99760700
SED-3	Core	564436.63	1115848.33	48.52711139	-122.99838455
SED-3	Grab	564445.13	1115848.64	48.52713471	-122.99838426
SED-4	N/A	564340.59	1115603.42	48.52682935	-122.99938400
SED-5	Core	564284.53	1115796.35	48.52669063	-122.99858132
SED-5	Grab	564284.96	1115797.99	48.52669193	-122.99857460
SED-6	N/A	564283.69	1115905.01	48.52669671	-122.99813300
SED-7	Core	564121.45	1115475.10	48.52621901	-122.99988756
SED-7	Grab	564116.11	1115477.05	48.52620453	-122.99987890
SED-8	Core	564098.98	1115529.42	48.52616163	-122.99966088
SED-9	Core	564064.55	1115595.13	48.52607236	-122.99938582
SED-10	Core	564043.10	1115688.13	48.52602567	-122.99900730
SED-11	Core	564049.96	1115717.13	48.52604180	-122.99888087
SED-11	Grab	564039.02	1115723.28	48.52601230	-122.99885423
SED-12	Core	564038.05	1115772.07	48.52601340	-122.99865286
SED-13	N/A	563999.37	1115675.97	48.52590001	-122.99904500
SED-14	Core	564164.34	1115714.22	48.52632734	-122.99890616
SED-14	Grab	564165.80	1115715.50	48.52635907	-122.99890105
SED-14	Core Duplicate	564164.32	1115720.12	48.52635538	-122.99888182
SED-15	Grab[2]	564157.24	1115608.22	48.52633799	- 122.99934259
SED-16	N/A	564180.22	1115513.50	48.52638300	-122.99973600
SED-17	N/A	564168.18	1115436.07	48.52634403	-123.00005400
SED-18	Grab	564578.40	1115698.53	48.52748829	-122.99901896
SED-19	Grab	564619.26	1115817.12	48.52760939	-122.99853450
SED-20	Grab	564473.99	1115911.80	48.52721865	-122.99812707
SED-21	Grab	564362.66	1115750.26	48.52690115	-122.99878052
SED-22	Grab	564368.66	1115889.89	48.52692836	-122.99820522
SED-23	Grab	564247.00	1115706.12	48.52658084	-122.99894917
SED-24	Grab	564231.95	1115841.34	48.52655003	-122.99838963
SED-25	Core	564121.70	1115600.35	48.52622936	-122.99937093
SED-26	Core	564113.29	1115685.87	48.52621291	-122.99901718
SED-27	Core	564087.08	1115767.74	48.52614741	-122.99867641
SED-27	Grab	564084.80	1115752.80	48.52614001	-122.99873778

Notes:

1. All 2018 sampling locations (WE 2018c) are summarized above; however, sample locations that are not proposed for re-sampling are indicated as N/A.
2. Grab sample to archive additional sediment for potential bioassay testing.

2.3.1 Sampling Equipment Decontamination:

All equipment used to collect and process sediment samples, including the mixing bowl and stainless-steel implements, were either decontaminated between sampling stations or prior to sampling. Decontamination protocols, described in the SAP (L-E 2023), adhere to PSEP guidelines (1997).

2.3.2 Sample Collection

Surface sediment samples were collected by a stainless steel pneumatic power grab in the biologically active zone at depths of 0 - 10 cm. In water core samples were collected by a vibracorer with decontaminated 4 inch diameter core barrels to a depth of 0 – 8 feet or to refusal.

Sediment sampling was not affected by weather. Skies were either clear or overcast with little to no wind. The majority of sediment core samples were collected in a single attempt, with core depths ranging from 2.3 ft – 8.5 ft. Three (3) attempts were required to collect acceptable sediment cores at locations SED-10, SED-11, SED-12, and SED-27. All sediment grab samples were collected in a single attempt except at sample locations SED-03, SED-07, SED-11. Multiple core and grab attempts were required due to a combination of hard dry coarse to fine sand, shell hash, rocks, woody material, and anthropogenic debris.

Field duplicate core samples were collected at SED-07, SED-11 and SED-14 for quality assurance/quality control (QA/QC) purposes. The NewFields team acted as the sampling manager, verifying each sample as representative and adequate during collection. See Appendix A for the complete sediment sample collection logs.

2.3.3 Sample Compositing

Surface sediment collected for analysis was composited using decontaminated stainless steel bowls and mixing spoons. After sediments were thoroughly composited to a uniform consistency, they were transferred into sample jars supplied by Friedman and Bruya, Inc (FBI) and Analytical Resources, Inc. (ARI).

2.3.4 Sample Storage and Delivery

All sample storage requirements described in the SAP (L-E 2022, L-E 2023) were met. Sediment samples (for chemical, biological, and conventional analyses) were stored in coolers between bags of ice to keep the samples cool. Ice was replaced, as needed, from bags of excess ice stored in extra coolers.

Samples for chemical analysis were delivered to FBI on March 24, 2023, immediately following sample collection. Sediment samples were analyzed in multiple sample delivery groups based on the laboratory performing the analysis. FBI analyzed two (2) sample delivery groups (303373 and 303388) between March 24, 2023 and April 26, 2023. ARI received and analyzed eight (8) sample delivery groups (23C0538, 23C0618, 23C0619, 23E0148, 23E0152, 23E0156, 23I0934, and 23J0690). Sample delivery and chain of custody (COC) procedures followed the SAP (L-E 2022). All associated COC forms are included in Appendix A.

2.4 Laboratory Analytical Methods

Analyses of sediment sample included COPCs and conventional sediment parameters specified in the SAP (L-E 2023). Sample preparation methods, analytical methods, and reporting limits are summarized in Table 2-3. Analytical laboratory reports are provided in Appendix B.

Per Ecology's March 2023 request, toxicity testing was performed, primarily to evaluate the extent of potential TBT effects. Toxicity test methods followed guidance provided by the Puget Sound Estuary Program (PSEP 1995), the SCUM (Ecology 2021), and the various updates presented during the Sediment Management Annual Review Meeting (SMARM). The sediment toxicity testing included the 10-day amphipod test, the 20-day juvenile polychaete survival and growth test, and the benthic larval development test.

Table 2-3. Requested Sample Preparation Methods, Analytical Methods, and Reporting Limits

Analyte	Preparation Method	Analytical Methods	Reporting Limits
Metals			**mg/kg dw**
Arsenic	EPA 6010/6020/3050B	EPA 6010/6020	57
Cadmium	EPA 6010/6020/3050B	EPA 6010/6020	5.1
Chromium	EPA 6010/6020/3050B	EPA 6010/6020	260
Copper	EPA 6010/6020/3050B	EPA 6010/6020	390
Lead	EPA 6010/6020/3050B	EPA 6010/6020	450
Mercury	EPA 7471	EPA 7471	0.41
Silver	EPA 6010/6020/3050B	EPA 6010/6020	6.1
Zinc	EPA 6010/6020/3050B	EPA 6010/6020	410
LPAHs[a]			**µg/kg dw**
Naphthalene	EPA 3550-mod[b,c]	EPA 8270	2100
Acenaphthylene	EPA 3550-mod[b,c]	EPA 8270	1300
Acenaphthene	EPA 3550-mod[b,c]	EPA 8270	500
Fluorene	EPA 3550-mod[b,c]	EPA 8270	540
Phenanthrene	EPA 3550-mod[b,c]	EPA 8270	1500
Anthracene	EPA 3550-mod[b,c]	EPA 8270	960
2-Methylnaphthalene	EPA 3550-mod[b]	EPA 8270	670
HPAHs[a]			**µg/kg dw**
Fluoranthene	EPA 3550-mod[b,c]	EPA 8270	1700
Pyrene	EPA 3550-mod[b,c]	EPA 8270	2600
Benzo(a)anthracene	EPA 3550-mod[b,c]	EPA 8270	1300
Chrysene	EPA 3550-mod[b,c]	EPA 8270	1400
Total benzofluoranthenes[d]	EPA 3550-mod[b,c]	EPA 8270	3200
Benzo(a)pyrene	EPA 3550-mod[b,c]	EPA 8270	1600
Indeno(1,2,3-cd)pyrene	EPA 3550-mod[b,c]	EPA 8270	600
Dibenzo(a,h)anthracene	EPA 3550-mod[b,c]	EPA 8270	230
Benzo(g,h,i)perylene	EPA 3550-mod[b,c]	EPA 8270	670
Chlorinated Hydrocarbons[a]			**µg/kg dw**
1,2-Dichlorobenzene	EPA 3550-mod[b]	EPA 8270	35
1,4-Dichlorobenzene	EPA 3550-mod[b,c]	EPA 8270	110
1,2,4-Trichlorobenzene	EPA 3550-mod[b,c]	EPA 8270	31
Hexachlorobenzene	EPA 3550-mod[b,c]/3540	EPA 8270/8081	22
Phthalates[a]			**µg/kg dw**
Dimethyl phthalate	EPA 3550-mod[b,c]	EPA 8270	71
Diethyl phthalate	EPA 3550-mod[b,c]	EPA 8270	200
Di-n butyl phthalate	EPA 3550-mod[b,c]	EPA 8270	1400
Butyl benzyl phthalate	EPA 3550-mod[b,c]	EPA 8270	63
Bis(2-ethylhexyl)phthalate	EPA 3550-mod[b,c]	EPA 8270	1300
Di-n-octyl phthalate	EPA 3550-mod[b,c]	EPA 8270	6200
Phenols[a]			**µg/kg dw**
Phenol	EPA 3550-mod[b,c]	EPA 8151/8270	420
2-Methylphenol	EPA 3550-mod[b,c]	EPA 8151/8270	63
4-Methylphenol[e]	EPA 3550-mod[b,c]	EPA 8151/8270	670
2,4-Dimethylphenol	EPA 3550-mod[b,c]	EPA 8151/8270	29
Pentachlorophenol	EPA 3550-mod[b,c]	EPA 8151/8270	360
Misc. Extractables[a]			**µg/kg dw**
Benzyl alcohol	EPA 3550-mod[b]	EPA 8151/8270	57
Benzoic acid	EPA 3550-mod[b]	EPA 8151/8270	650

Analyte	Preparation Method	Analytical Methods	Reporting Limits
Dibenzofuran	EPA 3550-mod[b]	EPA 8270	540
Hexachlorobutadiene	EPA 3550-mod[b]	EPA 8270	11
N-nitrosodiphenylamine	EPA 3550-mod[b]	EPA 8270	28
Polychlorinated biphenyls (PCBs)			**µg/kg dw**
PCB Aroclors/Congeners[f]	EPA 3540[c,f] /3550-mod	EPA 8082/1668	130
Conventionals			
Ammonia	[g]	Plumb (1981)	100 mg/L
Grain size[h]	[g]	PSEP, 1986/ASTM D-422	1%
Total solids	[g]	PSEP, 1986	0.1% (wet wt)
Total organic carbon (TOC)	[g]	EPA 9060	0.1%
Total sulfides	[g]	Plumb (1981)/9034/9030B	10 mg/kg
Bioaccumulative Chemicals of Concern			
Tributyltin (bulk sediment)	EPA 3550B or NMFS	Krone/Unger	10 µg/kg
Dioxins/Furans	EPA 1613B	EPA 1613B	0.5-5 or 1 ng/kg
Pesticides (Chlordane)	3540C, 3541, or 3550B	EPA 8081	2 µg/kg

Abbreviations and Acronyms:
EPA – U.S. Environmental Protection Agency
HPAH – high molecular weight polycyclic aromatic hydrocarbon
LPAH – low molecular weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PSEP – Puget Sound Estuary Program
TOC – total organic carbon

Notes:
[a] Selected ion monitoring may improve the sensitivity of EPA Method 8270 and is recommended in cases when detection limits must be lowered to human health criteria levels or when TOC levels elevate detection limits above ecological criteria levels. See PSEP organics chapter, Appendix B, Guidance for Selected Ion Monitoring (1997b).
[b] EPA Method 3550 is modified to add matrix spikes before the dehydration step.
[c] If sulfur is present in the samples (as is common in most marine sediment), cleanup procedures specified by EPA SW-846 Method 3660B should be used.
[d] Total benzofluoranthenes represent the sum of the b, j, and k isomers. Some laboratories report total benzofluoranthenes concentration rather than concentrations of individual isomers since isomers may not be able to be separated.
[e] In some instances, 3-methylphenol and 4-methylphenol may not be able to be separated. In this case methylphenol may be reported as the sum of the 3-methyl and 4-methylphenol isomers.
[f] PCB Congeners are not proposed in the initial sampling event, but may be collected if supplemental sampling is required. A SAP addendum will be prepared if subsequent sampling is required. All PCB extracts should be subjected to sulfuric acid/permanganate cleanup as specified by EPA SW-846 Method 3665A.
[g] Sample preparation methods for sediment conventional analyses are described in the analytical methods.
[h] Sternberg, D. (2006). Reporting of sediment-bound contaminants: standardization of sieving and analytical procedures. DMMP/SMS clarification paper on converting phi, mm, or microns to the standard "gravel, sand, silt, clay" groups. See Appendix B.

2.5 Quality Assurance and Quality Control (QA/QC) Requirements

QA/QC methods and requirements defined in the SAP (L-E 2022) were generally completed in the field and laboratory. Field duplicates were used to evaluate field conditions and laboratory results. QA/QC procedures for chemical analyses included analytical instrument calibration, verifying sample holding times, blank analyses, duplicate analyses, and analyses of spikes and standards to test analytical accuracy. The data validation report is provided in Appendix C (EcoChem 2025).

2.6 Deviations from the SAP

The field team encountered refusal at approximately 3.5-feet in each of three (3) attempts to collect a core at SED-12. The team attempted to collect an acceptable sample within 3 m of the sample location but hit refusal at each location when they reached approximately 3.5-feet below mudline. Based on these observations, Ecology approved a new sampling location, SED-27, in slightly deeper water. This sample was analyzed t for mercury, organometallics, PCBs, and dioxins and furans.

The sampling event field lead did not adhere to the sample container plan described in Table 3-1 of the SAP (L-E 2022), because FBI did not provide the required containers. Instead, the sampling field lead was required to utilize a smaller number of larger containers to collect sufficient sample volumes for analyses.

3. In-Water Sediment Investigation Results

This chapter presents analytical results for the chemical and conventional testing completed for this sediment characterization. Analytical results are compared to Ecology's SMS numeric criteria (Ecology 2021), and polar molecular compound and metal analyte results are compared to SMS dry weight apparent effects threshold (AET) criteria. Nonionizable organic compound analyte results are normalized based on total organic compound (TOC) percentage and compared to TOC-normalized criteria. As established in the RI Work Plan, tributyltin results are compared to DMMP screening level values (USACE 2021), because numeric screening criteria for organometallics are not established in SCUM.

FBI (Seattle, WA), ARI (Tukwila, WA), and HWA GeoSciences Inc. (HWA) (Bothell, WA) analyzed samples for the full suite of Washington SMS chemical analytes and conventional sediment parameters. ARI performed analyses for dioxins/furans, organometallics, TOC, ammonia, sulfides, and total solids. HWA performed grain size analyses. FBI performed the remaining analyses. The labs generally adhered to the recommended analytical methods summarized in Table 2-3.

Data are uploaded to Ecology's EIM system, where they can be accessed under Study ID JENSEN22.

3.1 Conventional Analytical Results

The Site surface sediments consist of predominantly silt and fine sands, but range from gravel to fine sands, with some trace organics and shells. Grain size at each sampling location is summarized by percent soil components in Table 3-1. TOC ranged from 0.18% to 2.89% and is summarized along with other conventional variable results in Table 3-2. Total sulfides are reported as estimated concentrations, noted with a data qualifier (J).

Table 3-1. Apparent Grain Size Distribution Summary

	Grainsize: Percent (%)			
Port of Friday Harbor Sediments	**Gravel**	**Sand**	**Silt**	**Clay**
SED-01G: 0 - 10 cm	0.0	20.6	74.1	5.2
SED-01C: 0 - 1 ft	0.1	26.9	67.5	5.6
SED-03G: 0 - 10 cm	0.0	17.6	75.2	7.2
SED-03C: 0 - 1 ft	0.2	15.8	76.6	8.0
SED-05G: 0 - 10 cm	0.0	12.9	81.5	5.5
SED-05C: 0 - 1 ft	0.2	17.0	77.5	5.3
SED-07G: 0 - 10 cm	55.8	21.8	19.9	2.5
SED-07C: 0 - 1 ft	28.3	40.4	26.5	4.8
SED-07C:1 - 3 ft	14.8	50.2	33.3	1.7
SED-08C: 0 - 1 ft	0.9	46.8	50.7	1.6
SED-08C: 1 - 3 ft	2.2	67.2	29.4	1.2
SED-09C: 0 - 1 ft	4.8	66.6	25.8	2.8
SED-09C: 1 - 3 ft	1.9	76.3	20.2	1.6
SED-10C: 0 - 1 ft	13.9	66.4	19.1	0.7
SED-10C: 1 - 3 ft	29.1	55.3	15.4	0.2
SED-11G: 0 - 10 cm	5.8	48.6	42.7	2.9
SED-11C: 0 - 1 ft	12.0	50.9	36.7	0.4
SED-11C: 1 - 3 ft	4.5	67.4	27.9	0.3
SED-12C: 0 - 1 ft	18.2	65.1	15.5	1.3
SED-14G: 0 - 10 cm	0.0	22.0	73.9	4.1
SED-14C: 0 - 1 ft	0.4	46.1	50.4	3.1
SED-15G: 0 - 10 cm	0.0	36.2	59.8	4.0
SED-18G: 0 - 10 cm	0.3	16.5	76.6	6.5
SED-19G: 0 - 10 cm	0.0	27.8	67.7	4.5
SED-20G: 0 - 10 cm	0.0	17.9	79.1	3.1
SED-21G: 0 - 10 cm	0.1	7.3	85.8	6.9
SED-22G: 0 - 10 cm	0.0	7.1	86.4	6.5
SED-23G: 0 - 10 cm	0.0	5.1	88.3	6.5
SED-24G: 0 - 10 cm	0.0	6.7	86.0	7.3
SED-25C: 0 - 1 ft	4.3	67.7	25.7	2.3
SED-25C: 1 - 3 ft	3.2	74.1	21.8	0.9
SED-26C: 0 - 1 ft	2.9	65.3	30.7	1.1
SED-26C: 1 - 3 ft	7.3	64.6	27.1	0.9
SED-27G: 0 - 10 cm				
SED-27C: 0 - 1 ft				

Table 3-2. Conventional Parameters

Port of Friday Harbor Sediments	Conventionals			
	Ammonia (mg/Kg)	Total Sulfides (mg/Kg)	Total Solids (%)	Total Organic Carbon (% dry)
SED-01G: 0 - 10 cm	8.74	304.00 J	53.25	0.85
SED-01C: 0 - 1 ft			55.22	0.72
SED-03G: 0 - 10 cm	4.51	259.00 J	45.94	1.39
SED-03C: 0 - 1 ft			55.48	1.52
SED-05G: 0 - 10 cm	12.00	262.00 J	51.94	1.12
SED-05C: 0 - 1 ft			54.83	1.00
SED-07G: 0 - 10 cm	10.40	89.70 J	73.61	1.37
SED-07C: 0 - 1 ft			81.65	0.16
SED-07C:1 - 3 ft			77.08	0.85
SED-08C: 0 - 1 ft			68.94	2.89
SED-08C: 1 - 3 ft			72.56	0.53
SED-09C: 0 - 1 ft			67.96	1.40
SED-09C: 1 - 3 ft			76.50	1.75
SED-10C: 0 - 1 ft			77.06	0.71
SED-10C: 1 - 3 ft			82.83	2.07
SED-11G: 0 - 10 cm	13.50	204.00 J	72.27	1.26
SED-11C: 0 - 1 ft			67.04	1.10
SED-11C: 1 - 3 ft			73.76	0.69
SED-12C: 0 - 1 ft			59.79	1.26
SED-14G: 0 - 10 cm	12.70	170.00 J	54.58	1.20
SED-14C: 0 - 1 ft			68.13	0.74
SED-14C: 1 - 3 ft			67.96	0.66
SED-15G: 0 - 10 cm	4.65	146.00	61.15	1.12
SED-18G: 0 - 10 cm			55.22	0.93
SED-19G: 0 - 10 cm			49.60	0.61
SED-20G: 0 - 10 cm			63.62	0.63
SED-21G: 0 - 10 cm			44.90	1.33
SED-22G: 0 - 10 cm			49.09	1.55
SED-23G: 0 - 10 cm			40.27	1.79
SED-24G: 0 - 10 cm			43.07	1.61
SED-25C: 0 - 1 ft			75.95	0.49
SED-25C: 1 - 3 ft			77.79	0.18
SED-26C: 0 - 1 ft			60.95	1.47
SED-26C: 1 - 3 ft			74.64	0.43
SED-27G: 0 - 10 cm				
SED-27C: 0 - 1 ft				

3.2 Chemical Analytical Results (dry weight) Comparison with SMS Marine AET

Chemical analytical results from the 2023 sampling event are presented on a dry weight basis and compared against SQS marine sediment AET criteria in Table 3-3. Chemical concentrations depicted in yellow represent exceedances greater than the SMS marine AET SQS/SCO criteria. Chemical concentrations depicted in red represent exceedances greater than the SMS marine AET Cleanup Screening Level (CSL) criteria. DMMP criteria were used for analytes without SMS criteria, including TBT and pesticides. Sample locations depicted in purple represent exceedances greater than applicable DMMP criteria. A summary of detects and non-detects is provided below.

3.2.1 Metals

The following analyte was detected at concentrations above SMS marine AET CSL criteria:

- Mercury: SED-10 (0 – 1 ft), SED-26 (0 – 1 ft)

Mercury exceedances at these two (2) locations are limited to the upper foot of sediment. Mercury concentrations in the underlying 1 – 3 ft subsurface interval are below SQS criteria.

The horizontal extent of the mercury exceedances is bound to SED-10 and SED-26 by sample locations SED-09, SED-11, SED-14, SED-25, and SED-27, where mercury concentrations were measured below SQS criteria. Mercury concentrations were not detected at SED-9 (1 – 3 ft) or SED-25 (1 – 3 ft). Undetected concentrations are flagged with a “U” data qualifier.

Figure 3-1 depicts the mercury concentrations detected during this sediment characterization effort.

Silver concentrations were undetected at all sampling locations except at SED-10 (0 – 1 ft), where silver was detected below SQS criteria. All other metals concentrations were measured below SQS criteria.

3.2.2 Organometallics

Under the approved RI Work Plan, Ecology agreed to use DMMP criteria to screen TBT, because numeric criteria are not provided under SMS.

TBT was detected above DMMP criteria at two sampling locations, SED-15 (0 – 10 cm) and SED-26 (0 – 1 ft, 1 – 3 ft). The vertical extent of TBT exceedances at sampling location SED-26 confined within the upper three (3) feet of sediment. TBT was undetected in the underlying 3 – 5 ft subsurface interval at SED-26.

The horizontal extent at sample location SED-26 is bound by sample locations SED-09, SED-10, SED-11, SED-14, SED-25, and SED-27, where TBT concentrations were measured below DMMP criteria. The exceedance measured at sampling location SED-15 occurred within the top ten (10) cm of the sediment surface.

On March 14, 2023, Ecology notified the Port that it would require toxicity testing to bound locations were TBT was detected; therefore, the Port collected toxicity samples at SED-07, SED-15, SED-11, and SED-14, which represented the approximate boundary where TBT concentrations measured during the 2018 sampling event met DMMP criteria. The results of these analyses, which all passed SMS criteria, are summarized in Section 3.4 (Biological Analytical Results) of this report.

Figure 3-2 depicts TBT concentrations measured during this sediment characterization effort.

Tetrabutyltin was undetected at all sampling locations. Monobutyltin undetected at SED-7 (0 – 1 ft, 1 – 3 ft), SED-8 (1 – 3 ft), SED-9 (1 – 3 ft), SED-14 (1 – 3 ft), and SED-25 (1 – 3 ft). Two monobutyltin concentrations were detected at estimated concentrations.

3.2.3 Organics and Chlorinated Organic Chemicals

Organic and chlorinated organic chemicals were undetected at all sample locations, except SED-01, SED-08, and SED-09. FBI reported these undetected concentrations at the Method Reporting Limit (MRL), receiving a "U" data qualifier.

The following analytes were detected at concentrations below dry-weight AET SQS criteria:

- 1,4-Dichlorobenzene: SED-01 (0 – 10 cm)
- Dibenzofuran: SED-08 (0 – 1 ft), SED-09 (0 – 1 ft)
- Hexachlorobenzene: SED-09 (0 – 1 ft)

At sample location SED-10 (0 – 1 ft) all organics and chlorinated organic analyzed, except dibenzofuran, resulted in exceedances above dry-weight AET SQS criteria.

The following analytes at SED-10 (0 – 1 ft) resulted in undetected or estimated concentrations above SMS marine AET SQS/SCO criteria:

- 1,2,4-trichlorobenzene
- n-nitrosodiphenylamine

The following analytes at SED-10 (0 – 1 ft) resulted in undetected or estimated concentrations above SMS marine AET CSL criteria:

- 2, 4-dimethylphenol
- 2-methylphenol
- 4-methylphenol
- benzoic acid
- benzyl alcohol
- pentachlorophenol
- phenol
- 1,2-dichlorobenzene
- 1,4-dichlorobenzene
- hexachlorobenzene
- hexachlorobutadiene

Analyses for the following analytes resulted estimated concentrations below SMS marine AET SQS/SCO criteria with a low bias Continuing Calibration Verification (CCV) outlier receiving a "UJ" data qualifier at nearly all sample locations:

- 2, 4-dimethylphenol
- 2-methylphenol
- benzoic acid
- benzyl alcohol
- 1,2,4-trichlorobenzene
- hexachlorobenzene

3.2.4 Phthalates

Phthalates were undetected or estimated at all sample locations, except SED-3, SED-10, SED-11, SED-12, and SED-26. FBI reported undetected and estimated concentrations at the MRL and flagged these data with a "U" or "UJ" data qualifier.

The following analytes were detected at concentrations below SMS marine dry-weight AET SQS/SCO criteria:

- bis-(2-ethlyhexyl) phthalate: SED-01 (0 – 10 cm), SED-12 (0 – 10 cm)
- butyl benzyl phthalate: SED-11 (1 – 3 ft)

- dimethyl phthalate: SED-26 (0 – 1 ft)

The following analytes at SED-10 (0 – 1 ft) were undetected or estimated at concentrations above SMS marine dry-weight AET SQS/SCO criteria:

- bis-(2-ethlyhexyl) phthalate
- diethyl phthalate

The following analytes at SED-10 (0 – 1 ft) were undetected or estimated at concentrations above SMS marine dry-weight AET CSL criteria:

- butyl benzyl phthalate
- dimethyl phthalate
- di-n-butyl phthalate

Analyses for the following analytes resulted estimated concentrations below SMS marine dry-weight AET SQS/SCO criteria with a low bias Continuing Calibration Verification (CCV) outlier at most sample locations receiving a "UJ" data qualifier:

- butyl benzyl phthalate
- diethyl phthalate
- dimethyl phthalate
- di-n-butyl phthalate

3.2.5 Pesticides

Under the approved RI Work Plan, pesticides without numeric SMS screening criteria are compared against DMMP screening level criteria. Pesticides were undetected or estimated at all sample locations except SED-3 and SED-10. Undetected and estimated concentrations were reported at the MRL by FBI and flagged with either a "U", "UJ", or "E" data qualifiers. Two analytes reported by FBI, beta-hexachlorocyclohexane and endrin ketone, do not have either SMS or DMMP criteria.

The following analytes were estimated at the MRL, below DMMP screening criteria, and flagged with an "E" data qualifier:

- Dieldrin: SED-01 (0 – 10 cm), SED-01 (0 – 1 ft), SED-3 (0 – 1 ft), SED-14 (0 – 1 ft, 1 – 3 ft)
- Endrin ketone: SED-01 (0 – 10 cm), SED-3 (0 – 1 ft), SED-14 (0 – 1 ft, 1 – 3 ft)
- DDTs: SED-01 (0 – 10 cm), SED-12 (0 – 10 cm), SED-18 (0 – 10 cm), SED-20 (0 – 10 cm), SED-21 (0 – 10 cm), SED-22 (0 – 10 cm), SED-23 (0 – 10 cm), SED-24 (0 – 10 cm)
- Heptachlor: SED-01 (0 – 10 cm), SED-10 (1 – 3 ft), SED-11 (0 – 1 ft, 1 – 3 ft), SED 22 (0 – 10 cm), SED-26 (0 – 1 ft)

The following undetected analytes were reported at the MRL, above the DMMP screening level criteria, and flagged with a "U" data qualifier:

- Aldrin: SED-21 (0 – 10 cm)
- DDEs: SED-21 (0 – 10 cm)
- DDDs: SED-26 (0 – 1 ft)
- Total chlordane: SED-11 (0 – 1 ft), SED-21 (0 – 10 cm), SED-23 (0 – 10 cm), SED-24 (0 – 10 cm)
- Dieldrin: SED-10 (0 – 10 cm), SED-21 (0 – 10 cm), SED-23 (0 – 10 cm), SED-24 (0 – 10 cm)
- Heptachlor: SED-10 (0 – 1 ft), SED-24 (0 – 10 cm)

The following estimated analytes were reported at the MRL, above the DMMP screening level criteria, and flagged with an "E" data qualifier: DDTs: SED-26 (0 – 1 ft).

The following analytes resulted estimated concentrations below SMS marine AET SQS/SCO criteria with a low bias Continuing Calibration Verification (CCV) outlier and flagged with a "UJ" data qualifier:

- Beta-hexachlorocyclohexane: SED-01 (0 – 10 cm), SED-01 (0 – 1 ft), SED-3 (0 – 1 ft), SED-5 (0 – 1 ft), SED-14 (0 – 1 ft, 1 – 3 ft)
- Heptachlor: SED-01 (0 – 10 cm, 0 – 1 ft), SED-3 (0 – 1 ft), SED-5 (0 – 1 ft), SED-11 (0 – 10 cm), SED-14 (0 – 1 ft, 1 – 3 ft), SED-26 (0 – 1 ft)
- DDTs at all sample locations, except as shown above where the lab flagged results with an "E" data qualifier
- All pesticides at SED-05 (0 – 1 ft)

3.2.6 Polychlorinated Biphenyl (PCB) Aroclors

Total PCB Aroclors are calculated as the sum of Aroclors 1016, 1221, 1232, 1242,1248, 1254, and 1260, found in Table 3-4. At least one PCB Aroclor was undetected at all sample locations. Undetected PCB Aroclors were reported by FBI at the MRL and flagged with a "U" data qualifier. At sample locations where the lab reported one or more undetected PCB Aroclors, a value of one-half the MDL for each undetected Aroclor is used to calculate the summation.

The following Aroclors were undetected:

- Aroclor 1016: all sample locations
- Aroclor 1221: all sample locations
- Aroclor 1232: all sample locations
- Aroclor 1242: all sample locations except SED-08 (0 – 1 ft), SED-10 (1 – 3 ft), SED-11 (0 – 1ft, 1 – 3 ft), SED-26 (1 – 3 ft)
- Aroclor 1248: all sample locations except SED-10 (0 – 1 ft)
- Aroclor 1254: SED-09 (1 – 3 ft)
- Aroclor 1260: all sample locations except SED-08 (0 – 1 ft), SED-09 (0 – 1 ft), SED11 (0 – 10 cm, 0 – 1ft, 1 – 3 ft), SED14 (0 – 10 cm, 0 – 1ft), SED-23 (0 – 10 cm), SED-27 (0 – 1 ft)

Total PCBs exceeded SMS marine AET SQS/SCO criteria at SED-10 (0 – 1 ft) and SED26 (0 – 1 ft).

Total PCBs exceedances of SQS criteria were only calculated in the upper foot of sediment. No total PCBs exceedances are calculated in any 1 – 3 ft interval.

Total PCB Aroclors SQS exceedances measured in surface sediments at SED-10 and SED-26 are bounded horizontally by all surrounding sample locations (SED-09, SED-11, SED-14, SED-25, and SED-27), where the lab reported Total PCBs concentrations below SQS.

Total PCBs measured during the March 2023 sampling event are depicted in Figure 3-3.

3.2.7 Low-Molecular-Weight Polycyclic Aromatic Hydrocarbons (LPAHs)

SMS marine dry-weight AET criteria are evaluated based on both individual analyte concentrations and the summation of LPAHs. All LPAHs analytes resulted in detected, undetected, or estimated concentrations below SMS marine dry-weight AET SQS/SCO criteria. The following undetected LPAHs were reported by FBI at the MRL and flagged with a "U" data qualifier:

- 2-methylaphthalene: SED-09 (1 – 3 ft), SED-10 (0 – 1 ft), SED-25 (1 – 3 ft)
- Acenaphthene: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-10 (0 – 10 cm, 0 – 1 ft, 1 – 3 ft), SED-25 (1 – 3 ft), SED-26 (1 – 3 ft)

- Acenaphthylene: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-10 (0 – 1 ft), SED-14 (1 – 3 ft), SED-25 (1 – 3 ft), SED-26 (1 – 3 ft)
- Anthracene: SED-09 (1 – 3 ft), SED-25 (1 – 3 ft)
- Fluorene: SED-10 (0 – 1 ft), SED-25 (1 – 3 ft), SED-26 (1 – 3 ft)
- Naphthalene: SED-09 (1 – 3 ft), SED-10 (0 – 1 ft), SED-25 (1 – 3 ft), SED-26 (1 – 3 ft)

3.2.8 High-Molecular-Weight Polycyclic Aromatic Hydrocarbons (HPAHs)

SMS marine dry-weight AET criteria are evaluated based on both individual analyte concentrations and the summation of LPAHs. All HPAHs analytes were detected at concentrations below SMS marine dry-weight AET SQS/SCO criteria, except for the following undetected samples, which FBI reported at the MRL and flagged with a "U" data qualifier:

- Benz[a]anthracene: SED-09 (1 – 3 ft)
- Benzo[a]pyrene: SED-09 (1 – 3 ft)
- Benzo[g,h,i]perylene: SED-09 (1 – 3 ft)
- Chrysene: SED-09 (1 – 3 ft)
- Dibenzo[a,h]anthracene: SED-09 (1 – 3 ft), SED-10 (0 – 1 ft), SED-14 (1 – 3 ft), SED-25 (1— 3 ft)
- Indeno[1,2,3-c,d]pyrene: SED-09 (1 – 3 ft), SED-25 (1 – 3 ft)
- Total benzofluoranthenes: SED-09 (1 – 3 ft)

3.2.9 Dioxins and Furans

Bioaccumulative chemicals, like dioxins and furans, are totaled and adjusted for the potential carcinogenic effects using a toxicity equivalency factor (TEF). The concentrations of the chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans congeners were multiplied by the TEF to calculate a toxicity equivalency (TEQ), which facilitates comparison to the SMS TEQ practical quantitation limit (PQL), found in Table 3-5.

Dioxin and furan congeners exceeded the TEQ PQL threshold at the following sample locations: SED-08 (0 – 1 ft), SED-09 (0 – 1 ft), SED-10 (0 – 1 ft), SED-11 (0 – 1 ft), and SED-26 (0 – 1 ft).

Dioxins/furans SMS exceedances are confined to surface sediments. No dioxins/furans TEQ concentrations exceeded SMS criteria at the 1 – 3 ft interval at any sampling location where the lab measured dioxins/furans concentrations.

The five (5) surface sample locations where dioxins/furans exceeded SMS criteria are bounded by sample locations SED-07, SED-12, SED-14, SED-25, and SED-27, where dioxins/furans concentrations were all measured below SMS TEQ PQL thresholds.

Figure 3-4 depicts dioxins/furans results compared to SMS criteria.

Undetected dioxin/furan congeners are flagged with a "U" data qualifier and included in TEQ calculations at one-half the EDL. The following individual congener concentrations were undetected:

- 2,3,7,8-Tetrachlorodibenzo-p-dioxin: SED-08 (1 – 3 ft), SED-09 (1 – 3 ft), SED-10 (1 – 3 ft), SED-11 (1 – 3 ft), SED-12 (0 – 1 ft), SED-26 (1 – 3 ft), SED-27 (0 – 1 ft)
- 1,2,3,7,8-Pentachlorodibenzo-p-dioxin: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-10 (1 – 3 ft), SED-12 (0 – 1 ft)
- 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-12 (0 – 1 ft)
- 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin: SED-09 (1 – 3 ft)

- 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin: SED-09 (1 – 3 ft)
- 2,3,7,8-Tetrachlorodibenzofuran: SED-09 (1 – 3 ft), SED-12 (0 – 1 ft), SED-26 (1 – 3 ft)
- 1,2,3,7,8-Pentachlorodibenzofuran: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-10 (1 – 3 ft), SED-11 (1 – 3 ft), SED-12 (0 – 1 ft), SED-26 (1 – 3 ft)
- 2,3,4,7,8-Pentachlorodibenzofuran: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-10 (1 – 3 ft), SED-11 (1 – 3 ft), SED-12 (0 – 1 ft), SED-26 (1 – 3 ft),
- 1,2,3,4,7,8-Hexachlorodibenzofuran: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-12 (0 – 1 ft)
- 1,2,3,6,7,8-Hexachlorodibenzofuran: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-12 (0 – 1 ft)
- 1,2,3,7,8,9-Hexac-1,2,3,7,8,9-Hexachlorodibenzofuran: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-10 (1 – 3 ft), SED-11 (1 – 3 ft), SED-12 (0 – 1 ft), SED-26 (1 – 3 ft), SED-27 (0 – 1 ft)
- 2,3,4,6,7,8-Hexachlorodibenzofuran: SED-09 (1 – 3 ft), SED-12 (0 – 1 ft)
- 1,2,3,4,7,8,9-Heptachlorodibenzofuran: SED-07 (0 – 1 ft), SED-09 (1 – 3 ft), SED-12 (0 – 1 ft)

Method blank detections were flagged with a “B” data qualifier. The following individual congeners were detected in method blanks:

- 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin: SED-07 (0 – 1 ft), SED-08 (0 – 1 ft, 1 – 3 ft), SED-09 (0 – 1 ft), SED-10 (0 – 1 ft, 1 – 3 ft), SED-11 (0 – 1 ft, 1 – 3 ft), SED-12 (0 – 1 ft), SED-14 (0 – 1 ft), SED-25 (0 – 1 ft), SED-26 (0 – 1 ft, 1 – 3 ft), SED-27 (0 – 1 ft)
- 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin: SED-07 (0 – 1 ft), SED-08 (1 – 3 ft), SED-09 (0 – 1 ft, 1 – 3 ft), SED-10 (0 – 1 ft, 1 – 3 ft), SED-11 (0 – 1 ft, 1 – 3 ft), SED-12 (0 – 1 ft), SED-14 (0 – 1 ft), SED-25 (0 – 1 ft), SED-26 (0 – 1 ft, 1 – 3 ft), SED-27 (0 – 1 ft)
- 1,2,3,4,6,7,8-Heptachlorodibenzofuran: SED-07 (0 – 1 ft), SED-08 (1 – 3 ft), SED-14 (0 – 1 ft), SED-26 (1 – 3 ft), SED-27 (0 – 1 ft)
- 1,2,3,4,6,7,8,9-Octachlorodibenzofuran: SED-07 (0 – 1 ft), SED-08 (1 – 3 ft), SED-14 (0 – 1 ft), SED-26 (1 – 3 ft), SED-27 (0 – 1 ft)

3.3 Chemical Analytical Results (OC Normalized) comparison between SMS Marine Criteria

Non-polar organic chemical analytical results from the 2023 sampling event are converted to Organic Carbon (OC) normalized concentrations and compared against SQS marine sediment criteria in Table 3-4. Sample locations depicted in yellow represent exceedances greater than the SMS marine SQS/SCO criteria. Sample locations depicted in red represent exceedances greater than the SMS marine Cleanup Screening Level (CSL) criteria. The summary of detected and non-detected analytes provided with the dry-weight comparison is not affected by OC normalization and will not be re-evaluated. However, data qualifiers for analytes that exceeds SMS criteria are noted below.

3.3.1 Total Organic Carbon

OC normalized concentrations are directly influenced by the Total Organic Carbon (TOC) concentration, represented as percent dry weight. When TOC is outside the range of 0.5 – 3.5%, Ecology may compare to both the OC normalized criteria and the dry-weight AET values. For TOC sediment concentrations below 0.5%, the OC normalized values are likely to exceed the SMS marine benthic criteria. Any exceedances at these sample locations will only be evaluated against the dry-weight criteria.

The following sample locations resulted in concentrations below 0.5%:

- SED-07 (0 – 1 ft): 0.16 % TOC
- SED-25 (0 – 1 ft): 0.49 % TOC
- SED-25 (1 – 3 ft): 0.18 % TOC

- SED-26 (1 – 3 ft): 0.43 % TOC

3.3.2 Organic and Chlorinated Organic Chemicals

Of the fourteen (14) organic and chlorinated organic chemicals tested, Ecology prescribes OC-normalized criteria for seven (7) of these analytes. All organic and chlorinated organic dry weight exceedances resulted in exceedances of OC-normalized criteria. However, most of these exceedances are a result of undetected or estimated concentrations, which were reported at the MRL.

The following analytes were detected at concentrations below SQS criteria:

- 1,4-Dichlorobenzene: SED-01 (0 – 10 cm)
- Dibenzofuran: SED-08 (0 – 1 ft), SED-09 (0 – 1 ft)
- Hexachlorobenzene: SED-09 (0 – 1 ft)

Hexachlorobenzene resulted in estimated (flagged with a "UJ" data qualifier) or undetected (flagged with a "U" data qualifier) concentrations above SMS marine SQS/SCO criteria at the following sample locations:

- SED-01 (0 – 10 cm): estimated concentration (UJ), low bias CCV outlier
- SED-05 (0 – 1 ft): undetected concentration (U)
- SED-10 (0 – 10 cm): estimated concentration (UJ), low bias CCV outlier
- SED-12 (0 – 10 cm): estimated concentration (UJ), low bias CCV outlier

3.3.3 Phthalates

Phthalates were undetected or estimates at all sample locations except SED-3, SED-10, SED-11, SED-12, and SED-26. Undetected results are flagged with a "U" data qualifier, and estimated concentrations are flagged with a "UJ" data qualifier.

The following analytes are detected at concentrations below SMS marine SQS/SCO criteria:

- bis-(2-ethlyhexyl) phthalate: SED-01 (0 – 10 cm), SED-12 (0 – 10 cm)
- butyl benzyl phthalate: SED-11 (1 – 3 ft)
- dimethyl phthalate: SED-26 (0 – 1 ft)

Butyl benzyl phthalate was estimated (low bias CCV outlier, flagged with a "UJ" data qualifier) above SMS marine SQS/SCO criteria at the following locations: SED-12 (0 – 10 cm) and SED-14 (0 – 1 ft).

The following phthalates were undetected (flagged with a "U" data qualifier) at SED-10 (0 – 1 ft) above SMS marine SQS/SCO criteria: di-n-butyl phthalate and di-n-octyl phthalate.

The following phthalates were undetected (flagged with a "U" data qualifier) at SED-10 (0 – 1 ft) above SMS marine CSL criteria: bis-(2-ethlyhexyl) phthalate and dimethyl phthalate.

The following phthalates were estimated (low bias CCV outlier, flagged with a "UJ" data qualifier) at SED-10 (0 – 1 ft) above SMS marine CSL criteria: butyl benzyl phthalate and diethyl phthalate.

3.3.4 Polychlorinated Biphenyl (PCB) Aroclors

Total PCB Aroclors include the summation of Aroclor 1016, 1221, 1232, 1242,1248, 1254, and 1260. At least one PCB Aroclor at all sample locations was undetected. FBI reported undetected PCB Aroclors at the MDL and flagged these data with a "U" data qualifier. Undetected PCB Aroclors are summarized in Section 3.2.6. Undetected PCB Aroclors are included in the Total PCBs summation as one-half the MDL.

OC-normalized Total PCBs exceeded the SMS marine SQS criteria at the following locations: SED-10 (0 – 1 ft) and SED26 (0 – 1 ft)

No exceedances of SMS marine SQS criteria for PCBs are reported below the upper foot of sediment.

Total PCB Aroclors exceedances at SED-10 (0 – 1 ft) and SED-26 (0 – 1 ft) are bounded horizontally at sample locations SED-09, SED-11, SED-14, SED-25, and SED-27, where PCB concentrations in surface sediments are reported below SQS criteria.

3.3.5 Low-Molecular-Weight Polycyclic Aromatic Hydrocarbons (LPAHs)

SMS marine criteria are evaluated based on both individual analyte concentrations and the summation of LPAHs. All individual LPAHs analytes and total LPAHs evaluated on an OC-normalized basis resulted in detected, undetected, or estimated concentrations below SMS marine SQS criteria.

3.3.6 High-Molecular-Weight Polycyclic Aromatic Hydrocarbons (HPAHs)

SMS marine criteria are evaluated based on both individual analyte concentrations and the summation of HPAHs. All individual HPAHs analytes and total HPAHs evaluated on an OC-normalized basis resulted in detected, undetected, or estimated concentrations below SMS marine SQS criteria.

3.4 Biological Toxicity Testing

EcoAnalysts conducted biological toxicity testing on eight (8) surface sediment (0 – 10 cm) grab samples at Jensens and three (3) reference samples collected from Carr Inlet as part of the remedial sediment investigation. A summary of the Bioassay Testing Results Report (EcoAnalysts, 2023) is provided below, and EcoAnalysts' report is provided as Appendix D.

Surface sediments at all locations passed the SCO and CSL criteria for the amphipod test, except at SED-03, which failed the SCO criteria. In consultation with Pete Adolphson at Ecology, the project team evaluated the control performance and larval results and concluded that the amphipod results are anomalous and do not constitute a SCO failure. Sediment passed the SCO and CSL criteria for the juvenile polychaete test at all locations except SED-11, SED-14, and SED-27, which all failed the SCO criteria, but were statistically less than the reference. Sediments passed the SCO and CSL criteria at all locations for larval development. Toxicity testing results are shown in Table 4-3 of the Bioassay Testing Results Report (Appendix D, EcoAnalysts, 2023).

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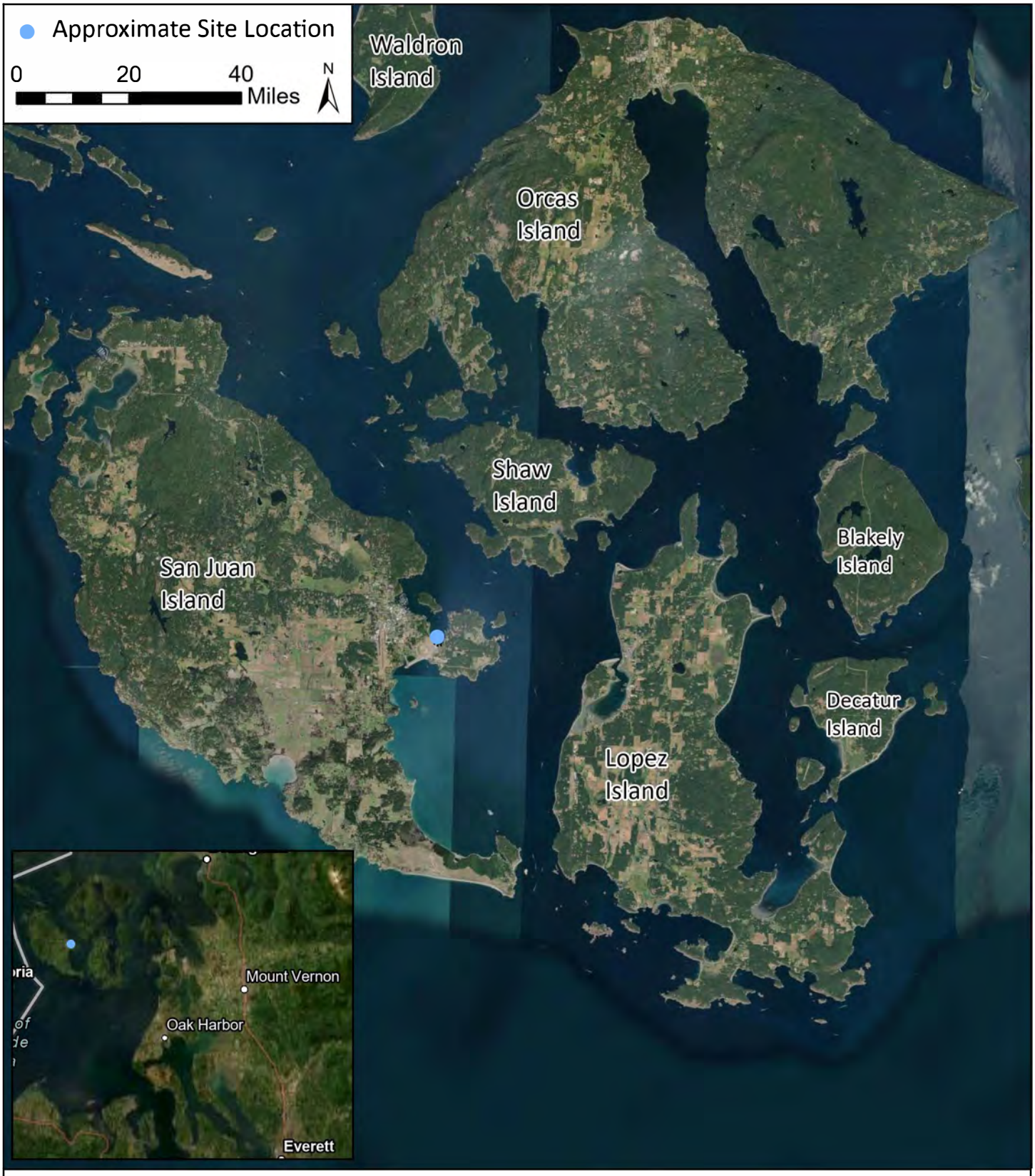
Figures and Tables



Port of Friday Harbor
Jensen and Son's Boatyard and Marina

Remedial Investigation
In-Water Sediment Characterization Report

Figure 1-1. Vicinity Map

Data Sources: ArcGIS Pro (3.5.0), ESRI World Imagery

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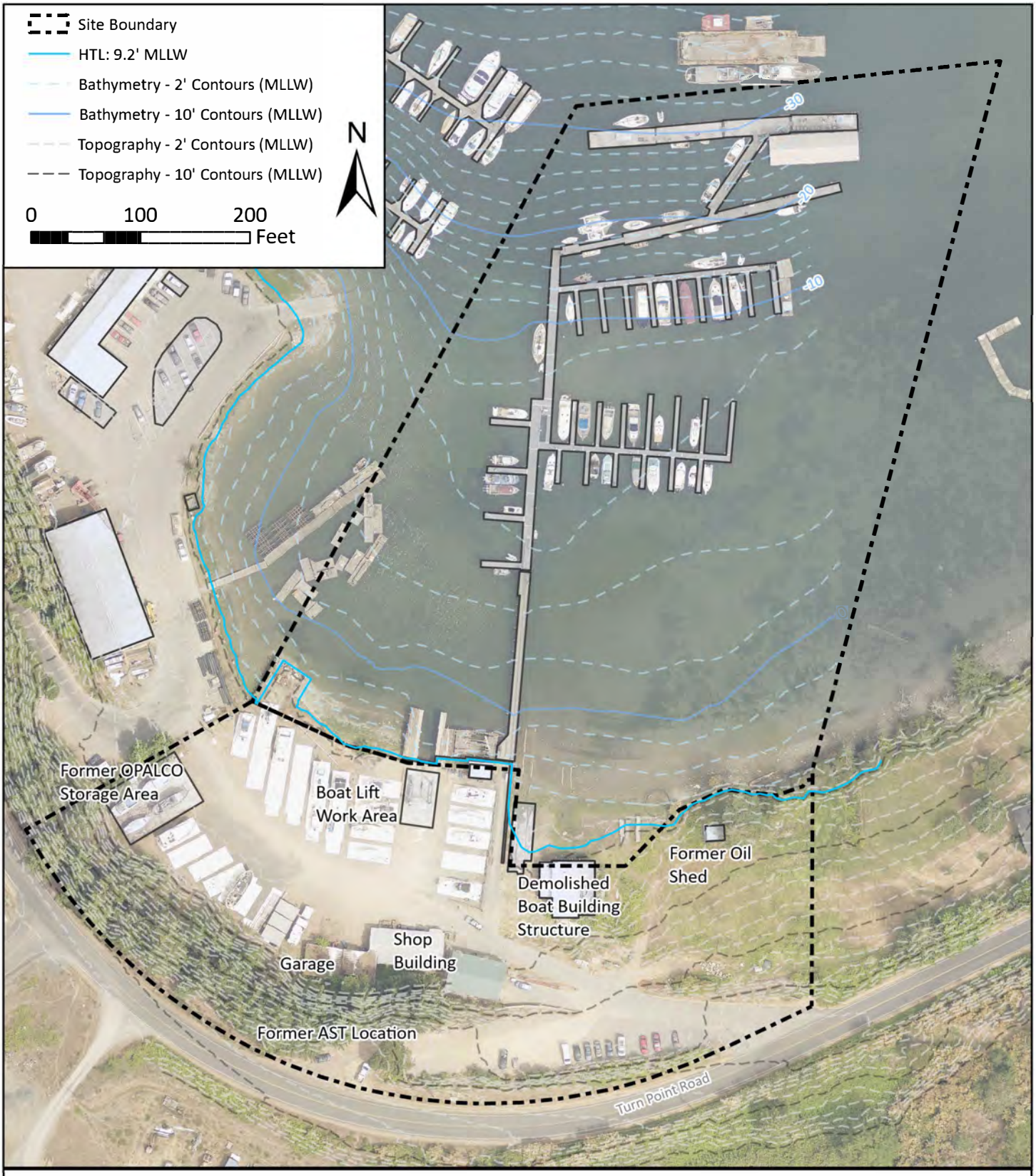
Port of Friday Harbor
Jensen and Son's Boatyard and Marina

Remedial Investigation
In-Water Sediment Characterization Report

Figure 1-2. Site Map

LEON Environmental, LLC

Data Sources: ArcGIS Pro (3.5.0), San Juan County Imagery (2023)



Port of Friday Harbor
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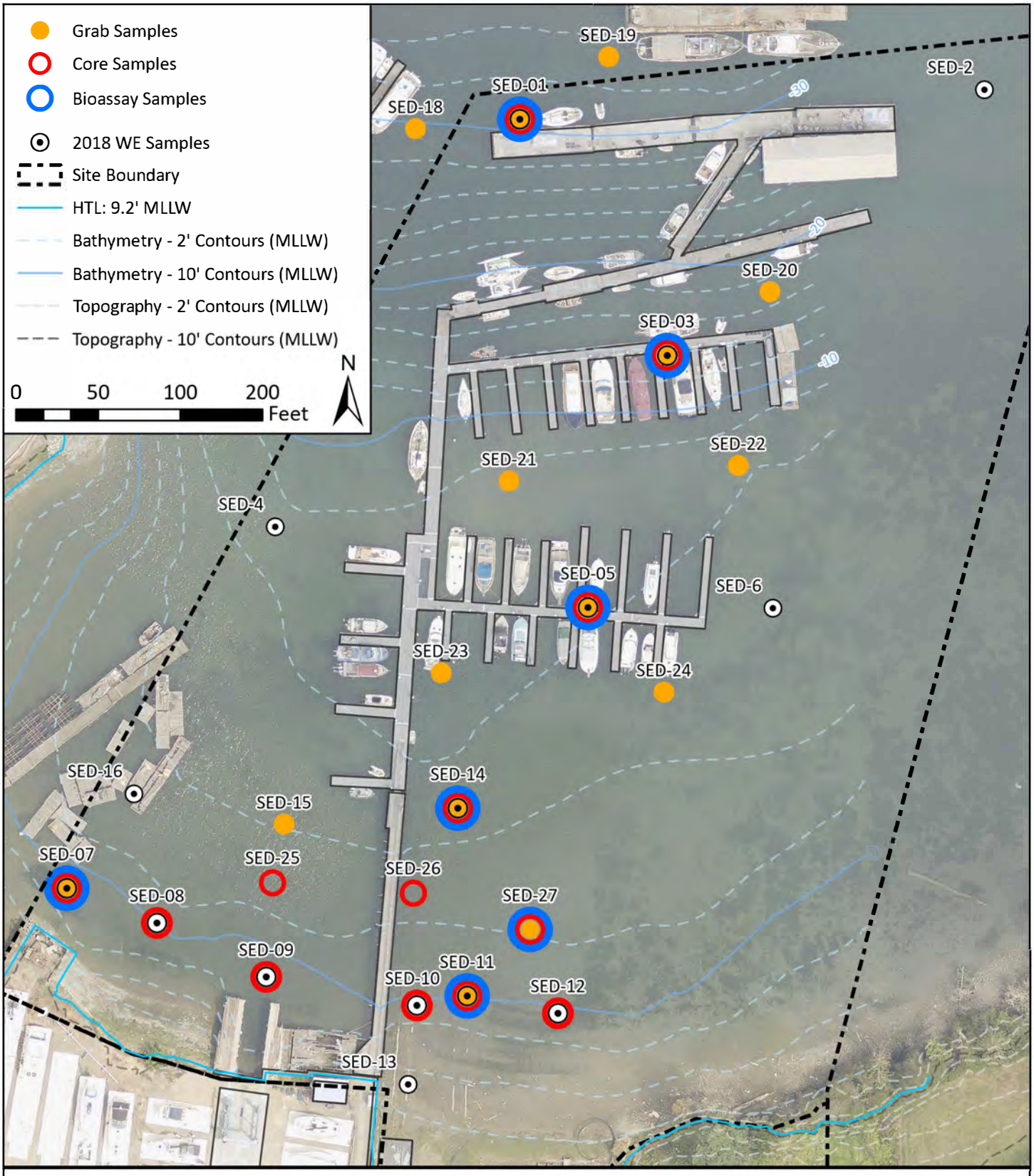
Remedial Investigation
In-Water Sediment Characterization Report

Figure 1-3. Existing Conditions

LEON Environmental, LLC

Data Sources: ArcGIS Pro (3.5.0), San Juan County Imagery (2023)



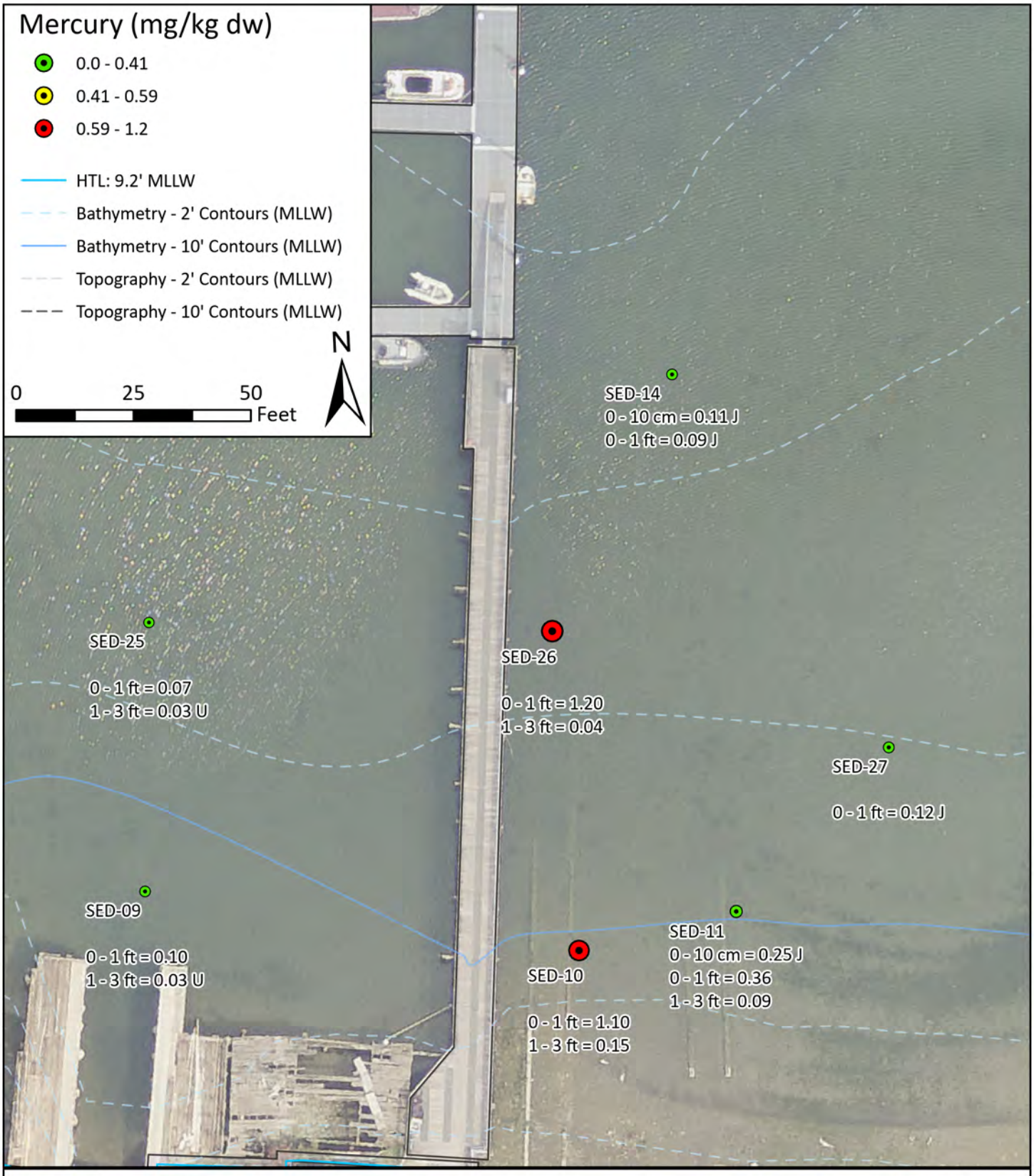
Port of Friday Harbor
Jensen and Son's Boatyard and Marina

Remedial Investigation
In-Water Sediment Characterization Report

Figure 2-1. In-Water Sediment Sample Locations

LEON Environmental, LLC

Data Sources: ArcGIS Pro (3.5.0), San Juan County Imagery (2023)



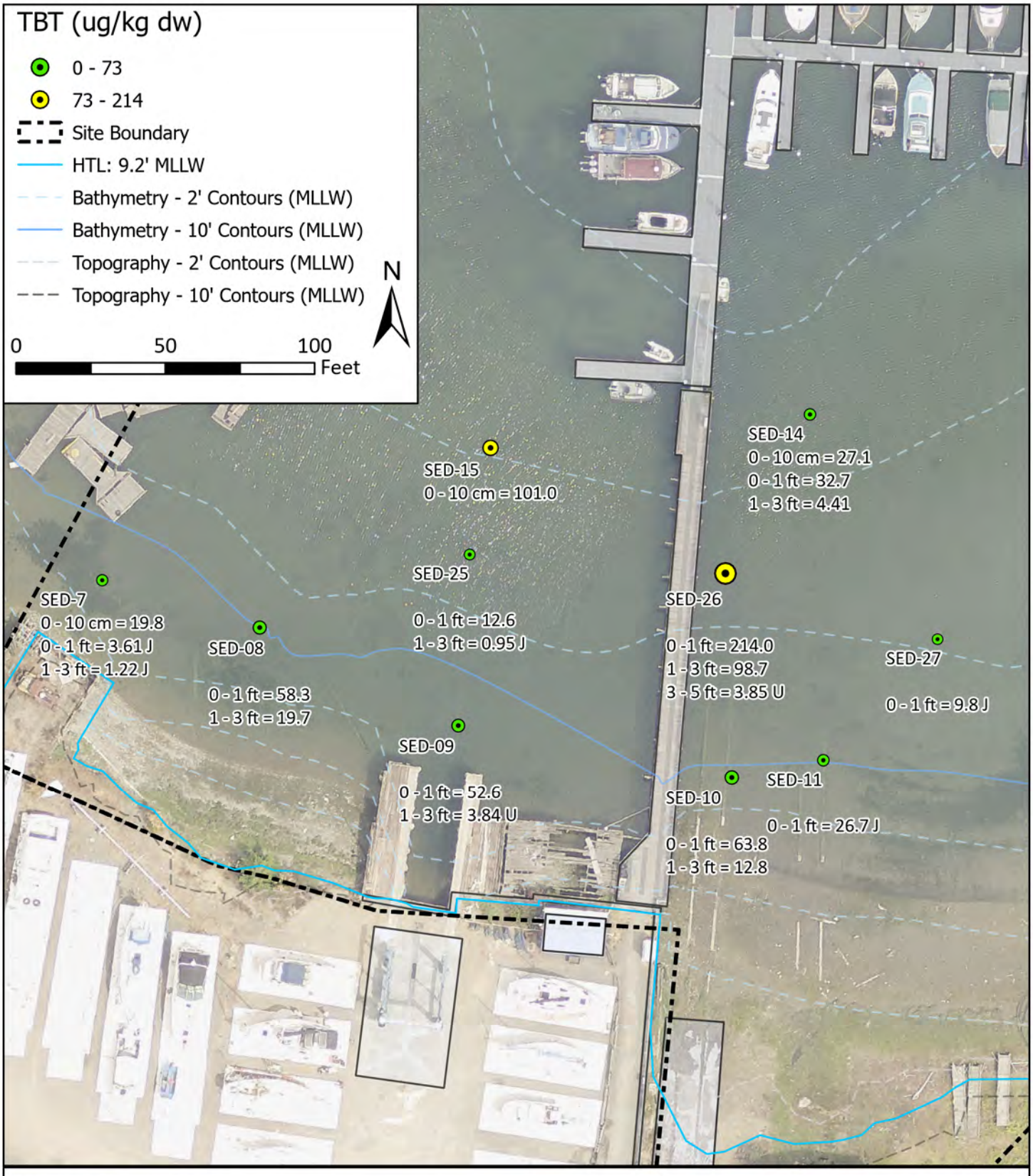
Port of Friday Harbor
Jensen and Son's Boatyard and Marina

Remedial Investigation
In-Water Sediment Characterization Report

Figure 3-1. Mercury (mg/kg dry weight) Results

LEON Environmental, LLC

Data Sources: ArcGIS Pro (3.5.0), San Juan County Imagery (2023)



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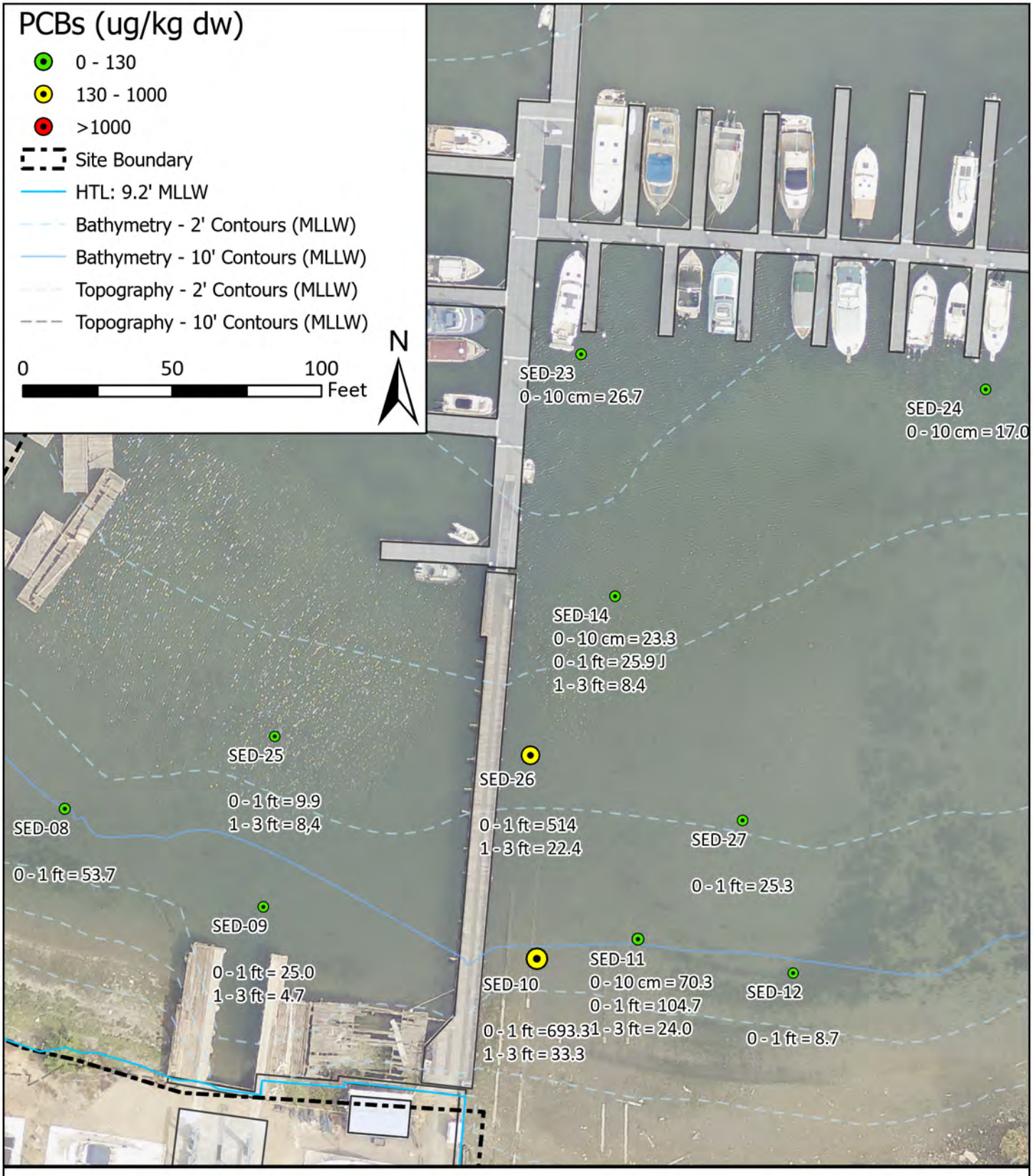
Remedial Investigation
In-Water Sediment Characterization Report

Figure 3-2. Tributyltin (ug/kg dry weight) Results

LEON Environmental, LLC

Data Sources: ArcGIS Pro (3.5.0), San Juan County Imagery (2023)



Port of Friday Harbor
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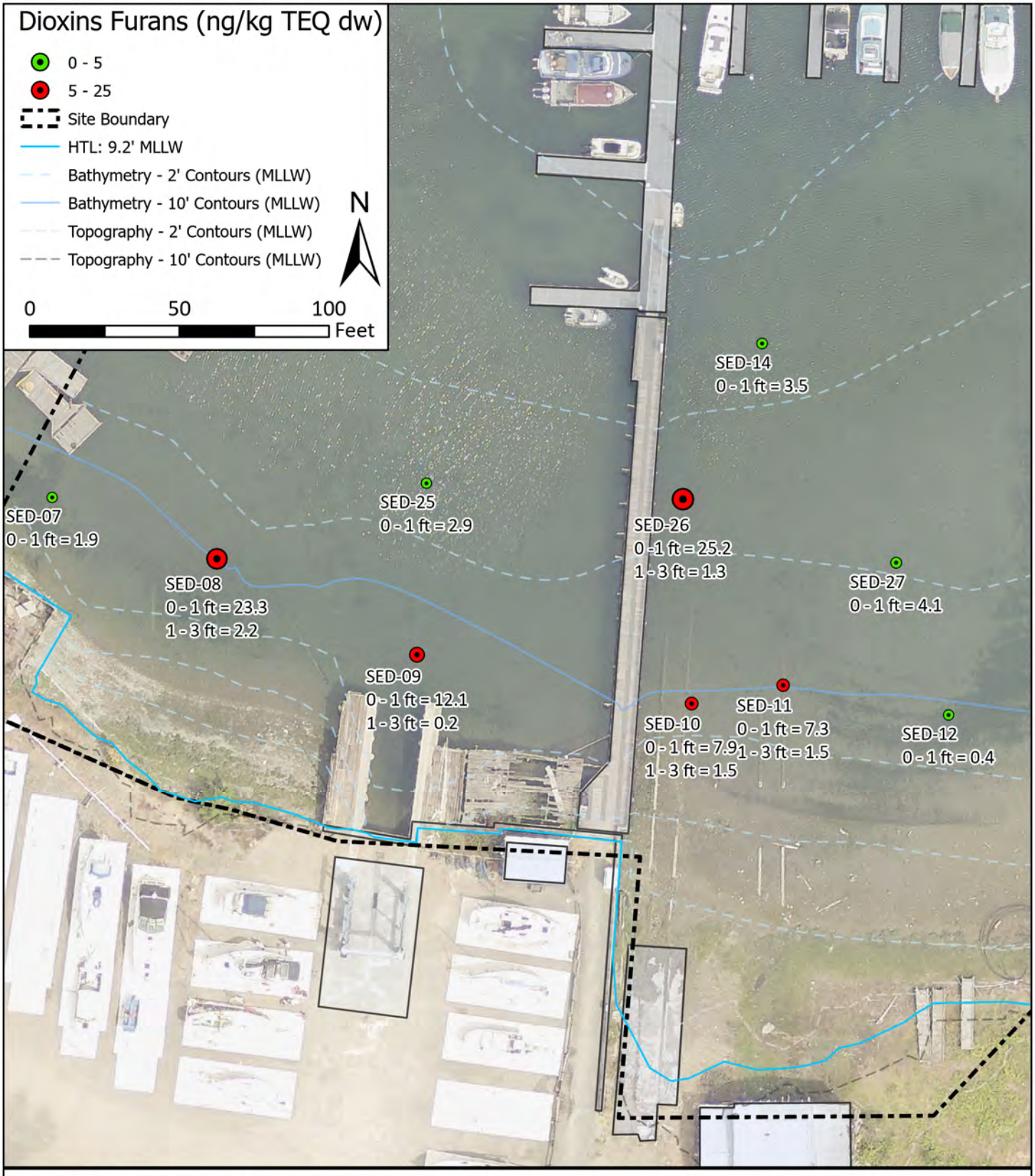
Remedial Investigation
In-Water Sediment Characterization Report

Figure 3-3. Total Polychlorinated Biphenyls (ug/kg dry weight) Results

LEON Environmental, LLC

Data Sources: ArcGIS Pro (3.5.0), San Juan County Imagery (2023)



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Remedial Investigation
In-Water Sediment Characterization Report

Figure 3-4. Dioxins/Furans (ng/kg TEQ dry weight) Results

LEON Environmental, LLC

Data Sources: ArcGIS Pro (3.5.0), San Juan County Imagery (2023)

Table 3 3. 2023 Dry-weight Chemical Analytical Results Compared against SQS Marine Sediment AET criteria

Port of Friday Harbor Sediments	AETs[b,c,d]			SED-1		SED-3		SED-5		SED-7			SED-8		SED-9		SED-10		SED-11			SED-12	SED-14			SED-15	SED-18	SED-19	SED-20	SED-21	SED-22	SED-23	SED-24	SED-25		SED-26			SED-27	SED-27
Dry-weight data summary				SED-01G	SED-01C	SED-03G	SED-03C	SED-05G	SED-05C	SED-07G	SED-07C		SED-08C		SED-09C		SED-10C		SED-11G	SED-11C			SED-14G	SED-14C		SED-15G	SED-18G	SED-19G	SED-20G	SED-21G	SED-22G	SED-23G	SED-24G	SED-25C		SED-26C			SED-27G	SED-27C
Analyte[a]	SCO	CSL	DMMP[e]	0 - 10 cm	0 - 1 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	0 - 1 ft	1 - 3 ft	0 - 1 ft	1 - 3 ft	0 - 1 ft	1 - 3 ft	0 - 1 ft	1 - 3 ft	0 - 10 cm	0 - 1 ft	1 - 3 ft	0 - 1 ft	0 - 10 cm	0 - 1 ft	1 - 3 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 3 ft	0 - 1 ft	1 - 3 ft	3 - 5 ft	0 - 10 cm	0 - 1 ft
Conventionals																																									
Ammonia (mg/Kg)				8.74		4.51		12.00		10.40									13.50				12.70			4.65													5.63	
Total sulfides (mg/Kg)				304.00 J		259.00 J		262.00 J		89.70 J									204.00 J				170.00 J			146.00 J												86.40	
Total Solids (%)				53.25	55.22	45.94	55.48	51.94	54.83	73.61	81.65	77.08	68.94	72.56	67.96	76.50	77.06	82.83	72.27	67.04	73.76	59.79	54.58	68.13	67.96	61.15	55.22	49.60	63.62	44.90	49.09	40.27	43.07	75.95	77.79	60.95	74.64	78.85	64.47	71.93
Total Organic Carbon (% dry)				0.85	0.72	1.39	1.52	1.12	1.00	1.37	0.16	0.85	2.89	0.53	1.40	1.75	0.71	2.07	1.26	1.10	0.69	1.26	1.20	0.74	0.66	1.12	0.93	0.61	0.63	1.33	1.55	1.79	1.61	0.49	0.18	1.47	0.43	0.20 J		0.52 J
Metals	mg/kg dw		N/A																																					
Arsenic	57	93													3.84	2.57	4.60	4.27	4.16	3.70	2.93		4.04	2.65										2.65	2.03	6.99	1.94			
Cadmium	5.1	6.7													0.85	0.56	0.44	0.53	0.86	0.94	0.69		1.88	1.86										1.34	1.34	1.38	1.38			
Chromium	260	270													10.50	8.16	8.92	7.58	10.50	12.10	8.46		16.50	11.80										8.80	6.57	15.00	7.29			
Copper	390	390													47.40	5.27	152.00	24.80	70.90	65.00	17.50		53.20	31.40 J										26.60	8.92	259.00	18.30			
Lead	450	530													10.70	0.84	26.50	15.80	21.60 J	25.70	52.70		16.40 J	14.20 J										8.70	2.90	27.10	3.58			
Mercury	0.41	0.59													0.10	0.03 U	1.10	0.15	0.25 J	0.36	0.09		0.11 J	0.09 J										0.07	0.03 U	1.20	0.04			0.12 J
Nickel															7.59	6.22	8.22	6.47	7.75	7.94	6.39		12.30	9.18										7.01	5.62	10.50	5.47			
Silver	6.1	6.1													1.00 U	1.00 U	1.00	1.00 U	1.00 U	1.00 U	1.00 U		1.00 U	1.00 U										1.00 U	1.00 U	1.00 U	1.00 U			
Zinc	410	960													76.70	13.60	105.00	27.30	102.00	85.20	31.80		64.20	46.00										30.80	16.60	74.20	19.00			
Organometallics	ug/kg dw		ug/kg dw																																					
Monobutyltin										6.31	4.06 U	4.07 U	10.40	4.07 U	7.19	4.06 U	9.46	4.65		7.32			7.58	5.30	4.07 U	6.98								2.13 J	4.07 U	40.60	4.81	1.97 J		4.35
Dibutyltin										15.60	5.75 U	5.76 U	36.40	3.28 J	37.10	5.75 U	56.10	8.36		23.30 J			36.70	22.40 J	2.87 J	36.90								8.47	5.77 U	216.00	20.30	5.77 U		6.84 J
Tributyltin[f]			73							19.80	3.61 J	1.22 J	58.30	19.70	52.60	3.84 U	63.80	12.80		26.70 J			27.10	32.70 J	4.41	101.00								12.60	0.95 J	214.00	98.70	3.85 U		9.84 J
Tetrabutyltin										4.98 U	4.97 U	4.98 U	4.97 U	4.98 U	5.00 U	4.98 U	4.92 U	4.99 U		4.98 U			5.00 U	5.00 U	4.99 U	4.98 U								5.00 U	4.99 U	4.99 U	4.99 U	4.99 U		4.99 U
Organics & Chlorinated Organics	µg/kg dw		N/A																																					
2,4-Dimethylphenol	29	29				29.00 UJ	29.00 UJ	29.00 UJ	29.00 UJ	29.00 UJ	29.00 UJ		29.00 UJ		29.00 UJ	29.00 UJ	580.00 UJ	29.00 UJ	29.00 UJ	29.00 UJ	29.00 UJ		29.00 UJ	29.00 UJ	29.00 UJ									29.00 UJ	29.00 UJ	29.00 UJ	29.00 UJ			
2-Methylphenol	63	63				63.00 UJ	63.00 UJ	63.00 UJ	63.00 UJ	63.00 UJ	63.00 UJ		63.00 UJ		63.00 UJ	63.00 UJ	1300.00 UJ	63.00 UJ	63.00 UJ	63.00 UJ	63.00 UJ		63.00 UJ	63.00 UJ	63.00 UJ									63.00 UJ	63.00 UJ	63.00 UJ	63.00 UJ			
4-Methylphenol[g]	670	670				200.00 U	200.00 U	200.00 U	200.00 U	200.00 U	200.00 U		200.00 U		200.00 U	200.00 U	4000.00 U	200.00 U	200.00 U	200.00 U	200.00 U		200.00 U	200.00 U	200.00 U									200.00 U	200.00 U	200.00 U	200.00 U			
Benzoic acid	650	650				500.00 U	500.00 U	500.00 U	500.00 U	500.00 U	500.00 U		500.00 U		500.00 U	500.00 U	10000.00 UJ	500.00 U	500.00 U	500.00 U	500.00 U		500.00 U	500.00 U	500.00 U									500.00 U	500.00 U	500.00 U	500.00 U			
Benzyl alcohol	57	73				57.00 UJ	57.00 UJ	57.00 UJ	57.00 UJ	57.00 UJ	57.00 UJ		57.00 UJ		57.00 UJ	57.00 UJ	1100.00 UJ	57.00 UJ	57.00 UJ	57.00 UJ	57.00 UJ		57.00 UJ	57.00 UJ	57.00 UJ									57.00 UJ	57.00 UJ	57.00 UJ	57.00 UJ			
Pentachlorophenol	360	690				50.00 U	50.00 U	50.00 U	50.00 U	50.00 U	50.00 U		50.00 U		50.00 U	50.00 U	1000.00 UJ	50.00 U	50.00 U	50.00 U	50.00 U		50.00 U	50.00 U	50.00 U									50.00 U	50.00 U	50.00 U	50.00 U			
Phenol	420	1200				100.00 U	100.00 U	100.00 U	100.00 U	100.00 U	100.00 U		100.00 U		100.00 U	100.00 U	2000.00 UJ	100.00 U	100.00 U	100.00 U	100.00 U		100.00 U	100.00 U	100.00 U									100.00 U	100.00 U	100.00 U	100.00 U			
Organics & Chlorinated Organics	µg/kg dw		N/A																																					
1,2,4-Trichlorobenzene	31	51				4.00 UJ	4.00 UJ	4.00 UJ	4.00 UJ	4.00 UJ	4.00 UJ		4.00 UJ		5.00 UJ	4.00 UJ	200.00 UJ	4.00 UJ	4.00 UJ	4.00 UJ	5.00 UJ		4.00 UJ	4.00 UJ	4.00 UJ									4.00 UJ	4.00 UJ	4.00 UJ	4.00 UJ			
1,2-Dichlorobenzene	35	50				10.00 U	10.00 U	10.00 U	10.00 U	10.00 U	10.00 U		10.00 U		10.00 U	10.00 U	200.00 U	10.00 U	10.00 U	10.00 U	10.00 U		10.00 U	10.00 U	10.00 U									10.00 U	10.00 U	10.00 U	10.00 U			
1,4-Dichlorobenzene	110	110				14.00	10.00 U	10.00 U	10.00 U	10.00 U	10.00 U		10.00 U		10.00 U	10.00 U	200.00 U	10.00 U	10.00 U	10.00 U	10.00 U		10.00 U	10.00 U	10.00 U									10.00 U	10.00 U	10.00 U	10.00 U			
Dibenzofuran	540	540				10.00 U	10.00 U	10.00 U	10.00 U	10.00 U	10.00 U		13.00		11.00	10.00 U	200.00 U	10.00 U	10.00 U	10.00 U	10.00 U		10.00 U	10.00 U	10.00 U									10.00 U	10.00 U	10.00 U	10.00 U			
Hexachlorobenzene	22	70				10.00 UJ	2.10 UJ	2.10 UJ	2.10 UJ	10.00 U	2.10 UJ		2.10 UJ		4.90 J	2.10 UJ	200.00 UJ	2.10 UJ	10.00 UJ	2.10 UJ	2.10 UJ		10.00 UJ	2.10 UJ	2.10 UJ									2.10 UJ	2.10 UJ	2.10 UJ	2.10 UJ			
Hexachlorobutadiene	11	120				10.00 U	10.00 U	10.00 U	10.00 U	10.00 U	10.00 U		10.00 U		10.00 U	10.00 U	200.00 U	10.00 U	10.00 U	10.00 U	10.00 U		10.00 U	10.00 U	10.00 U									10.00 U	10.00 U	10.00 U	10.00 U			
N-nitrosodiphenylamine	28	40				10.00 U	10.00 U	10.00 U	10.00 U	10.00 U	10.00 U		10.00 U		10.00 U	10.00 U	200.00 U	10.00 U	10.00 U	10.00 U	10.00 U		10.00 U	10.00 U	10.00 U									10.00 U	10.00 U	10.00 U	10.00 U			
Phthalates[g]	µg/kg dw		N/A																																					
Bis(2-Ethylhexyl)phthalate	1300	1900				180.00	160.00 U	160.00 U	160.00 U	160.00 U	160.00 U		160.00 U		160.00 U	160.00 U	3200.00 U	160.00 U	160.00 U	160.00 U	160.00 U		260.00	160.00 U	160.00 U									160.00 U	160.00 U	160.00 U	160.00 U			
Butylbenzyl phthalate	63	900				20.00 UJ	20.00 UJ	20.00 UJ	20.00 UJ	20.00 UJ	20.00 UJ		20.00 UJ		20.00 UJ	20.00 UJ	1300.00 UJ	20.00 UJ	20.00 UJ	20.00 UJ	23.00 J		63.00 UJ	63.00 UJ	20.00 UJ									20.00 UJ	20.00 UJ	20.00 UJ	20.00 UJ			
Diethyl phthalate	200	>1,200[f]				100.00 UJ	100.00 UJ	100.00 UJ	100.00 UJ	100.00 UJ	100.00 UJ		100.00 UJ		100.00 UJ	100.00 UJ	2000.00 UJ	100.00 UJ	100.00 UJ	100.00 UJ	100.00 UJ		100.00 UJ	100.00 UJ	100.00 UJ									100.00 UJ	100.00 UJ	100.00 UJ	100.00 UJ			
Dimethyl phthalate	71	160				71.00 UJ	71.00 UJ	71.00 UJ	71.00 UJ	71.00 UJ	71.00 UJ		71.00 UJ		71.00 UJ	71.00 UJ	1400.00 UJ	71.00 UJ	71.00 UJ	71.00 UJ	71.00 UJ		71.00 UJ	71.00 UJ	71.00 UJ									71.00 UJ	71.00 UJ	71.00	71.00 UJ			
Di-n-butyl phthalate	1400	1400				100.00 U	100.00 U	100.00 U	100.00 U	100.00 U	100.00 U		100.00 U		100.00 U	100.00 U	2000.00 UJ	100.00 U	100.00 U	100.00 U	100.00 U		100.00 U	100.00 U	100.00 U									100.00 U	100.00 U	100.00 UJ	100.00 U			
Di-n-octyl phthalate	6200	6200				100.00 U	100.00 U	100.00 U	100.00 U	100.00 U	100.00 U		100.00 U		100.00 U	100.00 U	2000.00 U	100.00 U	100.00 U	100.00 U	100.00 U		100.00 U	100.00 U	100.00 U									100.00 U	100.00 U	100.00 UJ	100.00 U			
Pesticides[g]			µg/kg dw																																					
Aldrin			9.5	1.70 U	1.70 U	1.70 U	1.70 U	1.70 U	1.70 U				1.70 U		1.70 U	1.70 U	1.70 U	1.70 U	1.70 U	1.70 U	1.70 U		1.70 U	1.70 U	1.70 U	17.00 U	1.70 U	3.40 U	3.40 U	1.70 U			1.70 U					
Total Chlordane			2.8	2.20 U	2.20 U	2.20 U	2.20 U	2.20 U	2.20 U				2.20 U		2.20 U	2.20 U	2.20 U	2.20 U	2.20 U	3.00 U	2.20 U		2.20 U	2.20 U	2.20 U	22.00 U	2.20 U	4.40 U	4.40 U	2.20 U			2.20 U					
beta-Hexachlorocyclohexane (beta-BHC)				0.50 UJ	0.50 UJ	0.50 U	0.50 U	0.50 U	0.50 U				0.50 U		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U	0.50 U	5.00 U	0.50 U	1.00 U	1.00 U	0.50 U			0.50 U					
Dieldrin			1.9	1.00 E	1.00 E	1.00 U	1.00 E	1.00	1.00 UJ				1.00 U		1.00 U	1.00 U	1.00 U	1.00 U	12.00 U	1.00 U	1.00 U		1.00 U	1.00 E	1.00 E	10.00 U	1.00 U	2.00 U	2.00 U	1.00 U			1.00 U					
Endrin ketone				1.00 E	1.00 U	1.00 U	5.00 U	1.00 E	1.00 UJ				1.70 U		1.70 U	1.00 U	1.20	1.00 U	1.00 U	1.50 U	1.00 U		1.00 U	1.00 E	1.00 E	10.00 U	1.00 U	2.00 U	2.00 U	1.00 U			3.40 U					
Heptachlor			1.5	0.50 UJ	0.50 UJ	0.50 E	0.50 U	0.50 UJ	0.50 UJ				0.50 U		0.50 U	0.50 U	7.00	0.50 E	0.50 UJ	0.50 E	0.50 E		0.50 E	0.50 UJ	0.50 UJ	5.00 U	0.50 U	1.00 E	5.00 U	0.50 U			0.50 U					
4,4'-DDD			16	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 UJ				1.00 U		1.00 U	1.00 U	1.00 U	1.00 U	2.50 U	5.00 U	1.00 U		1.00 U	1.00 U	1.20	10.00 U	1.00 U	2.00 U	2.00 U	1.00 U			1.00 U		20.00 U			
4,4'-DDE			9	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 UJ				1.00 U		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U		1.00 U	1.00 U	1.00 U	10.00 U	1.00 U	2.00 U	2.00 U	1.00 U			1.00 U		1.00 U			
4,4'-DDT			12	1.00 UJ	1.00 UJ	1.00 E	1.70 UJ	1.00 UJ	1.00 UJ				1.50 UJ		1.00 UJ	1.00 UJ	6.00 UJ	1.00 UJ	3.50 UJ	1.50 UJ	1.00 UJ		1.20 E	1.00 UJ	1.00 UJ	10.00 U	1.00 E	1.00 U	1.00 E	2.00 E			1.00 UJ		20.00 UJ			
PCBs	µg/kg dw		N/A																																					
Total Aroclor[h]	130	1000											53.65 U		24.95 U	4.70 U	693.30 U	33.30 U	70.25 U, J	104.65 U	23.95 U	8.70 U	23.30 U	25.90 U	8.40 U							26.70 U	17.00 U	9.85 U	8.40 U	514.00 U	22.35 U			25.33 U
Polycyclic Aromatic Hydrocarbons	µg/kg dw		N/A																																					
Total PAHs						1380.00	2027.60	1353.50	919.20	1063.30	816.90		5307.00		3188.90	35.60	3101.00	647.60	2961.00	2442.50	688.00		1897.80	1105.50	344.20									2147.50	75.00	3069.30	316.00			
Total LPAH	5200	5200				93.20	107.40	99.50	63.10	66.00	36.90		477.00		1214.90	14.20	477.00	61.80	198.00	212.50	78.10		153.80	123.50	32.50									113.60	14.10	165.30	21.90			
2-Methylnaphthalene	670	670				7.30	8.10	6.10	7.60	3.50	2.40		12.00		16.00	2.00 U	40.00 U	2.80	3.80	7.40	3.60		6.90	4.50	4.50									12.00	2.00 U	9.90	2.10			
Acenaphthene	500	500				4.60	5.10	3.40	2.60	2.50	2.00 U		19.00		15.00	2.00 U	40.00 U	2.00 U	6.90 U	13.00	6.70		5.40	5.10 J	2.70									4.10	2.00 U	8.30	2.00 U			
Acenaphthylene	1300	1300				5.30	6.10	5.00	3.30	2.90	2.00 U		12.00		6.90	2.00 U	40.00 U	3.60	5.50	5.40	3.30		5.10	2.90	2.00 U									7.50	2.00 U	11.00	2.00 U			
Anthracene	960	960				20.00	28.00	17.00	14.00	15.00	7.50		50.00		35.00	2.00 U	67.00	8.10	33.00	45.00	13.00		33.00	18.00	4.50									51.00	2.00 U	28.00	2.90			
Fluorene	540	540				8.30	10.00	7.30	6.50	4.50	2.60		26.00		22.00	2.10	40.00 U	3.80	9.30	13.00	6.70		13.00	7.60 J	3.50									20.00	2.00 U	12.00	2.00 U			
Naphthalene	2100	2100				5.00	6.20	3.80	3.70	2.10	2.80		10.00		36.00	2.00 U	40.00 U	4.30	3.50	6.10	4.40		4.30	2.90	2.80									11.00	2.00 U	15.00	2.00 U			
Phenanthrene	1500	1500				50.00	52.00	63.00	33.00	39.00	20.00		360.00		1100.00	4.10	250.00	40.00	140.00	130.00	44.00		93.00	87.00 J	17.00									220.00	4.10	91.00	11.00			
Total HPAH	12000	17000				1286.80	1920.20	1254.00	856.10	997.30	780.00		4830.00		1974.00	21.40	2624.00	585.80	2763.00	2230.00	609.90		1744.00	982.00	311.70									1833.90	60.90	2904.00	294.10			
Benzo(a)anthracene	1300	1600				87.00	110.00	76.00	59.00	71.00	28.00		250.00		140.00	2.00 U	220.00	50.00	170.00	180.00	48.00		160.00	65.00	15.00									150.00	5.10	160.00	14.00			
Benzo(a)pyrene	1600	1600				120.00	160.00 J	82.00 J	66.00 J	65.00 J	120.00		280.00		140.00	2.00 U	260.00	67.00	180.00 J	220.00	58.00		160.00	73.00	15.00									200.00	4.70	260.00 J	31.00			
Benzo[g,h,i]perylene	670	720				25.00	22.00 J	16.00 J	12.00 J	13.00 J	50.00		48.00		34.00	2.00 U	55.00	18.00	40.00 J	60.00	15.00		46.00	21.00	4.00									40.00	2.00	51.00 J	8.30			
Chrysene	1400	2800				190.00	200.00	160.00	130.00	170.00	70.00		580.00		300.00	2.00 U	300.00	59.00	320.00	270.00	58.00		280.00	130.00	19.00									190.00	6.80	310.00	30.00			
Dibenzo[a,h]anthracene	230	230				8.80	8.20 J	5.00 J	4.10 J	4.30 J	15.00		15.00		13.00	2.00 U	40.00 U	4.80	12.00 J	18.00	3.90		14.00	6.00	14.00 U									8.90	2.00 U	16.00 J	2.80			
Fluoranthene	1700	2500				150.00	210.00	240.00	120.00	210.00	50.00		1400.00		410.00	2.50	540.00	110.00	550.00	360.00	120.00		260.00	220.00	38.00									360.00	11.00	470.00	49.00			
Indeno[1,2,3-c,d]pyrene	600	690				35.00	30.00 J	21.00 J	16.00 J	18.00	59.00 J		67.00		47.00	2.00 U	69.00	21.00	51.00 J	72.00	18.00		54.00	24.00	4.70									46.00	2.00 U	67.00 J	11.00			
Pyrene	2600	3300				350.00	600.00	310.00	200.00	200.00	79.00		1300.00		480.00	2.90	570.00	140.00	520.00	440.00	160.00		290.00	220.00	52.00									450.00	13.00	810.00	71.00			
Total benzofluoranthenes	3200	3600				321.00	580.00 J	344.00 J	249.00 J	246.00 J	309.00		890.00		410.00	4.00 U	570.00	116.00	920.00 J	610.00	129.00		480.00	223.00	150.00									389.00	14.30	760.00 J	77.00			
Dioxins/Furans	ng/kg TEQ dw		N/A																																					
Dioxins/Furans[i,k]	5	5									U,J, 1.85 B		23.29 J,B	U,J, 2.19 B	12.07 J,B	U,J, 0.24 J,J,B	7.94 J,B	U,J, 1.53 B		7.23 J,B	U,J, 1.52 B	U,J, 0.38 B		3.47 J,B									2.86 J,B		25.24 J,B	U,J, 1.34 B			U,J, 4.11 B

(a) All above values are dry weight normalized.
(b) Marine values are dry weight normalized for metals and polar organics and normalized to total organic carbon for nonpolar organics (see seapratе table).
(c) When total organic carbon is outside the range of 0.5 – 3.5%, Ecology may compare to both the TOC normalized criteria and the dry-weight AET values. When total organic carbon values are > 5%, analysis of total volatile solids is recommended.
(d) Dry weight AETs for phthalates are derived from Barrick et.al, 1988. The SCO is established as the lowest AET and the CSL is the 2nd lowest AET, consistent with the dry weight AETs for the other SMS chemicals. Bioassays may be used in place of these AETs if necessary.
(e) DMMP criteria are listed for chemicals that do not have SMS criteria. The DMMP bioaccumulation trigger (BT) criteria is listed for TBT. DMMP SL criteria are listed for pesticides.
(f) "greater than" value indicates that the upper bound toxicity level is unknown, but is known to be above the concentration shown.
(g) 3-methylphenol and 4-methylphenol may not be able to be separated. In this case 4-methylphenol may be reported as the sum of the 3- and 4-methylphenol isomers. See Appendix N for more detail.
(h) Upon approval by Ecology on a case-by-case basis, Total PCB congeners may be used as a direct substitute for Total PCB Aroclors to verify compliance with the CSL benthic criteria (i.e., the sum of Total congeners value can substitute for the sum of Total Aroclors), but not the SCO benthic criteria. If the benthic SCO is exceeded, bioassays should be analyzed.
(i) Chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans congeners, see Dioxins/Furans Tab.

Internal user notes:
Summation w/non-detect values included as one-half MDL or one-half EDL for D/F
Outside Ecology's TOC range (see table note c).
Analytes exceeding DMMP criteria

Table 3-4. Polychlorinated Biphenyl Aroclors Summation

Port of Friday Harbor Sediments		Marine Sediment AETs		SED-08	SED-09		SED-10		SED-11			SED-12	SED-14			SED-23	SED-24	SED-25		SED-26		SED-DUPC	SED-27
PCB Summations				SED-08C:0-1	SED-09C:0-1	SED-09C:1-3	SED-10C:0-1	SED-10C:1-3	SED-11G:0-10	SED-11C: 0-1	SED-11C: 1-3	SED-12C:0-1	SED-14G: 0-10	SED-14C: 0-1	SED-14C:1-3	SED-23G:0-10	SED-24G: 0-10	SED-25C:0-1	SED-25C: 1-3	SED-26C: 0-1	SED-26C: 1-3	DUPC C: 0-1	SED-27C: 0-1
				0 - 1 ft	0 - 1 ft	1 - 3 ft	0 - 1 ft	1 - 3 ft	0 - 10 in	0 - 1 ft	1 - 3 ft	0 - 1 ft	0 - 10 cm	0 - 1 ft	1 - 3 ft	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 3 ft	0 - 1 ft	1 - 3 ft	0 - 1 ft	0 - 1 ft
Analytes	CAS	SQS	SIZmax	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q	Results Q
PCB Aroclors				µg/kg dw (ppb dw)																			
Aroclor 1016	12674-11-2			0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.43 U
Aroclor 1221	11104-28-2			0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.43 U
Aroclor 1232	11141-16-5			0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.43 U
Aroclor 1242	53469-21-9			22.00	0.65 U	0.65 U	0.65 U	14.00	0.65 U	18.00	4.60	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	4.00	0.65 U	0.43 U
Aroclor 1248	12672-29-6			0.70 U	0.65 U	0.70 U	430.00	0.65 U	0.65 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.65 U	0.70 U	0.70 U	0.70 U	0.70 U	0.43 U
Aroclor 1254	11097-69-1			19.00	13.00	0.70 U	260.00	16.00	33.00	48.00	11.00	4.70	13.00	13.00	4.40	15.00	13.00	5.90	4.40	510.00	15.00	14.00	15.00
Aroclor 1260	11096-82-5			10.00	8.70	0.70 U	0.70 U	0.70 U	34.00 J	36.00	5.70	0.70 U	7.00	9.60	0.70 U	8.40	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	9.80	8.20 J
Total PCBs (b)		130	1000	**53.65 U**	**24.95 U**	**4.70 U**	**693.30 U**	**33.30 U**	**70.25 U, J**	**104.65 U**	**23.95 U**	**8.70 U**	**23.30 U**	**25.90 U**	**8.40 U**	**26.70 U**	**17.00 U**	**9.85 U**	**8.40 U**	**514.00 U**	**22.35 U**	**27.10 U**	**25.33 U,J**
Aroclor 1262	37324-23-5			0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.65 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.43 U
Aroclor 1268	11100-14-4			0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.65 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.43 U

Notes:

(a) Where laboratory analysis indicates an individual chemical is not detected in a sediment sample, the method reporting limit shall be reported and shall be at or below the Marine Sediment Quality Standards chemical criteria value set in this table.

(b) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:

(i) Where laboratory analysis indicates a chemical is not detected in an individual compound or isomer then one-half the method dection limit will be reported and used in the total summation.

Not included in summation per SCUM Appendix O

Table 3-5. Dioxin and Furan Toxic Equivalency Summation

Port of Friday Harbor Sediments		SED-7			SED-8				SED-9				SED-10			SED-11				SED-12		SED-14		SED-25		SED-26				SED-27	
Dioxin & Furan Summation		SED-07C:0-1			SED-08C:0-1			SED-08C:1-3			SED-09C:0-1			SED-09C:1-3		SED-10C:0-1			SED-10C:1-3		SED-11C:0-1		SED-11C:1-3		SED-12C:0-1		SED-14C:0-1		SED-25C:0-1		SED-26C:0-1			SED-26C:1-3			SED-27C:0-1	
		0 - 1 ft			0 - 1 ft			1 - 3 ft			0 - 1 ft			1 - 3 ft		0 - 1 ft			1 - 3 ft		0 - 1 ft		1 - 3 ft		0 - 1 ft		0 - 1 ft		0 - 1 ft			1 - 3 ft			0 - 1 ft	
Analyte	TEF	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q	Results	TEQ	Q
Dioxins (ng/Kg)																																							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1	0.57	0.57	J	0.32	0.32	J	0.06	0.06	U	0.24	0.24	J	0.06	0.06	U	0.23	0.23	J	0.04	0.04	U	0.27	0.27	J	0.06	0.06	U	0.05	0.05	U	0.20	0.20	J	0.21	0.21	J	0.51	0.51	J	0.06	0.06	U	0.08	0.08	U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD)	1	0.14	0.14	U	3.29	3.29		0.32	0.32	J	1.30	1.30		0.08	0.08	U	1.44	1.44	J	0.10	0.10	U	1.91	1.91		0.35	0.35	J	0.09	0.09	U	0.72	0.72	J	0.72	0.72	J	4.31	4.31		0.17	0.17	J	0.69	0.69	J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-HxCDD)	0.1	0.13	0.01	U	5.04	0.50		0.29	0.03	J	1.73	0.17		0.06	0.01	U	1.39	0.14		0.26	0.03	J	1.59	0.16		0.31	0.03	J	0.08	0.01	U	0.62	0.06	J	0.62	0.06	J	4.08	0.41		0.20	0.02	J	1.03	0.10	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,6,7,8-HxCDD)	0.1	1.16	0.12		21.50	2.15		1.38	0.14		13.40	1.34		0.06	0.01	U	7.10	0.71		1.83	0.18	J	6.87	0.69		1.42	0.14	J	0.33	0.03	J	3.57	0.36		2.73	0.27		26.10	2.61		1.31	0.13		4.34	0.43	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-HxCDD)	0.1	0.79	0.08	J	8.83	0.88		0.88	0.09	J	4.88	0.49		0.07	0.01	U	3.27	0.33	J	0.77	0.08	J	4.09	0.41		0.76	0.08	J	0.11	0.01	J	1.95	0.20		1.44	0.14		11.00	1.10		0.69	0.07	J	2.92	0.29	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD)	0.01	31.50	0.32	B	1080.00	10.80	B	57.10	0.57	B	556.00	5.56	B	2.31	0.02	UJ	294.00	2.94	B	60.30	0.60	B	206.00	2.06	B	44.40	0.44	B	8.94	0.09	B	95.70	0.96	B	89.00	0.89	B	976.00	9.76	B	44.00	0.44	B	130.00	1.30	B
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (1,2,3,4,6,7,8,9-OCDD)	0.0003	216.00	0.06	B	7300.00	2.19	J	415.00	0.12	B	3810.00	1.14	B	15.00	0.00	B	2470.00	0.74	B	447.00	0.13	B	1470.00	0.44	B	318.00	0.10	B	59.30	0.02	B	761.00	0.23	B	611.00	0.18	B	8660.00	2.60	J	368.00	0.11	B	925.00	0.28	B
Furans (ng/Kg)																																												
2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF)	0.1	0.66	0.07	J	2.85	0.29	J	0.91	0.09	J	0.93	0.09	J	0.09	0.01	U	0.66	0.07	J	0.20	0.02	J	1.42	0.14		0.24	0.02	J	0.09	0.01	U	1.02	0.10	J	0.37	0.04	J	3.10	0.31	J	0.08	0.01	U	0.70	0.07	J
1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF)	0.03	0.15	0.00	U	3.06	0.09	J	0.61	0.02	J	2.10	0.06		0.10	0.00	U	0.48	0.01	J	0.11	0.00	U	1.08	0.03		0.09	0.00	U	0.10	0.00	U	0.55	0.02	J	0.33	0.01	J	2.65	0.08		0.10	0.00	U	0.44	0.01	J
2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8- PeCDF)	0.3	0.15	0.04	U	2.83	0.85		0.94	0.28	J	1.58	0.47	J	0.10	0.03	U	0.60	0.18	J	0.10	0.03	U	0.84	0.25	J	0.09	0.03	U	0.09	0.03	U	0.49	0.15	J	0.15	0.05	J	2.33	0.70		0.11	0.03	U	0.54	0.16	J
1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF)	0.1	0.11	0.01	U	3.98	0.40	J	0.95	0.09	J	2.70	0.27		0.04	0.00	U	1.65	0.17		0.46	0.05	J	1.73	0.17		0.48	0.05	J	0.05	0.00	U	0.98	0.10	J	0.59	0.06	J	4.68	0.47		0.48	0.05	J	1.34	0.13	J
1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8- HxCDF)	0.1	0.11	0.01	U	2.70	0.27	J	0.87	0.09	J	1.59	0.16		0.05	0.00	U	1.07	0.11		0.31	0.03	J	1.36	0.14		0.32	0.03	J	0.05	0.01	U	0.90	0.09	J	0.38	0.04	J	3.45	0.35		0.33	0.03	J	1.13	0.11	
1,2,3,7,8,9-Hexac1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9- HxCDF)	0.1	0.15	0.02	U	1.61	0.16	J	0.48	0.05	J	1.78	0.18		0.06	0.01	U	0.35	0.04	J	0.07	0.01	U	0.46	0.05	J	0.05	0.01	U	0.07	0.01	U	0.27	0.03	J	0.19	0.02	J	1.57	0.16	J	0.15	0.01	U	0.16	0.02	U
2,3,4,6,7,8-Hexachlorodibenzofuran (2,3,4,6,7,8-HxCDF)	0.1	1.01	0.10		4.17	0.42		1.28	0.13		1.94	0.19		0.05	0.00	U	1.59	0.16	J	0.56	0.06	J	1.84	0.18		0.47	0.05	J	0.05	0.01	U	0.71	0.07	J	0.62	0.06	J	5.03	0.50		0.65	0.07	J	1.43	0.14	
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF)	0.01	29.90	0.30	B	60.40	0.60		10.30	0.10	B	36.20	0.36		0.18	0.00	J	56.80	0.57		14.90	0.15		32.60	0.33		11.50	0.12		1.28	0.01		17.50	0.18	B	10.00	0.10		116.00	1.16		12.20	0.12	B	24.90	0.25	B
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-HpCDF)	0.01	0.26	0.00	U	3.22	0.03	J	0.66	0.01	J	1.73	0.02		0.10	0.00	U	2.98	0.03		0.87	0.01	J	1.96	0.02		1.00	0.01	J	0.08	0.00	U	0.92	0.01	J	0.58	0.01	J	5.85	0.06		0.67	0.01	J	1.59	0.02	
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (1,2,3,4,6,7,8,9-OCDF)	0.0003	19.30	0.01	B	147.00	0.04		15.70	0.00	B	61.10	0.02		0.15	0.00	J	297.00	0.09		62.30	0.02		95.30	0.03		40.60	0.01		2.92	0.00		32.60	0.01	B	23.20	0.01		554.00	0.17		28.50	0.01	B	51.00	0.02	B
Total TEQ			**1.85**	**U,J,B**		**23.29**	**J,B**		**2.19**	**U,J,B**		**12.07**	**J,B**		**0.24**	**U,UJ,J,B**		**7.94**	**J,B**		**1.53**	**U,J,B**		**7.27**	**J,B**		**1.52**	**U,J,B**		**0.38**	**U,J,B**		**3.47**	**J,B**		**2.86**	**J,B**		**25.24**	**J,B**		**1.34**	**U,J,B**		**4.11**	**U,J,B**

Notes:

(a) Where laboratory analysis indicates an individual chemical is not detected in a sediment sample, the method reporting limit shall be reported and shall be at or below the Marine Sediment Quality Standards chemical criteria value set in this table.

(b) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:

(i) Where laboratory analysis indicates a chemical is not detected in an individual compound/isomer then one-half the estimated dection limit will be reported and used in the total summation.

Table 3 6. Organic Carbon Normalized Chemical Analytical Results Compared against SQS Marine Sediment criteria

Port of Friday Harbor Sediments	SMS[a,c,d]		SED-3	SED-5		SED-7		SED-8	SED-9		SED-10		SED-11			SED-12	SED-14			SED-15	SED-23	SED-24	SED-25		SED-26		SED-27	SED-27
OC-normalized data summary			SED-03G	SED-05G	SED-05C	SED-07G	SED-07C	SED-08C	SED-09C		SED-10C		SED-11G	SED-11C		SED-12C	SED-14G	SED-14C		SED-15G	SED-23G	SED-24G	SED-25C		SED-26C		SED-27G	SED-27C
Analyte[a]	SCO	CSL	0 - 10 cm	0 - 10 cm	0 - 1 ft	0 - 10 cm	0 - 1 ft	0 - 1 ft	0 - 1 ft	1 - 3 ft	0 - 1 ft	1 - 3 ft	0 - 10 cm	0 - 1 ft	1 - 3 ft	0 - 1 ft	0 - 10 cm	0 - 1 ft	1 - 3 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 3 ft	0 - 1 ft	1 - 3 ft	0 - 10 cm	0 - 1 ft
Conventionals																												
Ammonia (mg/Kg)			4.51	12.00		10.40							13.50				12.70			4.65							5.63	
Total sulfides (mg/Kg)			259.00 J	262.00 J		89.70 J							204.00 J				170.00 J			146.00 J							86.40	
Total Solids (%)			45.94	51.94	54.83	73.61	81.65	68.94	67.96	76.50	77.06	82.83	72.27	67.04	73.76	59.79	54.58	68.13	67.96	61.15	40.27	43.07	75.95	77.79	60.95	74.64		71.93
Total Organic Carbon (% dry)			1.39	1.12	1.00	1.37	0.16	2.89	1.40	1.75	0.71	2.07	1.26	1.10	0.69	1.26	1.20	0.74	0.66	1.12	1.79	1.61	0.49	0.18	1.47	0.43		0.52 J
Organics & Chlorinated Organics	mg/kg OC																											
1,2,4-Trichlorobenzene	0.81	1.8	0.29 UJ	0.36 UJ	0.40 UJ	0.29 UJ	2.50 UJ	0.14 UJ	0.36 UJ	0.23 UJ	28.17 UJ	0.19 UJ	0.32 UJ	0.36 UJ	0.72 UJ		0.33 UJ	0.54 UJ	0.61 U				0.82 UJ	2.22 UJ	0.27 UJ	0.93 UJ		
1,2-Dichlorobenzene	2.3	2.3	0.72 U	0.89 U	1.00 U	0.73 U	6.25 U	0.35 U	0.71 U	0.57 U	28.17 U	0.48 U	0.79 U	0.91 U	1.45 U		0.83 U	1.35 U	1.52 U				2.04 U	5.56 U	0.68 U	2.33 U		
1,4-Dichlorobenzene	3.1	9	1.01	0.89 U	1.00 U	0.73 U	6.25 U	0.35 U	0.71 U	0.57 U	28.17 U	0.48 U	0.79 U	0.91 U	1.45 U		0.83 U	1.35 U	1.52 U				2.04 U	5.56 U	0.68 U	2.33 U		
Dibenzofuran	15	58	0.72 U	0.89 U	1.00 U	0.73 U	6.25 U	0.45	0.79	0.57 U	28.17 U	0.48 U	0.79 U	0.91 U	1.45 U		0.83 U	1.35 U	1.52 J				2.04 U	5.56 U	0.68 U	2.33 U		
Hexachlorobenzene	0.38	2.3	0.72 UJ	0.14 UJ	0.19 UJ	0.21 UJ	0.73 U	1.31 UJ	0.07 UJ	0.35	0.12 UJ	28.17 UJ	0.10 UJ	0.79 UJ	0.19 UJ	0.30 UJ	0.83 UJ	0.28 UJ	0.32 U				0.43 UJ	1.17 UJ	0.14 UJ	0.49 UJ		
Hexachlorobutadiene	3.9	6.2	0.72 U	0.66 U	0.89 U	1.00 U	0.73 U	6.25 U	0.35 U	0.71 U	0.57 U	28.17 U	0.48 U	0.79 U	0.91 U	1.45 U	0.83 U	1.35 U	1.52 U				2.04 U	5.56 U	0.68 U	2.33 U		
N-nitrosodiphenylamine	11	11	0.72 U	0.66 U	0.89 U	1.00 U	0.73 U	6.25 U	0.35 U	0.71 U	0.57 U	28.17 U	0.48 U	0.79 U	0.91 U	1.45 U	0.83 U	1.35 U	1.52 U				2.04 U	5.56 U	0.68 U	2.33 U		
Phthalates[d]	mg/kg OC																											
Bis(2-Ethylhexyl)phthalate	47	78	12.95	10.53 U	14.29 U	16.00 U	11.68 U	100.00 U	5.54 U	11.43 U	9.14 U	450.70 U	7.73 U	12.70 U	14.55 U	23.19 U	21.67	21.62 U	24.24 U				32.65 U	88.89 U	10.88 U	37.21 U		
Butylbenzyl phthalate	4.9	64	1.44 UJ	1.32 UJ	1.79 UJ	2.00 UJ	1.46 UJ	12.50 UJ	0.69 UJ	1.43 UJ	1.14 UJ	183.10 UJ	0.97 UJ	1.59 UJ	1.82 UJ	3.33	5.25 UJ	8.51 UJ	3.03 UJ				4.08 UJ	11.11 UJ	1.36 UJ	4.65 UJ		
Diethyl phthalate	61	110	7.19 UJ	6.58 UJ	8.93 UJ	10.00 UJ	7.30 UJ	62.50 UJ	3.46	7.14 UJ	5.71 UJ	281.69 UJ	4.83 UJ	7.94 UJ	9.09 UJ	14.49 UJ	8.33 UJ	13.51	15.15 UJ				20.41 UJ	55.56 UJ	6.80 UJ	23.26 UJ		
Dimethyl phthalate	53	53	5.11 UJ	4.67 UJ	6.34 UJ	7.10 UJ	5.18 UJ	44.38 U	2.46 U	5.07 U	4.06 U	197.18 U	3.43 U	5.63 UJ	6.45 U	10.29 U	5.92 UJ	9.59 UJ	10.76 UJ				14.49 U	39.44 U	4.83	16.51 U		
Di-n-butyl phthalate	220	1700	7.19 U	6.58 UJ	8.93 UJ	10.00 UJ	7.30 UJ	62.50 U	3.46 UJ	7.14 U	5.71 U	281.69 U	4.83 U	7.94 UJ	9.09 U	14.49 U	8.33 U	13.51 U	15.15 U				20.41 U	55.56 U	6.80 UJ	23.26 U		
Di-n-octyl phthalate	58	4500	7.19 U	6.58 UJ	8.93 UJ	10.00 UJ	7.30 UJ	62.50 U	3.46 U	7.14 U	5.71 U	281.69 U	4.83 U	7.94 UJ	9.09 U	14.49 U	8.33 U	13.51 U	15.15 U				20.41 U	55.56 U	6.80 UJ	23.26 U		
Pesticides																												
PCBs	mg/kg OC																											
Total Aroclors[f]	12	65						1.86 U	1.78 U	0.27 U	97.65 U	1.61 U	5.58 U, J	9.51 U	3.47 U	0.69 U	1.94 U	3.50 U	1.27 U		1.49 U	1.06 U	2.01 U	4.67 U	34.97 U	5.20 U		4.87 U
Polycyclic Aromatic Hydrocarbons	mg/kg OC																											
Total PAHs			99.28	133.39	120.85	91.92	77.61	510.56	183.63	227.78	2.03	436.76	31.29	235.00	222.05	99.71	158.15	149.39	52.15				438.27	41.67	208.80	73.49		
Total LPAH	370	780	6.71	7.07	8.88	6.31	4.82	23.06	16.51	86.78	0.81	67.18	2.99	15.71	19.32	11.32	12.82	16.69	4.92				64.00	7.83	11.24	5.09		
2-Methylnaphthalene	38	64	0.53	0.53	0.54	0.76	0.26	1.50	0.42	1.14	0.11 U	5.63 U	0.14	0.30	0.67	0.52	0.58	0.61	0.68				2.45	1.11 U	0.67	0.49		
Acenaphthene	16	57	0.33	0.34	0.30	0.26	0.18	1.25 U	0.66	1.07	0.11 U	5.63 U	0.10 U	0.55 U	1.18	0.97	0.45	0.69 J	0.41				0.84	1.11 U	0.56	0.47 U		
Acenaphthylene	66	66	0.38	0.40	0.45	0.33	0.21	1.25 U	0.42	0.49	0.11 U	5.63 U	0.17	0.44	0.49	0.48	0.43	0.39	0.30 U				1.53	1.11 U	0.75	0.47 U		
Anthracene	220	1200	1.44	1.84	1.52	1.40	1.09	4.69	1.73	2.50	0.11 U	9.44	0.39	2.62	4.09	1.88	2.75	2.43	0.68				10.41	1.11 U	1.90	0.67		
Fluorene	23	79	0.60	0.66	0.65	0.65	0.33	1.63	0.90	1.57	0.12	5.63 U	0.18	0.72	1.18	0.97	1.08	1.03 J	0.53				4.08	1.11 U	0.82	0.47 U		
Naphthalene	99	170	0.36	0.41	0.34	0.37	0.15	1.75	0.35	2.57	0.11 U	5.63 U	0.21	0.28	0.55	0.64	0.36	0.39	0.42				2.24	1.11 U	1.02	0.47 U		
Phenanthrene	100	480	3.60	3.42	5.63	3.30	2.85	12.50	12.46	78.57	0.23	35.21	1.93	11.11	11.82	6.38	7.75	11.76 J	2.58				44.90	2.28	6.19	2.56		
Total HPAH	960	5300	92.58	126.33	111.96	85.61	72.80	487.50	167.13	141.00	1.22	369.58	28.30	219.29	202.73	88.39	145.33	132.70	47.23				374.27	33.83	197.55	68.40		
Benzo[a]anthracene	110	270	6.26	7.24	6.79	5.90	5.18	17.50	8.65	10.00	0.11 U	30.99	2.42	13.49	16.36	6.96	13.33	8.78	2.27				30.61	2.83	10.88	3.26		
Benzo[a]pyrene	99	210	8.63	10.53 J	7.32 J	6.60 J	4.74 J	75.00	9.69	10.00	0.11 U	36.62	3.24	14.29 J	20.00	8.41	13.33	9.86	2.27				40.82	2.61	17.69 J	7.21		
Benzo[g,h,i]perylene	31	78	1.80	1.45 J	1.43 J	1.20 J	0.95 J	31.25	1.66	2.43	0.11 U	7.75	0.87	3.17 J	5.45	2.17	3.83	2.84	0.61				8.16	1.11	3.47 J	1.93		
Chrysene	110	460	13.67	13.16	14.29	13.00	12.41	43.75	20.07	21.43	0.11 U	42.25	2.85	25.40	24.55	8.41	23.33	17.57	2.88				38.78	3.78	21.09	6.98		
Dibenzo[a,h]anthracene	12	33	0.63	0.54 J	0.45 J	0.41 J	0.31 J	9.38	0.52	0.93	0.11 U	5.63 U	0.23	0.95 J	1.64	0.57	1.17	0.81	2.12 U				1.82	1.11 U	1.09 J	0.65		
Fluoranthene	160	1200	10.79	13.82	21.43	12.00	15.33	31.25	48.44	29.29	0.14	76.06	5.31	43.65	32.73	17.39	21.67	29.73	5.76				73.47	6.11	31.97	11.40		
Indeno[1,2,3-c,d]pyrene	34	88	2.52	1.97 J	1.88 J	1.60 J	1.31	36.88 J	2.32	3.36	0.11 U	9.72	1.01	4.05 J	6.55	2.61	4.50	3.24	0.71				9.39	1.11 U	4.56 J	2.56		
Pyrene	1000	1400	25.18	39.47	27.68	20.00	14.60	49.38	44.98	34.29	0.17	80.28	6.76	41.27	40.00	23.19	24.17	29.73	7.88				91.84	7.22	55.10	16.51		
Total benzofluoranthenes	230	450	23.09	38.16 J	30.71 J	24.90 J	17.96 J	193.13	30.80	29.29	0.23 U	80.28	5.60	73.02 J	55.45	18.70	40.00	30.14	22.73				79.39	7.94	51.70 J	17.91		

(a) Row 25 through Row 38, Row 47, and Row 52 through Row 70 values are organic carbon-normalized and in mg/kg.
(b) Marine values are dry weight normalized for metals and polar organics and normalized to total organic carbon for nonpolar organics.
(c) When total organic carbon is outside the range of 0.5 – 3.5%, Ecology may compare to both the TOC normalized criteria and the dry-weight AET values. When total organic carbon values are > 5%, analysis of total volatile solids is recommended.
(d) Dry weight AETs for phthalates are derived from Barrick et.al, 1988. The SCO is established as the lowest AET and the CSL is the 2nd lowest AET, consistent with the dry weight AETs for the other SMS chemicals. These differ from the DMMP values for phthalates which were updated in 2005, based on additional bioassay endpoints and synoptic chemistry/bioassay data. Bioassays may be used in place of these AETs if necessary.
(e) "greater than" value indicates that the upper bound toxicity level is unknown, but is known to be above theconcentration shown.
(f) Upon approval by Ecology on a case-by-case basis, Total PCB congeners may be used as a direct substitute for Total PCB Aroclors to verify compliance with the CSL benthic criteria (i.e., the sum of Total congeners value can substitute for the sum of Total Aroclors), but not the SCO benthic criteria. If the benthic SCO is exceeded, bioassays should be analyzed.

Internal user notes:
Outside Ecology's TOC range (see table note c).

Data Qualifier Flags

B	This analyte was detected in the method blank.
E	Estimated concentration for an analyte response above the valid calibration range. A dilution is required to obtain an accurate quantitation of the analyte.
J	Estimated concentration value detected below the reporting limit.
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
UJ	Indicates estimated concentrations with low bias Continuing Calibration Verification outlier

Appendix A: Field Forms and Chain of Custody Forms

Appendix B: Friedman and Bruya, Inc and Analytical Resources, Inc Laboratory Reports

Appendix C: EcoChem, Inc *Data Validation Report, Port of Friday Harbor*

Appendix D: EcoAnalysts, Inc *Bioassay Testing Results Report, Port of Friday Harbor Remedial Investigation Friday Harbor, Washington*